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# **AWS Data Wrangler**

***Release 2.15.1***

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# CONTENTS

<b>1</b>	<b>Read The Docs</b>	<b>3</b>
1.1	What is AWS Data Wrangler? . . . . .	3
1.2	Install . . . . .	3
1.3	Tutorials . . . . .	9
1.4	API Reference . . . . .	122
	<b>Index</b>	<b>325</b>



An AWS Professional Service open source initiative | [aws-proserve-opensource@amazon.com](mailto:aws-proserve-opensource@amazon.com)

```
>>> pip install awswrangler
```

```
import awswrangler as wr
import pandas as pd
from datetime import datetime

df = pd.DataFrame({"id": [1, 2], "value": ["foo", "boo"]})

# Storing data on Data Lake
wr.s3.to_parquet(
    df=df,
    path="s3://bucket/dataset/",
    dataset=True,
    database="my_db",
    table="my_table"
)

# Retrieving the data directly from Amazon S3
df = wr.s3.read_parquet("s3://bucket/dataset/", dataset=True)

# Retrieving the data from Amazon Athena
df = wr.athena.read_sql_query("SELECT * FROM my_table", database="my_db")

# Get a Redshift connection from Glue Catalog and retrieving data from Redshift Spectrum
con = wr.redshift.connect("my-glue-connection")
df = wr.redshift.read_sql_query("SELECT * FROM external_schema.my_table", con=con)
con.close()

# Amazon Timestream Write
df = pd.DataFrame({
    "time": [datetime.now(), datetime.now()],
    "my_dimension": ["foo", "boo"],
    "measure": [1.0, 1.1],
})
rejected_records = wr.timestream.write(df,
    database="sampleDB",
    table="sampleTable",
    time_col="time",
    measure_col="measure",
    dimensions_cols=["my_dimension"],
)

# Amazon Timestream Query
wr.timestream.query("""
SELECT time, measure_value::double, my_dimension
FROM "sampleDB"."sampleTable" ORDER BY time DESC LIMIT 3
""")
```



## READ THE DOCS

### 1.1 What is AWS Data Wrangler?

An [AWS Professional Service open source](#) python initiative that extends the power of [Pandas](#) library to AWS connecting **DataFrames** and AWS data related services.

Easy integration with Athena, Glue, Redshift, Timestream, OpenSearch, Neptune, QuickSight, Chime, CloudWatchLogs, DynamoDB, EMR, SecretManager, PostgreSQL, MySQL, SQLServer and S3 (Parquet, CSV, JSON and EXCEL).

Built on top of other open-source projects like [Pandas](#), [Apache Arrow](#) and [Boto3](#), it offers abstracted functions to execute usual ETL tasks like load/unload data from **Data Lakes**, **Data Warehouses** and **Databases**.

Check our [tutorials](#) or the [list of functionalities](#).

### 1.2 Install

**AWS Data Wrangler** runs on Python 3.7, 3.8, 3.9 and 3.10, and on several platforms (AWS Lambda, AWS Glue Python Shell, EMR, EC2, on-premises, Amazon SageMaker, local, etc).

Some good practices to follow for options below are:

- Use new and isolated Virtual Environments for each project ([venv](#)).
- On Notebooks, always restart your kernel after installations.

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**Note:** If you want to use `aws wrangler` to connect to Microsoft SQL Server, some additional configuration is needed. Please have a look at the corresponding section below.

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#### 1.2.1 PyPI (pip)

```
>>> pip install awswrangler
```

## 1.2.2 Conda

```
>>> conda install -c conda-forge awswrangler
```

## 1.2.3 AWS Lambda Layer

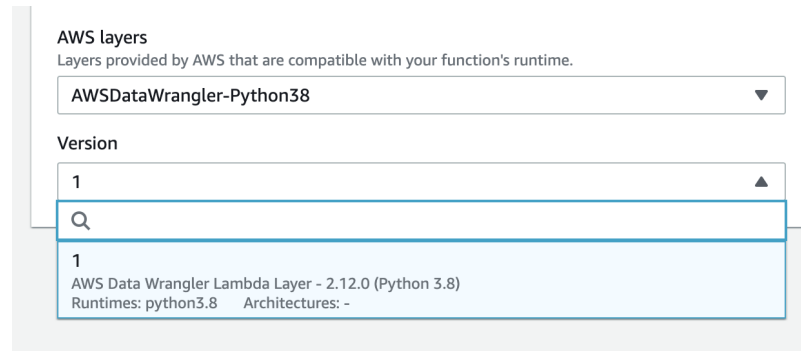
### Managed Layer

**Note:** There is a one week minimum delay between version release and layers being available in the AWS Lambda console.

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AWS Data Wrangler is available as an AWS Lambda Managed layer in all AWS commercial regions.

It can be accessed in the AWS Lambda console directly:



Or via its ARN: `arn:aws:lambda:<region>:336392948345:layer:AWSDataWrangler-Python<python-version>:<layer-version>`.

For example: `arn:aws:lambda:us-east-1:336392948345:layer:AWSDataWrangler-Python37:1`.

The full list of ARNs is available [here](#).

### Custom Layer

You can also create your own Lambda layer with these instructions:

- 1 - Go to [GitHub's release section](#) and download the zipped layer for to the desired version. Alternatively, you can download the zip from the [public artifacts bucket](#).
- 2 - Go to the AWS Lambda console, open the layer section (left side) and click **create layer**.
- 3 - Set name and python version, upload your downloaded zip file and press **create**.
- 4 - Go to your Lambda function and select your new layer!



## Serverless Application Repository (SAR)

Starting version 2.12.0, AWS Data Wrangler layers are also available in the [AWS Serverless Application Repository \(SAR\)](#).

The app deploys the Lambda layer version in your own AWS account and region via a CloudFormation stack. This option provides the ability to use semantic versions (i.e. library version) instead of Lambda layer versions.

Table 1: AWS Data Wrangler Layer Apps

App	ARN	Description
aws-data-wrangler-layer-py3-7	arn:aws:serverlessrepo:us-east-1:336392948345:applications/aws-data-wrangler-layer-py3-7	Layer for Python 3.7.x runtimes
aws-data-wrangler-layer-py3-8	arn:aws:serverlessrepo:us-east-1:336392948345:applications/aws-data-wrangler-layer-py3-8	Layer for Python 3.8.x runtimes
aws-data-wrangler-layer-py3-9	arn:aws:serverlessrepo:us-east-1:336392948345:applications/aws-data-wrangler-layer-py3-9	Layer for Python 3.9.x runtimes

Here is an example of how to create and use the AWS Data Wrangler Lambda layer in your CDK app:

```
from aws_cdk import core, aws_sam as sam, aws_lambda

class DataWranglerApp(core.Construct):
    def __init__(self, scope: core.Construct, id_: str):
        super().__init__(scope, id)

        wrangler_layer = sam.CfnApplication(
            self,
            "wrangler-layer",
            location=sam.CfnApplication.ApplicationLocationProperty(
                application_id="arn:aws:serverlessrepo:us-east-1:336392948345:applications/aws-
↪data-wrangler-layer-py3-8",
                semantic_version="2.15.1", # Get the latest version from https://github.com/
↪aws-labs/aws-data-wrangler/releases
            ),
        )

        wrangler_layer_arn = wrangler_layer.get_att("Outputs.WranglerLayer38Arn").to_string()
        wrangler_layer_version = aws_lambda.LayerVersion.from_layer_version_arn(self,
↪"wrangler-layer-version", wrangler_layer_arn)

        aws_lambda.Function(
            self,
            "wrangler-function",
            runtime=aws_lambda.Runtime.PYTHON_3_8,
            function_name="sample-wrangler-lambda-function",
            code=aws_lambda.Code.from_asset("./src/wrangler-lambda"),
            handler='lambda_function.lambda_handler',
```

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```
layers=[wrangler_layer_version]
)
```

## 1.2.4 AWS Glue Python Shell Jobs

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**Note:** Glue Python Shell runs on Python3.6, for which support was dropped in version 2.15.0 of Wrangler. Please use version 2.14.0 of the library or below.

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1 - Go to [GitHub's release page](#) and download the wheel file (.whl) related to the desired version. Alternatively, you can download the wheel from the [public artifacts bucket](#).

2 - Upload the wheel file to the Amazon S3 location of your choice.

3 - Go to your Glue Python Shell job and point to the S3 wheel file in the *Python library path* field.

[Official Glue Python Shell Reference](#)

## 1.2.5 AWS Glue PySpark Jobs

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**Note:** AWS Data Wrangler has compiled dependencies (C/C++) so support is only available for Glue PySpark Jobs `>= 2.0`.

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Go to your Glue PySpark job and create a new *Job parameters* key/value:

- Key: `--additional-python-modules`
- Value: `pyarrow==2,awswrangler`

To install a specific version, set the value for the above Job parameter as follows:

- Value: `cython==0.29.21,pg8000==1.21.0,pyarrow==2,pandas==1.3.0,awswrangler==2.15.1`

---

**Note:** Pyarrow 3 is not currently supported in Glue PySpark Jobs, which is why an installation of pyarrow 2 is required.

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[Official Glue PySpark Reference](#)

## 1.2.6 Public Artifacts

Lambda zipped layers and Python wheels are stored in a publicly accessible S3 bucket for all versions.

- Bucket: `aws-data-wrangler-public-artifacts`
- Prefix: `releases/<version>/`
  - Lambda layer: `awswrangler-layer-<version>-py<py-version>.zip`
  - Python wheel: `awswrangler-<version>-py3-none-any.whl`

For example: `s3://aws-data-wrangler-public-artifacts/releases/2.15.1/awswrangler-layer-2.15.1-py3.8.zip`

## 1.2.7 Amazon SageMaker Notebook

Run this command in any Python 3 notebook cell and then make sure to **restart the kernel** before importing the **aws wrangler** package.

```
>>> !pip install aws wrangler
```

## 1.2.8 Amazon SageMaker Notebook Lifecycle

Open the AWS SageMaker console, go to the lifecycle section and use the below snippet to configure AWS Data Wrangler for all compatible SageMaker kernels ([Reference](#)).

```
#!/bin/bash

set -e

# OVERVIEW
# This script installs a single pip package in all SageMaker conda environments, apart
# from the JupyterSystemEnv which
# is a system environment reserved for Jupyter.
# Note this may timeout if the package installations in all environments take longer
# than 5 mins, consider using
# "nohup" to run this as a background process in that case.

sudo -u ec2-user -i <<'EOF'

# PARAMETERS
PACKAGE=aws wrangler

# Note that "base" is special environment name, include it there as well.
for env in base /home/ec2-user/anaconda3/envs/*; do
    source /home/ec2-user/anaconda3/bin/activate $(basename "$env")
    if [ $env = 'JupyterSystemEnv' ]; then
        continue
    fi
    nohup pip install --upgrade "$PACKAGE" &
    source /home/ec2-user/anaconda3/bin/deactivate
done
EOF
```

## 1.2.9 EMR Cluster

Despite not being a distributed library, AWS Data Wrangler could be used to complement Big Data pipelines.

- Configure Python 3 as the default interpreter for PySpark on your cluster configuration [ONLY REQUIRED FOR EMR < 6]

```
[
  {
    "Classification": "spark-env",
    "Configurations": [
```

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```
{
  "Classification": "export",
  "Properties": {
    "PYSPARK_PYTHON": "/usr/bin/python3"
  }
}
]
```

- Keep the bootstrap script above on S3 and reference it on your cluster.
  - For EMR Release < 6

```
#!/usr/bin/env bash
set -ex

sudo pip-3.6 install pyarrow==2 awswrangler
```

- For EMR Release >= 6

```
#!/usr/bin/env bash
set -ex

sudo pip install pyarrow==2 awswrangler
```

---

**Note:** Make sure to freeze the library version in the bootstrap for production environments (e.g. `awswrangler==2.15.1`)

---

---

**Note:** Pyarrow 3 is not currently supported in the default EMR image, which is why an installation of pyarrow 2 is required.

---

## 1.2.10 From Source

```
>>> git clone https://github.com/aws-labs/aws-data-wrangler.git
>>> cd aws-data-wrangler
>>> pip install .
```

## 1.2.11 Notes for Microsoft SQL Server

`awswrangler` uses `pyodbc` for interacting with Microsoft SQL Server. To install this package you need the ODBC header files, which can be installed, with the following commands:

```
>>> sudo apt install unixodbc-dev
>>> yum install unixODBC-devel
```

After installing these header files you can either just install `pyodbc` or `awswrangler` with the `sqlserver` extra, which will also install `pyodbc`:

```
>>> pip install pyodbc
>>> pip install awswrangler[sqlserver]
```

Finally you also need the correct ODBC Driver for SQL Server. You can have a look at the [documentation from Microsoft](#) to see how they can be installed in your environment.

If you want to connect to Microsoft SQL Server from AWS Lambda, you can build a separate Layer including the needed ODBC drivers and *pyodbc*.

If you maintain your own environment, you need to take care of the above steps. Because of this limitation usage in combination with Glue jobs is limited and you need to rely on the provided [functionality inside Glue itself](#).

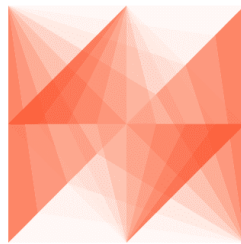
## 1.2.12 Notes for SPARQL support

To be able to use SPARQL either just install SPARQLWrapper or awswrangler with the sparql extra, which will also install SPARQLWrapper:

```
>>> pip install SPARQLWrapper
>>> pip install awswrangler[sparql]
```

## 1.3 Tutorials

**Note:** You can also find all Tutorial Notebooks on [GitHub](#).



## AWS Data Wrangler

### 1.3.1 1 - Introduction

#### What is AWS Data Wrangler?

An [open-source](#) Python package that extends the power of [Pandas](#) library to AWS connecting **DataFrames** and AWS data related services (**Amazon Redshift**, **AWS Glue**, **Amazon Athena**, **Amazon Timestream**, **Amazon EMR**, etc).

Built on top of other open-source projects like [Pandas](#), [Apache Arrow](#) and [Boto3](#), it offers abstracted functions to execute usual ETL tasks like load/unload data from **Data Lakes**, **Data Warehouses** and **Databases**.

Check our [list of functionalities](#).

### How to install?

Wrangler runs almost anywhere over Python 3.7, 3.8, 3.9 and 3.10, so there are several different ways to install it in the desired environment.

- PyPi (pip)
- Conda
- AWS Lambda Layer
- AWS Glue Python Shell Jobs
- AWS Glue PySpark Jobs
- Amazon SageMaker Notebook
- Amazon SageMaker Notebook Lifecycle
- EMR Cluster
- From source

Some good practices for most of the above methods are: - Use new and individual Virtual Environments for each project (`venv`) - On Notebooks, always restart your kernel after installations.

### Let's Install it!

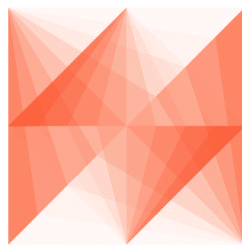
```
[ ]: !pip install awswrangler
```

Restart your kernel after the installation!

```
[1]: import awswrangler as wr
```

```
wr.__version__
```

```
[1]: '2.0.0'
```



## AWS Data Wrangler

## 1.3.2 2 - Sessions

### How Wrangler handle Sessions and AWS credentials?

After version 1.0.0 Wrangler absolutely relies on `Boto3.Session()` to manage AWS credentials and configurations.

Wrangler will not store any kind of state internally. Users are in charge of managing Sessions.

Most Wrangler functions receive the optional `boto3_session` argument. If `None` is received, the default boto3 Session will be used.

```
[1]: import awswrangler as wr
import boto3
```

### Using the default Boto3 Session

```
[2]: wr.s3.does_object_exist("s3://noaa-ghcn-pds/fake")
[2]: False
```

### Customizing and using the default Boto3 Session

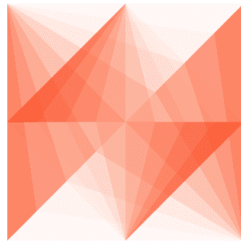
```
[3]: boto3.setup_default_session(region_name="us-east-2")

wr.s3.does_object_exist("s3://noaa-ghcn-pds/fake")
[3]: False
```

### Using a new custom Boto3 Session

```
[4]: my_session = boto3.Session(region_name="us-east-2")

wr.s3.does_object_exist("s3://noaa-ghcn-pds/fake", boto3_session=my_session)
[4]: False
```



**AWS Data Wrangler**

### 1.3.3 3 - Amazon S3

#### Table of Contents

- 1. *CSV files*
  - 1.1 *Writing CSV files*
  - 1.2 *Reading single CSV file*
  - 1.3 *Reading multiple CSV files*
    - \* 1.3.1 *Reading CSV by list*
    - \* 1.3.2 *Reading CSV by prefix*
- 2. *JSON files*
  - 2.1 *Writing JSON files*
  - 2.2 *Reading single JSON file*
  - 2.3 *Reading multiple JSON files*
    - \* 2.3.1 *Reading JSON by list*
    - \* 2.3.2 *Reading JSON by prefix*
- 3. *Parquet files*
  - 3.1 *Writing Parquet files*
  - 3.2 *Reading single Parquet file*
  - 3.3 *Reading multiple Parquet files*
    - \* 3.3.1 *Reading Parquet by list*
    - \* 3.3.2 *Reading Parquet by prefix*
- 4. *Fixed-width formatted files (only read)*
  - 4.1 *Reading single FWF file*
  - 4.2 *Reading multiple FWF files*
    - \* 4.2.1 *Reading FWF by list*
    - \* 4.2.2 *Reading FWF by prefix*
- 5. *Excel files*
  - 5.1 *Writing Excel file*
  - 5.2 *Reading Excel file*
- 6. *Reading with lastModified filter*
  - 6.1 *Define the Date time with UTC Timezone*
  - 6.2 *Define the Date time and specify the Timezone*
  - 6.3 *Read json using the LastModified filters*
- 7. *Download Objects*
  - 7.1 *Download object to a file path*
  - 7.2 *Download object to a file-like object in binary mode*



- 8. Upload Objects
  - 8.1 Upload object from a file path
  - 8.2 Upload object from a file-like object in binary mode
- 9. Delete objects

```
[1]: import awswrangler as wr
import pandas as pd
import boto3
import pytz
from datetime import datetime

df1 = pd.DataFrame({
    "id": [1, 2],
    "name": ["foo", "boo"]
})

df2 = pd.DataFrame({
    "id": [3],
    "name": ["bar"]
})
```

Enter your bucket name:

```
[2]: import getpass
bucket = getpass.getpass()
```

## 1. CSV files

### 1.1 Writing CSV files

```
[3]: path1 = f"s3://{bucket}/csv/file1.csv"
path2 = f"s3://{bucket}/csv/file2.csv"

wr.s3.to_csv(df1, path1, index=False)
wr.s3.to_csv(df2, path2, index=False);
```

### 1.2 Reading single CSV file

```
[4]: wr.s3.read_csv([path1])
```

```
[4]:   id name
0    1  foo
1    2  boo
```

## 1.3 Reading multiple CSV files

### 1.3.1 Reading CSV by list

```
[5]: wr.s3.read_csv([path1, path2])
```

```
[5]:   id name  
0    1  foo  
1    2  boo  
2    3  bar
```

### 1.3.2 Reading CSV by prefix

```
[6]: wr.s3.read_csv(f"s3://{bucket}/csv/")
```

```
[6]:   id name  
0    1  foo  
1    2  boo  
2    3  bar
```

## 2. JSON files

### 2.1 Writing JSON files

```
[7]: path1 = f"s3://{bucket}/json/file1.json"  
path2 = f"s3://{bucket}/json/file2.json"
```

```
wr.s3.to_json(df1, path1)  
wr.s3.to_json(df2, path2)
```

```
[7]: ['s3://woodadw-test/json/file2.json']
```

### 2.2 Reading single JSON file

```
[8]: wr.s3.read_json([path1])
```

```
[8]:   id name  
0    1  foo  
1    2  boo
```

## 2.3 Reading multiple JSON files

### 2.3.1 Reading JSON by list

```
[9]: wr.s3.read_json([path1, path2])
```

```
[9]:      id name
0     1  foo
1     2  boo
0     3  bar
```

### 2.3.2 Reading JSON by prefix

```
[10]: wr.s3.read_json(f"s3://{bucket}/json/")
```

```
[10]:      id name
0     1  foo
1     2  boo
0     3  bar
```

## 3. Parquet files

For more complex features related to Parquet Dataset check the tutorial number 4.

### 3.1 Writing Parquet files

```
[11]: path1 = f"s3://{bucket}/parquet/file1.parquet"
      path2 = f"s3://{bucket}/parquet/file2.parquet"

      wr.s3.to_parquet(df1, path1)
      wr.s3.to_parquet(df2, path2);
```

### 3.2 Reading single Parquet file

```
[12]: wr.s3.read_parquet([path1])
```

```
[12]:      id name
0     1  foo
1     2  boo
```

### 3.3 Reading multiple Parquet files

#### 3.3.1 Reading Parquet by list

```
[13]: wr.s3.read_parquet([path1, path2])
```

```
[13]:   id name
0    1  foo
1    2  boo
2    3  bar
```

#### 3.3.2 Reading Parquet by prefix

```
[14]: wr.s3.read_parquet(f"s3://{bucket}/parquet/")
```

```
[14]:   id name
0    1  foo
1    2  boo
2    3  bar
```

## 4. Fixed-width formatted files (only read)

As of today, Pandas doesn't implement a `to_fwf` functionality, so let's manually write two files:

```
[15]: content = "1  Herfelingen 27-12-18\n"\
               "2    Lambusart 14-06-18\n"\
               "3 Spormaggiore 15-04-18"
boto3.client("s3").put_object(Body=content, Bucket=bucket, Key="fwf/file1.txt")

content = "4    Buizingen 05-09-19\n"\
          "5    San Rafael 04-09-19"
boto3.client("s3").put_object(Body=content, Bucket=bucket, Key="fwf/file2.txt")

path1 = f"s3://{bucket}/fwf/file1.txt"
path2 = f"s3://{bucket}/fwf/file2.txt"
```

### 4.1 Reading single FWF file

```
[16]: wr.s3.read_fwf([path1], names=["id", "name", "date"])
```

```
[16]:   id      name      date
0    1  Herfelingen 27-12-18
1    2    Lambusart 14-06-18
2    3 Spormaggiore 15-04-18
```

## 4.2 Reading multiple FWF files

### 4.2.1 Reading FWF by list

```
[17]: wr.s3.read_fwf([path1, path2], names=["id", "name", "date"])
```

```
[17]:   id      name      date
0    1  Herfelingen  27-12-18
1    2    Lambusart  14-06-18
2    3  Spormaggiore  15-04-18
3    4    Buizingen  05-09-19
4    5    San Rafael  04-09-19
```

### 4.2.2 Reading FWF by prefix

```
[18]: wr.s3.read_fwf(f"s3://{bucket}/fwf/", names=["id", "name", "date"])
```

```
[18]:   id      name      date
0    1  Herfelingen  27-12-18
1    2    Lambusart  14-06-18
2    3  Spormaggiore  15-04-18
3    4    Buizingen  05-09-19
4    5    San Rafael  04-09-19
```

## 5. Excel files

### 5.1 Writing Excel file

```
[19]: path = f"s3://{bucket}/file0.xlsx"

wr.s3.to_excel(df1, path, index=False)
```

```
[19]: 's3://woodadw-test/file0.xlsx'
```

### 5.2 Reading Excel file

```
[20]: wr.s3.read_excel(path)
```

```
[20]:   id name
0    1  foo
1    2  boo
```

## 6. Reading with lastModified filter

Specify the filter by LastModified Date.

The filter needs to be specified as datetime with time zone

Internally the path needs to be listed, after that the filter is applied.

The filter compare the s3 content with the variables lastModified\_begin and lastModified\_end

<https://boto3.amazonaws.com/v1/documentation/api/latest/reference/services/s3.html>

### 6.1 Define the Date time with UTC Timezone

```
[21]: begin = datetime.strptime("20-07-31 20:30", "%y-%m-%d %H:%M")
      end = datetime.strptime("21-07-31 20:30", "%y-%m-%d %H:%M")

      begin_utc = pytz.utc.localize(begin)
      end_utc = pytz.utc.localize(end)
```

### 6.2 Define the Date time and specify the Timezone

```
[22]: begin = datetime.strptime("20-07-31 20:30", "%y-%m-%d %H:%M")
      end = datetime.strptime("21-07-31 20:30", "%y-%m-%d %H:%M")

      timezone = pytz.timezone("America/Los_Angeles")

      begin_Los_Angeles = timezone.localize(begin)
      end_Los_Angeles = timezone.localize(end)
```

### 6.3 Read json using the LastModified filters

```
[23]: wr.s3.read_fwf(f"s3://{bucket}/fwf/", names=["id", "name", "date"], last_modified_
      ↪begin=begin_utc, last_modified_end=end_utc)
      wr.s3.read_json(f"s3://{bucket}/json/", last_modified_begin=begin_utc, last_modified_
      ↪end=end_utc)
      wr.s3.read_csv(f"s3://{bucket}/csv/", last_modified_begin=begin_utc, last_modified_
      ↪end=end_utc)
      wr.s3.read_parquet(f"s3://{bucket}/parquet/", last_modified_begin=begin_utc, last_
      ↪modified_end=end_utc);
```

## 7. Download objects

Objects can be downloaded from S3 using either a path to a local file or a file-like object in binary mode.

### 7.1 Download object to a file path

```
[24]: local_file_dir = getpass.getpass()
```

```
[25]: import os

path1 = f"s3://{bucket}/csv/file1.csv"
local_file = os.path.join(local_file_dir, "file1.csv")
wr.s3.download(path=path1, local_file=local_file)

pd.read_csv(local_file)
```

```
[25]:    id name
0     1  foo
1     2  boo
```

### 7.2 Download object to a file-like object in binary mode

```
[26]: path2 = f"s3://{bucket}/csv/file2.csv"
local_file = os.path.join(local_file_dir, "file2.csv")
with open(local_file, mode="wb") as local_f:
    wr.s3.download(path=path2, local_file=local_f)

pd.read_csv(local_file)
```

```
[26]:    id name
0     3  bar
```

## 8. Upload objects

Objects can be uploaded to S3 using either a path to a local file or a file-like object in binary mode.

### 8.1 Upload object from a file path

```
[27]: local_file = os.path.join(local_file_dir, "file1.csv")
wr.s3.upload(local_file=local_file, path=path1)

wr.s3.read_csv(path1)
```

```
[27]:    id name
0     1  foo
1     2  boo
```

## 8.2 Upload object from a file-like object in binary mode

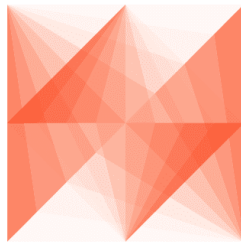
```
[28]: local_file = os.path.join(local_file_dir, "file2.csv")
      with open(local_file, "rb") as local_f:
          wr.s3.upload(local_file=local_f, path=path2)

      wr.s3.read_csv(path2)

[28]:    id name
      0   3  bar
```

## 9. Delete objects

```
[29]: wr.s3.delete_objects(f"s3://{bucket}/")
```



# AWS Data Wrangler

## 1.3.4 4 - Parquet Datasets

Wrangler has 3 different write modes to store Parquet Datasets on Amazon S3.

- **append** (Default)  
Only adds new files without any delete.
- **overwrite**  
Deletes everything in the target directory and then add new files.
- **overwrite\_partitions** (Partition Upsert)  
Only deletes the paths of partitions that should be updated and then writes the new partitions files. It's like a "partition Upsert".

```
[1]: from datetime import date
      import awswrangler as wr
      import pandas as pd
```



Enter your bucket name:

```
[2]: import getpass
      bucket = getpass.getpass()
      path = f"s3://{bucket}/dataset/"
      .....
```

### Creating the Dataset

```
[3]: df = pd.DataFrame({
      "id": [1, 2],
      "value": ["foo", "boo"],
      "date": [date(2020, 1, 1), date(2020, 1, 2)]
    })

      wr.s3.to_parquet(
        df=df,
        path=path,
        dataset=True,
        mode="overwrite"
      )

      wr.s3.read_parquet(path, dataset=True)
```

```
[3]:   id value      date
0    1  foo  2020-01-01
1    2  boo  2020-01-02
```

### Appending

```
[4]: df = pd.DataFrame({
      "id": [3],
      "value": ["bar"],
      "date": [date(2020, 1, 3)]
    })

      wr.s3.to_parquet(
        df=df,
        path=path,
        dataset=True,
        mode="append"
      )

      wr.s3.read_parquet(path, dataset=True)
```

```
[4]:   id value      date
0    3  bar  2020-01-03
1    1  foo  2020-01-01
2    2  boo  2020-01-02
```

## Overwriting

```
[5]: wr.s3.to_parquet(  
      df=df,  
      path=path,  
      dataset=True,  
      mode="overwrite"  
    )  
  
wr.s3.read_parquet(path, dataset=True)
```

```
[5]:   id value      date  
0    3   bar 2020-01-03
```

## Creating a Partitioned Dataset

```
[6]: df = pd.DataFrame({  
      "id": [1, 2],  
      "value": ["foo", "boo"],  
      "date": [date(2020, 1, 1), date(2020, 1, 2)]  
    })  
  
wr.s3.to_parquet(  
    df=df,  
    path=path,  
    dataset=True,  
    mode="overwrite",  
    partition_cols=["date"]  
  )  
  
wr.s3.read_parquet(path, dataset=True)
```

```
[6]:   id value      date  
0    1   foo 2020-01-01  
1    2   boo 2020-01-02
```

## Upserting partitions (overwrite\_partitions)

```
[7]: df = pd.DataFrame({  
      "id": [2, 3],  
      "value": ["xoo", "bar"],  
      "date": [date(2020, 1, 2), date(2020, 1, 3)]  
    })  
  
wr.s3.to_parquet(  
    df=df,  
    path=path,  
    dataset=True,  
    mode="overwrite_partitions",  
    partition_cols=["date"]  
  )
```

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```
wr.s3.read_parquet(path, dataset=True)
```

```
[7]:
```

	id	value	date
0	1	foo	2020-01-01
1	2	xoo	2020-01-02
2	3	bar	2020-01-03

### BONUS - Glue/Athena integration

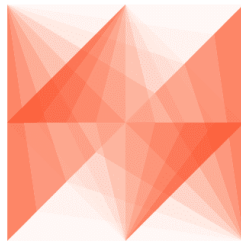
```
[8]: df = pd.DataFrame({
      "id": [1, 2],
      "value": ["foo", "boo"],
      "date": [date(2020, 1, 1), date(2020, 1, 2)]
    })

wr.s3.to_parquet(
    df=df,
    path=path,
    dataset=True,
    mode="overwrite",
    database="aws_data_wrangler",
    table="my_table"
)

wr.athena.read_sql_query("SELECT * FROM my_table", database="aws_data_wrangler")
```

```
[8]:
```

	id	value	date
0	1	foo	2020-01-01
1	2	boo	2020-01-02



**AWS Data Wrangler**

### 1.3.5 5 - Glue Catalog

Wrangler makes heavy use of [Glue Catalog](#) to store metadata of tables and connections.

```
[1]: import awswrangler as wr
import pandas as pd
```

Enter your bucket name:

```
[2]: import getpass
bucket = getpass.getpass()
path = f"s3://{bucket}/data/"

.....
```

#### Creating a Pandas DataFrame

```
[3]: df = pd.DataFrame({
    "id": [1, 2, 3],
    "name": ["shoes", "tshirt", "ball"],
    "price": [50.3, 10.5, 20.0],
    "in_stock": [True, True, False]
})
df
```

```
[3]:   id  name  price  in_stock
0    1  shoes   50.3      True
1    2 tshirt   10.5      True
2    3   ball   20.0     False
```

#### Checking Glue Catalog Databases

```
[4]: databases = wr.catalog.databases()
print(databases)
```

	Database	Description
0	aws_data_wrangler	AWS Data Wrangler Test Arena - Glue Database
1	default	Default Hive database

#### Create the database `awswrangler_test` if not exists

```
[5]: if "awswrangler_test" not in databases.values:
    wr.catalog.create_database("awswrangler_test")
    print(wr.catalog.databases())
else:
    print("Database awswrangler_test already exists")
```

	Database	Description
0	aws_data_wrangler	AWS Data Wrangler Test Arena - Glue Database
1	awswrangler_test	
2	default	Default Hive database

### Checking the empty database

```
[6]: wr.catalog.tables(database="awswrangler_test")
```

```
[6]: Empty DataFrame
Columns: [Database, Table, Description, Columns, Partitions]
Index: []
```

### Writing DataFrames to Data Lake (S3 + Parquet + Glue Catalog)

```
[7]: desc = "This is my product table."

param = {
    "source": "Product Web Service",
    "class": "e-commerce"
}

comments = {
    "id": "Unique product ID.",
    "name": "Product name",
    "price": "Product price (dollar)",
    "in_stock": "Is this product available in the stock?"
}

res = wr.s3.to_parquet(
    df=df,
    path=f"s3://{bucket}/products/",
    dataset=True,
    database="awswrangler_test",
    table="products",
    mode="overwrite",
    description=desc,
    parameters=param,
    columns_comments=comments
)
```

## Checking Glue Catalog (AWS Console)

Tables > products

Last updated 18 Sep 2020 Table Version (Current version) ▾

[Edit table](#) [Delete table](#) [View properties](#) [Compare versions](#) [Edit schema](#)

Name	products
Description	This is my product table.
Database	awswrangler_test
Classification	parquet
Location	s3://igor-tavares/products/
Connection	
Deprecated	No
Last updated	Fri Sep 18 19:03:00 GMT-300 2020
Input format	org.apache.hadoop.hive.q1.io.parquet.MapredParquetInputFormat
Output format	org.apache.hadoop.hive.q1.io.parquet.MapredParquetOutputFormat
Serde serialization lib	org.apache.hadoop.hive.q1.io.parquet.serde.ParquetHiveSerDe
Serde parameters	serialization.format 1

Table properties

compressionType	snappy	source	Product Web Service	projection.enabled	false	class	e-commerce	typeOfData	file
-----------------	--------	--------	---------------------	--------------------	-------	-------	------------	------------	------

Schema

Column name	Data type	Partition key	Comment
1 id	bigint		Unique product ID.
2 name	string		Product name
3 price	double		Product price (dollar)
4 in_stock	boolean		Is this product available in the stock?

Showing: 1 - 4 of 4 < >

## Looking Up for the new table!

```
[8]: wr.catalog.tables(name_contains="rodudc")
```

```
[8]:      Database      Table      Description \
0 awswrangler_test  products  This is my product table.

      Columns Partitions
0 id, name, price, in_stock
```

```
[9]: wr.catalog.tables(name_prefix="pro")
```

```
[9]:      Database      Table      Description \
0 awswrangler_test  products  This is my product table.

      Columns Partitions
0 id, name, price, in_stock
```

```
[10]: wr.catalog.tables(name_suffix="ts")
```

```
[10]:      Database      Table      Description \
0 awswrangler_test  products  This is my product table.

      Columns Partitions
0 id, name, price, in_stock
```

```
[11]: wr.catalog.tables(search_text="This is my")
```

```
[11]:      Database      Table      Description \
0 awswrangler_test  products  This is my product table.
```

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	Columns	Partitions
0	id, name, price, in_stock	

### Getting tables details

```
[12]: wr.catalog.table(database="awswrangler_test", table="products")
```

```
[12]:
```

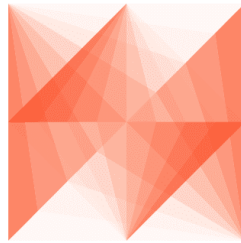
	Column Name	Type	Partition	Comment
0	id	bigint	False	Unique product ID.
1	name	string	False	Product name
2	price	double	False	Product price (dollar)
3	in_stock	boolean	False	Is this product available in the stock?

### Cleaning Up the Database

```
[13]: for table in wr.catalog.get_tables(database="awswrangler_test"):
      wr.catalog.delete_table_if_exists(database="awswrangler_test", table=table["Name"])
```

### Delete Database

```
[14]: wr.catalog.delete_database('awswrangler_test')
```



## AWS Data Wrangler

### 1.3.6 6 - Amazon Athena

Wrangler has three ways to run queries on Athena and fetch the result as a DataFrame:

- **ctas\_approach=True** (Default)

Wraps the query with a CTAS and then reads the table data as parquet directly from s3.

– PROS:

- \* Faster for mid and big result sizes.
- \* Can handle some level of nested types.

– CONS:

- \* Requires create/delete table permissions on Glue.
- \* Does not support timestamp with time zone
- \* Does not support columns with repeated names.
- \* Does not support columns with undefined data types.
- \* A temporary table will be created and then deleted immediately.
- \* Does not support custom data\_source/catalog\_id.

- **unload\_approach=True and ctas\_approach=False**

Does an UNLOAD query on Athena and parse the Parquet result on s3.

- PROS:

- \* Faster for mid and big result sizes.
    - \* Can handle some level of nested types.
    - \* Does not modify Glue Data Catalog.

- CONS:

- \* Output S3 path must be empty.
    - \* Does not support timestamp with time zone
    - \* Does not support columns with repeated names.
    - \* Does not support columns with undefined data types.
    - \* Does not support custom data\_source/catalog\_id.

- **ctas\_approach=False**

Does a regular query on Athena and parse the regular CSV result on s3.

- PROS:

- \* Faster for small result sizes (less latency).
    - \* Does not require create/delete table permissions on Glue
    - \* Supports timestamp with time zone.
    - \* Support custom data\_source/catalog\_id.

- CONS:

- \* Slower (But stills faster than other libraries that uses the regular Athena API)
    - \* Does not handle nested types at all.

```
[1]: import awswrangler as wr
```



Enter your bucket name:

```
[2]: import getpass
      # bucket = getpass.getpass()
      bucket = "antonkuk-us-east-1"
      path = f"s3://{bucket}/data/"
```

### Checking/Creating Glue Catalog Databases

```
[3]: if "awswrangler_test" not in wr.catalog.databases().values:
      wr.catalog.create_database("awswrangler_test")
```

### Creating a Parquet Table from the NOAA's CSV files

Reference

```
[ ]: cols = ["id", "dt", "element", "value", "m_flag", "q_flag", "s_flag", "obs_time"]

      df = wr.s3.read_csv(
          path="s3://noaa-ghcn-pds/csv/189",
          names=cols,
          parse_dates=["dt", "obs_time"]) # Read 10 files from the 1890 decade (~1GB)
```

df

```
[ ]: wr.s3.to_parquet(
      df=df,
      path=path,
      dataset=True,
      mode="overwrite",
      database="awswrangler_test",
      table="noaa"
    );
```

```
[ ]: wr.catalog.table(database="awswrangler_test", table="noaa")
```

### Reading with ctas\_approach=False

```
[ ]: %%time

      wr.athena.read_sql_query("SELECT * FROM noaa", database="awswrangler_test", ctas_
      ↪ approach=False)
```

### Default with ctas\_approach=True - 13x faster (default)

```
[ ]: %%time

wr.athena.read_sql_query("SELECT * FROM noaa", database="aws wrangler_test")
```

### Using categories to speed up and save memory - 24x faster

```
[ ]: %%time

wr.athena.read_sql_query("SELECT * FROM noaa", database="aws wrangler_test", categories=[
    ↪ "id", "dt", "element", "value", "m_flag", "q_flag", "s_flag", "obs_time"])
```

### Reading with unload\_approach=True

```
[ ]: %%time

wr.athena.read_sql_query("SELECT * FROM noaa", database="aws wrangler_test", ctas_
    ↪ approach=False, unload_approach=True, s3_output=f"s3://{bucket}/unload/")
```

### Batching (Good for restricted memory environments)

```
[ ]: %%time

dfs = wr.athena.read_sql_query(
    "SELECT * FROM noaa",
    database="aws wrangler_test",
    chunksize=True # Chunksize calculated automatically for ctas_approach.
)

for df in dfs: # Batching
    print(len(df.index))
```

```
[ ]: %%time

dfs = wr.athena.read_sql_query(
    "SELECT * FROM noaa",
    database="aws wrangler_test",
    chunksize=100_000_000
)

for df in dfs: # Batching
    print(len(df.index))
```

### Cleaning Up S3

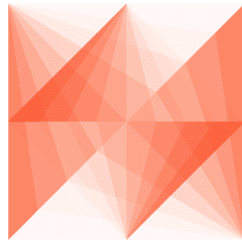
```
[ ]: wr.s3.delete_objects(path)
```

### Delete table

```
[ ]: wr.catalog.delete_table_if_exists(database="awswrangler_test", table="noaa");
```

### Delete Database

```
[ ]: wr.catalog.delete_database('awswrangler_test')
```



**AWS Data Wrangler**

## 1.3.7 7 - Redshift, MySQL, PostgreSQL and SQL Server

Wrangler's Redshift, MySQL and PostgreSQL have two basic function in common that tries to follow the Pandas conventions, but add more data type consistency.

- `wr.redshift.to_sql()`
- `wr.redshift.read_sql_query()`
- `wr.mysql.to_sql()`
- `wr.mysql.read_sql_query()`
- `wr.postgresql.to_sql()`
- `wr.postgresql.read_sql_query()`
- `wr.sqlserver.to_sql()`
- `wr.sqlserver.read_sql_query()`

```
[1]: import awswrangler as wr
import pandas as pd

df = pd.DataFrame({
    "id": [1, 2],
    "name": ["foo", "boo"]
})
```

## Connect using the Glue Catalog Connections

- `wr.redshift.connect()`
- `wr.mysql.connect()`
- `wr.postgresql.connect()`
- `wr.sqlserver.connect()`

```
[2]: con_redshift = wr.redshift.connect("aws-data-wrangler-redshift")
con_mysql = wr.mysql.connect("aws-data-wrangler-mysql")
con_postgresql = wr.postgresql.connect("aws-data-wrangler-postgresql")
con_sqlserver = wr.sqlserver.connect("aws-data-wrangler-sqlserver")
```

## Raw SQL queries (No Pandas)

```
[3]: with con_redshift.cursor() as cursor:
      for row in cursor.execute("SELECT 1"):
          print(row)
```

```
[1]
```

## Loading data to Database

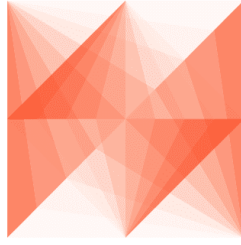
```
[4]: wr.redshift.to_sql(df, con_redshift, schema="public", table="tutorial", mode="overwrite")
wr.mysql.to_sql(df, con_mysql, schema="test", table="tutorial", mode="overwrite")
wr.postgresql.to_sql(df, con_postgresql, schema="public", table="tutorial", mode=
↳ "overwrite")
wr.sqlserver.to_sql(df, con_sqlserver, schema="dbo", table="tutorial", mode="overwrite")
```

## Unloading data from Database

```
[5]: wr.redshift.read_sql_query("SELECT * FROM public.tutorial", con=con_redshift)
wr.mysql.read_sql_query("SELECT * FROM test.tutorial", con=con_mysql)
wr.postgresql.read_sql_query("SELECT * FROM public.tutorial", con=con_postgresql)
wr.sqlserver.read_sql_query("SELECT * FROM dbo.tutorial", con=con_sqlserver)
```

```
[5]:   id name
0    1  foo
1    2  boo
```

```
[6]: con_redshift.close()
con_mysql.close()
con_postgresql.close()
con_sqlserver.close()
```



## AWS Data Wrangler

### 1.3.8 8 - Redshift - COPY & UNLOAD

Amazon Redshift has two SQL command that help to load and unload large amount of data staging it on Amazon S3:

1 - COPY

2 - UNLOAD

Let's take a look and how Wrangler can use it.

```
[1]: import awswrangler as wr

con = wr.redshift.connect("aws-data-wrangler-redshift")
```

Enter your bucket name:

```
[2]: import getpass
bucket = getpass.getpass()
path = f"s3://{bucket}/stage/"
```

.....

Enter your IAM ROLE ARN:

```
[3]: iam_role = getpass.getpass()
```

.....

### Creating a Dataframe from the NOAA's CSV files

Reference

```
[4]: cols = ["id", "dt", "element", "value", "m_flag", "q_flag", "s_flag", "obs_time"]

df = wr.s3.read_csv(
    path="s3://noaa-ghcn-pds/csv/1897.csv",
    names=cols,
```

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```
parse_dates=["dt", "obs_time"]) # ~127MB, ~4MM rows
```

```
df
```

```
[4]:
```

	id	dt	element	value	m_flag	q_flag	s_flag	obs_time
0	AG0000060590	1897-01-01	TMAX	170	NaN	NaN	E	NaN
1	AG0000060590	1897-01-01	TMIN	-14	NaN	NaN	E	NaN
2	AG0000060590	1897-01-01	PRCP	0	NaN	NaN	E	NaN
3	AGE00135039	1897-01-01	TMAX	140	NaN	NaN	E	NaN
4	AGE00135039	1897-01-01	TMIN	40	NaN	NaN	E	NaN
...	...	...	...	...	...	...	...	...
3923594	UZM00038457	1897-12-31	TMIN	-145	NaN	NaN	r	NaN
3923595	UZM00038457	1897-12-31	PRCP	4	NaN	NaN	r	NaN
3923596	UZM00038457	1897-12-31	TAVG	-95	NaN	NaN	r	NaN
3923597	UZM00038618	1897-12-31	PRCP	66	NaN	NaN	r	NaN
3923598	UZM00038618	1897-12-31	TAVG	-45	NaN	NaN	r	NaN

```
[3923599 rows x 8 columns]
```

## Load and Unload with COPY and UNLOAD commands

Note: Please use a empty S3 path for the COPY command.

```
[5]: %%time

wr.redshift.copy(
    df=df,
    path=path,
    con=con,
    schema="public",
    table="commands",
    mode="overwrite",
    iam_role=iam_role,
)

CPU times: user 2.78 s, sys: 293 ms, total: 3.08 s
Wall time: 20.7 s
```

```
[6]: %%time

wr.redshift.unload(
    sql="SELECT * FROM public.commands",
    con=con,
    iam_role=iam_role,
    path=path,
    keep_files=True,
)

CPU times: user 10 s, sys: 1.14 s, total: 11.2 s
Wall time: 27.5 s
```

```
[6]:
```

	id	dt	element	value	m_flag	q_flag	s_flag	obs_time
0	AG0000060590	1897-01-01	TMAX	170	<NA>	<NA>	E	<NA>

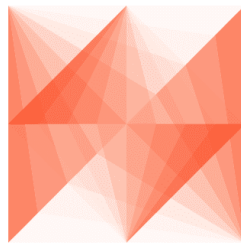
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1	AG000060590	1897-01-01	PRCP	0	<NA>	<NA>	E	<NA>
2	AGE00135039	1897-01-01	TMIN	40	<NA>	<NA>	E	<NA>
3	AGE00147705	1897-01-01	TMAX	164	<NA>	<NA>	E	<NA>
4	AGE00147705	1897-01-01	PRCP	0	<NA>	<NA>	E	<NA>
...	...	...	...	...	...	...	...	...
3923594	USW00094967	1897-12-31	TMAX	-144	<NA>	<NA>	6	<NA>
3923595	USW00094967	1897-12-31	PRCP	0	P	<NA>	6	<NA>
3923596	UZM00038457	1897-12-31	TMAX	-49	<NA>	<NA>	r	<NA>
3923597	UZM00038457	1897-12-31	PRCP	4	<NA>	<NA>	r	<NA>
3923598	UZM00038618	1897-12-31	PRCP	66	<NA>	<NA>	r	<NA>

[7847198 rows x 8 columns]

```
[7]: con.close()
```



**AWS Data Wrangler**

### 1.3.9 9 - Redshift - Append, Overwrite and Upsert

Wrangler's `copy/to_sql` function has three different mode options for Redshift.

1 - append

2 - overwrite

3 - upsert

```
[2]: import awswrangler as wr
import pandas as pd
from datetime import date

con = wr.redshift.connect("aws-data-wrangler-redshift")
```

Enter your bucket name:

```
[3]: import getpass
      bucket = getpass.getpass()
      path = f"s3://{bucket}/stage/"
```

```
.....
```

Enter your IAM ROLE ARN:

```
[4]: iam_role = getpass.getpass()
```

```
.....
```

Creating the table (Overwriting if it exists)

```
[10]: df = pd.DataFrame({
      "id": [1, 2],
      "value": ["foo", "boo"],
      "date": [date(2020, 1, 1), date(2020, 1, 2)]
    })

    wr.redshift.copy(
        df=df,
        path=path,
        con=con,
        schema="public",
        table="my_table",
        mode="overwrite",
        iam_role=iam_role,
        primary_keys=["id"]
    )

    wr.redshift.read_sql_table(table="my_table", schema="public", con=con)
```

```
[10]:   id value      date
      0   2   boo  2020-01-02
      1   1   foo  2020-01-01
```

Appending

```
[11]: df = pd.DataFrame({
      "id": [3],
      "value": ["bar"],
      "date": [date(2020, 1, 3)]
    })

    wr.redshift.copy(
        df=df,
```

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```

    path=path,
    con=con,
    schema="public",
    table="my_table",
    mode="append",
    iam_role=iam_role,
    primary_keys=["id"]
)

wr.redshift.read_sql_table(table="my_table", schema="public", con=con)

```

```

[11]:
   id value      date
0    1  foo  2020-01-01
1    2  boo  2020-01-02
2    3  bar  2020-01-03

```

### Upserting

```

[12]: df = pd.DataFrame({
        "id": [2, 3],
        "value": ["xoo", "bar"],
        "date": [date(2020, 1, 2), date(2020, 1, 3)]
    })

wr.redshift.copy(
    df=df,
    path=path,
    con=con,
    schema="public",
    table="my_table",
    mode="upsert",
    iam_role=iam_role,
    primary_keys=["id"]
)

wr.redshift.read_sql_table(table="my_table", schema="public", con=con)

```

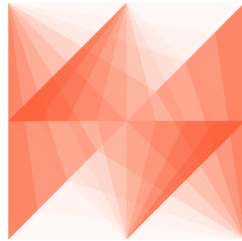
```

[12]:
   id value      date
0    1  foo  2020-01-01
1    2  xoo  2020-01-02
2    3  bar  2020-01-03

```

## Cleaning Up

```
[13]: with con.cursor() as cursor:
      cursor.execute("DROP TABLE public.my_table")
      con.close()
```



## AWS Data Wrangler

### 1.3.10 10 - Parquet Crawler

Wrangler can extract only the metadata from Parquet files and Partitions and then add it to the Glue Catalog.

```
[1]: import awswrangler as wr
```

Enter your bucket name:

```
[2]: import getpass
      bucket = getpass.getpass()
      path = f"s3://{bucket}/data/"
```

.....

### Creating a Parquet Table from the NOAA's CSV files

#### Reference

```
[3]: cols = ["id", "dt", "element", "value", "m_flag", "q_flag", "s_flag", "obs_time"]

      df = wr.s3.read_csv(
          path="s3://noaa-ghcn-pds/csv/189",
          names=cols,
          parse_dates=["dt", "obs_time"]) # Read 10 files from the 1890 decade (~1GB)
```

df

```
[3]:
```

	id	dt	element	value	m_flag	q_flag	s_flag	obs_time
0	AGE00135039	1890-01-01	TMAX	160	NaN	NaN	E	NaN
1	AGE00135039	1890-01-01	TMIN	30	NaN	NaN	E	NaN
2	AGE00135039	1890-01-01	PRCP	45	NaN	NaN	E	NaN

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3	AGE00147705	1890-01-01	TMAX	140	NaN	NaN	E	NaN
4	AGE00147705	1890-01-01	TMIN	74	NaN	NaN	E	NaN
...	...	...	...	...	...	...	...	...
29249753	UZM00038457	1899-12-31	PRCP	16	NaN	NaN	r	NaN
29249754	UZM00038457	1899-12-31	TAVG	-73	NaN	NaN	r	NaN
29249755	UZM00038618	1899-12-31	TMIN	-76	NaN	NaN	r	NaN
29249756	UZM00038618	1899-12-31	PRCP	0	NaN	NaN	r	NaN
29249757	UZM00038618	1899-12-31	TAVG	-60	NaN	NaN	r	NaN

[29249758 rows x 8 columns]

```
[4]: df["year"] = df["dt"].dt.year
```

```
df.head(3)
```

```
[4]:
```

	id	dt	element	value	m_flag	q_flag	s_flag	obs_time	year
0	AGE00135039	1890-01-01	TMAX	160	NaN	NaN	E	NaN	1890
1	AGE00135039	1890-01-01	TMIN	30	NaN	NaN	E	NaN	1890
2	AGE00135039	1890-01-01	PRCP	45	NaN	NaN	E	NaN	1890

```
[5]: res = wr.s3.to_parquet(
    df=df,
    path=path,
    dataset=True,
    mode="overwrite",
    partition_cols=["year"],
)
```

```
[6]: [ x.split("data/", 1)[1] for x in wr.s3.list_objects(path)]
```

```
[6]: ['year=1890/06a519afc8e48c9b08c8908f30adcfe.snappy.parquet',
'year=1891/5a99c28dbef54008bfc770c946099e02.snappy.parquet',
'year=1892/9b1ea5d1cfad40f78c920f93540ca8ec.snappy.parquet',
'year=1893/92259b49c134401eaf772506ee802af6.snappy.parquet',
'year=1894/c734469ffff944f69dc277c630064a16.snappy.parquet',
'year=1895/cf7ccde86aaf4d138f86c379c0817aa6.snappy.parquet',
'year=1896/ce02f4c2c554438786b766b33db451b6.snappy.parquet',
'year=1897/e04de04ad3c444deadcc9c410ab97ca1.snappy.parquet',
'year=1898/acb0e02878f04b56a6200f4b5a97be0e.snappy.parquet',
'year=1899/a269bdbb0f6a48faac55f3bcfef7df7a.snappy.parquet']
```

## Crawling!

```
[7]: %%time

res = wr.s3.store_parquet_metadata(
    path=path,
    database="awswrangler_test",
    table="crawler",
    dataset=True,
    mode="overwrite",
```

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```
dtype={"year": "int"}
)

CPU times: user 1.81 s, sys: 528 ms, total: 2.33 s
Wall time: 3.21 s
```

## Checking

```
[8]: wr.catalog.table(database="aws wrangler_test", table="crawler")
```

```
[8]: Column Name      Type      Partition Comment
0      id      string      False
1      dt      timestamp      False
2      element      string      False
3      value      bigint      False
4      m_flag      string      False
5      q_flag      string      False
6      s_flag      string      False
7      obs_time      string      False
8      year      int      True
```

```
[9]: %%time
```

```
wr.athena.read_sql_query("SELECT * FROM crawler WHERE year=1890", database="aws wrangler_
↪test")
```

```
CPU times: user 3.52 s, sys: 811 ms, total: 4.33 s
Wall time: 9.6 s
```

```
[9]:      id      dt element  value m_flag q_flag s_flag obs_time \
0      USC00195145 1890-01-01  TMIN    -28  <NA>  <NA>      6  <NA>
1      USC00196770 1890-01-01  PRCP      0      P  <NA>      6  <NA>
2      USC00196770 1890-01-01  SNOW      0  <NA>  <NA>      6  <NA>
3      USC00196915 1890-01-01  PRCP      0      P  <NA>      6  <NA>
4      USC00196915 1890-01-01  SNOW      0  <NA>  <NA>      6  <NA>
...      ...      ...      ...      ...      ...      ...      ...
6139  ASN00022006 1890-12-03  PRCP      0  <NA>  <NA>      a  <NA>
6140  ASN00022007 1890-12-03  PRCP      0  <NA>  <NA>      a  <NA>
6141  ASN00022008 1890-12-03  PRCP      0  <NA>  <NA>      a  <NA>
6142  ASN00022009 1890-12-03  PRCP      0  <NA>  <NA>      a  <NA>
6143  ASN00022011 1890-12-03  PRCP      0  <NA>  <NA>      a  <NA>

      year
0      1890
1      1890
2      1890
3      1890
4      1890
...      ...
6139  1890
6140  1890
6141  1890
```

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```
6142  1890
6143  1890

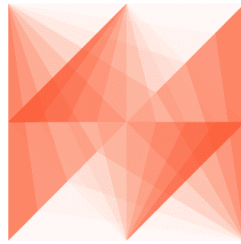
[1276246 rows x 9 columns]
```

### Cleaning Up S3

```
[10]: wr.s3.delete_objects(path)
```

### Cleaning Up the Database

```
[11]: for table in wr.catalog.get_tables(database="awswrangler_test"):
        wr.catalog.delete_table_if_exists(database="awswrangler_test", table=table["Name"])
```



## AWS Data Wrangler

### 1.3.11 11 - CSV Datasets

Wrangler has 3 different write modes to store CSV Datasets on Amazon S3.

- **append** (Default)  
Only adds new files without any delete.
- **overwrite**  
Deletes everything in the target directory and then add new files.
- **overwrite\_partitions** (Partition Upsert)  
Only deletes the paths of partitions that should be updated and then writes the new partitions files. It's like a "partition Upsert".

```
[1]: from datetime import date
import awswrangler as wr
import pandas as pd
```

Enter your bucket name:

```
[2]: import getpass
      bucket = getpass.getpass()
      path = f"s3://{bucket}/dataset/"
      .....
```

### Checking/Creating Glue Catalog Databases

```
[3]: if "awswrangler_test" not in wr.catalog.databases().values:
      wr.catalog.create_database("awswrangler_test")
```

### Creating the Dataset

```
[4]: df = pd.DataFrame({
      "id": [1, 2],
      "value": ["foo", "boo"],
      "date": [date(2020, 1, 1), date(2020, 1, 2)]
    })

    wr.s3.to_csv(
        df=df,
        path=path,
        index=False,
        dataset=True,
        mode="overwrite",
        database="awswrangler_test",
        table="csv_dataset"
    )

    wr.athena.read_sql_table(database="awswrangler_test", table="csv_dataset")

[4]:   id value      date
0    1  foo  2020-01-01
1    2  boo  2020-01-02
```

### Appending

```
[5]: df = pd.DataFrame({
      "id": [3],
      "value": ["bar"],
      "date": [date(2020, 1, 3)]
    })

    wr.s3.to_csv(
        df=df,
        path=path,
        index=False,
```

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```

dataset=True,
mode="append",
database="awswrangler_test",
table="csv_dataset"
)

wr.athena.read_sql_table(database="awswrangler_test", table="csv_dataset")

```

```

[5]:   id value      date
     0   3   bar  2020-01-03
     1   1   foo  2020-01-01
     2   2   boo  2020-01-02

```

### Overwriting

```

[6]: wr.s3.to_csv(
      df=df,
      path=path,
      index=False,
      dataset=True,
      mode="overwrite",
      database="awswrangler_test",
      table="csv_dataset"
    )

wr.athena.read_sql_table(database="awswrangler_test", table="csv_dataset")

```

```

[6]:   id value      date
     0   3   bar  2020-01-03

```

### Creating a Partitoned Dataset

```

[7]: df = pd.DataFrame({
      "id": [1, 2],
      "value": ["foo", "boo"],
      "date": [date(2020, 1, 1), date(2020, 1, 2)]
    })

wr.s3.to_csv(
    df=df,
    path=path,
    index=False,
    dataset=True,
    mode="overwrite",
    database="awswrangler_test",
    table="csv_dataset",
    partition_cols=["date"]
)

wr.athena.read_sql_table(database="awswrangler_test", table="csv_dataset")

```

```
[7]:
```

	id	value	date
0	2	boo	2020-01-02
1	1	foo	2020-01-01

### Upserting partitions (overwrite\_partitions)

```
[8]:
```

```
df = pd.DataFrame({
    "id": [2, 3],
    "value": ["xoo", "bar"],
    "date": [date(2020, 1, 2), date(2020, 1, 3)]
})

wr.s3.to_csv(
    df=df,
    path=path,
    index=False,
    dataset=True,
    mode="overwrite_partitions",
    database="awswrangler_test",
    table="csv_dataset",
    partition_cols=["date"]
)

wr.athena.read_sql_table(database="awswrangler_test", table="csv_dataset")
```

```
[8]:
```

	id	value	date
0	1	foo	2020-01-01
1	2	xoo	2020-01-02
0	3	bar	2020-01-03

### BONUS - Glue/Athena integration

```
[9]:
```

```
df = pd.DataFrame({
    "id": [1, 2],
    "value": ["foo", "boo"],
    "date": [date(2020, 1, 1), date(2020, 1, 2)]
})

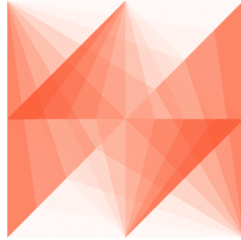
wr.s3.to_csv(
    df=df,
    path=path,
    dataset=True,
    index=False,
    mode="overwrite",
    database="aws_data_wrangler",
    table="my_table",
    compression="gzip"
)

wr.athena.read_sql_query("SELECT * FROM my_table", database="aws_data_wrangler")
```



```
[9]:
```

	id	value	date
0	1	foo	2020-01-01
1	2	boo	2020-01-02



## AWS Data Wrangler

### 1.3.12 12 - CSV Crawler

Wrangler can extract only the metadata from a Pandas DataFrame and then add it can be added to Glue Catalog as a table.

```
[1]: import awswrangler as wr
      from datetime import datetime
      import pandas as pd
```

Enter your bucket name:

```
[2]: import getpass
      bucket = getpass.getpass()
      path = f"s3://{bucket}/csv_crawler/"
      .....
```

### Creating a Pandas DataFrame

```
[3]: ts = lambda x: datetime.strptime(x, "%Y-%m-%d %H:%M:%S.%f") # noqa
      dt = lambda x: datetime.strptime(x, "%Y-%m-%d").date() # noqa

      df = pd.DataFrame(
          {
              "id": [1, 2, 3],
              "string": ["foo", None, "boo"],
              "float": [1.0, None, 2.0],
              "date": [dt("2020-01-01"), None, dt("2020-01-02")],
              "timestamp": [ts("2020-01-01 00:00:00.0"), None, ts("2020-01-02 00:00:01.0")],
              "bool": [True, None, False],
              "par0": [1, 1, 2],
              "par1": ["a", "b", "b"],
```

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```

    }
)

df

```

```

[3]:
   id string  float      date      timestamp  bool  par0 par1
0   1   foo    1.0  2020-01-01  2020-01-01 00:00:00  True    1   a
1   2  None    NaN      None           NaT   None    1   b
2   3   boo    2.0  2020-01-02  2020-01-02 00:00:01  False   2   b

```

### Extracting the metadata

```

[4]: columns_types, partitions_types = wr.catalog.extract_athena_types(
      df=df,
      file_format="csv",
      index=False,
      partition_cols=["par0", "par1"]
    )

```

```

[5]: columns_types

```

```

[5]: {'id': 'bigint',
      'string': 'string',
      'float': 'double',
      'date': 'date',
      'timestamp': 'timestamp',
      'bool': 'boolean'}

```

```

[6]: partitions_types

```

```

[6]: {'par0': 'bigint', 'par1': 'string'}

```

### Creating the table

```

[7]: wr.catalog.create_csv_table(
      table="csv_crawler",
      database="awswrangler_test",
      path=path,
      partitions_types=partitions_types,
      columns_types=columns_types,
    )

```

## Checking

```
[8]: wr.catalog.table(database="awswrangler_test", table="csv_crawler")
```

```
[8]:
```

	Column Name	Type	Partition	Comment
0	id	bigint	False	
1	string	string	False	
2	float	double	False	
3	date	date	False	
4	timestamp	timestamp	False	
5	bool	boolean	False	
6	par0	bigint	True	
7	par1	string	True	

We can still using the extracted metadata to ensure all data types consistence to new data

```
[9]: df = pd.DataFrame(
    {
        "id": [1],
        "string": ["1"],
        "float": [1],
        "date": [ts("2020-01-01 00:00:00.0")],
        "timestamp": [dt("2020-01-02")],
        "bool": [1],
        "par0": [1],
        "par1": ["a"],
    }
)

df
```

```
[9]:
```

	id	string	float	date	timestamp	bool	par0	par1
0	1	1	1	2020-01-01	2020-01-02	1	1	a

```
[10]: res = wr.s3.to_csv(
    df=df,
    path=path,
    index=False,
    dataset=True,
    database="awswrangler_test",
    table="csv_crawler",
    partition_cols=["par0", "par1"],
    dtype=columns_types
)
```

You can also extract the metadata directly from the Catalog if you want

```
[11]: dtype = wr.catalog.get_table_types(database="awswrangler_test", table="csv_crawler")
```

```
[12]: res = wr.s3.to_csv(  
    df=df,  
    path=path,  
    index=False,  
    dataset=True,  
    database="awswrangler_test",  
    table="csv_crawler",  
    partition_cols=["par0", "par1"],  
    dtype=dtype  
)
```

### Checking out

```
[13]: df = wr.athena.read_sql_table(database="awswrangler_test", table="csv_crawler")
```

df

```
[13]:
```

	id	string	float	date	timestamp	bool	par0	par1
0	1	1	1.0	None	2020-01-02	True	1	a
1	1	1	1.0	None	2020-01-02	True	1	a

```
[14]: df.dtypes
```

```
[14]: id                Int64  
string              string  
float               float64  
date                object  
timestamp           datetime64[ns]  
bool                boolean  
par0                Int64  
par1                string  
dtype: object
```

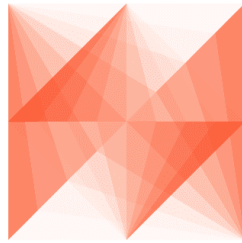
### Cleaning Up S3

```
[15]: wr.s3.delete_objects(path)
```

### Cleaning Up the Database

```
[16]: wr.catalog.delete_table_if_exists(database="awswrangler_test", table="csv_crawler")
```

```
[16]: True
```



AWS Data Wrangler

### 1.3.13 13 - Merging Datasets on S3

Wrangler has 3 different copy modes to store Parquet Datasets on Amazon S3.

- **append** (Default)  
Only adds new files without any delete.
- **overwrite**  
Deletes everything in the target directory and then add new files.
- **overwrite\_partitions** (Partition Upsert)  
Only deletes the paths of partitions that should be updated and then writes the new partitions files. It's like a "partition Upsert".

```
[1]: from datetime import date
import awswrangler as wr
import pandas as pd
```

Enter your bucket name:

```
[2]: import getpass
bucket = getpass.getpass()
path1 = f"s3://{bucket}/dataset1/"
path2 = f"s3://{bucket}/dataset2/"
.....
```

### Creating Dataset 1

```
[3]: df = pd.DataFrame({
      "id": [1, 2],
      "value": ["foo", "boo"],
      "date": [date(2020, 1, 1), date(2020, 1, 2)]
    })

wr.s3.to_parquet(
    df=df,
    path=path1,
    dataset=True,
    mode="overwrite",
    partition_cols=["date"]
)

wr.s3.read_parquet(path1, dataset=True)
```

```
[3]:   id value      date
0    1  foo  2020-01-01
1    2  boo  2020-01-02
```

### Creating Dataset 2

```
[4]: df = pd.DataFrame({
      "id": [2, 3],
      "value": ["xoo", "bar"],
      "date": [date(2020, 1, 2), date(2020, 1, 3)]
    })

dataset2_files = wr.s3.to_parquet(
    df=df,
    path=path2,
    dataset=True,
    mode="overwrite",
    partition_cols=["date"]
)["paths"]

wr.s3.read_parquet(path2, dataset=True)
```

```
[4]:   id value      date
0    2  xoo  2020-01-02
1    3  bar  2020-01-03
```

**Merging (Dataset 2 -> Dataset 1) (APPEND)**

```
[5]: wr.s3.merge_datasets(
      source_path=path2,
      target_path=path1,
      mode="append"
    )

wr.s3.read_parquet(path1, dataset=True)
```

```
[5]:   id value      date
0    1  foo  2020-01-01
1    2  xoo  2020-01-02
2    2  boo  2020-01-02
3    3  bar  2020-01-03
```

**Merging (Dataset 2 -> Dataset 1) (OVERWRITE\_PARTITIONS)**

```
[6]: wr.s3.merge_datasets(
      source_path=path2,
      target_path=path1,
      mode="overwrite_partitions"
    )

wr.s3.read_parquet(path1, dataset=True)
```

```
[6]:   id value      date
0    1  foo  2020-01-01
1    2  xoo  2020-01-02
2    3  bar  2020-01-03
```

**Merging (Dataset 2 -> Dataset 1) (OVERWRITE)**

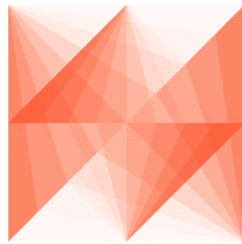
```
[7]: wr.s3.merge_datasets(
      source_path=path2,
      target_path=path1,
      mode="overwrite"
    )

wr.s3.read_parquet(path1, dataset=True)
```

```
[7]:   id value      date
0    2  xoo  2020-01-02
1    3  bar  2020-01-03
```

## Cleaning Up

```
[8]: wr.s3.delete_objects(path1)
     wr.s3.delete_objects(path2)
```



## AWS Data Wrangler

### 1.3.14 14 - Schema Evolution

Wrangler support new **columns** on Parquet and CSV datasets through:

- `wr.s3.to_parquet()`
- `wr.s3.store_parquet_metadata()` i.e. “Crawler”
- `wr.s3.to_csv()`

```
[1]: from datetime import date
     import awswrangler as wr
     import pandas as pd
```

Enter your bucket name:

```
[2]: import getpass
     bucket = getpass.getpass()
     path = f"s3://{bucket}/dataset/"
```

.....

## Creating the Dataset

### Parquet

```
[3]: df = pd.DataFrame({
     "id": [1, 2],
     "value": ["foo", "boo"],
     })

     wr.s3.to_parquet(
         df=df,
```

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```
    path=path,  
    dataset=True,  
    mode="overwrite",  
    database="aws_data_wrangler",  
    table="my_table"  
)  
  
wr.s3.read_parquet(path, dataset=True)
```

```
[3]:   id value  
0    1   foo  
1    2   boo
```

## CSV

```
[ ]: df = pd.DataFrame({  
    "id": [1, 2],  
    "value": ["foo", "boo"],  
})  
  
wr.s3.to_csv(  
    df=df,  
    path=path,  
    dataset=True,  
    mode="overwrite",  
    database="aws_data_wrangler",  
    table="my_table"  
)  
  
wr.s3.read_csv(path, dataset=True)
```

## Schema Version 0 on Glue Catalog (AWS Console)

Tables &gt; my\_table

[Edit table](#) [Delete table](#)

Name	my_table
Description	
Database	aws_data_wrangler
Classification	parquet
Location	s3://[REDACTED]/dataset/
Connection	
Deprecated	No
Last updated	Tue May 19 19:07:03 GMT-300 2020
Input format	org.apache.hadoop.hive ql.io.parquet.MapredParquetInputFormat
Output format	org.apache.hadoop.hive ql.io.parquet.MapredParquetOutputFormat
Serde serialization lib	org.apache.hadoop.hive ql.io.parquet.serde.ParquetHiveSerDe
Serde parameters	serialization.format 1
Table properties	compressionType <b>snappy</b> typeOfData <b>file</b>

Last updated 19 May 2020 Table **Version (Current version)**

Showing: 1 - 1 < >		
Version	Created:	Created by:
0	19 May 2020 7:0...	[REDACTED]

Schema

Showing: 1 - 2 of 2 &lt; &gt;

	Column name	Data type	Partition key	Comment
1	id	bigint		
2	value	string		

## Appending with NEW COLUMNS

## Parquet

```
[4]: df = pd.DataFrame({
    "id": [3, 4],
    "value": ["bar", None],
    "date": [date(2020, 1, 3), date(2020, 1, 4)],
    "flag": [True, False]
})

wr.s3.to_parquet(
    df=df,
    path=path,
    dataset=True,
    mode="append",
    database="aws_data_wrangler",
    table="my_table",
    catalog_versioning=True # Optional
)

wr.s3.read_parquet(path, dataset=True, validate_schema=False)
```

```
[4]:   id value      date  flag
0    3  bar  2020-01-03  True
1    4 None  2020-01-04 False
```

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2	1	foo	NaN	NaN
3	2	boo	NaN	NaN

## CSV

Note: for CSV datasets due to `column ordering`, by default, schema evolution is disabled. Enable it by passing `schema_evolution=True` flag

```
[ ]: df = pd.DataFrame({
    "id": [3, 4],
    "value": ["bar", None],
    "date": [date(2020, 1, 3), date(2020, 1, 4)],
    "flag": [True, False]
})

wr.s3.to_csv(
    df=df,
    path=path,
    dataset=True,
    mode="append",
    database="aws_data_wrangler",
    table="my_table",
    schema_evolution=True,
    catalog_versioning=True # Optional
)

wr.s3.read_csv(path, dataset=True, validate_schema=False)
```

Schema Version 1 on Glue Catalog (AWS Console)

Tables > my\_table

Edit tableDelete table

Name

my\_table

Description

aws\_data\_wrangler

Database

aws\_data\_wrangler

Classification

parquet

Location

s3://[REDACTED]dataset/

Connection

Deprecated

No

Last updated

Tue May 19 19:11:15 GMT-300 2020

Input format

org.apache.hadoop.hive.q1.io.parquet.MapredParquetInputFormat

Output format

org.apache.hadoop.hive.q1.io.parquet.MapredParquetOutputFormat

Serde serialization lib

org.apache.hadoop.hive.q1.io.parquet.serde.ParquetHiveSerDe

Serde parameters

serialization.format1

Table properties

compressionTypesnappytypeOfDatafile

Schema

	Column name	Data type	Partition key	Comment
1	id	bigint		
2	value	string		
3	date	date		
4	flag	boolean		

Last updated 19 May 2020

Table Version (Current version)

Showing: 1 - 2

Version	Created:	Created by:
1	19 May 2020 7:1...	
0	19 May 2020 7:1...	

Reading from Athena

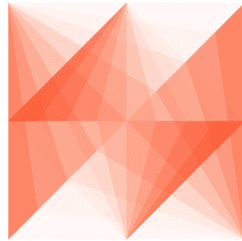
```
[5]: wr.athena.read_sql_table(table="my_table", database="aws_data_wrangler")

[5]:   id value      date  flag
0    3   bar 2020-01-03  True
1    4  None 2020-01-04 False
2    1   foo      None  <NA>
3    2   boo      None  <NA>
```

### Cleaning Up

```
[6]: wr.s3.delete_objects(path)
     wr.catalog.delete_table_if_exists(table="my_table", database="aws_data_wrangler")
```

```
[6]: True
```



**AWS Data Wrangler**

### 1.3.15 15 - EMR

```
[1]: import awswrangler as wr
     import boto3
```

Enter your bucket name:

```
[2]: import getpass
     bucket = getpass.getpass()
```

```
.....
```

Enter your Subnet ID:

```
[8]: subnet = getpass.getpass()
```

```
.....
```

### Creating EMR Cluster

```
[9]: cluster_id = wr.emr.create_cluster(subnet)
```

### Uploading our PySpark script to Amazon S3

```
[10]: script = """
      from pyspark.sql import SparkSession
      spark = SparkSession.builder.appName("docker-awsrangler").getOrCreate()
      sc = spark.sparkContext

      print("Spark Initialized")
      """

      _ = boto3.client("s3").put_object(
          Body=script,
          Bucket=bucket,
          Key="test.py"
      )
```

### Submit PySpark step

```
[11]: step_id = wr.emr.submit_step(cluster_id, command=f"spark-submit s3://{bucket}/test.py")
```

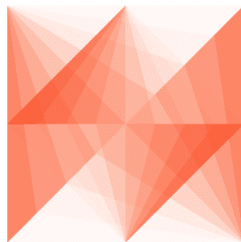
### Wait Step

```
[12]: while wr.emr.get_step_state(cluster_id, step_id) != "COMPLETED":
      pass
```

### Terminate Cluster

```
[13]: wr.emr.terminate_cluster(cluster_id)
```

```
[ ]:
```



**AWS Data Wrangler**

### 1.3.16 16 - EMR & Docker

```
[ ]: import awswrangler as wr
import boto3
import getpass
```

Enter your bucket name:

```
[2]: bucket = getpass.getpass()
```

```
.....
```

Enter your Subnet ID:

```
[3]: subnet = getpass.getpass()
```

```
.....
```

#### Build and Upload Docker Image to ECR repository

Replace the {ACCOUNT\_ID} placeholder.

```
[ ]: %%writefile Dockerfile

FROM amazoncorretto:8

RUN yum -y update
RUN yum -y install yum-utils
RUN yum -y groupinstall development

RUN yum list python3*
RUN yum -y install python3 python3-dev python3-pip python3-virtualenv

RUN python -V
RUN python3 -V

ENV PYSARK_DRIVER_PYTHON python3
ENV PYSARK_PYTHON python3

RUN pip3 install --upgrade pip
RUN pip3 install awswrangler

RUN python3 -c "import awswrangler as wr"
```

```
[ ]: %%bash

docker build -t 'local/emr-wrangler' .
aws ecr create-repository --repository-name emr-wrangler
docker tag local/emr-wrangler {ACCOUNT_ID}.dkr.ecr.us-east-1.amazonaws.com/emr-wrangler:
↪emr-wrangler
```

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```
eval $(aws ecr get-login --region us-east-1 --no-include-email)
docker push {ACCOUNT_ID}.dkr.ecr.us-east-1.amazonaws.com/emr-wrangler:emr-wrangler
```

## Creating EMR Cluster

```
[4]: cluster_id = wr.emr.create_cluster(subnet, docker=True)
```

## Refresh ECR credentials in the cluster (expiration time: 12h )

```
[5]: wr.emr.submit_ecr_credentials_refresh(cluster_id, path=f"s3://{bucket}/")
```

```
[5]: 's-1B0045RWJL8CL'
```

## Uploading application script to Amazon S3 (PySpark)

```
[7]: script = """
from pyspark.sql import SparkSession
spark = SparkSession.builder.appName("docker-aws wrangler").getOrCreate()
sc = spark.sparkContext

print("Spark Initialized")

import awswrangler as wr

print(f"Wrangler version: {wr.__version__}")
"""

boto3.client("s3").put_object(Body=script, Bucket=bucket, Key="test_docker.py");
```

## Submit PySpark step

```
[8]: DOCKER_IMAGE = f"{wr.get_account_id()}.dkr.ecr.us-east-1.amazonaws.com/emr-wrangler:emr-
    ↪ wrangler"

step_id = wr.emr.submit_spark_step(
    cluster_id,
    f"s3://{bucket}/test_docker.py",
    docker_image=DOCKER_IMAGE
)
```



### Wait Step

```
[ ]: while wr.emr.get_step_state(cluster_id, step_id) != "COMPLETED":
    pass
```

### Terminate Cluster

```
[ ]: wr.emr.terminate_cluster(cluster_id)
```

### Another example with custom configurations

```
[9]: cluster_id = wr.emr.create_cluster(
    cluster_name="my-demo-cluster-v2",
    logging_s3_path=f"s3://{bucket}/emr-logs/",
    emr_release="emr-6.0.0",
    subnet_id=subnet,
    emr_ec2_role="EMR_EC2_DefaultRole",
    emr_role="EMR_DefaultRole",
    instance_type_master="m5.2xlarge",
    instance_type_core="m5.2xlarge",
    instance_ebs_size_master=50,
    instance_ebs_size_core=50,
    instance_num_on_demand_master=0,
    instance_num_on_demand_core=0,
    instance_num_spot_master=1,
    instance_num_spot_core=2,
    spot_bid_percentage_of_on_demand_master=100,
    spot_bid_percentage_of_on_demand_core=100,
    spot_provisioning_timeout_master=5,
    spot_provisioning_timeout_core=5,
    spot_timeout_to_on_demand_master=False,
    spot_timeout_to_on_demand_core=False,
    python3=True,
    docker=True,
    spark_glue_catalog=True,
    hive_glue_catalog=True,
    presto_glue_catalog=True,
    debugging=True,
    applications=["Hadoop", "Spark", "Hive", "Zeppelin", "Livy"],
    visible_to_all_users=True,
    maximize_resource_allocation=True,
    keep_cluster_alive_when_no_steps=True,
    termination_protected=False,
    spark_pyarrow=True
)

wr.emr.submit_ecr_credentials_refresh(cluster_id, path=f"s3://{bucket}/emr/")

DOCKER_IMAGE = f"{wr.get_account_id()}.dkr.ecr.us-east-1.amazonaws.com/emr-wrangler:emr-
↪wrangler"
```

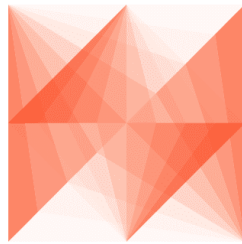
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```
step_id = wr.emr.submit_spark_step(  
    cluster_id,  
    f"s3://{bucket}/test_docker.py",  
    docker_image=DOCKER_IMAGE  
)
```

```
[ ]: while wr.emr.get_step_state(cluster_id, step_id) != "COMPLETED":  
    pass  
  
wr.emr.terminate_cluster(cluster_id)
```

```
[ ]:
```



**AWS Data Wrangler**

### 1.3.17 17 - Partition Projection

<https://docs.aws.amazon.com/athena/latest/ug/partition-projection.html>

```
[1]: import awswrangler as wr  
import pandas as pd  
from datetime import datetime  
import getpass
```

Enter your bucket name:

```
[2]: bucket = getpass.getpass()
```

```
.....
```

### Integer projection

```
[3]: df = pd.DataFrame({
      "value": [1, 2, 3],
      "year": [2019, 2020, 2021],
      "month": [10, 11, 12],
      "day": [25, 26, 27]
    })

df
```

```
[3]:   value  year  month  day
0      1  2019     10   25
1      2  2020     11   26
2      3  2021     12   27
```

```
[4]: wr.s3.to_parquet(
      df=df,
      path=f"s3://{bucket}/table_integer/",
      dataset=True,
      partition_cols=["year", "month", "day"],
      database="default",
      table="table_integer",
      projection_enabled=True,
      projection_types={
          "year": "integer",
          "month": "integer",
          "day": "integer"
      },
      projection_ranges={
          "year": "2000,2025",
          "month": "1,12",
          "day": "1,31"
      },
    );
```

```
[5]: wr.athena.read_sql_query(f"SELECT * FROM table_integer", database="default")
```

```
[5]:   value  year  month  day
0      3  2021     12   27
1      2  2020     11   26
2      1  2019     10   25
```

## Enum projection

```
[6]: df = pd.DataFrame({  
    "value": [1, 2, 3],  
    "city": ["São Paulo", "Tokio", "Seattle"],  
})
```

df

```
[6]:   value    city  
0      1  São Paulo  
1      2    Tokio  
2      3   Seattle
```

```
[7]: wr.s3.to_parquet(  
    df=df,  
    path=f"s3://{bucket}/table_enum/",  
    dataset=True,  
    partition_cols=["city"],  
    database="default",  
    table="table_enum",  
    projection_enabled=True,  
    projection_types={  
        "city": "enum",  
    },  
    projection_values={  
        "city": "São Paulo,Tokio,Seattle"  
    },  
);
```

```
[8]: wr.athena.read_sql_query(f"SELECT * FROM table_enum", database="default")
```

```
[8]:   value    city  
0      1  São Paulo  
1      3   Seattle  
2      2    Tokio
```

## Date projection

```
[9]: ts = lambda x: datetime.strptime(x, "%Y-%m-%d %H:%M:%S")  
    dt = lambda x: datetime.strptime(x, "%Y-%m-%d").date()  
  
    df = pd.DataFrame({  
        "value": [1, 2, 3],  
        "dt": [dt("2020-01-01"), dt("2020-01-02"), dt("2020-01-03")],  
        "ts": [ts("2020-01-01 00:00:00"), ts("2020-01-01 00:00:01"), ts("2020-01-01 00:00:02  
↪")],  
    })  
  
    df
```

```
[9]:
```

	value	dt	ts
0	1	2020-01-01	2020-01-01 00:00:00
1	2	2020-01-02	2020-01-01 00:00:01
2	3	2020-01-03	2020-01-01 00:00:02

```
[10]: wr.s3.to_parquet(
    df=df,
    path=f"s3://{bucket}/table_date/",
    dataset=True,
    partition_cols=["dt", "ts"],
    database="default",
    table="table_date",
    projection_enabled=True,
    projection_types={
        "dt": "date",
        "ts": "date",
    },
    projection_ranges={
        "dt": "2020-01-01,2020-01-03",
        "ts": "2020-01-01 00:00:00,2020-01-01 00:00:02"
    },
);
```

```
[11]: wr.athena.read_sql_query(f"SELECT * FROM table_date", database="default")
```

```
[11]:
```

	value	dt	ts
0	1	2020-01-01	2020-01-01 00:00:00
1	2	2020-01-02	2020-01-01 00:00:01
2	3	2020-01-03	2020-01-01 00:00:02

### Injected projection

```
[12]: df = pd.DataFrame({
    "value": [1, 2, 3],
    "uuid": ["761e2488-a078-11ea-bb37-0242ac130002", "b89ed095-8179-4635-9537-88592c0f6bc3", "87adc586-ce88-4f0a-b1c8-bf8e00d32249"],
})
```

df

```
[12]:
```

	value	uuid
0	1	761e2488-a078-11ea-bb37-0242ac130002
1	2	b89ed095-8179-4635-9537-88592c0f6bc3
2	3	87adc586-ce88-4f0a-b1c8-bf8e00d32249

```
[13]: wr.s3.to_parquet(
    df=df,
    path=f"s3://{bucket}/table_injected/",
    dataset=True,
    partition_cols=["uuid"],
    database="default",
```

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```

    table="table_injected",
    projection_enabled=True,
    projection_types={
        "uuid": "injected",
    }
);

```

```

[14]: wr.athena.read_sql_query(
        sql=f"SELECT * FROM table_injected WHERE uuid='b89ed095-8179-4635-9537-88592c0f6bc3'"
        ↪,
        database="default"
    )

```

```

[14]:
value                                uuid
0      2  b89ed095-8179-4635-9537-88592c0f6bc3

```

## Cleaning Up

```

[15]: wr.s3.delete_objects(f"s3://{bucket}/table_integer/")
wr.s3.delete_objects(f"s3://{bucket}/table_enum/")
wr.s3.delete_objects(f"s3://{bucket}/table_date/")
wr.s3.delete_objects(f"s3://{bucket}/table_injected/")

```

```

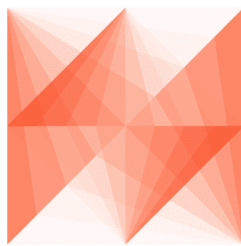
[16]: wr.catalog.delete_table_if_exists(table="table_integer", database="default")
wr.catalog.delete_table_if_exists(table="table_enum", database="default")
wr.catalog.delete_table_if_exists(table="table_date", database="default")
wr.catalog.delete_table_if_exists(table="table_injected", database="default");

```

```

[ ]:

```



# AWS Data Wrangler

### 1.3.18 18 - QuickSight

For this tutorial we will use the public AWS COVID-19 data lake.

References:

- [A public data lake for analysis of COVID-19 data](#)
- [Exploring the public AWS COVID-19 data lake](#)
- [CloudFormation template](#)

*Please, install the Cloudformation template above to have access to the public data lake.*

*P.S. To be able to access the public data lake, you must allow explicitly QuickSight to access the related external bucket.*

```
[1]: import awswrangler as wr
      from time import sleep
```

List users of QuickSight account

```
[2]: [{"username": user["UserName"], "role": user["Role"]} for user in wr.quicksight.list_
      ↪ users('default')]
```

```
[2]: [{'username': 'dev', 'role': 'ADMIN'}]
```

```
[3]: wr.catalog.databases()
```

	Database	Description
0	aws_data_wrangler	AWS Data Wrangler Test Arena - Glue Database
1	awswrangler_test	
2	covid-19	
3	default	Default Hive database

```
[4]: wr.catalog.tables(database="covid-19")
```

	Database	Table \
0	covid-19	alleninstitute_comprehend_medical
1	covid-19	alleninstitute_metadata
2	covid-19	country_codes
3	covid-19	county_populations
4	covid-19	covid_knowledge_graph_edges
5	covid-19	covid_knowledge_graph_nodes_author
6	covid-19	covid_knowledge_graph_nodes_concept
7	covid-19	covid_knowledge_graph_nodes_institution
8	covid-19	covid_knowledge_graph_nodes_paper
9	covid-19	covid_knowledge_graph_nodes_topic
10	covid-19	covid_testing_states_daily
11	covid-19	covid_testing_us_daily
12	covid-19	covid_testing_us_total
13	covid-19	covidcast_data
14	covid-19	covidcast_metadata
15	covid-19	enigma_jhu
16	covid-19	enigma_jhu_timeseries
17	covid-19	hospital_beds
18	covid-19	nytimes_counties
19	covid-19	nytimes_states

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```

20 covid-19      prediction_models_county_predictions
21 covid-19      prediction_models_severity_index
22 covid-19      tableau_covid_datahub
23 covid-19      tableau_jhu
24 covid-19      us_state_abbreviations
25 covid-19      world_cases_deaths_testing

```

## Description \

```

0  Comprehend Medical results run against Allen I...
1  Metadata on papers pulled from the Allen Insti...
2      Lookup table for country codes
3  Lookup table for population for each county ba...
4      AWS Knowledge Graph for COVID-19 data
5      AWS Knowledge Graph for COVID-19 data
6      AWS Knowledge Graph for COVID-19 data
7      AWS Knowledge Graph for COVID-19 data
8      AWS Knowledge Graph for COVID-19 data
9      AWS Knowledge Graph for COVID-19 data
10 USA total test daily trend by state. Sourced ...
11 USA total test daily trend. Sourced from covi...
12 USA total tests. Sourced from covidtracking.c...
13      CMU Delphi's COVID-19 Surveillance Data
14      CMU Delphi's COVID-19 Surveillance Metadata
15 Johns Hopkins University Consolidated data on ...
16 Johns Hopkins University data on COVID-19 case...
17 Data on hospital beds and their utilization in...
18 Data on COVID-19 cases from NY Times at US cou...
19 Data on COVID-19 cases from NY Times at US sta...
20 County-level Predictions Data. Sourced from Yu...
21 Severity Index models. Sourced from Yu Group a...
22 COVID-19 data that has been gathered and unifi...
23 Johns Hopkins University data on COVID-19 case...
24      Lookup table for US state abbreviations
25 Data on confirmed cases, deaths, and testing. ...

```

## Columns Partitions

```

0  paper_id, date, dx_name, test_name, procedure_...
1  cord_uid, sha, source_x, title, doi, pmcid, pu...
2  country, alpha-2 code, alpha-3 code, numeric c...
3  id, id2, county, state, population estimate 2018
4      id, label, from, to, score
5      id, label, first, last, full_name
6      id, label, entity, concept
7      id, label, institution, country, settlement
8  id, label, doi, sha_code, publish_time, source...
9      id, label, topic, topic_num
10 date, state, positive, negative, pending, hosp...
11 date, states, positive, negative, posneg, pend...
12 positive, negative, posneg, hospitalized, deat...
13 data_source, signal, geo_type, time_value, geo...
14 data_source, signal, time_type, geo_type, min_...
15 fips, admin2, province_state, country_region, ...

```

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```

16 uid, fips, iso2, iso3, code3, admin2, latitude...
17 objectid, hospital_name, hospital_type, hq_add...
18     date, county, state, fips, cases, deaths
19     date, state, fips, cases, deaths
20 countyfips, countyname, statename, severity_co...
21 severity_1-day, severity_2-day, severity_3-day...
22 country_short_name, country_alpha_3_code, coun...
23 case_type, cases, difference, date, country_re...
24     state, abbreviation
25 iso_code, location, date, total_cases, new_cas...

```

Create data source of QuickSight Note: data source stores the connection information.

```

[5]: wr.quicksight.create_athena_data_source(
      name="covid-19",
      workgroup="primary",
      allowed_to_manage=["dev"]
    )

```

```

[6]: wr.catalog.tables(database="covid-19", name_contains="nyt")

```

```

[6]: Database           Table \
0 covid-19 nytimes_counties
1 covid-19 nytimes_states

Description \
0 Data on COVID-19 cases from NY Times at US cou...
1 Data on COVID-19 cases from NY Times at US sta...

Columns Partitions
0 date, county, state, fips, cases, deaths
1     date, state, fips, cases, deaths

```

```

[7]: wr.athena.read_sql_query("SELECT * FROM nytimes_counties limit 10", database="covid-19",
    ↪ ctas_approach=False)

```

```

[7]:   date      county      state  fips  cases  deaths
0 2020-01-21  Snohomish  Washington  53061      1      0
1 2020-01-22  Snohomish  Washington  53061      1      0
2 2020-01-23  Snohomish  Washington  53061      1      0
3 2020-01-24    Cook      Illinois  17031      1      0
4 2020-01-24  Snohomish  Washington  53061      1      0
5 2020-01-25    Orange  California  06059      1      0
6 2020-01-25    Cook      Illinois  17031      1      0
7 2020-01-25  Snohomish  Washington  53061      1      0
8 2020-01-26  Maricopa    Arizona   04013      1      0
9 2020-01-26 Los Angeles  California  06037      1      0

```

```

[8]: sql = """
SELECT
  j.*,
  co.Population,

```

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```

co.county AS county2,
hb.*
FROM
(
    SELECT
        date,
        county,
        state,
        fips,
        cases as confirmed,
        deaths
    FROM "covid-19".nytimes_counties
) j
LEFT OUTER JOIN (
    SELECT
        DISTINCT county,
        state,
        "population estimate 2018" AS Population
    FROM
        "covid-19".county_populations
    WHERE
        state IN (
            SELECT
                DISTINCT state
            FROM
                "covid-19".nytimes_counties
        )
        AND county IN (
            SELECT
                DISTINCT county as county
            FROM "covid-19".nytimes_counties
        )
) co ON co.county = j.county
AND co.state = j.state
LEFT OUTER JOIN (
    SELECT
        count(objectid) as Hospital,
        fips as hospital_fips,
        sum(num_licensed_beds) as licensed_beds,
        sum(num_staffed_beds) as staffed_beds,
        sum(num_icu_beds) as icu_beds,
        avg(bed_utilization) as bed_utilization,
        sum(
            potential_increase_in_bed_capac
        ) as potential_increase_bed_capacity
    FROM "covid-19".hospital_beds
    WHERE
        fips in (
            SELECT
                DISTINCT fips
            FROM
                "covid-19".nytimes_counties

```

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```

    )
    GROUP BY
    2
  ) hb ON hb.hospital_fips = j.fips
"""

```

```
wr.athena.read_sql_query(sql, database="covid-19", ctas_approach=False)
```

```
[8]:
```

	date	county	state	fips	confirmed	deaths	population \
0	2020-04-12	Park	Montana	30067	7	0	16736
1	2020-04-12	Ravalli	Montana	30081	3	0	43172
2	2020-04-12	Silver Bow	Montana	30093	11	0	34993
3	2020-04-12	Clay	Nebraska	31035	2	0	6214
4	2020-04-12	Cuming	Nebraska	31039	2	0	8940
...	...	...	...	...	...	...	...
227684	2020-06-11	Hockley	Texas	48219	28	1	22980
227685	2020-06-11	Hudspeth	Texas	48229	11	0	4795
227686	2020-06-11	Jones	Texas	48253	633	0	19817
227687	2020-06-11	La Salle	Texas	48283	4	0	7531
227688	2020-06-11	Limestone	Texas	48293	36	1	23519

	county2	Hospital	hospital_fips	licensed_beds	staffed_beds \
0	Park	0	30067	25	25
1	Ravalli	0	30081	25	25
2	Silver Bow	0	30093	98	71
3	Clay	<NA>	<NA>	<NA>	<NA>
4	Cuming	0	31039	25	25
...	...	...	...	...	...
227684	Hockley	0	48219	48	48
227685	Hudspeth	<NA>	<NA>	<NA>	<NA>
227686	Jones	0	48253	45	7
227687	La Salle	<NA>	<NA>	<NA>	<NA>
227688	Limestone	0	48293	78	69

	icu_beds	bed_utilization	potential_increase_bed_capacity
0	4	0.432548	0
1	5	0.567781	0
2	11	0.551457	27
3	<NA>	NaN	<NA>
4	4	0.204493	0
...	...	...	...
227684	8	0.120605	0
227685	<NA>	NaN	<NA>
227686	1	0.718591	38
227687	<NA>	NaN	<NA>
227688	9	0.163940	9

```
[227689 rows x 15 columns]
```

Create Dataset with custom SQL option

```
[9]: wr.quicksight.create_athena_dataset(
      name="covid19-nytimes-usa",
```

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```

    sql=sql,
    sql_name='CustomSQL',
    data_source_name="covid-19",
    import_mode='SPICE',
    allowed_to_manage=["dev"]
)

```

```
[10]: ingestion_id = wr.quicksight.create_ingestion("covid19-nytimes-usa")
```

Wait ingestion

```
[11]: while wr.quicksight.describe_ingestion(ingestion_id=ingestion_id, dataset_name="covid19-
↳ nytimes-usa")["IngestionStatus"] not in ["COMPLETED", "FAILED"]:
    sleep(1)
```

Describe last ingestion

```
[12]: wr.quicksight.describe_ingestion(ingestion_id=ingestion_id, dataset_name="covid19-
↳ nytimes-usa")["RowInfo"]
```

```
[12]: {'RowsIngested': 227689, 'RowsDropped': 0}
```

List all ingestions

```
[13]: [{"time": user["CreatedTime"], "source": user["RequestSource"]} for user in wr.
↳ quicksight.list_ingestions("covid19-nytimes-usa")]
```

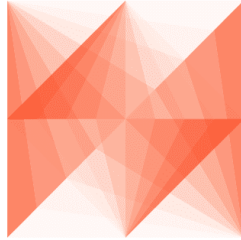
```
[13]: [{'time': datetime.datetime(2020, 6, 12, 15, 13, 46, 996000, tzinfo=tzlocal()),
      'source': 'MANUAL'},
      {'time': datetime.datetime(2020, 6, 12, 15, 13, 42, 344000, tzinfo=tzlocal()),
      'source': 'MANUAL'}]
```

Create new dataset from a table directly

```
[14]: wr.quicksight.create_athena_dataset(
    name="covid-19-tableau_jhu",
    table="tableau_jhu",
    data_source_name="covid-19",
    database="covid-19",
    import_mode='DIRECT_QUERY',
    rename_columns={
        "cases": "Count_of_Cases",
        "combined_key": "County"
    },
    cast_columns_types={
        "Count_of_Cases": "INTEGER"
    },
    allowed_to_manage=["dev"]
)
```

Cleaning up

```
[15]: wr.quicksight.delete_data_source("covid-19")
wr.quicksight.delete_dataset("covid19-nytimes-usa")
wr.quicksight.delete_dataset("covid-19-tableau-jhu")
```



## AWS Data Wrangler

### 1.3.19 19 - Amazon Athena Cache

Wrangler has a cache strategy that is disabled by default and can be enabled passing `max_cache_seconds` bigger than 0. This cache strategy for Amazon Athena can help you to **decrease query times and costs**.

When calling `read_sql_query`, instead of just running the query, we now can verify if the query has been run before. If so, and this last run was within `max_cache_seconds` (a new parameter to `read_sql_query`), we return the same results as last time if they are still available in S3. We have seen this increase performance more than 100x, but the potential is pretty much infinite.

The detailed approach is: - When `read_sql_query` is called with `max_cache_seconds > 0` (it defaults to 0), we check for the last queries run by the same workgroup (the most we can get without pagination). - By default it will check the last 50 queries, but you can customize it through the `max_cache_query_inspections` argument. - We then sort those queries based on `CompletionDateTime`, descending - For each of those queries, we check if their `CompletionDateTime` is still within the `max_cache_seconds` window. If so, we check if the query string is the same as now (with some smart heuristics to guarantee coverage over both `ctas_approaches`). If they are the same, we check if the last one's results are still on S3, and then return them instead of re-running the query. - During the whole cache resolution phase, if there is anything wrong, the logic falls back to the usual `read_sql_query` path.

*P.S. The ``cache scope is bounded for the current workgroup``, so you will be able to reuse queries results from others colleagues running in the same environment.*

```
[1]: import awswrangler as wr
```

Enter your bucket name:

```
[2]: import getpass
bucket = getpass.getpass()
path = f"s3://{bucket}/data/"
```

```
.....
```

## Checking/Creating Glue Catalog Databases

```
[3]: if "awswrangler_test" not in wr.catalog.databases().values:
      wr.catalog.create_database("awswrangler_test")
```

## Creating a Parquet Table from the NOAA's CSV files

### Reference

```
[4]: cols = ["id", "dt", "element", "value", "m_flag", "q_flag", "s_flag", "obs_time"]

df = wr.s3.read_csv(
    path="s3://noaa-ghcn-pds/csv/189",
    names=cols,
    parse_dates=["dt", "obs_time"]) # Read 10 files from the 1890 decade (~1GB)
```

```
df
```

	id	dt	element	value	m_flag	q_flag	s_flag	obs_time
0	AGE00135039	1890-01-01	TMAX	160	NaN	NaN	E	NaN
1	AGE00135039	1890-01-01	TMIN	30	NaN	NaN	E	NaN
2	AGE00135039	1890-01-01	PRCP	45	NaN	NaN	E	NaN
3	AGE00147705	1890-01-01	TMAX	140	NaN	NaN	E	NaN
4	AGE00147705	1890-01-01	TMIN	74	NaN	NaN	E	NaN
...	...	...	...	...	...	...	...	...
29240014	UZM00038457	1899-12-31	PRCP	16	NaN	NaN	r	NaN
29240015	UZM00038457	1899-12-31	TAVG	-73	NaN	NaN	r	NaN
29240016	UZM00038618	1899-12-31	TMIN	-76	NaN	NaN	r	NaN
29240017	UZM00038618	1899-12-31	PRCP	0	NaN	NaN	r	NaN
29240018	UZM00038618	1899-12-31	TAVG	-60	NaN	NaN	r	NaN

[29240019 rows x 8 columns]

```
[5]: wr.s3.to_parquet(
      df=df,
      path=path,
      dataset=True,
      mode="overwrite",
      database="awswrangler_test",
      table="noaa"
    );
```

```
[6]: wr.catalog.table(database="awswrangler_test", table="noaa")
```

```
[6]:
```

	Column Name	Type	Partition	Comment
0	id	string	False	
1	dt	timestamp	False	
2	element	string	False	
3	value	bigint	False	
4	m_flag	string	False	
5	q_flag	string	False	

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6	s_flag	string	False
7	obs_time	string	False

### The test query

The more computational resources the query needs, the more the cache will help you. That's why we're doing it using this long running query.

```
[7]: query = """
SELECT
    n1.element,
    count(1) as cnt
FROM
    noaa n1
JOIN
    noaa n2
ON
    n1.id = n2.id
GROUP BY
    n1.element
"""
```

### First execution...

```
[8]: %%time

wr.athena.read_sql_query(query, database="awsdatawrangler_test")
```

```
CPU times: user 5.31 s, sys: 232 ms, total: 5.54 s
Wall time: 6min 42s
```

```
[8]:   element      cnt
0    WDMV    49755046
1    SNWD   5089486328
2    DATN   10817510
3    DAPR   102579666
4    MDTN   10817510
5    WT03   71184687
6    WT09    584412
7    TOBS  146984266
8    DASF   7764526
9    WT04   9648963
10   WT18   92635444
11   WT01   87526136
12   WT16  323354156
13   PRCP  71238907298
14   SNOW  21950890838
15   WT06    307339
16   TAVG  2340863803
17   TMIN  41450979633
```

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18	MDTX	11210687
19	WT07	4486872
20	WT10	137873
21	EVAP	970404
22	WT14	8073701
23	DATX	11210687
24	WT08	33933005
25	WT05	8211491
26	TMAX	39876132467
27	MDPR	114320989
28	WT11	22212890
29	DWPR	69005655
30	MDSF	12004843

**Second execution with CACHE (400x faster)****[9]:** %%time

```
wr.athena.read_sql_query(query, database="awsdatawrangler_test", max_cache_seconds=900)
```

```
CPU times: user 493 ms, sys: 34.9 ms, total: 528 ms
```

```
Wall time: 975 ms
```

**[9]:**

	element	cnt
0	WDMV	49755046
1	SNWD	5089486328
2	DATN	10817510
3	DAPR	102579666
4	MDTN	10817510
5	WT03	71184687
6	WT09	584412
7	TOBS	146984266
8	DASF	7764526
9	WT04	9648963
10	WT18	92635444
11	WT01	87526136
12	WT16	323354156
13	PRCP	71238907298
14	SNOW	21950890838
15	WT06	307339
16	TAVG	2340863803
17	TMIN	41450979633
18	MDTX	11210687
19	WT07	4486872
20	WT10	137873
21	EVAP	970404
22	WT14	8073701
23	DATX	11210687
24	WT08	33933005
25	WT05	8211491
26	TMAX	39876132467

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```

27  MDPR    114320989
28  WT11    22212890
29  DWPR    69005655
30  MDSF    12004843

```

Allowing Wrangler to inspect up to 500 historical queries to find same result to reuse.

[10]: %%time

```

wr.athena.read_sql_query(query, database="awsdatawrangler_test", max_cache_seconds=900, max_
↳ cache_query_inspections=500)

```

```

CPU times: user 504 ms, sys: 44 ms, total: 548 ms
Wall time: 1.19 s

```

[10]:

```

      element      cnt
0      WDMV    49755046
1      SNWD    5089486328
2      DATN    10817510
3      DAPR    102579666
4      MDTN    10817510
5      WT03    71184687
6      WT09     584412
7      TOBS    146984266
8      DASF     7764526
9      WT04     9648963
10     WT18    92635444
11     WT01    87526136
12     WT16    323354156
13     PRCP    71238907298
14     SNOW    21950890838
15     WT06     307339
16     TAVG    2340863803
17     TMIN    41450979633
18     MDTX     11210687
19     WT07     4486872
20     WT10     137873
21     EVAP     970404
22     WT14     8073701
23     DATX     11210687
24     WT08     33933005
25     WT05     8211491
26     TMAX    39876132467
27     MDPR    114320989
28     WT11    22212890
29     DWPR    69005655
30     MDSF    12004843

```

### Cleaning Up S3

```
[11]: wr.s3.delete_objects(path)
```

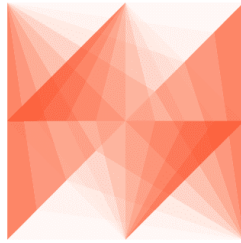
### Delete table

```
[12]: wr.catalog.delete_table_if_exists(database="awswrangler_test", table="noaa")
```

```
[12]: True
```

### Delete Database

```
[13]: wr.catalog.delete_database('awswrangler_test')
```



**AWS Data Wrangler**

## 1.3.20 20 - Spark Table Interoperability

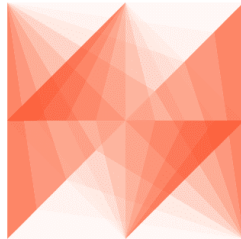
Wrangler has no difficulties to insert, overwrite or do any other kind of interaction with a Table created by Apache Spark.

But if you want to do the opposite (Spark interacting with a table created by Wrangler) you should be aware that Wrangler follows the Hive's format and you must be explicit when using the Spark's `saveAsTable` method:

```
[ ]: spark_df.write.format("hive").saveAsTable("database.table")
```

Or just move forward using the `insertInto` alternative:

```
[ ]: spark_df.write.insertInto("database.table")
```



**AWS Data Wrangler**

### 1.3.21 21 - Global Configurations

Wrangler has two ways to set global configurations that will override the regular default arguments configured in functions signatures.

- Environment variables
- `wr.config`

*P.S. Check the [function API doc](#) to see if your function has some argument that can be configured through Global configurations.*

*P.P.S. One exception to the above mentioned rules is the ```botocore_config``` property. It cannot be set through environment variables but only via ```wr.config```. It will be used as the ```botocore.config.Config``` for all underlying ```boto3``` calls. The default config is ```botocore.config.Config(retries={``max_attempts``: 5}, connect_timeout=10, max_pool_connections=10)```. If you only want to change the retry behavior, you can use the environment variables ```AWS_MAX_ATTEMPTS``` and ```AWS_RETRY_MODE```. (see [Boto3 documentation](#))*

#### Environment Variables

```
[1]: %env WR_DATABASE=default
      %env WR_CTAS_APPROACH=False
      %env WR_MAX_CACHE_SECONDS=900
      %env WR_MAX_CACHE_QUERY_INSPECTIONS=500
      %env WR_MAX_REMOTE_CACHE_ENTRIES=50
      %env WR_MAX_LOCAL_CACHE_ENTRIES=100
```

```
env: WR_DATABASE=default
env: WR_CTAS_APPROACH=False
env: WR_MAX_CACHE_SECONDS=900
env: WR_MAX_CACHE_QUERY_INSPECTIONS=500
env: WR_MAX_REMOTE_CACHE_ENTRIES=50
env: WR_MAX_LOCAL_CACHE_ENTRIES=100
```

```
[2]: import awswrangler as wr
      import boto3
```

```
[3]: wr.athena.read_sql_query("SELECT 1 AS FOO")
```

```
[3]:    foo
      0    1
```

#### Resetting

```
[4]: # Specific
      wr.config.reset("database")
      # All
      wr.config.reset()
```

**wr.config**

```
[5]: wr.config.database = "default"
wr.config.ctas_approach = False
wr.config.max_cache_seconds = 900
wr.config.max_cache_query_inspections = 500
wr.config.max_remote_cache_entries = 50
wr.config.max_local_cache_entries = 100
# Set botocore.config.Config that will be used for all boto3 calls
wr.config.botocore_config = botocore.config.Config(
    retries={"max_attempts": 10},
    connect_timeout=20,
    max_pool_connections=20
)
```

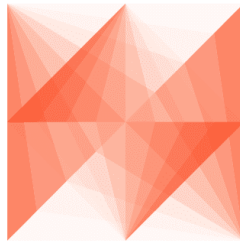
```
[6]: wr.athena.read_sql_query("SELECT 1 AS FOO")
```

```
[6]:    foo
0      1
```

**Visualizing**

```
[7]: wr.config
```

```
[7]: <aws wrangler._config._Config at 0x2d3a2c63df0>
```

**AWS Data Wrangler****1.3.22 22 - Writing Partitions Concurrently**

- `concurrent_partitioning` argument:

If True will increase the parallelism level during the partitions writing. It will ↪ decrease the writing time and increase the memory usage.

*P.S. Check the `function API` doc to see it has some argument that can be configured through Global configurations.*

```
[1]: %reload_ext memory_profiler
```

```
import awswrangler as wr
```

Enter your bucket name:

```
[2]: import getpass
bucket = getpass.getpass()
path = f"s3://{bucket}/data/"
.....
```

### Reading 4 GB of CSV from NOAA's historical data and creating a year column

```
[3]: noaa_path = "s3://noaa-ghcn-pds/csv/193"

cols = ["id", "dt", "element", "value", "m_flag", "q_flag", "s_flag", "obs_time"]
dates = ["dt", "obs_time"]
dtype = {x: "category" for x in ["element", "m_flag", "q_flag", "s_flag"]}

df = wr.s3.read_csv(noaa_path, names=cols, parse_dates=dates, dtype=dtype)

df["year"] = df["dt"].dt.year

print(f"Number of rows: {len(df.index)}")
print(f"Number of columns: {len(df.columns)}")

Number of rows: 125407761
Number of columns: 9
```

### Default Writing

```
[4]: %%time
%%memit

wr.s3.to_parquet(
    df=df,
    path=path,
    dataset=True,
    mode="overwrite",
    partition_cols=["year"],
);

peak memory: 22169.04 MiB, increment: 11119.68 MiB
CPU times: user 49 s, sys: 12.5 s, total: 1min 1s
Wall time: 1min 11s
```

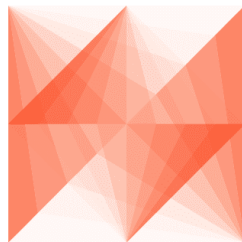
**Concurrent Partitioning (Decreasing writing time, but increasing memory usage)**

```
[5]: %%time
      %%memit

      wr.s3.to_parquet(
          df=df,
          path=path,
          dataset=True,
          mode="overwrite",
          partition_cols=["year"],
          concurrent_partitioning=True # <-----
      );

      peak memory: 27819.48 MiB, increment: 15743.30 MiB
      CPU times: user 52.3 s, sys: 13.6 s, total: 1min 5s
      Wall time: 41.6 s
```

```
[ ]:
```



**AWS Data Wrangler**

**1.3.23 23 - Flexible Partitions Filter (PUSH-DOWN)**

- `partition_filter` argument:

- Callback Function filters to apply on PARTITION columns (PUSH-DOWN filter).
- This function MUST receive a single argument (Dict[str, str]) where keys are ↵ partitions names and values are partitions values.
- This function MUST return a bool, True to read the partition or False to ignore ↵ it.
- Ignored if ``dataset=False``.

*P.S. Check the [function API](#) docto see it has some argument that can be configured through Global configurations.*

```
[1]: import awswrangler as wr
      import pandas as pd
```

Enter your bucket name:

```
[2]: import getpass
      bucket = getpass.getpass()
      path = f"s3://{bucket}/dataset/"
      .....
```

### Creating the Dataset (PARQUET)

```
[3]: df = pd.DataFrame({
      "id": [1, 2, 3],
      "value": ["foo", "boo", "bar"],
    })

      wr.s3.to_parquet(
          df=df,
          path=path,
          dataset=True,
          mode="overwrite",
          partition_cols=["value"]
      )

      wr.s3.read_parquet(path, dataset=True)
```

```
[3]:   id value
      0    3   bar
      1    2   boo
      2    1   foo
```

### Example 1

```
[4]: my_filter = lambda x: x["value"].endswith("oo")

      wr.s3.read_parquet(path, dataset=True, partition_filter=my_filter)
```

```
[4]:   id value
      0    2   boo
      1    1   foo
```

### Example 2

```
[5]: from Levenshtein import distance

      def my_filter(partitions):
          return distance("boo", partitions["value"]) <= 1

      wr.s3.read_parquet(path, dataset=True, partition_filter=my_filter)
```

```
[5]:      id value
     0    2  boo
     1    1  foo
```

### Creating the Dataset (CSV)

```
[6]: df = pd.DataFrame({
      "id": [1, 2, 3],
      "value": ["foo", "boo", "bar"],
    })

wr.s3.to_csv(
    df=df,
    path=path,
    dataset=True,
    mode="overwrite",
    partition_cols=["value"],
    compression="gzip",
    index=False
)

wr.s3.read_csv(path, dataset=True)
```

```
[6]:      id value
     0    3  bar
     1    2  boo
     2    1  foo
```

### Example 1

```
[7]: my_filter = lambda x: x["value"].endswith("oo")

wr.s3.read_csv(path, dataset=True, partition_filter=my_filter)
```

```
[7]:      id value
     0    2  boo
     1    1  foo
```

### Example 2

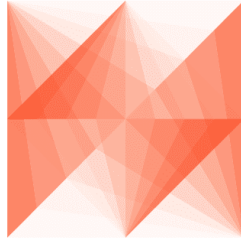
```
[8]: from Levenshtein import distance

def my_filter(partitions):
    return distance("boo", partitions["value"]) <= 1

wr.s3.read_csv(path, dataset=True, partition_filter=my_filter)
```



```
[8]:      id value
0     2   boo
1     1   foo
```



## AWS Data Wrangler

### 1.3.24 24 - Athena Query Metadata

For `wr.athena.read_sql_query()` and `wr.athena.read_sql_table()` the resulting `DataFrame` (or every `DataFrame` in the returned Iterator for chunked queries) have a `query_metadata` attribute, which brings the query result metadata returned by Boto3/Athena.

The expected `query_metadata` format is the same returned by:

[https://boto3.amazonaws.com/v1/documentation/api/latest/reference/services/athena.html#Athena.Client.get\\_query\\_execution](https://boto3.amazonaws.com/v1/documentation/api/latest/reference/services/athena.html#Athena.Client.get_query_execution)

#### Environment Variables

```
[1]: %env WR_DATABASE=default
env: WR_DATABASE=default
```

```
[2]: import awswrangler as wr
```

```
[5]: df = wr.athena.read_sql_query("SELECT 1 AS foo")
```

```
df
```

```
[5]:      foo
0     1
```

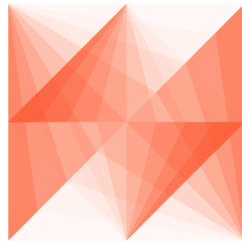
## Getting statistics from query metadata

```
[6]: print(f'DataScannedInBytes:           {df.query_metadata["Statistics"][
      ↪ "DataScannedInBytes"]}')
     print(f'TotalExecutionTimeInMillis:   {df.query_metadata["Statistics"][
      ↪ "TotalExecutionTimeInMillis"]}')
     print(f'QueryQueueTimeInMillis:       {df.query_metadata["Statistics"][
      ↪ "QueryQueueTimeInMillis"]}')
     print(f'QueryPlanningTimeInMillis:    {df.query_metadata["Statistics"][
      ↪ "QueryPlanningTimeInMillis"]}')
     print(f'ServiceProcessingTimeInMillis: {df.query_metadata["Statistics"][
      ↪ "ServiceProcessingTimeInMillis"]}')

```

```
DataScannedInBytes:           0
TotalExecutionTimeInMillis:   2311
QueryQueueTimeInMillis:       121
QueryPlanningTimeInMillis:    250
ServiceProcessingTimeInMillis: 37

```



AWS Data Wrangler

## 1.3.25 25 - Redshift - Loading Parquet files with Spectrum

Enter your bucket name:

```
[1]: import getpass
     bucket = getpass.getpass()
     PATH = f"s3://{bucket}/files/"

```

.....

## Mocking some Parquet Files on S3

```
[2]: import awswrangler as wr
     import pandas as pd

     df = pd.DataFrame({
         "col0": [0, 1, 2, 3, 4, 5, 6, 7, 8, 9],
         "col1": ["a", "b", "c", "d", "e", "f", "g", "h", "i", "j"],
     })

```

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df

```
[2]:      col0 col1
      0      0    a
      1      1    b
      2      2    c
      3      3    d
      4      4    e
      5      5    f
      6      6    g
      7      7    h
      8      8    i
      9      9    j
```

```
[3]: wr.s3.to_parquet(df, PATH, max_rows_by_file=2, dataset=True, mode="overwrite");
```

### Crawling the metadata and adding into Glue Catalog

```
[4]: wr.s3.store_parquet_metadata(
      path=PATH,
      database="aws_data_wrangler",
      table="test",
      dataset=True,
      mode="overwrite"
    )
```

```
[4]: ({'col0': 'bigint', 'col1': 'string'}, None, None)
```

### Running the CTAS query to load the data into Redshift storage

```
[5]: con = wr.redshift.connect(connection="aws-data-wrangler-redshift")
```

```
[6]: query = "CREATE TABLE public.test AS (SELECT * FROM aws_data_wrangler_external.test)"
```

```
[7]: with con.cursor() as cursor:
      cursor.execute(query)
```

### Running an INSERT INTO query to load MORE data into Redshift storage

```
[8]: df = pd.DataFrame({
      "col0": [10, 11],
      "col1": ["k", "l"],
    })
wr.s3.to_parquet(df, PATH, dataset=True, mode="overwrite");
```

```
[9]: query = "INSERT INTO public.test (SELECT * FROM aws_data_wrangler_external.test)"
```

```
[10]: with con.cursor() as cursor:
      cursor.execute(query)
```

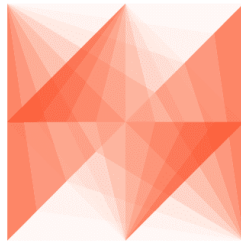
### Checking the result

```
[11]: query = "SELECT * FROM public.test"
```

```
[13]: wr.redshift.read_sql_table(con=con, schema="public", table="test")
```

```
[13]:      col0 coll
      0      5    f
      1      1    b
      2      3    d
      3      6    g
      4      8    i
      5     10    k
      6      4    e
      7      0    a
      8      2    c
      9      7    h
     10      9    j
     11     11    l
```

```
[14]: con.close()
```



## AWS Data Wrangler

### 1.3.26 26 - Amazon Timestream

#### Creating resources

```
[10]: import awswrangler as wr
      import pandas as pd
      from datetime import datetime

      wr.timestream.create_database("sampleDB")
      wr.timestream.create_table("sampleDB", "sampleTable", memory_retention_hours=1, magnetic_
      ↪retention_days=1);
```

## Write

```
[11]: df = pd.DataFrame(
    {
        "time": [datetime.now(), datetime.now(), datetime.now()],
        "dim0": ["foo", "boo", "bar"],
        "dim1": [1, 2, 3],
        "measure": [1.0, 1.1, 1.2],
    }
)

rejected_records = wr.timestream.write(
    df=df,
    database="sampleDB",
    table="sampleTable",
    time_col="time",
    measure_col="measure",
    dimensions_cols=["dim0", "dim1"],
)

print(f"Number of rejected records: {len(rejected_records)}")
```

Number of rejected records: 0

## Query

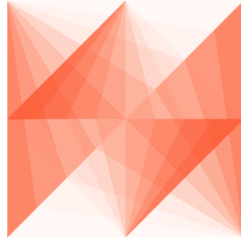
```
[12]: wr.timestream.query(
    'SELECT time, measure_value::double, dim0, dim1 FROM "sampleDB"."sampleTable" ORDER_
    ↪BY time DESC LIMIT 3'
)

[12]:
```

	time	measure_value::double	dim0	dim1
0	2020-12-08 19:15:32.468	1.0	foo	1
1	2020-12-08 19:15:32.468	1.2	bar	3
2	2020-12-08 19:15:32.468	1.1	boo	2

## Deleting resources

```
[13]: wr.timestream.delete_table("sampleDB", "sampleTable")
wr.timestream.delete_database("sampleDB")
```



## AWS Data Wrangler

### 1.3.27 27 - Amazon Timestream - Example 2

#### Reading test data

```
[1]: import awswrangler as wr
import pandas as pd
from datetime import datetime

df = pd.read_csv(
    "https://raw.githubusercontent.com/awslabs/amazon-timestream-tools/master/sample_
    ↪apps/data/sample.csv",
    names=[
        "ignore0",
        "region",
        "ignore1",
        "az",
        "ignore2",
        "hostname",
        "measure_kind",
        "measure",
        "ignore3",
        "ignore4",
        "ignore5",
    ],
    usecols=["region", "az", "hostname", "measure_kind", "measure"],
)
df["time"] = datetime.now()
df.reset_index(inplace=True, drop=False)

df
```

```
[1]:
```

	index	region	az	hostname	measure_kind \
0	0	us-east-1	us-east-1a	host-fj2hx	cpu_utilization
1	1	us-east-1	us-east-1a	host-fj2hx	memory_utilization
2	2	us-east-1	us-east-1a	host-6kMPE	cpu_utilization
3	3	us-east-1	us-east-1a	host-6kMPE	memory_utilization
4	4	us-east-1	us-east-1a	host-sxj7X	cpu_utilization
...	...	...	...	...	...
125995	125995	eu-north-1	eu-north-1c	host-De8RB	memory_utilization

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```

125996 125996 eu-north-1 eu-north-1c host-2z8tn memory_utilization
125997 125997 eu-north-1 eu-north-1c host-2z8tn cpu_utilization
125998 125998 eu-north-1 eu-north-1c host-9FcZw memory_utilization
125999 125999 eu-north-1 eu-north-1c host-9FcZw cpu_utilization

```

```

      measure                                time
0      21.394363 2020-12-08 16:18:47.599597
1      68.563420 2020-12-08 16:18:47.599597
2      17.144579 2020-12-08 16:18:47.599597
3      73.507870 2020-12-08 16:18:47.599597
4      26.584865 2020-12-08 16:18:47.599597
...      ...
125995 68.063468 2020-12-08 16:18:47.599597
125996 72.203680 2020-12-08 16:18:47.599597
125997 29.212219 2020-12-08 16:18:47.599597
125998 71.746134 2020-12-08 16:18:47.599597
125999  1.677793 2020-12-08 16:18:47.599597

```

```
[126000 rows x 7 columns]
```

## Creating resources

```

[2]: wr.timestream.create_database("sampleDB")
wr.timestream.create_table("sampleDB", "sampleTable", memory_retention_hours=1, magnetic_
    ↪ retention_days=1);

```

## Write CPU\_UTILIZATION records

```

[3]: df_cpu = df[df.measure_kind == "cpu_utilization"].copy()
df_cpu.rename(columns={"measure": "cpu_utilization"}, inplace=True)
df_cpu

```

```

[3]:
   index  region  az  hostname  measure_kind \
0      0  us-east-1  us-east-1a  host-fj2hx  cpu_utilization
2      2  us-east-1  us-east-1a  host-6kMPE  cpu_utilization
4      4  us-east-1  us-east-1a  host-sxj7X  cpu_utilization
6      6  us-east-1  us-east-1a  host-ExOui  cpu_utilization
8      8  us-east-1  us-east-1a  host-Bwb3j  cpu_utilization
...      ...      ...      ...      ...      ...
125990 125990  eu-north-1  eu-north-1c  host-aPtc6  cpu_utilization
125992 125992  eu-north-1  eu-north-1c  host-7ZF9L  cpu_utilization
125994 125994  eu-north-1  eu-north-1c  host-De8RB  cpu_utilization
125997 125997  eu-north-1  eu-north-1c  host-2z8tn  cpu_utilization
125999 125999  eu-north-1  eu-north-1c  host-9FcZw  cpu_utilization

      cpu_utilization                                time
0      21.394363 2020-12-08 16:18:47.599597
2      17.144579 2020-12-08 16:18:47.599597
4      26.584865 2020-12-08 16:18:47.599597

```

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```

6          52.930970 2020-12-08 16:18:47.599597
8          99.134110 2020-12-08 16:18:47.599597
...          ...          ...
125990     89.566125 2020-12-08 16:18:47.599597
125992     75.510598 2020-12-08 16:18:47.599597
125994       2.771261 2020-12-08 16:18:47.599597
125997     29.212219 2020-12-08 16:18:47.599597
125999       1.677793 2020-12-08 16:18:47.599597

```

```
[63000 rows x 7 columns]
```

```

[4]: rejected_records = wr.timestream.write(
      df=df_cpu,
      database="sampleDB",
      table="sampleTable",
      time_col="time",
      measure_col="cpu_utilization",
      dimensions_cols=["index", "region", "az", "hostname"],
    )

assert len(rejected_records) == 0

```

### Write MEMORY\_UTILIZATION records

```

[5]: df_memory = df[df.measure_kind == "memory_utilization"].copy()
      df_memory.rename(columns={"measure": "memory_utilization"}, inplace=True)

```

```
df_memory
```

```

[5]:
      index  region  az  hostname  measure_kind \
1         1  us-east-1  us-east-1a  host-fj2hx  memory_utilization
3         3  us-east-1  us-east-1a  host-6kMPE  memory_utilization
5         5  us-east-1  us-east-1a  host-sxj7X  memory_utilization
7         7  us-east-1  us-east-1a  host-ExOui  memory_utilization
9         9  us-east-1  us-east-1a  host-Bwb3j  memory_utilization
...      ...      ...      ...      ...      ...
125991 125991  eu-north-1  eu-north-1c  host-aPtc6  memory_utilization
125993 125993  eu-north-1  eu-north-1c  host-7ZF9L  memory_utilization
125995 125995  eu-north-1  eu-north-1c  host-De8RB  memory_utilization
125996 125996  eu-north-1  eu-north-1c  host-2z8tn  memory_utilization
125998 125998  eu-north-1  eu-north-1c  host-9FcZw  memory_utilization

      memory_utilization  time
1         68.563420 2020-12-08 16:18:47.599597
3         73.507870 2020-12-08 16:18:47.599597
5         22.401424 2020-12-08 16:18:47.599597
7         45.440135 2020-12-08 16:18:47.599597
9         15.042701 2020-12-08 16:18:47.599597
...      ...      ...
125991     75.686739 2020-12-08 16:18:47.599597
125993     18.386152 2020-12-08 16:18:47.599597

```

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```

125995          68.063468 2020-12-08 16:18:47.599597
125996          72.203680 2020-12-08 16:18:47.599597
125998          71.746134 2020-12-08 16:18:47.599597

```

```
[63000 rows x 7 columns]
```

```

[6]: rejected_records = wr.timestream.write(
    df=df_memory,
    database="sampleDB",
    table="sampleTable",
    time_col="time",
    measure_col="memory_utilization",
    dimensions_cols=["index", "region", "az", "hostname"],
)

assert len(rejected_records) == 0

```

### Querying CPU\_UTILIZATION

```

[7]: wr.timestream.query("""
    SELECT
        hostname, region, az, measure_name, measure_value::double, time
    FROM "sampleDB"."sampleTable"
    WHERE measure_name = 'cpu_utilization'
    ORDER BY time DESC
    LIMIT 10
""")

```

```

[7]:
  hostname      region      az      measure_name \
0 host-0gvFx    us-west-1    us-west-1a  cpu_utilization
1 host-rZUNx    eu-north-1    eu-north-1a  cpu_utilization
2 host-t1kAB    us-east-2      us-east-2b  cpu_utilization
3 host-RdQRf    us-east-1      us-east-1c  cpu_utilization
4 host-4Llhu    us-east-1      us-east-1c  cpu_utilization
5 host-2plqa    us-west-1      us-west-1a  cpu_utilization
6 host-J3Q4z    us-east-1      us-east-1b  cpu_utilization
7 host-VIR5T    ap-east-1      ap-east-1a  cpu_utilization
8 host-G042D    us-east-1      us-east-1c  cpu_utilization
9 host-8EBHm    us-west-2      us-west-2c  cpu_utilization

  measure_value::double      time
0          39.617911 2020-12-08 19:18:47.600
1          30.793332 2020-12-08 19:18:47.600
2          74.453239 2020-12-08 19:18:47.600
3          76.984448 2020-12-08 19:18:47.600
4          41.862733 2020-12-08 19:18:47.600
5          34.864762 2020-12-08 19:18:47.600
6          71.574266 2020-12-08 19:18:47.600
7          14.017491 2020-12-08 19:18:47.600
8          60.199068 2020-12-08 19:18:47.600
9          96.631624 2020-12-08 19:18:47.600

```

## Querying MEMORY\_UTILIZATION

```
[8]: wr.timestream.query("""
      SELECT
        hostname, region, az, measure_name, measure_value::double, time
      FROM "sampleDB"."sampleTable"
      WHERE measure_name = 'memory_utilization'
      ORDER BY time DESC
      LIMIT 10
      """)
```

```
[8]:
```

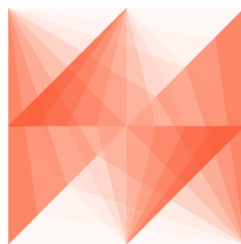
	hostname	region	az	measure_name	\
0	host-7c897	us-west-2	us-west-2b	memory_utilization	
1	host-2z8tn	eu-north-1	eu-north-1c	memory_utilization	
2	host-J3Q4z	us-east-1	us-east-1b	memory_utilization	
3	host-mjrQb	us-east-1	us-east-1b	memory_utilization	
4	host-AyWSI	us-east-1	us-east-1c	memory_utilization	
5	host-Axf0g	us-west-2	us-west-2a	memory_utilization	
6	host-ilMBa	us-east-2	us-east-2b	memory_utilization	
7	host-CWdXX	us-west-2	us-west-2c	memory_utilization	
8	host-8EBHm	us-west-2	us-west-2c	memory_utilization	
9	host-dRIJj	us-east-1	us-east-1c	memory_utilization	

	measure_value::double	time
0	63.427726	2020-12-08 19:18:47.600
1	41.071368	2020-12-08 19:18:47.600
2	23.944388	2020-12-08 19:18:47.600
3	69.173431	2020-12-08 19:18:47.600
4	75.591467	2020-12-08 19:18:47.600
5	29.720739	2020-12-08 19:18:47.600
6	71.544134	2020-12-08 19:18:47.600
7	79.792799	2020-12-08 19:18:47.600
8	66.082554	2020-12-08 19:18:47.600
9	86.748960	2020-12-08 19:18:47.600

## Deleting resources

```
[9]: wr.timestream.delete_table("sampleDB", "sampleTable")
      wr.timestream.delete_database("sampleDB")
```



**AWS Data Wrangler**

## 1.3.28 28 - Amazon DynamoDB

### Writing Data

```
[1]: import awswrangler as wr
import pandas as pd
from pathlib import Path
```

### Writing DataFrame

```
[2]: df = pd.DataFrame({
    "key": [1, 2],
    "value": ["foo", "boo"]
})
wr.dynamodb.put_df(df=df, table_name="table")
```

### Writing CSV file

```
[3]: filepath = Path("items.csv")
df.to_csv(filepath, index=False)
wr.dynamodb.put_csv(path=filepath, table_name="table")
filepath.unlink()
```

### Writing JSON files

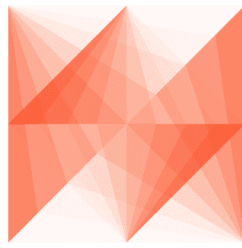
```
[4]: filepath = Path("items.json")
df.to_json(filepath, orient="records")
wr.dynamodb.put_json(path="items.json", table_name="table")
filepath.unlink()
```

### Writing list of items

```
[5]: items = df.to_dict(orient="records")
wr.dynamodb.put_items(items=items, table_name="table")
```

### Deleting items

```
[6]: wr.dynamodb.delete_items(items=items, table_name="table")
```



## AWS Data Wrangler

### 1.3.29 29 - S3 Select

AWS Data Wrangler supports [Amazon S3 Select](#), enabling applications to use SQL statements in order to query and filter the contents of a single S3 object. It works on objects stored in CSV, JSON or Apache Parquet, including compressed and large files of several TBs.

With S3 Select, the query workload is delegated to Amazon S3, leading to lower latency and cost, and to higher performance (up to 400% improvement). This is in comparison with other Wrangler operations such as `read_parquet` where the S3 object is downloaded and filtered on the client-side.

This feature has a number of limitations however, and should be used for specific scenarios only: \* It operates on a single S3 object \* The maximum length of a record in the input or result is 1 MB \* The maximum uncompressed row group size is 256 MB (Parquet only) \* It can only emit nested data in JSON format \* Certain SQL operations are not supported (e.g. ORDER BY)

#### Read full CSV file

```
[1]: import awswrangler as wr

df = wr.s3.select_query(
    sql="SELECT * FROM s3object",
    path="s3://nyc-tlc/trip data/fhv_tripdata_2019-09.csv", # 58 MB
    input_serialization="CSV",
    input_serialization_params={
        "FileHeaderInfo": "Use",
        "RecordDelimiter": "\r\n",
    },
    use_threads=True,
)
df.head()
```

	dispatching_base_num	pickup_datetime	dropoff_datetime	PULocationID	\
0	B00009	2019-09-01 00:35:00	2019-09-01 00:59:00	264	
1	B00009	2019-09-01 00:48:00	2019-09-01 01:09:00	264	
2	B00014	2019-09-01 00:16:18	2019-09-02 00:35:37	264	
3	B00014	2019-09-01 00:55:03	2019-09-01 01:09:35	264	
4	B00014	2019-09-01 00:13:08	2019-09-02 01:12:31	264	
	DOLocationID	SR_Flag			
0	264				

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```
1      264
2      264
3      264
4      264
```

### Filter JSON file

```
[2]: wr.s3.select_query(
      sql="SELECT * FROM s3object[*] s where s.\"family_name\" = \"Biden\"",
      path="s3://aws-glue-datasets/examples/us-legislators/all/persons.json",
      input_serialization="JSON",
      input_serialization_params={
          "Type": "Document",
      },
  )
```

```
[2]: family_name      contact_details      name \
0      Biden  [{ 'type': 'twitter', 'value': 'joebiden' }]  Joseph Biden, Jr.

      links gender \
0  [{ 'note': 'Wikipedia (ace)', 'url': 'https://a...  male

      image \
0  https://theunitedstates.io/images/congress/ori...

      identifiers \
0  [{ 'scheme': 'bioguide', 'identifier': 'B000444...

      other_names      sort_name \
0  [{ 'note': 'alternate', 'name': 'Joe Biden' }, { ...  Biden, Joseph

      images given_name birth_date \
0  [{ 'url': 'https://theunitedstates.io/images/co...  Joseph  1942-11-20

      id
0  64239edf-8e06-4d2d-acc0-33d96bc79774
```

### Read Snappy compressed Parquet

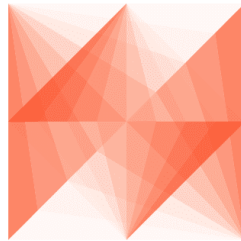
```
[3]: df = wr.s3.select_query(
      sql="SELECT * FROM s3object s where s.\"star_rating\" >= 5",
      path="s3://amazon-reviews-pds/parquet/product_category=Gift_Card/part-00000-
      ↪495c48e6-96d6-4650-aa65-3c36a3516ddd.c000.snappy.parquet",
      input_serialization="Parquet",
      input_serialization_params={},
      use_threads=True,
  )
df.loc[:, df.columns != "product_title"].head()
```

```
[3]: marketplace customer_id review_id product_id product_parent \
0 US 52670295 RGPOFKORD8RTU B0002CZPPG 867256265
1 US 29964102 R2U8X8V5KPB4J3 B00H5BMF00 373287760
2 US 25173351 R15XV3LXUMLTXL B00PG40C04 137115061
3 US 12516181 R3G6G7H8TX4H0T B0002CZPPG 867256265
4 US 38355314 R2NJ7WNBUI6YTQ B00B2TFS06 89375983

star_rating helpful_votes total_votes vine verified_purchase \
0 5 105 107 N N
1 5 0 0 N Y
2 5 0 0 N Y
3 5 6 6 N N
4 5 0 0 N Y

review_headline review_body \
0 Excellent Gift Idea I wonder if the other reviewer actually read t...
1 Five Stars convenience is the name of the game.
2 Birthday Gift This gift card was handled with accuracy in de...
3 Love 'em. Gotta love these iTunes Prepaid Card thingys. ...
4 Five Stars perfect

review_date year
0 2005-02-08 2005
1 2015-05-03 2015
2 2015-05-03 2015
3 2005-10-15 2005
4 2015-05-03 2015
```



**AWS Data Wrangler**

### 1.3.30 30 - Data Api

The Data Api simplifies access to Amazon Redshift and RDS by removing the need to manage database connections and credentials. Instead, you can execute SQL commands to an Amazon Redshift cluster or Amazon Aurora cluster by simply invoking an HTTPS API endpoint provided by the Data API. It takes care of managing database connections and returning data. Since the Data API leverages IAM user credentials or database credentials stored in AWS Secrets Manager, you don't need to pass credentials in API calls.

#### Connect to the cluster

- `wr.data_api.redshift.connect()`
- `wr.data_api.rds.connect()`

```
[ ]: con_redshift = wr.data_api.redshift.connect(
    cluster_id="aws-data-wrangler-1xn5lqxrdrv3",
    database="test_redshift",
    secret_arn="arn:aws:secretsmanager:us-east-1:111111111111:secret:aws-data-wrangler/
↳redshift-ewn43d"
)

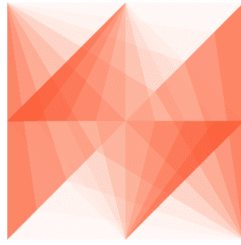
con_mysql = wr.data_api.rds.connect(
    cluster_id="arn:aws:rds:us-east-1:111111111111:cluster:mysql-serverless-cluster-
↳wrangler",
    database="test_rds",
    secret_arn="arn:aws:secretsmanager:us-east-1:111111111111:secret:aws-data-wrangler/
↳mysql-23df3"
)
```

#### Read from database

- `wr.data_api.redshift.read_sql_query()`
- `wr.data_api.rds.read_sql_query()`

```
[ ]: df = wr.data_api.redshift.read_sql_query(
    sql="SELECT * FROM public.test_table",
    con=con_redshift,
)

df = wr.data_api.rds.read_sql_query(
    sql="SELECT * FROM test.test_table",
    con=con_rds,
)
```



## AWS Data Wrangler

### 1.3.31 31 - OpenSearch

#### Table of Contents

- 1. Initialize
  - *Connect to your Amazon OpenSearch domain*
  - *Enter your bucket name*
  - *Initialize sample data*
- 2. Indexing (load)
  - *Index documents (no Pandas)*
  - *Index json file*
  - *Index CSV*
- 3. Search
  - *3.1 Search by DSL*
  - *3.2 Search by SQL*
- 4. Delete Indices
- 5. Bonus - Prepare data and index from DataFrame
  - *Prepare the data for indexing*
  - *Create index with mapping*
  - *Index dataframe*
  - *Execute geo query*



## 1. Initialize

```
[1]: import awswrangler as wr
```

### Connect to your Amazon OpenSearch domain

```
[2]: client = wr.opensearch.connect(
      host='OPENSEARCH-ENDPOINT',
      #   username='FGAC-USERNAME(OPTIONAL)',
      #   password='FGAC-PASSWORD(OPTIONAL)'
    )
client.info()
```

### Enter your bucket name

```
[3]: bucket = 'BUCKET'
```

### Initialize sample data

```
[4]: sf_restaurants_inspections = [
      {
        "inspection_id": "24936_20160609",
        "business_address": "315 California St",
        "business_city": "San Francisco",
        "business_id": "24936",
        "business_location": {"lon": -122.400152, "lat": 37.793199},
        "business_name": "San Francisco Soup Company",
        "business_postal_code": "94104",
        "business_state": "CA",
        "inspection_date": "2016-06-09T00:00:00.000",
        "inspection_score": 77,
        "inspection_type": "Routine - Unscheduled",
        "risk_category": "Low Risk",
        "violation_description": "Improper food labeling or menu misrepresentation",
        "violation_id": "24936_20160609_103141",
      },
      {
        "inspection_id": "60354_20161123",
        "business_address": "10 Mason St",
        "business_city": "San Francisco",
        "business_id": "60354",
        "business_location": {"lon": -122.409061, "lat": 37.783527},
        "business_name": "Soup Unlimited",
        "business_postal_code": "94102",
        "business_state": "CA",
        "inspection_date": "2016-11-23T00:00:00.000",
        "inspection_type": "Routine",
      }
    ]
```

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```

    "inspection_score": 95,
  },
  {
    "inspection_id": "1797_20160705",
    "business_address": "2872 24th St",
    "business_city": "San Francisco",
    "business_id": "1797",
    "business_location": {"lon": -122.409752, "lat": 37.752807},
    "business_name": "TIO CHILOS GRILL",
    "business_postal_code": "94110",
    "business_state": "CA",
    "inspection_date": "2016-07-05T00:00:00.000",
    "inspection_score": 90,
    "inspection_type": "Routine - Unscheduled",
    "risk_category": "Low Risk",
    "violation_description": "Unclean nonfood contact surfaces",
    "violation_id": "1797_20160705_103142",
  },
  {
    "inspection_id": "66198_20160527",
    "business_address": "1661 Tennessee St Suite 3B",
    "business_city": "San Francisco Whard Restaurant",
    "business_id": "66198",
    "business_location": {"lon": -122.388478, "lat": 37.75072},
    "business_name": "San Francisco Restaurant",
    "business_postal_code": "94107",
    "business_state": "CA",
    "inspection_date": "2016-05-27T00:00:00.000",
    "inspection_type": "Routine",
    "inspection_score": 56,
  },
  {
    "inspection_id": "5794_20160907",
    "business_address": "2162 24th Ave",
    "business_city": "San Francisco",
    "business_id": "5794",
    "business_location": {"lon": -122.481299, "lat": 37.747228},
    "business_name": "Soup House",
    "business_phone_number": "+14155752700",
    "business_postal_code": "94116",
    "business_state": "CA",
    "inspection_date": "2016-09-07T00:00:00.000",
    "inspection_score": 96,
    "inspection_type": "Routine - Unscheduled",
    "risk_category": "Low Risk",
    "violation_description": "Unapproved or unmaintained equipment or utensils",
    "violation_id": "5794_20160907_103144",
  },
  # duplicate record
  {
    "inspection_id": "5794_20160907",

```

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```

        "business_address": "2162 24th Ave",
        "business_city": "San Francisco",
        "business_id": "5794",
        "business_location": {"lon": -122.481299, "lat": 37.747228},
        "business_name": "Soup-or-Salad",
        "business_phone_number": "+14155752700",
        "business_postal_code": "94116",
        "business_state": "CA",
        "inspection_date": "2016-09-07T00:00:00.000",
        "inspection_score": 96,
        "inspection_type": "Routine - Unscheduled",
        "risk_category": "Low Risk",
        "violation_description": "Unapproved or unmaintained equipment or utensils",
        "violation_id": "5794_20160907_103144",
    },
]

```

## 2. Indexing (load)

### Index documents (no Pandas)

[5]: # index documents w/o providing keys (\_id is auto-generated)

```

wr.opensearch.index_documents(
    client,
    documents=sf_restaurants_inspections,
    index="sf_restaurants_inspections"
)

```

Indexing: 100% (6/6) |#####|Elapsed Time: 0:00:01

[5]: {'success': 6, 'errors': []}

[6]: # read all documents. There are total 6 documents

```

wr.opensearch.search(
    client,
    index="sf_restaurants_inspections",
    _source=["inspection_id", "business_name", "business_location"]
)

```

[6]:

	_id	business_name \
0	663dd72d-0da4-495b-b0ae-ed000105ae73	TIO CHILOS GRILL
1	ff2f50f6-5415-4706-9bcb-af7c5eb0afa3	Soup House
2	b9e8f6a2-8fd1-4660-b041-2997a1a80984	San Francisco Soup Company
3	56b352e6-102b-4eff-8296-7e1fb2459bab	Soup Unlimited
4	6fec5411-f79a-48e4-be7b-e0e44d5ebbab	San Francisco Restaurant
5	7ba4fb17-f9a9-49da-b90e-8b3553d6d97c	Soup-or-Salad

	inspection_id	business_location.lon	business_location.lat
0	1797_20160705	-122.409752	37.752807
1	5794_20160907	-122.481299	37.747228
2	24936_20160609	-122.400152	37.793199

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3	60354_20161123	-122.409061	37.783527
4	66198_20160527	-122.388478	37.750720
5	5794_20160907	-122.481299	37.747228

**Index json file**

```
[ ]: import pandas as pd
df = pd.DataFrame(sf_restaurants_inspections)
path = f"s3://{bucket}/json/sf_restaurants_inspections.json"
wr.s3.to_json(df, path, orient='records', lines=True)
```

```
[8]: # index json w/ providing keys
wr.opensearch.index_json(
    client,
    path=path, # path can be s3 or local
    index="sf_restaurants_inspections_dedup",
    id_keys=["inspection_id"] # can be multiple fields. arg applicable to all index_
    ↪ * functions
)
```

```
Indexing: 100% (6/6) |#####|Elapsed Time: 0:00:00
```

```
[8]: {'success': 6, 'errors': []}
```

```
[9]: # now there are no duplicates. There are total 5 documents
wr.opensearch.search(
    client,
    index="sf_restaurants_inspections_dedup",
    _source=["inspection_id", "business_name", "business_location"]
)
```

```
[9]:
```

	_id	business_name	inspection_id \
0	24936_20160609	San Francisco Soup Company	24936_20160609
1	66198_20160527	San Francisco Restaurant	66198_20160527
2	5794_20160907	Soup-or-Salad	5794_20160907
3	60354_20161123	Soup Unlimited	60354_20161123
4	1797_20160705	TIO CHILOS GRILL	1797_20160705

	business_location.lon	business_location.lat
0	-122.400152	37.793199
1	-122.388478	37.750720
2	-122.481299	37.747228
3	-122.409061	37.783527
4	-122.409752	37.752807

## Index CSV

```
[11]: wr.opensearch.index_csv(
    client,
    index="nyc_restaurants_inspections_sample",
    path='https://data.cityofnewyork.us/api/views/43nn-pn8j/rows.csv?
    ↪accessType=DOWNLOAD', # index_csv supports local, s3 and url path
    id_keys=["CAMIS"],
    pandas_kwargs={'na_filter': True, 'nrows': 1000}, # pandas.read_csv() args ↪
    ↪https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.read_csv.html
    bulk_size=500 # modify based on your cluster size
)
```

```
Indexing: 100% (1000/1000)|#####|Elapsed Time: 0:00:00
```

```
[11]: {'success': 1000, 'errors': []}
```

```
[12]: wr.opensearch.search(
    client,
    index="nyc_restaurants_inspections_sample",
    size=5
)
```

```
[12]:
```

	_id	CAMIS	DBA	BORO	BUILDING	\
0	41610426	41610426	GLOW THAI RESTAURANT	Brooklyn	7107	
1	40811162	40811162	CARMINE'S	Manhattan	2450	
2	50012113	50012113	TANG	Queens	196-50	
3	50014618	50014618	TOTTO RAMEN	Manhattan	248	
4	50045782	50045782	OLLIE'S CHINESE RESTAURANT	Manhattan	2705	

	STREET	ZIPCODE	PHONE	CUISINE	DESCRIPTION	\
0	3 AVENUE	11209.0	7187481920		Thai	
1	BROADWAY	10024.0	2123622200		Italian	
2	NORTHERN BOULEVARD	11358.0	7182797080		Korean	
3	EAST 52 STREET	10022.0	2124210052		Japanese	
4	BROADWAY	10025.0	2129323300		Chinese	

	INSPECTION DATE	...	RECORD DATE	INSPECTION TYPE	\
0	02/26/2020	...	10/04/2021	Cycle Inspection / Re-inspection	
1	05/28/2019	...	10/04/2021	Cycle Inspection / Initial Inspection	
2	08/16/2018	...	10/04/2021	Cycle Inspection / Initial Inspection	
3	08/20/2018	...	10/04/2021	Cycle Inspection / Re-inspection	
4	10/21/2019	...	10/04/2021	Cycle Inspection / Re-inspection	

	Latitude	Longitude	Community	Board	Council	District	Census Tract	\
0	40.633865	-74.026798		310.0		43.0	6800.0	
1	40.791168	-73.974308		107.0		6.0	17900.0	
2	40.757850	-73.784593		411.0		19.0	145101.0	
3	40.756596	-73.968749		106.0		4.0	9800.0	
4	40.799318	-73.968440		107.0		6.0	19100.0	

	BIN	BBL	NTA
0	3146519.0	3.058910e+09	BK31
1	1033560.0	1.012380e+09	MN12

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```

2  4124565.0  4.055200e+09  QN48
3  1038490.0  1.013250e+09  MN19
4  1056562.0  1.018750e+09  MN12

```

```
[5 rows x 27 columns]
```

### 3. Search

#### 3.1 Search by DSL

```

[13]: # add a search query. search all soup businesses
wr.opensearch.search(
    client,
    index="sf_restaurants_inspections",
    _source=["inspection_id", "business_name", "business_location"],
    filter_path=["hits.hits._id", "hits.hits._source"],
    search_body={
        "query": {
            "match": {
                "business_name": "soup"
            }
        }
    }
)

```

```

[13]:
      _id                                business_name \
0  ff2f50f6-5415-4706-9bcb-af7c5eb0afa3      Soup House
1  7ba4fb17-f9a9-49da-b90e-8b3553d6d97c      Soup-or-Salad
2  b9e8f6a2-8fd1-4660-b041-2997a1a80984  San Francisco Soup Company
3  56b352e6-102b-4eff-8296-7e1fb2459bab      Soup Unlimited

      inspection_id  business_location.lon  business_location.lat
0  5794_20160907      -122.481299          37.747228
1  5794_20160907      -122.481299          37.747228
2  24936_20160609      -122.400152          37.793199
3  60354_20161123      -122.409061          37.783527

```

#### 3.1 Search by SQL

```

[14]: wr.opensearch.search_by_sql(
    client,
    sql_query="""SELECT business_name, inspection_score
FROM sf_restaurants_inspections_dedup
WHERE business_name LIKE '%soup%'
ORDER BY inspection_score DESC LIMIT 5"""
)

```

```

[14]:
      _index _type      _id _score \
0  sf_restaurants_inspections_dedup  _doc  5794_20160907  None

```

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1	sf_restaurants_inspections_dedup	_doc	60354_20161123	None
2	sf_restaurants_inspections_dedup	_doc	24936_20160609	None
	business_name	inspection_score		
0	Soup-or-Salad		96	
1	Soup Unlimited		95	
2	San Francisco Soup Company		77	

#### 4. Delete Indices

```
[15]: wr.opensearch.delete_index(
        client=client,
        index="sf_restaurants_inspections"
    )
```

```
[15]: {'acknowledged': True}
```

#### 5. Bonus - Prepare data and index from DataFrame

For this exercise we'll use [DOHMH New York City Restaurant Inspection Results](#) dataset

```
[16]: import pandas as pd
```

```
[17]: df = pd.read_csv('https://data.cityofnewyork.us/api/views/43nn-pn8j/rows.csv?
    ↪accessType=DOWNLOAD')
```

#### Prepare the data for indexing

```
[18]: # fields names underscore casing
df.columns = [col.lower().replace(' ', '_') for col in df.columns]

# convert lon/lat to OpenSearch geo_point
df['business_location'] = "POINT (" + df.longitude.fillna('0').astype(str) + " " + df.
    ↪latitude.fillna('0').astype(str) + ")"
```

#### Create index with mapping

```
[19]: # delete index if exists
wr.opensearch.delete_index(
    client=client,
    index="nyc_restaurants"
)

# use dynamic_template to map date fields
# define business_location as geo_point
```

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```

wr.opensearch.create_index(
    client=client,
    index="nyc_restaurants_inspections",
    mappings={
        "dynamic_templates" : [
            {
                "dates" : {
                    "match" : "*date",
                    "mapping" : {
                        "type" : "date",
                        "format" : 'MM/dd/yyyy'
                    }
                }
            }
        ],
        "properties": {
            "business_location": {
                "type": "geo_point"
            }
        }
    }
)

```

```

[19]: {'acknowledged': True,
      'shards_acknowledged': True,
      'index': 'nyc_restaurants_inspections'}

```

### Index dataframe

```

[20]: wr.opensearch.index_df(
      client,
      df=df,
      index="nyc_restaurants_inspections",
      id_keys=["camis"],
      bulk_size=1000
    )

```

```
Indexing: 100% (382655/382655)|#####|Elapsed Time: 0:04:15
```

```

[20]: {'success': 382655, 'errors': []}

```

### Execute geo query

#### Sort restaurants by distance from Times-Square

```

[21]: wr.opensearch.search(
      client,
      index="nyc_restaurants_inspections",
      filter_path=["hits.hits._source"],

```

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```

size=100,
search_body={
  "query": {
    "match_all": {}
  },
  "sort": [
    {
      "_geo_distance": {
        "business_location": { # Times-Square - https://geojson.io/#map=16/40.
↪7563/-73.9862
          "lat": 40.75613228383523,
          "lon": -73.9865791797638
        },
        "order": "asc"
      }
    ]
  }
}
)

```

[21]:

	camis	dba	boro	building	street	\
0	41551304	THE COUNTER	Manhattan	7	TIMES SQUARE	
1	50055665	ANN INC CAFE	Manhattan	7	TIMES SQUARE	
2	50049552	ERNST AND YOUNG	Manhattan	5	TIMES SQ	
3	50014078	RED LOBSTER	Manhattan	5	TIMES SQ	
4	50015171	NEW AMSTERDAM THEATER	Manhattan	214	WEST 42 STREET	
..	...	...	...	...	...	
95	41552060	PROSKAUER ROSE	Manhattan	11	TIMES SQUARE	
96	41242148	GABBY O'HARA'S	Manhattan	123	WEST 39 STREET	
97	50095860	THE TIMES EATERY	Manhattan	680	8 AVENUE	
98	50072861	ITSU	Manhattan	530	7 AVENUE	
99	50068109	LUKE'S LOBSTER	Manhattan	1407	BROADWAY	

	zipcode	phone	cuisine_description	inspection_date	\
0	10036.0	2129976801	American	12/22/2016	
1	10036.0	2125413287	American	12/11/2019	
2	10036.0	2127739994	Coffee/Tea	11/30/2018	
3	10036.0	2127306706	Seafood	10/03/2017	
4	10036.0	2125825472	American	06/26/2018	
..	...	...	...	...	
95	10036.0	2129695493	American	08/11/2017	
96	10018.0	2122788984	Irish	07/30/2019	
97	10036.0	6463867787	American	02/28/2020	
98	10018.0	9176393645	Asian/Asian Fusion	09/10/2018	
99	10018.0	9174759192	Seafood	09/06/2017	

	action	...	\
0	Violations were cited in the following area(s).	...	
1	Violations were cited in the following area(s).	...	
2	Violations were cited in the following area(s).	...	
3	Violations were cited in the following area(s).	...	
4	Violations were cited in the following area(s).	...	

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```

..                                     ...
95 Violations were cited in the following area(s). ...
96 Violations were cited in the following area(s). ...
97 Violations were cited in the following area(s). ...
98 Violations were cited in the following area(s). ...
99 Violations were cited in the following area(s). ...

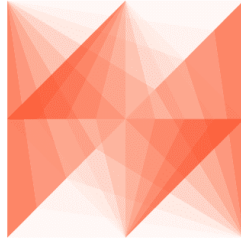
                                inspection_type  latitude  longitude  \
0      Cycle Inspection / Initial Inspection  40.755908 -73.986681
1      Cycle Inspection / Initial Inspection  40.755908 -73.986681
2      Cycle Inspection / Initial Inspection  40.755702 -73.987208
3      Cycle Inspection / Initial Inspection  40.755702 -73.987208
4      Cycle Inspection / Re-inspection      40.756317 -73.987652
..                                     ...
95 Administrative Miscellaneous / Initial Inspection  40.756891 -73.990023
96      Cycle Inspection / Re-inspection      40.753405 -73.986602
97      Pre-permit (Operational) / Initial Inspection  40.757991 -73.989218
98      Pre-permit (Operational) / Initial Inspection  40.753844 -73.988551
99      Pre-permit (Operational) / Initial Inspection  40.753432 -73.987151

community_board council_district census_tract      bin      bbl  \
0      105.0      3.0      11300.0  1086069.0  1.009940e+09
1      105.0      3.0      11300.0  1086069.0  1.009940e+09
2      105.0      3.0      11300.0  1024656.0  1.010130e+09
3      105.0      3.0      11300.0  1024656.0  1.010130e+09
4      105.0      3.0      11300.0  1024660.0  1.010130e+09
..      ...      ...      ...      ...      ...
95      105.0      3.0      11300.0  1087978.0  1.010138e+09
96      105.0      4.0      11300.0  1080611.0  1.008150e+09
97      105.0      3.0      11900.0  1024703.0  1.010150e+09
98      105.0      3.0      11300.0  1014485.0  1.007880e+09
99      105.0      3.0      11300.0  1015265.0  1.008140e+09

nta      business_location
0  MN17 POINT (-73.986680953809 40.755907817312)
1  MN17 POINT (-73.986680953809 40.755907817312)
2  MN17 POINT (-73.987207980138 40.755702020307)
3  MN17 POINT (-73.987207980138 40.755702020307)
4  MN17 POINT (-73.987651832547 40.756316895053)
..      ...
95  MN17 POINT (-73.990023200823 40.756890780426)
96  MN17 POINT (-73.986602050292 40.753404587174)
97  MN17 POINT (-73.989218092096 40.757991356019)
98  MN17 POINT (-73.988551029682 40.753843959794)
99  MN17 POINT (-73.98715066791 40.753432097521)

```

[100 rows x 27 columns]



## AWS Data Wrangler

### 1.3.32 32 - AWS Lake Formation - Glue Governed tables

This tutorial assumes that your IAM user/role has the required Lake Formation permissions to create and read AWS Glue Governed tables

#### Table of Contents

- *1. Read Governed table*
  - *1.1 Read PartiQL query*
    - \* *1.1.1 Read within transaction*
    - \* *1.1.2 Read within query as of time*
  - *1.2 Read full table*
- *2. Write Governed table*
  - *2.1 Create new Governed table*
    - \* *2.1.1 CSV table*
    - \* *2.1.2 Parquet table*
  - *2.2 Overwrite operations*
    - \* *2.2.1 Overwrite*
    - \* *2.2.2 Append*
    - \* *2.2.3 Create partitioned Governed table*
    - \* *2.2.4 Overwrite partitions*
- *3. Multiple read/write operations within a transaction*

## 1. Read Governed table

### 1.1 Read PartiQL query

```
[ ]: import awswrangler as wr

database = "gov_db" # Assumes a Glue database registered with Lake Formation exists in_
↳ the account
table = "gov_table" # Assumes a Governed table exists in the account
catalog_id = "111111111111" # AWS Account Id

# Note 1: If a transaction_id is not specified, a new transaction is started
df = wr.lakeformation.read_sql_query(
    sql=f"SELECT * FROM {table};",
    database=database,
    catalog_id=catalog_id
)
```

#### 1.1.1 Read within transaction

```
[ ]: transaction_id = wr.lakeformation.start_transaction(read_only=True)
df = wr.lakeformation.read_sql_query(
    sql=f"SELECT * FROM {table};",
    database=database,
    transaction_id=transaction_id
)
```

#### 1.1.2 Read within query as of time

```
[ ]: import calendar
import time

query_as_of_time = query_as_of_time = calendar.timegm(time.gmtime())
df = wr.lakeformation.read_sql_query(
    sql=f"SELECT * FROM {table} WHERE id=:id; AND name=:name;",
    database=database,
    query_as_of_time=query_as_of_time,
    params={"id": 1, "name": "Ayoub"}
)
```

## 1.2 Read full table

```
[ ]: df = wr.lakeformation.read_sql_table(
    table=table,
    database=database
)
```

## 2. Write Governed table

### 2.1 Create a new Governed table

Enter your bucket name:

```
[ ]: import getpass

bucket = getpass.getpass()
```

If a governed table does not exist, it can be created by passing an S3 path argument. Make sure your IAM user/role has enough permissions in the Lake Formation database

#### 2.1.1 CSV table

```
[ ]: import pandas as pd

table = "gov_table_csv"

df=pd.DataFrame({
    "col": [1, 2, 3],
    "col2": ["A", "A", "B"],
    "col3": [None, "test", None]
})
# Note 1: If a transaction_id is not specified, a new transaction is started
# Note 2: When creating a new Governed table, `table_type="GOVERNED"` must be specified.
# Otherwise the default is to create an EXTERNAL_TABLE
wr.s3.to_csv(
    df=df,
    path=f"s3://{bucket}/{database}/{table}/", # S3 path
    dataset=True,
    database=database,
    table=table,
    table_type="GOVERNED"
)
```

## 2.1.2 Parquet table

```
[ ]: table = "gov_table_parquet"

df = pd.DataFrame({"c0": [0, None]}, dtype="Int64")
wr.s3.to_parquet(
    df=df,
    path=f"s3://{bucket}/{database}/{table}/",
    dataset=True,
    database=database,
    table=table,
    table_type="GOVERNED",
    description="c0",
    parameters={"num_cols": str(len(df.columns)), "num_rows": str(len(df.index))},
    columns_comments={"c0": "0"}
)
```

## 2.2 Overwrite operations

### 2.2.1 Overwrite

```
[ ]: df = pd.DataFrame({"c1": [None, 1, None]}, dtype="Int16")
wr.s3.to_parquet(
    df=df,
    dataset=True,
    mode="overwrite",
    database=database,
    table=table,
    description="c1",
    parameters={"num_cols": str(len(df.columns)), "num_rows": str(len(df.index))},
    columns_comments={"c1": "1"}
)
```

### 2.2.2 Append

```
[ ]: df = pd.DataFrame({"c1": [None, 2, None]}, dtype="Int8")
wr.s3.to_parquet(
    df=df,
    dataset=True,
    mode="append",
    database=database,
    table=table,
    description="c1",
    parameters={"num_cols": str(len(df.columns)), "num_rows": str(len(df.index) * 2)},
    columns_comments={"c1": "1"}
)
```

### 2.2.3 Create partitioned Governed table

```
[ ]: table = "gov_table_parquet_partitioned"

df = pd.DataFrame({"c0": ["foo", None], "c1": [0, 1]})
wr.s3.to_parquet(
    df=df,
    path=f"s3://{bucket}/{database}/{table}/",
    dataset=True,
    database=database,
    table=table,
    table_type="GOVERNED",
    partition_cols=["c1"],
    description="c0+c1",
    parameters={"num_cols": "2", "num_rows": "2"},
    columns_comments={"c0": "zero", "c1": "one"}
)
```

### 2.2.4 Overwrite partitions

```
[ ]: df = pd.DataFrame({"c0": [None, None], "c1": [0, 2]})
wr.s3.to_parquet(
    df=df,
    dataset=True,
    mode="overwrite_partitions",
    database=database,
    table=table,
    partition_cols=["c1"],
    description="c0+c1",
    parameters={"num_cols": "2", "num_rows": "3"},
    columns_comments={"c0": "zero", "c1": "one"}
)
```

## 3. Multiple read/write operations within a transaction

```
[ ]: read_table = "gov_table_parquet"
write_table = "gov_table_multi_parquet"

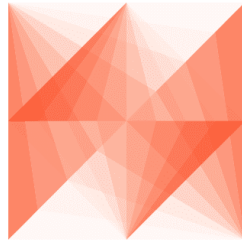
transaction_id = wr.lakeformation.start_transaction(read_only=False)

df = pd.DataFrame({"c0": [0, None]}, dtype="Int64")
wr.s3.to_parquet(
    df=df,
    path=f"s3://{bucket}/{database}/{write_table}_1",
    dataset=True,
    database=database,
    table=f"{write_table}_1",
    table_type="GOVERNED",
    transaction_id=transaction_id,
)
```

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```
df2 = wr.lakeformation.read_sql_table(  
    table=read_table,  
    database=database,  
    transaction_id=transaction_id,  
    use_threads=True  
)  
  
df3 = pd.DataFrame({"c1": [None, 1, None]}, dtype="Int16")  
wr.s3.to_parquet(  
    df=df2,  
    path=f"s3://{bucket}/{database}/{write_table}_2",  
    dataset=True,  
    mode="append",  
    database=database,  
    table=f"{write_table}_2",  
    table_type="GOVERNED",  
    transaction_id=transaction_id,  
)  
  
wr.lakeformation.commit_transaction(transaction_id=transaction_id)
```



## AWS Data Wrangler

### 1.3.33 33 - Amazon Neptune

Note: to be able to use SPARQL you must either install SPARQLWrapper or install AWS Data Wrangler with `sparql` extra:

```
[ ]: !pip install awswrangler[sparql]
```



## Initialize

The first step to using AWS Data Wrangler with Amazon Neptune is to import the library and create a client connection.

Note: Connecting to Amazon Neptune requires that the application you are running has access to the Private VPC where Neptune is located. Without this access you will not be able to connect using AWS Data Wrangler.

```
[ ]: import awswrangler as wr
import pandas as pd

url='<INSERT CLUSTER ENDPOINT>' # The Neptune Cluster endpoint
iam_enabled = False # Set to True/False based on the configuration of your cluster
neptune_port = 8182 # Set to the Neptune Cluster Port, Default is 8182
client = wr.neptune.connect(url, neptune_port, iam_enabled=iam_enabled)
```

## Return the status of the cluster

```
[ ]: print(client.status())
```

## Retrieve Data from Neptune using AWS Data Wrangler

AWS Data Wrangler supports querying Amazon Neptune using TinkerPop Gremlin and openCypher for property graph data or SPARQL for RDF data.

### Gremlin

```
[ ]: query = "g.E().project('source', 'target').by(outV().id()).by(inV().id()).limit(5)"
df = wr.neptune.execute_gremlin(client, query)
display(df.head(5))
```

### SPARQL

```
[ ]: query = "SELECT ?s ?o WHERE { ?s ?p ?o .} LIMIT 5"
df = wr.neptune.execute_sparql(client, query)
display(df.head(5))
```

### openCypher

```
[ ]: query = "MATCH (n)-[r]->(d) RETURN id(n) as source, id(d) as target LIMIT 5"
df = wr.neptune.execute_opencypher(client, query)
display(df.head(5))
```

## Saving Data using AWS Data Wrangler

AWS Data Wrangler supports saving Pandas DataFrames into Amazon Neptune using either a property graph or RDF data model.

### Property Graph

If writing to a property graph then DataFrames for vertices and edges must be written separately. DataFrames for vertices must have a `~label` column with the label and a `~id` column for the vertex id.

If the `~id` column does not exist, the specified id does not exist, or is empty then a new vertex will be added.

If no `~label` column exists then writing to the graph will be treated as an update of the element with the specified `~id` value.

DataFrames for edges must have a `~id`, `~label`, `~to`, and `~from` column. If the `~id` column does not exist the specified id does not exist, or is empty then a new edge will be added. If no `~label`, `~to`, or `~from` column exists an exception will be thrown.

### Add Vertices/Nodes

```
[ ]: import uuid
import random
import string
def _create_dummy_vertex():
    data = dict()
    data["~id"] = uuid.uuid4()
    data["~label"] = "foo"
    data["int"] = random.randint(0, 1000)
    data["str"] = "".join(random.choice(string.ascii_lowercase) for i in range(10))
    data["list"] = [random.randint(0, 1000), random.randint(0, 1000)]
    return data

data = [_create_dummy_vertex(), _create_dummy_vertex(), _create_dummy_vertex()]
df = pd.DataFrame(data)
res = wr.neptune.to_property_graph(client, df)
query = f'MATCH (s) WHERE id(s)={data[0]["~id"]} RETURN s'
df = wr.neptune.execute_opencypher(client, query)
display(df)
```

### Add Edges

```
[ ]: import uuid
import random
import string
def _create_dummy_edge():
    data = dict()
    data["~id"] = uuid.uuid4()
    data["~label"] = "bar"
    data["~to"] = uuid.uuid4()
    data["~from"] = uuid.uuid4()
```

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```

data["int"] = random.randint(0, 1000)
data["str"] = "".join(random.choice(string.ascii_lowercase) for i in range(10))
return data

data = [_create_dummy_edge(), _create_dummy_edge(), _create_dummy_edge()]
df = pd.DataFrame(data)
res = wr.neptune.to_property_graph(client, df)
query = f"MATCH (s)-[r]->(d) WHERE id(r)='{data[0]['~id']}' RETURN r"
df = wr.neptune.execute_opencypher(client, query)
display(df)

```

### Update Existing Nodes

```

[ ]: idval=uuid.uuid4()
wr.neptune.execute_gremlin(client, f"g.addV().property(T.id, '{str(idval)}')")
query = f"MATCH (s) WHERE id(s)='{idval}' RETURN s"
df = wr.neptune.execute_opencypher(client, query)
print("Before")
display(df)
data = [{"~id": idval, "age": 50}]
df = pd.DataFrame(data)
res = wr.neptune.to_property_graph(client, df)
df = wr.neptune.execute_opencypher(client, query)
print("After")
display(df)

```

### Setting cardinality based on the header

If you would like to save data using single cardinality then you can postfix (single) to the column header and set `use_header_cardinality=True` (default). e.g. A column named `name(single)` will save the name property as single cardinality. You can disable this by setting `use_header_cardinality=False`.

```

[ ]: data = [_create_dummy_vertex()]
df = pd.DataFrame(data)
# Adding (single) to the column name in the DataFrame will cause it to write that_
↳property as `single` cardinality
df.rename(columns={"int": "int(single)"}, inplace=True)
res = wr.neptune.to_property_graph(client, df, use_header_cardinality=True)

# This can be disabled by setting `use_header_cardinality = False`
df.rename(columns={"int": "int(single)"}, inplace=True)
res = wr.neptune.to_property_graph(client, df, use_header_cardinality=False)

```

## RDF

The DataFrame must consist of triples with column names for the subject, predicate, and object specified. If none are provided than s, p, and o are the default.

If you want to add data into a named graph then you will also need the graph column, default is g.

### Write Triples

```
[ ]: def _create_dummy_triple():
    data = dict()
    data["s"] = "foo"
    data["p"] = uuid.uuid4()
    data["o"] = random.randint(0, 1000)
    return data

data = [_create_dummy_triple(), _create_dummy_triple(), _create_dummy_triple()]
df = pd.DataFrame(data)
res = wr.neptune.to_rdf_graph(client, df)
query = "SELECT ?o WHERE { <foo> <" + str(data[0]['p']) + "> ?o .}"
df = wr.neptune.execute_sparql(client, query)
display(df)
```

### Write Quads

```
[ ]: def _create_dummy_quad():
    data = _create_dummy_triple()
    data["g"] = "bar"
    return data

data = [_create_dummy_quad(), _create_dummy_quad(), _create_dummy_quad()]
df = pd.DataFrame(data)
res = wr.neptune.to_rdf_graph(client, df)
query = "SELECT ?o WHERE { <foo> <" + str(data[0]['p']) + "> ?o .}"
df = wr.neptune.execute_sparql(client, query)
display(df)
```

### Flatten DataFrames

One of the complexities of working with a row/columns paradigm, such as Pandas, with graph results set is that it is very common for graph results to return complex and nested objects. To help simplify using the results returned from a graph within a more tabular format we have added a method to flatten the returned Pandas DataFrame.

## Flattening the DataFrame

```
[ ]: client = wr.neptune.connect(url, 8182, iam_enabled=False)
      query = "MATCH (n) RETURN n LIMIT 1"
      df = wr.neptune.execute_opencypher(client, query)
      print("Original")
      display(df)
      df_new=wr.neptune.flatten_nested_df(df)
      print("Flattened")
      display(df_new)
```

## Removing the prefixing of the parent column name

```
[ ]: df_new=wr.neptune.flatten_nested_df(df, include_prefix=False)
      display(df_new)
```

## Specifying the column header separator

```
[ ]: df_new=wr.neptune.flatten_nested_df(df, separator='|')
      display(df_new)
```

## Putting it into a workflow

```
[ ]: pip install igraph networkx
```

## Running PageRank using NetworkX

```
[ ]: import networkx as nx

      # Retrieve Data from neptune
      client = wr.neptune.connect(url, 8182, iam_enabled=False)
      query = "MATCH (n)-[r]->(d) RETURN id(n) as source, id(d) as target LIMIT 100"
      df = wr.neptune.execute_opencypher(client, query)

      # Run PageRank
      G=nx.from_pandas_edgelist(df, edge_attr=True)
      pg = nx.pagerank(G)

      # Save values back into Neptune
      rows=[]
      for k in pg.keys():
          rows.append({'~id': k, 'pageRank_nx(single)': pg[k]})
      pg_df=pd.DataFrame(rows, columns=['~id', 'pageRank_nx(single)'])
      res = wr.neptune.to_property_graph(client, pg_df, use_header_cardinality=True)

      # Retrieve newly saved data
```

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```
query = "MATCH (n:airport) WHERE n.pageRank_nx IS NOT NULL RETURN n.code, n.pageRank_nx,
↳ORDER BY n.pageRank_nx DESC LIMIT 5"
df = wr.neptune.execute_opencypher(client, query)
display(df)
```

## Running PageRank using iGraph

```
[ ]: import igraph as ig

# Retrieve Data from neptune
client = wr.neptune.connect(url, 8182, iam_enabled=False)
query = "MATCH (n)-[r]->(d) RETURN id(n) as source, id(d) as target LIMIT 100"
df = wr.neptune.execute_opencypher(client, query)

# Run PageRank
g = ig.Graph.TupleList(df.itertuples(index=False), directed=True, weights=False)
pg = g.pagerank()

# Save values back into Neptune
rows=[]
for idx, v in enumerate(g.vs):
    rows.append({'~id': v['name'], 'pageRank_ig(single)': pg[idx]})
pg_df=pd.DataFrame(rows, columns=['~id', 'pageRank_ig(single)'])
res = wr.neptune.to_property_graph(client, pg_df, use_header_cardinality=True)

# Retrieve newly saved data
query = "MATCH (n:airport) WHERE n.pageRank_ig IS NOT NULL RETURN n.code, n.pageRank_ig,
↳ORDER BY n.pageRank_ig DESC LIMIT 5"
df = wr.neptune.execute_opencypher(client, query)
display(df)
```

## 1.4 API Reference

- *Amazon S3*
- *AWS Glue Catalog*
- *Amazon Athena*
- *AWS Lake Formation*
- *Amazon Redshift*
- *PostgreSQL*
- *MySQL*
- *Microsoft SQL Server*
- *Data API Redshift*
- *Data API RDS*
- *OpenSearch*

- *Amazon Neptune*
- *DynamoDB*
- *Amazon Timestream*
- *Amazon EMR*
- *Amazon CloudWatch Logs*
- *Amazon QuickSight*
- *AWS STS*
- *AWS Secrets Manager*
- *Amazon Chime*
- *Global Configurations*

### 1.4.1 Amazon S3

<code>copy_objects(paths, source_path, target_path)</code>	Copy a list of S3 objects to another S3 directory.
<code>delete_objects(path[, use_threads, ...])</code>	Delete Amazon S3 objects from a received S3 prefix or list of S3 objects paths.
<code>describe_objects(path[, version_id, ...])</code>	Describe Amazon S3 objects from a received S3 prefix or list of S3 objects paths.
<code>does_object_exist(path[, ...])</code>	Check if object exists on S3.
<code>download(path, local_file[, version_id, ...])</code>	Download file from a received S3 path to local file.
<code>get_bucket_region(bucket[, boto3_session])</code>	Get bucket region name.
<code>list_buckets([boto3_session])</code>	List Amazon S3 buckets.
<code>list_directories(path[, chunked, ...])</code>	List Amazon S3 objects from a prefix.
<code>list_objects(path[, suffix, ignore_suffix, ...])</code>	List Amazon S3 objects from a prefix.
<code>merge_datasets(source_path, target_path[, ...])</code>	Merge a source dataset into a target dataset.
<code>merge_upsert_table(delta_df, database, ...)</code>	Perform Upsert (Update else Insert) onto an existing Glue table.
<code>read_csv(path[, path_suffix, ...])</code>	Read CSV file(s) from a received S3 prefix or list of S3 objects paths.
<code>read_excel(path[, version_id, use_threads, ...])</code>	Read EXCEL file(s) from a received S3 path.
<code>read_fwf(path[, path_suffix, ...])</code>	Read fixed-width formatted file(s) from a received S3 prefix or list of S3 objects paths.
<code>read_json(path[, path_suffix, ...])</code>	Read JSON file(s) from a received S3 prefix or list of S3 objects paths.
<code>read_parquet(path[, path_root, path_suffix, ...])</code>	Read Apache Parquet file(s) from a received S3 prefix or list of S3 objects paths.
<code>read_parquet_metadata(path[, version_id, ...])</code>	Read Apache Parquet file(s) metadata from a received S3 prefix or list of S3 objects paths.
<code>read_parquet_table(table, database[, ...])</code>	Read Apache Parquet table registered on AWS Glue Catalog.
<code>select_query(sql, path, input_serialization, ...)</code>	Filter contents of an Amazon S3 object based on SQL statement.
<code>size_objects(path[, version_id, ...])</code>	Get the size (ContentLength) in bytes of Amazon S3 objects from a received S3 prefix or list of S3 objects paths.
<code>store_parquet_metadata(path, database, table)</code>	Infer and store parquet metadata on AWS Glue Catalog.
<code>to_csv(df[, path, sep, index, columns, ...])</code>	Write CSV file or dataset on Amazon S3.
<code>to_excel(df, path[, boto3_session, ...])</code>	Write EXCEL file on Amazon S3.
<code>to_json(df[, path, index, columns, ...])</code>	Write JSON file on Amazon S3.
<code>to_parquet(df[, path, index, compression, ...])</code>	Write Parquet file or dataset on Amazon S3.
<code>upload(local_file, path[, use_threads, ...])</code>	Upload file from a local file to received S3 path.
<code>wait_objects_exist(paths[, delay, ...])</code>	Wait Amazon S3 objects exist.
<code>wait_objects_not_exist(paths[, delay, ...])</code>	Wait Amazon S3 objects not exist.



## awswrangler.s3.copy\_objects

`awswrangler.s3.copy_objects(paths: List[str], source_path: str, target_path: str, replace_filenames: Optional[Dict[str, str]] = None, use_threads: Union[bool, int] = True, boto3_session: Optional[boto3.session.Session] = None, s3_additional_kwargs: Optional[Dict[str, Any]] = None) → List[str]`

Copy a list of S3 objects to another S3 directory.

**Note:** In case of `use_threads=True` the number of threads that will be spawned will be gotten from `os.cpu_count()`.

### Parameters

- **paths** (`List[str]`) – List of S3 objects paths (e.g. `[s3://bucket/dir0/key0, s3://bucket/dir0/key1]`).
- **source\_path** (`str`,) – S3 Path for the source directory.
- **target\_path** (`str`,) – S3 Path for the target directory.
- **replace\_filenames** (`Dict[str, str]`, *optional*) – e.g. `{“old_name.csv”: “new_name.csv”, “old_name2.csv”: “new_name2.csv”}`
- **use\_threads** (`bool`, `int`) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` will be used as the max number of threads. If integer is provided, specified number is used.
- **boto3\_session** (`boto3.Session()`, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.
- **s3\_additional\_kwargs** (`Optional[Dict[str, Any]]`) – Forwarded to botocore requests. e.g. `s3_additional_kwargs={‘ServerSideEncryption’: ‘aws:kms’, ‘SSEKMSKeyId’: ‘YOUR_KMS_KEY_ARN’}`

**Returns** List of new objects paths.

**Return type** `List[str]`

### Examples

Copying

```
>>> import awswrangler as wr
>>> wr.s3.copy_objects(
...     paths=["s3://bucket0/dir0/key0", "s3://bucket0/dir0/key1"],
...     source_path="s3://bucket0/dir0/",
...     target_path="s3://bucket1/dir1/"
... )
["s3://bucket1/dir1/key0", "s3://bucket1/dir1/key1"]
```

Copying with a KMS key

```
>>> import awswrangler as wr
>>> wr.s3.copy_objects(
...     paths=["s3://bucket0/dir0/key0", "s3://bucket0/dir0/key1"],
```

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```

...     source_path="s3://bucket0/dir0/",
...     target_path="s3://bucket1/dir1/",
...     s3_additional_kwargs={
...         'ServerSideEncryption': 'aws:kms',
...         'SSEKMSKeyId': 'YOUR_KMS_KEY_ARN'
...     }
... )
["s3://bucket1/dir1/key0", "s3://bucket1/dir1/key1"]

```

### aws wrangler.s3.delete\_objects

`aws wrangler.s3.delete_objects`(*path*: Union[str, List[str]], *use\_threads*: Union[bool, int] = True, *last\_modified\_begin*: Optional[datetime.datetime] = None, *last\_modified\_end*: Optional[datetime.datetime] = None, *s3\_additional\_kwargs*: Optional[Dict[str, Any]] = None, *boto3\_session*: Optional[boto3.session.Session] = None) → None

Delete Amazon S3 objects from a received S3 prefix or list of S3 objects paths.

This function accepts Unix shell-style wildcards in the path argument. \* (matches everything), ? (matches any single character), [seq] (matches any character in seq), [!seq] (matches any character not in seq). If you want to use a path which includes Unix shell-style wildcard characters (\*, ?, []), you can use `glob.escape(path)` before passing the path to this function.

---

**Note:** In case of `use_threads=True` the number of threads that will be spawned will be gotten from `os.cpu_count()`.

---



---

**Note:** The filter by `last_modified begin last_modified end` is applied after list all S3 files

---

#### Parameters

- **path** (Union[str, List[str]]) – S3 prefix (accepts Unix shell-style wildcards) (e.g. `s3://bucket/prefix`) or list of S3 objects paths (e.g. `[s3://bucket/key0, s3://bucket/key1]`).
- **use\_threads** (bool, int) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` will be used as the max number of threads. If integer is provided, specified number is used.
- **last\_modified\_begin** – Filter the s3 files by the Last modified date of the object. The filter is applied only after list all s3 files.
- **last\_modified\_end** (datetime, optional) – Filter the s3 files by the Last modified date of the object. The filter is applied only after list all s3 files.
- **s3\_additional\_kwargs** (Optional[Dict[str, Any]]) – Forwarded to botocore requests. e.g. `s3_additional_kwargs={'RequestPayer': 'requester'}`
- **boto3\_session** (boto3.Session(), optional) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.

**Returns** None.

**Return type** None

## Examples

```
>>> import awswrangler as wr
>>> wr.s3.delete_objects(['s3://bucket/key0', 's3://bucket/key1']) # Delete both
↳objects
>>> wr.s3.delete_objects('s3://bucket/prefix') # Delete all objects under the
↳received prefix
```

## awswrangler.s3.describe\_objects

```
awswrangler.s3.describe_objects(path: Union[str, List[str]], version_id: Optional[Union[str, Dict[str, str]]]
                                = None, use_threads: Union[bool, int] = True, last_modified_begin:
                                Optional[datetime.datetime] = None, last_modified_end:
                                Optional[datetime.datetime] = None, s3_additional_kwargs:
                                Optional[Dict[str, Any]] = None, boto3_session:
                                Optional[boto3.session.Session] = None) → Dict[str, Dict[str, Any]]
```

Describe Amazon S3 objects from a received S3 prefix or list of S3 objects paths.

Fetch attributes like ContentLength, DeleteMarker, last\_modified, ContentType, etc The full list of attributes can be explored under the boto3 head\_object documentation: [https://boto3.amazonaws.com/v1/documentation/api/latest/reference/services/s3.html#S3.Client.head\\_object](https://boto3.amazonaws.com/v1/documentation/api/latest/reference/services/s3.html#S3.Client.head_object)

This function accepts Unix shell-style wildcards in the path argument. \* (matches everything), ? (matches any single character), [seq] (matches any character in seq), ![seq] (matches any character not in seq). If you want to use a path which includes Unix shell-style wildcard characters (\*, ?, []), you can use `glob.escape(path)` before passing the path to this function.

---

**Note:** In case of `use_threads=True` the number of threads that will be spawned will be gotten from `os.cpu_count()`.

---



---

**Note:** The filter by last\_modified begin last\_modified end is applied after list all S3 files

---

### Parameters

- **path** (*Union[str, List[str]]*) – S3 prefix (accepts Unix shell-style wildcards) (e.g. `s3://bucket/prefix`) or list of S3 objects paths (e.g. `[s3://bucket/key0, s3://bucket/key1]`).
- **version\_id** (*Optional[Union[str, Dict[str, str]]*) – Version id of the object or mapping of object path to version id. (e.g. `{'s3://bucket/key0': '121212', 's3://bucket/key1': '343434'}`)
- **use\_threads** (*bool, int*) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` will be used as the max number of threads. If integer is provided, specified number is used.
- **last\_modified\_begin** – Filter the s3 files by the Last modified date of the object. The filter is applied only after list all s3 files.
- **last\_modified\_end** (*datetime, optional*) – Filter the s3 files by the Last modified date of the object. The filter is applied only after list all s3 files.
- **s3\_additional\_kwargs** (*Optional[Dict[str, Any]]*) – Forwarded to botocore requests. e.g. `s3_additional_kwargs={'RequestPayer': 'requester'}`

- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Return a dictionary of objects returned from head\_objects where the key is the object path. The response object can be explored here: [https://boto3.amazonaws.com/v1/documentation/api/latest/reference/services/s3.html#S3.Client.head\\_object](https://boto3.amazonaws.com/v1/documentation/api/latest/reference/services/s3.html#S3.Client.head_object)

**Return type** Dict[str, Dict[str, Any]]

## Examples

```
>>> import awswrangler as wr
>>> descs0 = wr.s3.describe_objects(['s3://bucket/key0', 's3://bucket/key1']) # Describe both objects
>>> descs1 = wr.s3.describe_objects('s3://bucket/prefix') # Describe all objects under the prefix
```

## awswrangler.s3.does\_object\_exist

**awswrangler.s3.does\_object\_exist**(*path: str*, *s3\_additional\_kwargs: Optional[Dict[str, Any]] = None*, *boto3\_session: Optional[boto3.session.Session] = None*, *version\_id: Optional[str] = None*) → bool

Check if object exists on S3.

### Parameters

- **path** (*str*) – S3 path (e.g. s3://bucket/key).
- **s3\_additional\_kwargs** (*Optional[Dict[str, Any]]*) – Forwarded to botocore requests. e.g. s3\_additional\_kwargs={'RequestPayer': 'requester'}
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.
- **version\_id** (*str*, *optional*) – Specific version of the object that should exist.

**Returns** True if exists, False otherwise.

**Return type** bool

## Examples

Using the default boto3 session

```
>>> import awswrangler as wr
>>> wr.s3.does_object_exist('s3://bucket/key_real')
True
>>> wr.s3.does_object_exist('s3://bucket/key_unreal')
False
```

Using a custom boto3 session

```
>>> import boto3
>>> import awswrangler as wr
>>> wr.s3.does_object_exist('s3://bucket/key_real', boto3_session=boto3.Session())
```

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```
True
>>> wr.s3.does_object_exist('s3://bucket/key_unreal', boto3_session=boto3.Session())
False
```

## aws wrangler.s3.download

`aws wrangler.s3.download(path: str, local_file: Union[str, Any], version_id: Optional[str] = None, use_threads: Union[bool, int] = True, boto3_session: Optional[boto3.session.Session] = None, s3_additional_kwargs: Optional[Dict[str, Any]] = None) → None`

Download file from a received S3 path to local file.

**Note:** In case of `use_threads=True` the number of threads that will be spawned will be gotten from `os.cpu_count()`.

### Parameters

- **path** (*str*) – S3 path (e.g. `s3://bucket/key0`).
- **local\_file** (*Union[str, Any]*) – A file-like object in binary mode or a path to local file (e.g. `./local/path/to/key0`).
- **version\_id** (*Optional[str]*) – Version id of the object.
- **use\_threads** (*bool, int*) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` will be used as the max number of threads. If integer is provided, specified number is used.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.
- **s3\_additional\_kwargs** (*Optional[Dict[str, Any]]*) – Forward to botocore requests, only “SSECustomerAlgorithm”, “SSECustomerKey” and “RequestPayer” arguments will be considered.

**Return type** None

### Examples

Downloading a file using a path to local file

```
>>> import aws wrangler as wr
>>> wr.s3.download(path='s3://bucket/key', local_file='./key')
```

Downloading a file using a file-like object

```
>>> import aws wrangler as wr
>>> with open(file='./key', mode='wb') as local_f:
>>>     wr.s3.download(path='s3://bucket/key', local_file=local_f)
```

### aws wrangler.s3.get\_bucket\_region

`aws wrangler.s3.get_bucket_region(bucket: str, boto3_session: Optional[boto3.session.Session] = None) → str`

Get bucket region name.

#### Parameters

- **bucket** (*str*) – Bucket name.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Region code (e.g. 'us-east-1').

**Return type** *str*

### Examples

Using the default boto3 session

```
>>> import aws wrangler as wr
>>> region = wr.s3.get_bucket_region('bucket-name')
```

Using a custom boto3 session

```
>>> import boto3
>>> import aws wrangler as wr
>>> region = wr.s3.get_bucket_region('bucket-name', boto3_session=boto3.Session())
```

### aws wrangler.s3.list\_buckets

`aws wrangler.s3.list_buckets(boto3_session: Optional[boto3.session.Session] = None) → List[str]`

List Amazon S3 buckets.

**Parameters** **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session to use, default to None.

**Returns** List of bucket names.

**Return type** *List[str]*

### aws wrangler.s3.list\_directories

`aws wrangler.s3.list_directories(path: str, chunked: bool = False, s3_additional_kwargs: Optional[Dict[str, Any]] = None, boto3_session: Optional[boto3.session.Session] = None) → Union[List[str], Iterator[List[str]]]`

List Amazon S3 objects from a prefix.

This function accepts Unix shell-style wildcards in the path argument. \* (matches everything), ? (matches any single character), [seq] (matches any character in seq), ![seq] (matches any character not in seq). If you want to use a path which includes Unix shell-style wildcard characters (\*, ?, []), you can use `glob.escape(path)` before passing the path to this function.

#### Parameters

- **path** (*str*) – S3 path (e.g. `s3://bucket/prefix`).
- **chunked** (*bool*) – If True returns iterator, and a single list otherwise. False by default.
- **s3\_additional\_kwargs** (*Optional[Dict[str, Any]]*) – Forwarded to botocore requests. e.g. `s3_additional_kwargs={'RequestPayer': 'requester'}`
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.

**Returns** List of objects paths.

**Return type** Union[List[str], Iterator[List[str]]]

## Examples

Using the default boto3 session

```
>>> import awswrangler as wr
>>> wr.s3.list_directories('s3://bucket/prefix/')
['s3://bucket/prefix/dir0/', 's3://bucket/prefix/dir1/', 's3://bucket/prefix/dir2/']
```

Using a custom boto3 session

```
>>> import boto3
>>> import awswrangler as wr
>>> wr.s3.list_directories('s3://bucket/prefix/', boto3_session=boto3.Session())
['s3://bucket/prefix/dir0/', 's3://bucket/prefix/dir1/', 's3://bucket/prefix/dir2/']
```

## awswrangler.s3.list\_objects

`awswrangler.s3.list_objects`(*path: str, suffix: Optional[Union[str, List[str]]] = None, ignore\_suffix: Optional[Union[str, List[str]]] = None, last\_modified\_begin: Optional[datetime.datetime] = None, last\_modified\_end: Optional[datetime.datetime] = None, ignore\_empty: bool = False, chunked: bool = False, s3\_additional\_kwargs: Optional[Dict[str, Any]] = None, boto3\_session: Optional[boto3.session.Session] = None*) → Union[List[str], Iterator[List[str]]]

List Amazon S3 objects from a prefix.

This function accepts Unix shell-style wildcards in the path argument. \* (matches everything), ? (matches any single character), [seq] (matches any character in seq), [!seq] (matches any character not in seq). If you want to use a path which includes Unix shell-style wildcard characters (\*, ?, []), you can use `glob.escape(path)` before passing the path to this function.

---

**Note:** The filter by `last_modified begin` `last_modified end` is applied after list all S3 files

---

### Parameters

- **path** (*str*) – S3 path (e.g. `s3://bucket/prefix`).
- **suffix** (*Union[str, List[str], None]*) – Suffix or List of suffixes for filtering S3 keys.

- **ignore\_suffix** (*Union[str, List[str], None]*) – Suffix or List of suffixes for S3 keys to be ignored.
- **last\_modified\_begin** – Filter the s3 files by the Last modified date of the object. The filter is applied only after list all s3 files.
- **last\_modified\_end** (*datetime, optional*) – Filter the s3 files by the Last modified date of the object. The filter is applied only after list all s3 files.
- **ignore\_empty** (*bool*) – Ignore files with 0 bytes.
- **chunked** (*bool*) – If True returns iterator, and a single list otherwise. False by default.
- **s3\_additional\_kwargs** (*Optional[Dict[str, Any]]*) – Forwarded to botocore requests. e.g. `s3_additional_kwargs={'RequestPayer': 'requester'}`
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.

**Returns** List of objects paths.

**Return type** `Union[List[str], Iterator[List[str]]]`

## Examples

Using the default boto3 session

```
>>> import awswrangler as wr
>>> wr.s3.list_objects('s3://bucket/prefix')
['s3://bucket/prefix0', 's3://bucket/prefix1', 's3://bucket/prefix2']
```

Using a custom boto3 session

```
>>> import boto3
>>> import awswrangler as wr
>>> wr.s3.list_objects('s3://bucket/prefix', boto3_session=boto3.Session())
['s3://bucket/prefix0', 's3://bucket/prefix1', 's3://bucket/prefix2']
```

## awswrangler.s3.merge\_datasets

`awswrangler.s3.merge_datasets`(*source\_path: str, target\_path: str, mode: str = 'append', ignore\_empty: bool = False, use\_threads: Union[bool, int] = True, boto3\_session: Optional[boto3.session.Session] = None, s3\_additional\_kwargs: Optional[Dict[str, Any]] = None*) → List[str]

Merge a source dataset into a target dataset.

This function accepts Unix shell-style wildcards in the `source_path` argument. `*` (matches everything), `?` (matches any single character), `[seq]` (matches any character in seq), `[!seq]` (matches any character not in seq). If you want to use a path which includes Unix shell-style wildcard characters (`*`, `?`, `[]`), you can use `glob.escape(source_path)` before passing the path to this function.

---

**Note:** If you are merging tables (S3 datasets + Glue Catalog metadata), remember that you will also need to update your partitions metadata in some cases. (e.g. `wr.athena.repair_table(table='...', database='...')`)

---



---

**Note:** In case of `use_threads=True` the number of threads that will be spawned will be gotten from `os.cpu_count()`.

---

### Parameters

- **source\_path** (*str*,) – S3 Path for the source directory.
- **target\_path** (*str*,) – S3 Path for the target directory.
- **mode** (*str*, *optional*) – append (Default), overwrite, overwrite\_partitions.
- **ignore\_empty** (*bool*) – Ignore files with 0 bytes.
- **use\_threads** (*bool*, *int*) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` will be used as the max number of threads. If integer is provided, specified number is used.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.
- **s3\_additional\_kwargs** (*Optional[Dict[str, Any]]*) – Forwarded to botocore requests. e.g. `s3_additional_kwargs={'ServerSideEncryption': 'aws:kms', 'SSEKMSKeyId': 'YOUR_KMS_KEY_ARN'}`

**Returns** List of new objects paths.

**Return type** List[str]

### Examples

Merging

```
>>> import awswrangler as wr
>>> wr.s3.merge_datasets(
...     source_path="s3://bucket0/dir0/",
...     target_path="s3://bucket1/dir1/",
...     mode="append"
... )
["s3://bucket1/dir1/key0", "s3://bucket1/dir1/key1"]
```

Merging with a KMS key

```
>>> import awswrangler as wr
>>> wr.s3.merge_datasets(
...     source_path="s3://bucket0/dir0/",
...     target_path="s3://bucket1/dir1/",
...     mode="append",
...     s3_additional_kwargs={
...         'ServerSideEncryption': 'aws:kms',
...         'SSEKMSKeyId': 'YOUR_KMS_KEY_ARN'
...     }
... )
["s3://bucket1/dir1/key0", "s3://bucket1/dir1/key1"]
```

### awswrangler.s3.merge\_upsert\_table

```
awswrangler.s3.merge_upsert_table(delta_df: pandas.core.frame.DataFrame, database: str, table: str,
                                   primary_key: List[str], boto3_session: Optional[boto3.session.Session]
                                   = None) → None
```

Perform Upsert (Update else Insert) onto an existing Glue table.

#### Parameters

- **delta\_df** (*pandas.DataFrame*) – The delta dataframe has all the data which needs to be merged on the primary key
- **database** (*Str*) – An existing database name
- **table** (*Str*) – An existing table name
- **primary\_key** (*List[str]*) – Pass the primary key as a List of string columns List['column\_a', 'column\_b']
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Return type** None

#### Examples

```
Reading all Parquet files under a prefix >>> import awswrangler as wr >>> import pandas as pd >>>
delta_df = pd.DataFrame({"id": [1], "cchar": ["foo"], "date": [datetime.date(2021, 1, 2)]}) >>> primary_key
= ["id", "cchar"] >>> wr.s3.merge_upsert_table(delta_df=delta_df, database='database', table='table', pri-
mary_key=primary_key)
```

### awswrangler.s3.read\_csv

```
awswrangler.s3.read_csv(path: Union[str, List[str]], path_suffix: Optional[Union[str, List[str]]] = None,
                        path_ignore_suffix: Optional[Union[str, List[str]]] = None, version_id:
                        Optional[Union[str, Dict[str, str]]] = None, ignore_empty: bool = True, use_threads:
                        Union[bool, int] = True, last_modified_begin: Optional[datetime.datetime] = None,
                        last_modified_end: Optional[datetime.datetime] = None, boto3_session:
                        Optional[boto3.session.Session] = None, s3_additional_kwargs: Optional[Dict[str,
                        Any]] = None, chunksize: Optional[int] = None, dataset: bool = False,
                        partition_filter: Optional[Callable[[Dict[str, str]], bool]] = None,
                        **pandas_kwargs: Any) → Union[pandas.core.frame.DataFrame,
                        Iterator[pandas.core.frame.DataFrame]]
```

Read CSV file(s) from a received S3 prefix or list of S3 objects paths.

This function accepts Unix shell-style wildcards in the path argument. \* (matches everything), ? (matches any single character), [seq] (matches any character in seq), [!seq] (matches any character not in seq). If you want to use a path which includes Unix shell-style wildcard characters (\*, ?, []), you can use *glob.escape(path)* before passing the path to this function.

---

**Note:** For partial and gradual reading use the argument *chunksize* instead of *iterator*.

---

---

**Note:** In case of `use_threads=True` the number of threads that will be spawned will be gotten from `os.cpu_count()`.

---



---

**Note:** The filter by `last_modified` begin `last_modified` end is applied after list all S3 files

---

### Parameters

- **path** (*Union[str, List[str]]*) – S3 prefix (accepts Unix shell-style wildcards) (e.g. `s3://bucket/prefix`) or list of S3 objects paths (e.g. `[s3://bucket/key0, s3://bucket/key1]`).
- **path\_suffix** (*Union[str, List[str], None]*) – Suffix or List of suffixes to be read (e.g. `[".csv"]`). If `None`, will try to read all files. (default)
- **path\_ignore\_suffix** (*Union[str, List[str], None]*) – Suffix or List of suffixes for S3 keys to be ignored.(e.g. `["_SUCCESS"]`). If `None`, will try to read all files. (default)
- **version\_id** (*Optional[Union[str, Dict[str, str]]]*) – Version id of the object or mapping of object path to version id. (e.g. `{ 's3://bucket/key0': '121212', 's3://bucket/key1': '343434' }`)
- **ignore\_empty** (*bool*) – Ignore files with 0 bytes.
- **use\_threads** (*Union[bool, int]*) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` will be used as the max number of threads. If integer is provided, specified number is used.
- **last\_modified\_begin** – Filter the s3 files by the Last modified date of the object. The filter is applied only after list all s3 files.
- **last\_modified\_end** (*datetime, optional*) – Filter the s3 files by the Last modified date of the object. The filter is applied only after list all s3 files.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive `None`.
- **s3\_additional\_kwargs** (*Optional[Dict[str, Any]]*) – Forward to botocore requests, only “SSECustomerAlgorithm” and “SSECustomerKey” arguments will be considered.
- **chunksize** (*int, optional*) – If specified, return an generator where chunksize is the number of rows to include in each chunk.
- **dataset** (*bool*) – If `True` read a CSV dataset instead of simple file(s) loading all the related partitions as columns.
- **partition\_filter** (*Optional[Callable[[Dict[str, str]], bool]]*) – Callback Function filters to apply on PARTITION columns (PUSH-DOWN filter). This function MUST receive a single argument (`Dict[str, str]`) where keys are partitions names and values are partitions values. Partitions values will be always strings extracted from S3. This function MUST return a bool, True to read the partition or False to ignore it. Ignored if `dataset=False`. E.g `lambda x: True if x["year"] == "2020" and x["month"] == "1" else False` <https://aws-data-wrangler.readthedocs.io/en/2.15.1/tutorials/023%20-%20Flexible%20Partitions%20Filter.html>
- **pandas\_kwargs** – KEYWORD arguments forwarded to `pandas.read_csv()`. You can NOT pass `pandas_kwargs` explicit, just add valid Pandas arguments in the function

call and Wrangler will accept it. e.g. `wr.s3.read_csv('s3://bucket/prefix/', sep='|', na_values=['null', 'none'], skip_blank_lines=True)` [https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.read\\_csv.html](https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.read_csv.html)

**Returns** Pandas DataFrame or a Generator in case of *chunksize != None*.

**Return type** Union[pandas.DataFrame, Generator[pandas.DataFrame, None, None]]

## Examples

Reading all CSV files under a prefix

```
>>> import awswrangler as wr
>>> df = wr.s3.read_csv(path='s3://bucket/prefix/')
```

Reading all CSV files under a prefix and using pandas\_kwargs

```
>>> import awswrangler as wr
>>> df = wr.s3.read_csv('s3://bucket/prefix/', sep='|', na_values=['null', 'none'],
↳ skip_blank_lines=True)
```

Reading all CSV files from a list

```
>>> import awswrangler as wr
>>> df = wr.s3.read_csv(path=['s3://bucket/filename0.csv', 's3://bucket/filename1.
↳ csv'])
```

Reading in chunks of 100 lines

```
>>> import awswrangler as wr
>>> dfs = wr.s3.read_csv(path=['s3://bucket/filename0.csv', 's3://bucket/filename1.
↳ csv'], chunksize=100)
>>> for df in dfs:
>>>     print(df) # 100 lines Pandas DataFrame
```

Reading CSV Dataset with PUSH-DOWN filter over partitions

```
>>> import awswrangler as wr
>>> my_filter = lambda x: True if x["city"].startswith("new") else False
>>> df = wr.s3.read_csv(path, dataset=True, partition_filter=my_filter)
```

## awswrangler.s3.read\_excel

`awswrangler.s3.read_excel(path: str, version_id: Optional[str] = None, use_threads: Union[bool, int] = True, boto3_session: Optional[boto3.session.Session] = None, s3_additional_kwargs: Optional[Dict[str, Any]] = None, **pandas_kwargs: Any) → pandas.core.frame.DataFrame`

Read EXCEL file(s) from a received S3 path.

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**Note:** This function accepts any Pandas's `read_excel()` argument. [https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.read\\_excel.html](https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.read_excel.html)

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**Note:** Depending on the file extension ('xlsx', 'xls', 'odf'...), an additional library might have to be installed first (e.g. xlrd).

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**Note:** In case of `use_threads=True` the number of threads that will be spawned will be gotten from `os.cpu_count()`.

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### Parameters

- **path** (*str*) – S3 path (e.g. `s3://bucket/key.xlsx`).
- **version\_id** (*Optional[str]*) – Version id of the object.
- **use\_threads** (*Union[bool, int]*) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` will be used as the max number of threads. If given an int will use the given amount of threads. If integer is provided, specified number is used.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.
- **s3\_additional\_kwargs** (*Optional[Dict[str, Any]]*) – Forward to botocore requests, only “SSECustomerAlgorithm” and “SSECustomerKey” arguments will be considered.
- **pandas\_kwargs** – KEYWORD arguments forwarded to `pandas.read_excel()`. You can NOT pass `pandas_kwargs` explicit, just add valid Pandas arguments in the function call and Wrangler will accept it. e.g. `wr.s3.read_excel("s3://bucket/key.xlsx", na_rep="", verbose=True)` [https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.read\\_excel.html](https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.read_excel.html)

**Returns** Pandas DataFrame.

**Return type** `pandas.DataFrame`

### Examples

Reading an EXCEL file

```
>>> import awswrangler as wr
>>> df = wr.s3.read_excel('s3://bucket/key.xlsx')
```

### `awswrangler.s3.read_fwf`

`awswrangler.s3.read_fwf`(*path: Union[str, List[str]], path\_suffix: Optional[Union[str, List[str]]] = None, path\_ignore\_suffix: Optional[Union[str, List[str]]] = None, version\_id: Optional[Union[str, Dict[str, str]]] = None, ignore\_empty: bool = True, use\_threads: Union[bool, int] = True, last\_modified\_begin: Optional[datetime.datetime] = None, last\_modified\_end: Optional[datetime.datetime] = None, boto3\_session: Optional[boto3.session.Session] = None, s3\_additional\_kwargs: Optional[Dict[str, Any]] = None, chunksize: Optional[int] = None, dataset: bool = False, partition\_filter: Optional[Callable[[Dict[str, str]], bool]] = None, \*\*pandas\_kwargs: Any) → Union[pandas.core.frame.DataFrame, Iterator[pandas.core.frame.DataFrame]]*

Read fixed-width formatted file(s) from a received S3 prefix or list of S3 objects paths.

This function accepts Unix shell-style wildcards in the path argument. `*` (matches everything), `?` (matches any single character), `[seq]` (matches any character in seq), `[!seq]` (matches any character not in seq). If you want to use a path which includes Unix shell-style wildcard characters (`*`, `?`, `[]`), you can use `glob.escape(path)` before passing the path to this function.

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**Note:** For partial and gradual reading use the argument `chunksize` instead of `iterator`.

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**Note:** In case of `use_threads=True` the number of threads that will be spawned will be gotten from `os.cpu_count()`.

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**Note:** The filter by `last_modified` begin `last_modified` end is applied after list all S3 files

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### Parameters

- **path** (*Union[str, List[str]]*) – S3 prefix (accepts Unix shell-style wildcards) (e.g. `s3://bucket/prefix`) or list of S3 objects paths (e.g. `[s3://bucket/key0, s3://bucket/key1]`).
- **path\_suffix** (*Union[str, List[str], None]*) – Suffix or List of suffixes to be read (e.g. `[“.txt”]`). If `None`, will try to read all files. (default)
- **path\_ignore\_suffix** (*Union[str, List[str], None]*) – Suffix or List of suffixes for S3 keys to be ignored.(e.g. `[“_SUCCESS”]`). If `None`, will try to read all files. (default)
- **version\_id** (*Optional[Union[str, Dict[str, str]]]*) – Version id of the object or mapping of object path to version id. (e.g. `{‘s3://bucket/key0’: ‘121212’, ‘s3://bucket/key1’: ‘343434’}`)
- **ignore\_empty** (*bool*) – Ignore files with 0 bytes.
- **use\_threads** (*Union[bool, int]*) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` will be used as the max number of threads. If integer is provided, specified number is used.
- **last\_modified\_begin** – Filter the s3 files by the Last modified date of the object. The filter is applied only after list all s3 files.
- **last\_modified\_end** (*datetime, optional*) – Filter the s3 files by the Last modified date of the object. The filter is applied only after list all s3 files.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive `None`.
- **s3\_additional\_kwargs** (*Optional[Dict[str, Any]]*) – Forward to botocore requests, only “SSECustomerAlgorithm” and “SSECustomerKey” arguments will be considered.
- **chunksize** (*int, optional*) – If specified, return an generator where chunksize is the number of rows to include in each chunk.
- **dataset** (*bool*) – If `True` read a FWF dataset instead of simple file(s) loading all the related partitions as columns.

- **partition\_filter** (*Optional[Callable[[Dict[str, str]], bool]]*) – Callback Function filters to apply on PARTITION columns (PUSH-DOWN filter). This function MUST receive a single argument (Dict[str, str]) where keys are partitions names and values are partitions values. Partitions values will be always strings extracted from S3. This function MUST return a bool, True to read the partition or False to ignore it. Ignored if *dataset=False*. E.g `lambda x: True if x["year"] == "2020" and x["month"] == "1" else False` <https://aws-data-wrangler.readthedocs.io/en/2.15.1/tutorials/023%20-%20Flexible%20Partitions%20Filter.html>
- **pandas\_kwargs** – KEYWORD arguments forwarded to `pandas.read_fwf()`. You can NOT pass *pandas\_kwargs* explicit, just add valid Pandas arguments in the function call and Wrangler will accept it. e.g. `wr.s3.read_fwf(path='s3://bucket/prefix/', widths=[1, 3], names=["c0", "c1"])` [https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.read\\_fwf.html](https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.read_fwf.html)

**Returns** Pandas DataFrame or a Generator in case of *chunksize != None*.

**Return type** Union[pandas.DataFrame, Generator[pandas.DataFrame, None, None]]

## Examples

Reading all fixed-width formatted (FWF) files under a prefix

```
>>> import awswrangler as wr
>>> df = wr.s3.read_fwf(path='s3://bucket/prefix/', widths=[1, 3], names=['c0', 'c1', 'c2'])
```

Reading all fixed-width formatted (FWF) files from a list

```
>>> import awswrangler as wr
>>> df = wr.s3.read_fwf(path=['s3://bucket/0.txt', 's3://bucket/1.txt'], widths=[1, 3], names=['c0', 'c1'])
```

Reading in chunks of 100 lines

```
>>> import awswrangler as wr
>>> dfs = wr.s3.read_fwf(
...     path=['s3://bucket/0.txt', 's3://bucket/1.txt'],
...     chunksize=100,
...     widths=[1, 3],
...     names=["c0", "c1"]
... )
>>> for df in dfs:
>>>     print(df) # 100 lines Pandas DataFrame
```

Reading FWF Dataset with PUSH-DOWN filter over partitions

```
>>> import awswrangler as wr
>>> my_filter = lambda x: True if x["city"].startswith("new") else False
>>> df = wr.s3.read_fwf(path, dataset=True, partition_filter=my_filter, widths=[1, 3], names=["c0", "c1"])
```

**aws wrangler.s3.read\_json**

```
aws wrangler.s3.read_json(path: Union[str, List[str]], path_suffix: Optional[Union[str, List[str]]] = None,
                          path_ignore_suffix: Optional[Union[str, List[str]]] = None, version_id:
                          Optional[Union[str, Dict[str, str]]] = None, ignore_empty: bool = True, orient: str
                          = 'columns', use_threads: Union[bool, int] = True, last_modified_begin:
                          Optional[datetime.datetime] = None, last_modified_end:
                          Optional[datetime.datetime] = None, boto3_session:
                          Optional[boto3.session.Session] = None, s3_additional_kwargs: Optional[Dict[str,
                          Any]] = None, chunksize: Optional[int] = None, dataset: bool = False,
                          partition_filter: Optional[Callable[[Dict[str, str]], bool]] = None,
                          **pandas_kwargs: Any) → Union[pandas.core.frame.DataFrame,
                          Iterator[pandas.core.frame.DataFrame]]
```

Read JSON file(s) from a received S3 prefix or list of S3 objects paths.

This function accepts Unix shell-style wildcards in the path argument. \* (matches everything), ? (matches any single character), [seq] (matches any character in seq), [!seq] (matches any character not in seq). If you want to use a path which includes Unix shell-style wildcard characters (\*, ?, []), you can use `glob.escape(path)` before passing the path to this function.

---

**Note:** For partial and gradual reading use the argument `chunksize` instead of `iterator`.

---



---

**Note:** In case of `use_threads=True` the number of threads that will be spawned will be gotten from `os.cpu_count()`.

---



---

**Note:** The filter by `last_modified begin last_modified end` is applied after list all S3 files

---

**Parameters**

- **path** (`Union[str, List[str]]`) – S3 prefix (accepts Unix shell-style wildcards) (e.g. `s3://bucket/prefix`) or list of S3 objects paths (e.g. `[s3://bucket/key0, s3://bucket/key1]`).
- **path\_suffix** (`Union[str, List[str], None]`) – Suffix or List of suffixes to be read (e.g. `[".json"]`). If `None`, will try to read all files. (default)
- **path\_ignore\_suffix** (`Union[str, List[str], None]`) – Suffix or List of suffixes for S3 keys to be ignored.(e.g. `["_SUCCESS"]`). If `None`, will try to read all files. (default)
- **version\_id** (`Optional[Union[str, Dict[str, str]]]`) – Version id of the object or mapping of object path to version id. (e.g. `{ 's3://bucket/key0': '121212', 's3://bucket/key1': '343434' }`)
- **ignore\_empty** (`bool`) – Ignore files with 0 bytes.
- **orient** (`str`) – Same as Pandas: [https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.read\\_json.html](https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.read_json.html)
- **use\_threads** (`Union[bool, int]`) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` will be used as the max number of threads. If integer is provided, specified number is used.
- **last\_modified\_begin** – Filter the s3 files by the Last modified date of the object. The filter is applied only after list all s3 files.



- **last\_modified\_end** (*datetime, optional*) – Filter the s3 files by the Last modified date of the object. The filter is applied only after list all s3 files.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.
- **s3\_additional\_kwargs** (*Optional[Dict[str, Any]]*) – Forward to botocore requests, only “SSECustomerAlgorithm” and “SSECustomerKey” arguments will be considered.
- **chunksize** (*int, optional*) – If specified, return an generator where chunksize is the number of rows to include in each chunk.
- **dataset** (*bool*) – If *True* read a JSON dataset instead of simple file(s) loading all the related partitions as columns. If *True*, the *lines=True* will be assumed by default.
- **partition\_filter** (*Optional[Callable[[Dict[str, str]], bool]]*) – Callback Function filters to apply on PARTITION columns (PUSH-DOWN filter). This function MUST receive a single argument (Dict[str, str]) where keys are partitions names and values are partitions values. Partitions values will be always strings extracted from S3. This function MUST return a bool, True to read the partition or False to ignore it. Ignored if *dataset=False*. E.g `lambda x: True if x["year"] == "2020" and x["month"] == "1" else False` <https://aws-data-wrangler.readthedocs.io/en/2.15.1/tutorials/023%20-%20Flexible%20Partitions%20Filter.html>
- **pandas\_kwargs** – KEYWORD arguments forwarded to `pandas.read_json()`. You can NOT pass *pandas\_kwargs* explicit, just add valid Pandas arguments in the function call and Wrangler will accept it. e.g. `wr.s3.read_json('s3://bucket/prefix/', lines=True, keep_default_dates=True)` [https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.read\\_json.html](https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.read_json.html)

**Returns** Pandas DataFrame or a Generator in case of *chunksize != None*.

**Return type** Union[pandas.DataFrame, Generator[pandas.DataFrame, None, None]]

## Examples

Reading all JSON files under a prefix

```
>>> import awswrangler as wr
>>> df = wr.s3.read_json(path='s3://bucket/prefix/')
```

Reading all CSV files under a prefix and using pandas\_kwargs

```
>>> import awswrangler as wr
>>> df = wr.s3.read_json('s3://bucket/prefix/', lines=True, keep_default_dates=True)
```

Reading all JSON files from a list

```
>>> import awswrangler as wr
>>> df = wr.s3.read_json(path=['s3://bucket/filename0.json', 's3://bucket/filename1.
↪ json'])
```

Reading in chunks of 100 lines

```
>>> import awswrangler as wr
>>> dfs = wr.s3.read_json(path=['s3://bucket/0.json', 's3://bucket/1.json'], ↪
↪ chunksize=100, lines=True)
```

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```
>>> for df in dfs:
>>>     print(df) # 100 lines Pandas DataFrame
```

Reading JSON Dataset with PUSH-DOWN filter over partitions

```
>>> import awswrangler as wr
>>> my_filter = lambda x: True if x["city"].startswith("new") else False
>>> df = wr.s3.read_json(path, dataset=True, partition_filter=my_filter)
```

## awswrangler.s3.read\_parquet

`awswrangler.s3.read_parquet`(*path*: Union[str, List[str]], *path\_root*: Optional[str] = None, *path\_suffix*: Optional[Union[str, List[str]]] = None, *path\_ignore\_suffix*: Optional[Union[str, List[str]]] = None, *version\_id*: Optional[Union[str, Dict[str, str]]] = None, *ignore\_empty*: bool = True, *ignore\_index*: Optional[bool] = None, *partition\_filter*: Optional[Callable[[Dict[str, str], bool]] = None, *columns*: Optional[List[str]] = None, *validate\_schema*: bool = False, *chunked*: Union[bool, int] = False, *dataset*: bool = False, *categories*: Optional[List[str]] = None, *safe*: bool = True, *map\_types*: bool = True, *use\_threads*: Union[bool, int] = True, *last\_modified\_begin*: Optional[datetime.datetime] = None, *last\_modified\_end*: Optional[datetime.datetime] = None, *boto3\_session*: Optional[boto3.session.Session] = None, *s3\_additional\_kwargs*: Optional[Dict[str, Any]] = None, *pyarrow\_additional\_kwargs*: Optional[Dict[str, Any]] = None) → Union[pandas.core.frame.DataFrame, Iterator[pandas.core.frame.DataFrame]]

Read Apache Parquet file(s) from a received S3 prefix or list of S3 objects paths.

The concept of Dataset goes beyond the simple idea of files and enable more complex features like partitioning and catalog integration (AWS Glue Catalog).

This function accepts Unix shell-style wildcards in the path argument. \* (matches everything), ? (matches any single character), [seq] (matches any character in seq), ![seq] (matches any character not in seq). If you want to use a path which includes Unix shell-style wildcard characters (\*, ?, []), you can use `glob.escape(path)` before passing the path to this function.

---

**Note:** *Batching* (*chunked* argument) (Memory Friendly):

Will enable the function to return a Iterable of DataFrames instead of a regular DataFrame.

There are two batching strategies on Wrangler:

- If **chunked=True**, a new DataFrame will be returned for each file in your path/dataset.
- If **chunked=INTEGER**, Wrangler will iterate on the data by number of rows equal the received INTEGER.

*P.S. chunked=True* if faster and uses less memory while *chunked=INTEGER* is more precise in number of rows for each DataFrame.

---

**Note:** In case of *use\_threads=True* the number of threads that will be spawned will be gotten from `os.cpu_count()`.

---

---

**Note:** The filter by last\_modified begin last\_modified end is applied after list all S3 files

---

### Parameters

- **path** (*Union[str, List[str]]*) – S3 prefix (accepts Unix shell-style wildcards) (e.g. s3://bucket/prefix) or list of S3 objects paths (e.g. [s3://bucket/key0, s3://bucket/key1]).
- **path\_root** (*Optional[str]*) – Root path of the table. If dataset='True', will be used as a starting point to load partition columns.
- **path\_suffix** (*Union[str, List[str], None]*) – Suffix or List of suffixes to be read (e.g. [".gz.parquet", ".snappy.parquet"]). If None, will try to read all files. (default)
- **path\_ignore\_suffix** (*Union[str, List[str], None]*) – Suffix or List of suffixes for S3 keys to be ignored.(e.g. [".csv", "\_SUCCESS"]). If None, will try to read all files. (default)
- **version\_id** (*Optional[Union[str, Dict[str, str]]]*) – Version id of the object or mapping of object path to version id. (e.g. { 's3://bucket/key0': '121212', 's3://bucket/key1': '343434' })
- **ignore\_empty** (*bool*) – Ignore files with 0 bytes.
- **ignore\_index** (*Optional[bool]*) – Ignore index when combining multiple parquet files to one DataFrame.
- **partition\_filter** (*Optional[Callable[[Dict[str, str]], bool]]*) – Callback Function filters to apply on PARTITION columns (PUSH-DOWN filter). This function MUST receive a single argument (Dict[str, str]) where keys are partitions names and values are partitions values. Partitions values will be always strings extracted from S3. This function MUST return a bool, True to read the partition or False to ignore it. Ignored if *dataset=False*. E.g lambda x: True if x["year"] == "2020" and x["month"] == "1" else False
- **columns** (*List[str], optional*) – Names of columns to read from the file(s).
- **validate\_schema** – Check that individual file schemas are all the same / compatible. Schemas within a folder prefix should all be the same. Disable if you have schemas that are different and want to disable this check.
- **chunked** (*Union[int, bool]*) – If passed will split the data in a Iterable of DataFrames (Memory friendly). If *True* wrangler will iterate on the data by files in the most efficient way without guarantee of chunksize. If an *INTEGER* is passed Wrangler will iterate on the data by number of rows igual the received *INTEGER*.
- **dataset** (*bool*) – If *True* read a parquet dataset instead of simple file(s) loading all the related partitions as columns.
- **categories** (*Optional[List[str]], optional*) – List of columns names that should be returned as pandas.Categorical. Recommended for memory restricted environments.
- **safe** (*bool, default True*) – For certain data types, a cast is needed in order to store the data in a pandas DataFrame or Series (e.g. timestamps are always stored as nanoseconds in pandas). This option controls whether it is a safe cast or not.
- **map\_types** (*bool, default True*) – True to convert pyarrow DataTypes to pandas ExtensionDtypes. It is used to override the default pandas type for conversion of built-in pyarrow types or in absence of pandas\_metadata in the Table schema.

- **use\_threads** (*Union[bool, int]*) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` will be used as the max number of threads. If integer is provided, specified number is used.
- **last\_modified\_begin** – Filter the s3 files by the Last modified date of the object. The filter is applied only after list all s3 files.
- **last\_modified\_end** (*datetime, optional*) – Filter the s3 files by the Last modified date of the object. The filter is applied only after list all s3 files.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.
- **s3\_additional\_kwargs** (*Optional[Dict[str, Any]]*) – Forward to botocore requests, only “SSECustomerAlgorithm” and “SSECustomerKey” arguments will be considered.
- **pyarrow\_additional\_kwargs** (*Optional[Dict[str, Any]]*) – Forward to the `ParquetFile` class or converting an Arrow table to Pandas, currently only an “coerce\_int96\_timestamp\_unit” or “timestamp\_as\_object” argument will be considered. If reading parquet files where you cannot convert a timestamp to pandas `Timestamp[ns]` consider setting `timestamp_as_object=True`, to allow for timestamp units larger than “ns”. If reading parquet data that still uses INT96 (like Athena outputs) you can use `coerce_int96_timestamp_unit` to specify what timestamp unit to encode INT96 to (by default this is “ns”, if you know the output parquet came from a system that encodes timestamp to a particular unit then set this to that same unit e.g. `coerce_int96_timestamp_unit="ms"`).

**Returns** Pandas DataFrame or a Generator in case of `chunked=True`.

**Return type** `Union[pandas.DataFrame, Generator[pandas.DataFrame, None, None]]`

## Examples

Reading all Parquet files under a prefix

```
>>> import awswrangler as wr
>>> df = wr.s3.read_parquet(path='s3://bucket/prefix/')
```

Reading all Parquet files from a list

```
>>> import awswrangler as wr
>>> df = wr.s3.read_parquet(path=['s3://bucket/filename0.parquet', 's3://bucket/
↳ filename1.parquet'])
```

Reading in chunks (Chunk by file)

```
>>> import awswrangler as wr
>>> dfs = wr.s3.read_parquet(path=['s3://bucket/filename0.csv', 's3://bucket/
↳ filename1.csv'], chunked=True)
>>> for df in dfs:
>>>     print(df) # Smaller Pandas DataFrame
```

Reading in chunks (Chunk by 1MM rows)

```
>>> import awswrangler as wr
>>> dfs = wr.s3.read_parquet(path=['s3://bucket/filename0.csv', 's3://bucket/
↳ filename1.csv'], chunked=1_000_000)
```

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```
>>> for df in dfs:
>>>     print(df) # IMM Pandas DataFrame
```

Reading Parquet Dataset with PUSH-DOWN filter over partitions

```
>>> import awswrangler as wr
>>> my_filter = lambda x: True if x["city"].startswith("new") else False
>>> df = wr.s3.read_parquet(path, dataset=True, partition_filter=my_filter)
```

## awswrangler.s3.read\_parquet\_metadata

`awswrangler.s3.read_parquet_metadata(path: Union[str, List[str]], version_id: Optional[Union[str, Dict[str, str]]] = None, path_suffix: Optional[str] = None, path_ignore_suffix: Optional[str] = None, ignore_empty: bool = True, ignore_null: bool = False, dtype: Optional[Dict[str, str]] = None, sampling: float = 1.0, dataset: bool = False, use_threads: Union[bool, int] = True, boto3_session: Optional[boto3.session.Session] = None, s3_additional_kwargs: Optional[Dict[str, Any]] = None, pyarrow_additional_kwargs: Optional[Dict[str, Any]] = None) → Any`

Read Apache Parquet file(s) metadata from a received S3 prefix or list of S3 objects paths.

The concept of Dataset goes beyond the simple idea of files and enable more complex features like partitioning and catalog integration (AWS Glue Catalog).

This function accepts Unix shell-style wildcards in the path argument. \* (matches everything), ? (matches any single character), [seq] (matches any character in seq), ![seq] (matches any character not in seq). If you want to use a path which includes Unix shell-style wildcard characters (\*, ?, []), you can use `glob.escape(path)` before passing the path to this function.

---

**Note:** In case of `use_threads=True` the number of threads that will be spawned will be gotten from `os.cpu_count()`.

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---

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

---

Check out the [Global Configurations Tutorial](#) for details.

### Parameters

- **path** (`Union[str, List[str]]`) – S3 prefix (accepts Unix shell-style wildcards) (e.g. `s3://bucket/prefix`) or list of S3 objects paths (e.g. `[s3://bucket/key0, s3://bucket/key1]`).
- **version\_id** (`Optional[Union[str, Dict[str, str]]]`) – Version id of the object or mapping of object path to version id. (e.g. `{'s3://bucket/key0': '121212', 's3://bucket/key1': '343434'}`)
- **path\_suffix** (`Union[str, List[str], None]`) – Suffix or List of suffixes to be read (e.g. `[".gz.parquet", ".snappy.parquet"]`). If None, will try to read all files. (default)
- **path\_ignore\_suffix** (`Union[str, List[str], None]`) – Suffix or List of suffixes for S3 keys to be ignored.(e.g. `[".csv", "_SUCCESS"]`). If None, will try to read all files. (default)

- **ignore\_empty** (*bool*) – Ignore files with 0 bytes.
- **ignore\_null** (*bool*) – Ignore columns with null type.
- **dtype** (*Dict[str, str], optional*) – Dictionary of columns names and Athena/Glue types to be casted. Useful when you have columns with undetermined data types as partitions columns. (e.g. {'col name': 'bigint', 'col2 name': 'int'})
- **sampling** (*float*) – Random sample ratio of files that will have the metadata inspected. Must be  $0.0 < sampling \leq 1.0$ . The higher, the more accurate. The lower, the faster.
- **dataset** (*bool*) – If True read a parquet dataset instead of simple file(s) loading all the related partitions as columns.
- **use\_threads** (*bool, int*) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` will be used as the max number of threads. If integer is provided, specified number is used.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.
- **s3\_additional\_kwargs** (*Optional[Dict[str, Any]]*) – Forward to botocore requests, only “SSECustomerAlgorithm” and “SSECustomerKey” arguments will be considered.
- **pyarrow\_additional\_kwargs** (*Optional[Dict[str, Any]]*) – Forward kwargs to parquet reader currently only excepts “coerce\_int96\_timestamp\_unit”. Which can be used to cast deprecated Parquet INT96 into a specified timestamp unit (e.g. “ms”).

**Returns** `columns_types`: Dictionary with keys as column names and values as data types (e.g. {'col0': 'bigint', 'col1': 'double'}). / `partitions_types`: Dictionary with keys as partition names and values as data types (e.g. {'col2': 'date'}).

**Return type** `Tuple[Dict[str, str], Optional[Dict[str, str]]]`

## Examples

Reading all Parquet files (with partitions) metadata under a prefix

```
>>> import awswrangler as wr
>>> columns_types, partitions_types = wr.s3.read_parquet_metadata(path='s3://bucket/
↳ prefix/', dataset=True)
```

Reading all Parquet files metadata from a list

```
>>> import awswrangler as wr
>>> columns_types, partitions_types = wr.s3.read_parquet_metadata(path=[
...     's3://bucket/filename0.parquet',
...     's3://bucket/filename1.parquet'
... ])
```

## aws wrangler.s3.read\_parquet\_table

```
aws wrangler.s3.read_parquet_table(table: str, database: str, filename_suffix: Optional[Union[str, List[str]]]
    = None, filename_ignore_suffix: Optional[Union[str, List[str]]] = None,
    catalog_id: Optional[str] = None, partition_filter:
    Optional[Callable[[Dict[str, str]], bool]] = None, columns:
    Optional[List[str]] = None, validate_schema: bool = True, categories:
    Optional[List[str]] = None, safe: bool = True, map_types: bool = True,
    chunked: Union[bool, int] = False, use_threads: Union[bool, int] =
    True, boto3_session: Optional[boto3.session.Session] = None,
    s3_additional_kwargs: Optional[Dict[str, Any]] = None) → Any
```

Read Apache Parquet table registered on AWS Glue Catalog.

---

**Note:** *Batching* (*chunked* argument) (Memory Friendly):

Will enable the function to return an Iterable of DataFrames instead of a regular DataFrame.

There are two batching strategies on Wrangler:

- If **chunked=True**, a new DataFrame will be returned for each file in your path/dataset.
- If **chunked=INTEGER**, Wrangler will paginate through files slicing and concatenating to return DataFrames with the number of row equal the received INTEGER.

*P.S. chunked=True* if faster and uses less memory while *chunked=INTEGER* is more precise in number of rows for each DataFrame.

---

**Note:** In case of *use\_threads=True* the number of threads that will be spawned will be gotten from `os.cpu_count()`.

---

**Note:** This function has arguments which can be configured globally through *wr.config* or environment variables:

- `catalog_id`
- `database`

Check out the [Global Configurations Tutorial](#) for details.

### Parameters

- **table** (*str*) – AWS Glue Catalog table name.
- **database** (*str*) – AWS Glue Catalog database name.
- **filename\_suffix** (*Union[str, List[str], None]*) – Suffix or List of suffixes to be read (e.g. [“.gz.parquet”, “.snappy.parquet”). If None, will try to read all files. (default)
- **filename\_ignore\_suffix** (*Union[str, List[str], None]*) – Suffix or List of suffixes for S3 keys to be ignored.(e.g. [“.csv”, “\_SUCCESS”). If None, will try to read all files. (default)
- **catalog\_id** (*str, optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.

- **partition\_filter** (*Optional[Callable[[Dict[str, str]], bool]]*) – Callback Function filters to apply on PARTITION columns (PUSH-DOWN filter). This function MUST receive a single argument (Dict[str, str]) where keys are partition names and values are partition values. Partition values will be always strings extracted from S3. This function MUST return a bool, True to read the partition or False to ignore it. Ignored if *dataset=False*. E.g `lambda x: True if x["year"] == "2020" and x["month"] == "1" else False` <https://aws-data-wrangler.readthedocs.io/en/2.15.1/tutorials/023%20-%20Flexible%20Partitions%20Filter.html>
- **columns** (*List[str], optional*) – Names of columns to read from the file(s).
- **validate\_schema** – Check that individual file schemas are all the same / compatible. Schemas within a folder prefix should all be the same. Disable if you have schemas that are different and want to disable this check.
- **categories** (*Optional[List[str]], optional*) – List of columns names that should be returned as pandas.Categorical. Recommended for memory restricted environments.
- **safe** (*bool, default True*) – For certain data types, a cast is needed in order to store the data in a pandas DataFrame or Series (e.g. timestamps are always stored as nanoseconds in pandas). This option controls whether it is a safe cast or not.
- **map\_types** (*bool, default True*) – True to convert pyarrow DataTypes to pandas ExtensionDtypes. It is used to override the default pandas type for conversion of built-in pyarrow types or in absence of pandas\_metadata in the Table schema.
- **chunked** (*bool*) – If True will break the data in smaller DataFrames (Non-deterministic number of lines). Otherwise return a single DataFrame with the whole data.
- **use\_threads** (*Union[bool, int]*) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` will be used as the max number of threads. If integer is provided, specified number is used.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.
- **s3\_additional\_kwargs** (*Optional[Dict[str, Any]]*) – Forward to botocore requests, only “SSECustomerAlgorithm” and “SSECustomerKey” arguments will be considered.

**Returns** Pandas DataFrame or a Generator in case of *chunked=True*.

**Return type** Union[pandas.DataFrame, Generator[pandas.DataFrame, None, None]]

## Examples

Reading Parquet Table

```
>>> import awswrangler as wr
>>> df = wr.s3.read_parquet_table(database='...', table='...')
```

Reading Parquet Table encrypted

```
>>> import awswrangler as wr
>>> df = wr.s3.read_parquet_table(
...     database='...',
...     table='...',
...     s3_additional_kwargs={
```

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```

...     'ServerSideEncryption': 'aws:kms',
...     'SSEKMSKeyId': 'YOUR_KMS_KEY_ARN'
... }
... )

```

Reading Parquet Table in chunks (Chunk by file)

```

>>> import awswrangler as wr
>>> dfs = wr.s3.read_parquet_table(database='...', table='...', chunked=True)
>>> for df in dfs:
>>>     print(df) # Smaller Pandas DataFrame

```

Reading Parquet Dataset with PUSH-DOWN filter over partitions

```

>>> import awswrangler as wr
>>> my_filter = lambda x: True if x["city"].startswith("new") else False
>>> df = wr.s3.read_parquet_table(path, dataset=True, partition_filter=my_filter)

```

### awswrangler.s3.select\_query

**awswrangler.s3.select\_query**(*sql: str, path: str, input\_serialization: str, input\_serialization\_params: Dict[str, Union[bool, str]], compression: Optional[str] = None, use\_threads: Union[bool, int] = False, boto3\_session: Optional[boto3.session.Session] = None, s3\_additional\_kwargs: Optional[Dict[str, Any]] = None*) → *pandas.core.frame.DataFrame*

Filter contents of an Amazon S3 object based on SQL statement.

Note: Scan ranges are only supported for uncompressed CSV/JSON, CSV (without quoted delimiters) and JSON objects (in LINES mode only). It means scanning cannot be split across threads if the latter conditions are not met, leading to lower performance.

#### Parameters

- **sql** (*str*) – SQL statement used to query the object.
- **path** (*str*) – S3 path to the object (e.g. `s3://bucket/key`).
- **input\_serialization** (*str*,) – Format of the S3 object queried. Valid values: “CSV”, “JSON”, or “Parquet”. Case sensitive.
- **input\_serialization\_params** (*Dict[str, Union[bool, str]]*) – Dictionary describing the serialization of the S3 object.
- **compression** (*Optional[str]*) – Compression type of the S3 object. Valid values: None, “gzip”, or “bzip2”. gzip and bzip2 are only valid for CSV and JSON objects.
- **use\_threads** (*Union[bool, int]*) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` is used as the max number of threads. If integer is provided, specified number is used.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session is used if none is provided.
- **s3\_additional\_kwargs** (*Optional[Dict[str, Any]]*) – Forwarded to botocore requests. Valid values: “SSECustomerAlgorithm”, “SSECustomerKey”, “ExpectedBucketOwner”. e.g. `s3_additional_kwargs={'SSECustomerAlgorithm': 'md5'}`

**Returns** Pandas DataFrame with results from query.

**Return type** pandas.DataFrame

## Examples

Reading a gzip compressed JSON document

```
>>> import awswrangler as wr
>>> df = wr.s3.select_query(
...     sql='SELECT * FROM s3object[*][*]',
...     path='s3://bucket/key.json.gzip',
...     input_serialization='JSON',
...     input_serialization_params={
...         'Type': 'Document',
...     },
...     compression="gzip",
... )
```

Reading an entire CSV object using threads

```
>>> import awswrangler as wr
>>> df = wr.s3.select_query(
...     sql='SELECT * FROM s3object',
...     path='s3://bucket/key.csv',
...     input_serialization='CSV',
...     input_serialization_params={
...         'FileHeaderInfo': 'Use',
...         'RecordDelimiter': '\r\n'
...     },
...     use_threads=True,
... )
```

Reading a single column from Parquet object with pushdown filter

```
>>> import awswrangler as wr
>>> df = wr.s3.select_query(
...     sql='SELECT s.\"id\" FROM s3object s where s.\"id\" = 1.0',
...     path='s3://bucket/key.snappy.parquet',
...     input_serialization='Parquet',
... )
```

## awswrangler.s3.size\_objects

`awswrangler.s3.size_objects(path: Union[str, List[str]], version_id: Optional[Union[str, Dict[str, str]]] = None, use_threads: Union[bool, int] = True, s3_additional_kwargs: Optional[Dict[str, Any]] = None, boto3_session: Optional[boto3.session.Session] = None) → Dict[str, Optional[int]]`

Get the size (ContentLength) in bytes of Amazon S3 objects from a received S3 prefix or list of S3 objects paths.

This function accepts Unix shell-style wildcards in the path argument. \* (matches everything), ? (matches any single character), [seq] (matches any character in seq), [!seq] (matches any character not in seq). If you want to

use a path which includes Unix shell-style wildcard characters (\*, ?, []), you can use `glob.escape(path)` before passing the path to this function.

**Note:** In case of `use_threads=True` the number of threads that will be spawned will be gotten from `os.cpu_count()`.

### Parameters

- **path** (`Union[str, List[str]]`) – S3 prefix (accepts Unix shell-style wildcards) (e.g. `s3://bucket/prefix`) or list of S3 objects paths (e.g. `[s3://bucket/key0, s3://bucket/key1]`).
- **version\_id** (`Optional[Union[str, Dict[str, str]]]`) – Version id of the object or mapping of object path to version id. (e.g. `{ 's3://bucket/key0': '121212', 's3://bucket/key1': '343434' }`)
- **use\_threads** (`bool, int`) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` will be used as the max number of threads. If integer is provided, specified number is used.
- **s3\_additional\_kwargs** (`Optional[Dict[str, Any]]`) – Forwarded to botocore requests. e.g. `s3_additional_kwargs={'RequestPayer': 'requester'}`
- **boto3\_session** (`boto3.Session()`, `optional`) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.

**Returns** Dictionary where the key is the object path and the value is the object size.

**Return type** `Dict[str, Optional[int]]`

### Examples

```
>>> import awswrangler as wr
>>> sizes0 = wr.s3.size_objects(['s3://bucket/key0', 's3://bucket/key1']) # Get
↳ the sizes of both objects
>>> sizes1 = wr.s3.size_objects('s3://bucket/prefix') # Get the sizes of all
↳ objects under the received prefix
```

### awswrangler.s3.store\_parquet\_metadata

`awswrangler.s3.store_parquet_metadata(path: str, database: str, table: str, catalog_id: Optional[str] = None, path_suffix: Optional[str] = None, path_ignore_suffix: Optional[str] = None, ignore_empty: bool = True, dtype: Optional[Dict[str, str]] = None, sampling: float = 1.0, dataset: bool = False, use_threads: Union[bool, int] = True, description: Optional[str] = None, parameters: Optional[Dict[str, str]] = None, columns_comments: Optional[Dict[str, str]] = None, compression: Optional[str] = None, mode: str = 'overwrite', catalog_versioning: bool = False, regular_partitions: bool = True, projection_enabled: bool = False, projection_types: Optional[Dict[str, str]] = None, projection_ranges: Optional[Dict[str, str]] = None, projection_values: Optional[Dict[str, str]] = None, projection_intervals: Optional[Dict[str, str]] = None, projection_digits: Optional[Dict[str, str]] = None, s3_additional_kwargs: Optional[Dict[str, Any]] = None, boto3_session: Optional[boto3.session.Session] = None) → Any`

Infer and store parquet metadata on AWS Glue Catalog.

Infer Apache Parquet file(s) metadata from a received S3 prefix And then stores it on AWS Glue Catalog including all inferred partitions (No need for 'MSCK REPAIR TABLE')

The concept of Dataset goes beyond the simple idea of files and enables more complex features like partitioning and catalog integration (AWS Glue Catalog).

This function accepts Unix shell-style wildcards in the path argument. \* (matches everything), ? (matches any single character), [seq] (matches any character in seq), [!seq] (matches any character not in seq). If you want to use a path which includes Unix shell-style wildcard characters (\*, ?, []), you can use *glob.escape(path)* before passing the path to this function.

---

**Note:** In case of *use\_threads=True* the number of threads that will be spawned will be gotten from *os.cpu\_count()*.

---

---

**Note:** This function has arguments which can be configured globally through *wr.config* or environment variables:

- `catalog_id`
- `database`

Check out the [Global Configurations Tutorial](#) for details.

---

### Parameters

- **path** (*str*) – S3 prefix (accepts Unix shell-style wildcards) (e.g. `s3://bucket/prefix`).
- **table** (*str*) – Glue/Athena catalog: Table name.
- **database** (*str*) – AWS Glue Catalog database name.
- **catalog\_id** (*str*, *optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **path\_suffix** (*Union[str, List[str], None]*) – Suffix or List of suffixes for filtering S3 keys.
- **path\_ignore\_suffix** (*Union[str, List[str], None]*) – Suffix or List of suffixes for S3 keys to be ignored.
- **ignore\_empty** (*bool*) – Ignore files with 0 bytes.
- **dtype** (*Dict[str, str]*, *optional*) – Dictionary of columns names and Athena/Glue types to be casted. Useful when you have columns with undetermined data types as partitions columns. (e.g. `{'col name': 'bigint', 'col2 name': 'int'}`)
- **sampling** (*float*) – Random sample ratio of files that will have the metadata inspected. Must be  $0.0 < sampling \leq 1.0$ . The higher, the more accurate. The lower, the faster.
- **dataset** (*bool*) – If True read a parquet dataset instead of simple file(s) loading all the related partitions as columns.
- **use\_threads** (*bool*, *int*) – True to enable concurrent requests, False to disable multiple threads. If enabled *os.cpu\_count()* will be used as the max number of threads. If integer is provided, specified number is used.
- **description** (*str*, *optional*) – Glue/Athena catalog: Table description

- **parameters** (*Dict[str, str], optional*) – Glue/Athena catalog: Key/value pairs to tag the table.
- **columns\_comments** (*Dict[str, str], optional*) – Glue/Athena catalog: Columns names and the related comments (e.g. {'col0': 'Column 0.', 'col1': 'Column 1.', 'col2': 'Partition.'}).
- **compression** (*str, optional*) – Compression style (None, snappy, gzip, etc).
- **mode** (*str*) – 'overwrite' to recreate any possible existing table or 'append' to keep any possible existing table.
- **catalog\_versioning** (*bool*) – If True and *mode="overwrite"*, creates an archived version of the table catalog before updating it.
- **regular\_partitions** (*bool*) – Create regular partitions (Non projected partitions) on Glue Catalog. Disable when you will work only with Partition Projection. Keep enabled even when working with projections is useful to keep Redshift Spectrum working with the regular partitions.
- **projection\_enabled** (*bool*) – Enable Partition Projection on Athena (<https://docs.aws.amazon.com/athena/latest/ug/partition-projection.html>)
- **projection\_types** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections types. Valid types: "enum", "integer", "date", "injected" <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. {'col\_name': 'enum', 'col2\_name': 'integer'})
- **projection\_ranges** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections ranges. <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. {'col\_name': '0,10', 'col2\_name': '-1,8675309'})
- **projection\_values** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections values. <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. {'col\_name': 'A,B,Unknown', 'col2\_name': 'foo,boo,bar'})
- **projection\_intervals** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections intervals. <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. {'col\_name': '1', 'col2\_name': '5'})
- **projection\_digits** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections digits. <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. {'col\_name': '1', 'col2\_name': '2'})
- **s3\_additional\_kwargs** (*Optional[Dict[str, Any]]*) – Forwarded to botocore requests. e.g. s3\_additional\_kwargs={'ServerSideEncryption': 'aws:kms', 'SSEKMSKeyId': 'YOUR\_KMS\_KEY\_ARN'}
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** The metadata used to create the Glue Table. *columns\_types*: Dictionary with keys as column names and values as data types (e.g. {'col0': 'bigint', 'col1': 'double'}). / *partitions\_types*: Dictionary with keys as partition names and values as data types (e.g. {'col2': 'date'}). / *partitions\_values*: Dictionary with keys as S3 path locations and values as a list of partitions values as str (e.g. {'s3://bucket/prefix/y=2020/m=10/': ['2020', '10']}).

**Return type** Tuple[Dict[str, str], Optional[Dict[str, str]], Optional[Dict[str, List[str]]]]

## Examples

Reading all Parquet files metadata under a prefix

```
>>> import awswrangler as wr
>>> columns_types, partitions_types, partitions_values = wr.s3.store_parquet_
↳ metadata(
...     path='s3://bucket/prefix/',
...     database='...',
...     table='...',
...     dataset=True
... )
```

## awswrangler.s3.to\_csv

`awswrangler.s3.to_csv(df: pandas.core.frame.DataFrame, path: Optional[str] = None, sep: str = ',', index: bool = True, columns: Optional[List[str]] = None, use_threads: Union[bool, int] = True, boto3_session: Optional[boto3.session.Session] = None, s3_additional_kwargs: Optional[Dict[str, Any]] = None, sanitize_columns: bool = False, dataset: bool = False, filename_prefix: Optional[str] = None, partition_cols: Optional[List[str]] = None, bucketing_info: Optional[Tuple[List[str], int]] = None, concurrent_partitioning: bool = False, mode: Optional[str] = None, catalog_versioning: bool = False, schema_evolution: bool = False, database: Optional[str] = None, table: Optional[str] = None, table_type: Optional[str] = None, transaction_id: Optional[str] = None, dtype: Optional[Dict[str, str]] = None, description: Optional[str] = None, parameters: Optional[Dict[str, str]] = None, columns_comments: Optional[Dict[str, str]] = None, regular_partitions: bool = True, projection_enabled: bool = False, projection_types: Optional[Dict[str, str]] = None, projection_ranges: Optional[Dict[str, str]] = None, projection_values: Optional[Dict[str, str]] = None, projection_intervals: Optional[Dict[str, str]] = None, projection_digits: Optional[Dict[str, str]] = None, catalog_id: Optional[str] = None, **pandas_kwargs: Any) → Any`

Write CSV file or dataset on Amazon S3.

The concept of Dataset goes beyond the simple idea of ordinary files and enable more complex features like partitioning and catalog integration (Amazon Athena/AWS Glue Catalog).

---

**Note:** If `database` and `table` arguments are passed, the table name and all column names will be automatically sanitized using `wr.catalog.sanitize_table_name` and `wr.catalog.sanitize_column_name`. Please, pass `sanitize_columns=True` to enforce this behaviour always.

---



---

**Note:** If `table` and `database` arguments are passed, `pandas_kwargs` will be ignored due restrictive quoting, `date_format`, `escapechar` and encoding required by Athena/Glue Catalog.

---



---

**Note:** Compression: The minimum acceptable version to achieve it is Pandas 1.2.0 that requires Python >= 3.7.1.

---



---

**Note:** In case of `use_threads=True` the number of threads that will be spawned will be gotten from

---

---

`os.cpu_count()`.

---

**Note:** This function has arguments which can be configured globally through *wr.config* or environment variables:

- `catalog_id`
- `concurrent_partitioning`
- `database`

Check out the [Global Configurations Tutorial](#) for details.

---

### Parameters

- **df** (*pandas.DataFrame*) – Pandas DataFrame <https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.html>
- **path** (*str, optional*) – Amazon S3 path (e.g. `s3://bucket/prefix/filename.csv`) (for dataset e.g. `s3://bucket/prefix`). Required if `dataset=False` or when creating a new dataset
- **sep** (*str*) – String of length 1. Field delimiter for the output file.
- **index** (*bool*) – Write row names (index).
- **columns** (*Optional[List[str]]*) – Columns to write.
- **use\_threads** (*bool, int*) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` will be used as the max number of threads. If integer is provided, specified number is used.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 Session will be used if `boto3_session` receive None.
- **s3\_additional\_kwargs** (*Optional[Dict[str, Any]]*) – Forwarded to botocore requests. e.g. `s3_additional_kwargs={'ServerSideEncryption': 'aws:kms', 'SSEKMSKeyId': 'YOUR_KMS_KEY_ARN'}`
- **sanitize\_columns** (*bool*) – True to sanitize columns names or False to keep it as is. True value is forced if `dataset=True`.
- **dataset** (*bool*) – If True store as a dataset instead of ordinary file(s) If True, enable all follow arguments: `partition_cols`, `mode`, `database`, `table`, `description`, `parameters`, `columns_comments`, `concurrent_partitioning`, `catalog_versioning`, `projection_enabled`, `projection_types`, `projection_ranges`, `projection_values`, `projection_intervals`, `projection_digits`, `catalog_id`, `schema_evolution`.
- **filename\_prefix** (*str, optional*) – If `dataset=True`, add a filename prefix to the output files.
- **partition\_cols** (*List[str], optional*) – List of column names that will be used to create partitions. Only takes effect if `dataset=True`.
- **bucketing\_info** (*Tuple[List[str], int], optional*) – Tuple consisting of the column names used for bucketing as the first element and the number of buckets as the second element. Only *str*, *int* and *bool* are supported as column data types for bucketing.



- **concurrent\_partitioning** (*bool*) – If True will increase the parallelism level during the partitions writing. It will decrease the writing time and increase the memory usage. <https://aws-data-wrangler.readthedocs.io/en/2.15.1/tutorials/022%20-%20Writing%20Partitions%20Concurrently.html>
- **mode** (*str, optional*) – `append` (Default), `overwrite`, `overwrite_partitions`. Only takes effect if `dataset=True`. For details check the related tutorial: [https://aws-data-wrangler.readthedocs.io/en/2.15.1/stubs/awswrangler.s3.to\\_parquet.html#awswrangler.s3.to\\_parquet](https://aws-data-wrangler.readthedocs.io/en/2.15.1/stubs/awswrangler.s3.to_parquet.html#awswrangler.s3.to_parquet)
- **catalog\_versioning** (*bool*) – If True and `mode="overwrite"`, creates an archived version of the table catalog before updating it.
- **schema\_evolution** (*bool*) – If True allows schema evolution (new or missing columns), otherwise a exception will be raised. (Only considered if `dataset=True` and `mode` in (`"append"`, `"overwrite_partitions"`)). False by default. Related tutorial: <https://aws-data-wrangler.readthedocs.io/en/2.15.1/tutorials/014%20-%20Schema%20Evolution.html>
- **database** (*str, optional*) – Glue/Athena catalog: Database name.
- **table** (*str, optional*) – Glue/Athena catalog: Table name.
- **table\_type** (*str, optional*) – The type of the Glue Table. Set to `EXTERNAL_TABLE` if None
- **transaction\_id** (*str, optional*) – The ID of the transaction when writing to a Governed Table.
- **dtype** (*Dict[str, str], optional*) – Dictionary of columns names and Athena/Glue types to be casted. Useful when you have columns with undetermined or mixed data types. (e.g. `{'col name': 'bigint', 'col2 name': 'int'}`)
- **description** (*str, optional*) – Glue/Athena catalog: Table description
- **parameters** (*Dict[str, str], optional*) – Glue/Athena catalog: Key/value pairs to tag the table.
- **columns\_comments** (*Dict[str, str], optional*) – Glue/Athena catalog: Columns names and the related comments (e.g. `{'col0': 'Column 0.', 'col1': 'Column 1.', 'col2': 'Partition.'}`).
- **regular\_partitions** (*bool*) – Create regular partitions (Non projected partitions) on Glue Catalog. Disable when you will work only with Partition Projection. Keep enabled even when working with projections is useful to keep Redshift Spectrum working with the regular partitions.
- **projection\_enabled** (*bool*) – Enable Partition Projection on Athena (<https://docs.aws.amazon.com/athena/latest/ug/partition-projection.html>)
- **projection\_types** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections types. Valid types: `"enum"`, `"integer"`, `"date"`, `"injected"` <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. `{'col_name': 'enum', 'col2_name': 'integer'}`)
- **projection\_ranges** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections ranges. <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. `{'col_name': '0,10', 'col2_name': '-1,8675309'}`)
- **projection\_values** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections values. <https://docs.aws.amazon.com/athena/latest/>



`ug/partition-projection-supported-types.html` (e.g. `{'col_name': 'A,B,Unknown', 'col2_name': 'foo,boo,bar'}`)

- **projection\_intervals** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections intervals. <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. `{'col_name': '1', 'col2_name': '5'}`)
- **projection\_digits** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections digits. <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. `{'col_name': '1', 'col2_name': '2'}`)
- **catalog\_id** (*str, optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **pandas\_kwargs** – KEYWORD arguments forwarded to `pandas.DataFrame.to_csv()`. You can NOT pass `pandas_kwargs` explicit, just add valid Pandas arguments in the function call and Wrangler will accept it. e.g. `wr.s3.to_csv(df, path, sep='|', na_rep='NULL', decimal=',')` [https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.to\\_csv.html](https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.to_csv.html)

**Returns** Dictionary with: `'paths'`: List of all stored files paths on S3. `'partitions_values'`: Dictionary of partitions added with keys as S3 path locations and values as a list of partitions values as str.

**Return type** `Dict[str, Union[List[str], Dict[str, List[str]]]]`

## Examples

Writing single file

```
>>> import awswrangler as wr
>>> import pandas as pd
>>> wr.s3.to_csv(
...     df=pd.DataFrame({'col': [1, 2, 3]}),
...     path='s3://bucket/prefix/my_file.csv',
... )
{
  'paths': ['s3://bucket/prefix/my_file.csv'],
  'partitions_values': {}
}
```

Writing single file with `pandas_kwargs`

```
>>> import awswrangler as wr
>>> import pandas as pd
>>> wr.s3.to_csv(
...     df=pd.DataFrame({'col': [1, 2, 3]}),
...     path='s3://bucket/prefix/my_file.csv',
...     sep='|',
...     na_rep='NULL',
...     decimal=',',
... )
{
  'paths': ['s3://bucket/prefix/my_file.csv'],
  'partitions_values': {}
}
```

Writing single file encrypted with a KMS key

```
>>> import awswrangler as wr
>>> import pandas as pd
>>> wr.s3.to_csv(
...     df=pd.DataFrame({'col': [1, 2, 3]}),
...     path='s3://bucket/prefix/my_file.csv',
...     s3_additional_kwargs={
...         'ServerSideEncryption': 'aws:kms',
...         'SSEKMSKeyId': 'YOUR_KMS_KEY_ARN'
...     }
... )
{
  'paths': ['s3://bucket/prefix/my_file.csv'],
  'partitions_values': {}
}
```

Writing partitioned dataset

```
>>> import awswrangler as wr
>>> import pandas as pd
>>> wr.s3.to_csv(
...     df=pd.DataFrame({
...         'col': [1, 2, 3],
...         'col2': ['A', 'A', 'B']
...     }),
...     path='s3://bucket/prefix',
...     dataset=True,
...     partition_cols=['col2']
... )
{
  'paths': ['s3://.../col2=A/x.csv', 's3://.../col2=B/y.csv'],
  'partitions_values': {
    's3://.../col2=A/': ['A'],
    's3://.../col2=B/': ['B']
  }
}
```

Writing bucketed dataset

```
>>> import awswrangler as wr
>>> import pandas as pd
>>> wr.s3.to_csv(
...     df=pd.DataFrame({
...         'col': [1, 2, 3],
...         'col2': ['A', 'A', 'B']
...     }),
...     path='s3://bucket/prefix',
...     dataset=True,
...     bucketing_info=(["col2"], 2)
... )
{
  'paths': ['s3://.../x_bucket-00000.csv', 's3://.../col2=B/x_bucket-00001.csv'],
  'partitions_values': {}
}
```

Writing dataset to S3 with metadata on Athena/Glue Catalog.

```
>>> import awswrangler as wr
>>> import pandas as pd
>>> wr.s3.to_csv(
...     df=pd.DataFrame({
...         'col': [1, 2, 3],
...         'col2': ['A', 'A', 'B']
...     }),
...     path='s3://bucket/prefix',
...     dataset=True,
...     partition_cols=['col2'],
...     database='default', # Athena/Glue database
...     table='my_table' # Athena/Glue table
... )
{
  'paths': ['s3://.../col2=A/x.csv', 's3://.../col2=B/y.csv'],
  'partitions_values': {
    's3://.../col2=A/': ['A'],
    's3://.../col2=B/': ['B']
  }
}
```

Writing dataset to Glue governed table

```
>>> import awswrangler as wr
>>> import pandas as pd
>>> wr.s3.to_csv(
...     df=pd.DataFrame({
...         'col': [1, 2, 3],
...         'col2': ['A', 'A', 'B'],
...         'col3': [None, None, None]
...     }),
...     dataset=True,
...     mode='append',
...     database='default', # Athena/Glue database
...     table='my_table', # Athena/Glue table
...     table_type='GOVERNED',
...     transaction_id="xxx",
... )
{
  'paths': ['s3://.../x.csv'],
  'partitions_values': {}
}
```

Writing dataset casting empty column data type

```
>>> import awswrangler as wr
>>> import pandas as pd
>>> wr.s3.to_csv(
...     df=pd.DataFrame({
...         'col': [1, 2, 3],
...         'col2': ['A', 'A', 'B'],
...         'col3': [None, None, None]
...     })
```

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```

...     }},
...     path='s3://bucket/prefix',
...     dataset=True,
...     database='default', # Athena/Glue database
...     table='my_table' # Athena/Glue table
...     dtype={'col3': 'date'}
... )
{
  'paths': ['s3://.../x.csv'],
  'partitions_values': {}
}

```

## awsrangler.s3.to\_excel

`awsrangler.s3.to_excel(df: pandas.core.frame.DataFrame, path: str, boto3_session: Optional[boto3.session.Session] = None, s3_additional_kwargs: Optional[Dict[str, Any]] = None, use_threads: Union[bool, int] = True, **pandas_kwargs: Any) → str`

Write EXCEL file on Amazon S3.

**Note:** This function accepts any Pandas's `read_excel()` argument. [https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.read\\_excel.html](https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.read_excel.html)

**Note:** Depending on the file extension ('xlsx', 'xls', 'odf...'), an additional library might have to be installed first (e.g. xlrld).

**Note:** In case of `use_threads=True` the number of threads that will be spawned will be gotten from `os.cpu_count()`.

### Parameters

- **df** (*pandas.DataFrame*) – Pandas DataFrame <https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.html>
- **path** (*str*) – Amazon S3 path (e.g. `s3://bucket/filename.xlsx`).
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 Session will be used if `boto3_session` receive None.
- **s3\_additional\_kwargs** (*Optional[Dict[str, Any]]*) – Forwarded to botocore requests. e.g. `s3_additional_kwargs={'ServerSideEncryption': 'aws:kms', 'SSEKMSKeyId': 'YOUR_KMS_KEY_ARN'}`
- **use\_threads** (*bool*, *int*) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` will be used as the max number of threads. If integer is provided, specified number is used.
- **pandas\_kwargs** – KEYWORD arguments forwarded to `pandas.DataFrame.to_excel()`. You can NOT pass `pandas_kwargs` explicit, just add valid Pandas arguments in the function call and Wrangler will accept it. e.g. `wr.s3.to_excel(df, path, na_rep="", index=False)` [https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.to\\_excel.html](https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.to_excel.html)

**Returns** Written S3 path.

**Return type** str

## Examples

Writing EXCEL file

```
>>> import awswrangler as wr
>>> import pandas as pd
>>> wr.s3.to_excel(df, 's3://bucket/filename.xlsx')
```

## awswrangler.s3.to\_json

`awswrangler.s3.to_json(df: pandas.core.frame.DataFrame, path: Optional[str] = None, index: bool = True, columns: Optional[List[str]] = None, use_threads: Union[bool, int] = True, boto3_session: Optional[boto3.session.Session] = None, s3_additional_kwargs: Optional[Dict[str, Any]] = None, sanitize_columns: bool = False, dataset: bool = False, filename_prefix: Optional[str] = None, partition_cols: Optional[List[str]] = None, bucketing_info: Optional[Tuple[List[str], int]] = None, concurrent_partitioning: bool = False, mode: Optional[str] = None, catalog_versioning: bool = False, schema_evolution: bool = True, database: Optional[str] = None, table: Optional[str] = None, table_type: Optional[str] = None, transaction_id: Optional[str] = None, dtype: Optional[Dict[str, str]] = None, description: Optional[str] = None, parameters: Optional[Dict[str, str]] = None, columns_comments: Optional[Dict[str, str]] = None, regular_partitions: bool = True, projection_enabled: bool = False, projection_types: Optional[Dict[str, str]] = None, projection_ranges: Optional[Dict[str, str]] = None, projection_values: Optional[Dict[str, str]] = None, projection_intervals: Optional[Dict[str, str]] = None, projection_digits: Optional[Dict[str, str]] = None, catalog_id: Optional[str] = None, **pandas_kwargs: Any) → Union[List[str], Dict[str, Union[List[str], Dict[str, List[str]]]]]`

Write JSON file on Amazon S3.

---

**Note:** In case of `use_threads=True` the number of threads that will be spawned will be gotten from `os.cpu_count()`.

---



---

**Note:** Compression: The minimum acceptable version to achieve it is Pandas 1.2.0 that requires Python `>= 3.7.1`.

---

## Parameters

- **df** (`pandas.DataFrame`) – Pandas DataFrame <https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.html>
- **path** (`str`) – Amazon S3 path (e.g. `s3://bucket/filename.json`).
- **index** (`bool`) – Write row names (index).
- **columns** (`Optional[List[str]]`) – Columns to write.
- **use\_threads** (`bool`, `int`) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` will be used as the max number of threads. If integer is provided, specified number is used.

- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 Session will be used if boto3\_session receive None.
- **s3\_additional\_kwargs** (*Optional[Dict[str, Any]]*) – Forwarded to botocore requests. e.g. `s3_additional_kwargs={'ServerSideEncryption': 'aws:kms', 'SSEKMSKeyId': 'YOUR_KMS_KEY_ARN'}`
- **sanitize\_columns** (*bool*) – True to sanitize columns names or False to keep it as is. True value is forced if *dataset=True*.
- **dataset** (*bool*) – If True store as a dataset instead of ordinary file(s) If True, enable all follow arguments: *partition\_cols*, *mode*, *database*, *table*, *description*, *parameters*, *columns\_comments*, *concurrent\_partitioning*, *catalog\_versioning*, *projection\_enabled*, *projection\_types*, *projection\_ranges*, *projection\_values*, *projection\_intervals*, *projection\_digits*, *catalog\_id*, *schema\_evolution*.
- **filename\_prefix** (*str*, *optional*) – If dataset=True, add a filename prefix to the output files.
- **partition\_cols** (*List[str]*, *optional*) – List of column names that will be used to create partitions. Only takes effect if dataset=True.
- **bucketing\_info** (*Tuple[List[str], int]*, *optional*) – Tuple consisting of the column names used for bucketing as the first element and the number of buckets as the second element. Only *str*, *int* and *bool* are supported as column data types for bucketing.
- **concurrent\_partitioning** (*bool*) – If True will increase the parallelism level during the partitions writing. It will decrease the writing time and increase the memory usage. <https://aws-data-wrangler.readthedocs.io/en/2.15.1/tutorials/022%20-%20Writing%20Partitions%20Concurrently.html>
- **mode** (*str*, *optional*) – *append* (Default), *overwrite*, *overwrite\_partitions*. Only takes effect if dataset=True. For details check the related tutorial: [https://aws-data-wrangler.readthedocs.io/en/2.15.1/stubs/awswrangler.s3.to\\_parquet.html#awswrangler.s3.to\\_parquet](https://aws-data-wrangler.readthedocs.io/en/2.15.1/stubs/awswrangler.s3.to_parquet.html#awswrangler.s3.to_parquet)
- **catalog\_versioning** (*bool*) – If True and *mode="overwrite"*, creates an archived version of the table catalog before updating it.
- **schema\_evolution** (*bool*) – If True allows schema evolution (new or missing columns), otherwise a exception will be raised. (Only considered if dataset=True and mode in (“append”, “overwrite\_partitions”)) Related tutorial: <https://aws-data-wrangler.readthedocs.io/en/2.15.1/tutorials/014%20-%20Schema%20Evolution.html>
- **database** (*str*, *optional*) – Glue/Athena catalog: Database name.
- **table** (*str*, *optional*) – Glue/Athena catalog: Table name.
- **table\_type** (*str*, *optional*) – The type of the Glue Table. Set to `EXTERNAL_TABLE` if None
- **transaction\_id** (*str*, *optional*) – The ID of the transaction when writing to a Governed Table.
- **dtype** (*Dict[str, str]*, *optional*) – Dictionary of columns names and Athena/Glue types to be casted. Useful when you have columns with undetermined or mixed data types. (e.g. `{'col name': 'bigint', 'col2 name': 'int'}`)
- **description** (*str*, *optional*) – Glue/Athena catalog: Table description
- **parameters** (*Dict[str, str]*, *optional*) – Glue/Athena catalog: Key/value pairs to tag the table.

- **columns\_comments** (*Dict[str, str], optional*) – Glue/Athena catalog: Columns names and the related comments (e.g. {'col0': 'Column 0.', 'col1': 'Column 1.', 'col2': 'Partition.'}).
- **regular\_partitions** (*bool*) – Create regular partitions (Non projected partitions) on Glue Catalog. Disable when you will work only with Partition Projection. Keep enabled even when working with projections is useful to keep Redshift Spectrum working with the regular partitions.
- **projection\_enabled** (*bool*) – Enable Partition Projection on Athena (<https://docs.aws.amazon.com/athena/latest/ug/partition-projection.html>)
- **projection\_types** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections types. Valid types: “enum”, “integer”, “date”, “injected” <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. {'col\_name': 'enum', 'col2\_name': 'integer'})
- **projection\_ranges** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections ranges. <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. {'col\_name': '0,10', 'col2\_name': '-1,8675309'})
- **projection\_values** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections values. <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. {'col\_name': 'A,B,Unknown', 'col2\_name': 'foo,boo,bar'})
- **projection\_intervals** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections intervals. <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. {'col\_name': '1', 'col2\_name': '5'})
- **projection\_digits** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections digits. <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. {'col\_name': '1', 'col2\_name': '2'})
- **catalog\_id** (*str, optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **pandas\_kwargs** – KEYWORD arguments forwarded to `pandas.DataFrame.to_json()`. You can NOT pass `pandas_kwargs` explicit, just add valid Pandas arguments in the function call and Wrangler will accept it. e.g. `wr.s3.to_json(df, path, lines=True, date_format='iso')` [https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.to\\_json.html](https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.to_json.html)

**Returns** List of written files.

**Return type** List[str]

## Examples

Writing JSON file

```
>>> import awswrangler as wr
>>> import pandas as pd
>>> wr.s3.to_json(
...     df=pd.DataFrame({'col': [1, 2, 3]}),
...     path='s3://bucket/filename.json',
... )
```

Writing JSON file using pandas\_kwargs

```
>>> import awswrangler as wr
>>> import pandas as pd
>>> wr.s3.to_json(
...     df=pd.DataFrame({'col': [1, 2, 3]}),
...     path='s3://bucket/filename.json',
...     lines=True,
...     date_format='iso'
... )
```

Writing CSV file encrypted with a KMS key

```
>>> import awswrangler as wr
>>> import pandas as pd
>>> wr.s3.to_json(
...     df=pd.DataFrame({'col': [1, 2, 3]}),
...     path='s3://bucket/filename.json',
...     s3_additional_kwargs={
...         'ServerSideEncryption': 'aws:kms',
...         'SSEKMSKeyId': 'YOUR_KMS_KEY_ARN'
...     }
... )
```

## awswrangler.s3.to\_parquet

`awswrangler.s3.to_parquet(df: pandas.core.frame.DataFrame, path: Optional[str] = None, index: bool = False, compression: Optional[str] = 'snappy', pyarrow_additional_kwargs: Optional[Dict[str, Any]] = None, max_rows_by_file: Optional[int] = None, use_threads: Union[bool, int] = True, boto3_session: Optional[boto3.session.Session] = None, s3_additional_kwargs: Optional[Dict[str, Any]] = None, sanitize_columns: bool = False, dataset: bool = False, filename_prefix: Optional[str] = None, partition_cols: Optional[List[str]] = None, bucketing_info: Optional[Tuple[List[str], int]] = None, concurrent_partitioning: bool = False, mode: Optional[str] = None, catalog_versioning: bool = False, schema_evolution: bool = True, database: Optional[str] = None, table: Optional[str] = None, table_type: Optional[str] = None, transaction_id: Optional[str] = None, dtype: Optional[Dict[str, str]] = None, description: Optional[str] = None, parameters: Optional[Dict[str, str]] = None, columns_comments: Optional[Dict[str, str]] = None, regular_partitions: bool = True, projection_enabled: bool = False, projection_types: Optional[Dict[str, str]] = None, projection_ranges: Optional[Dict[str, str]] = None, projection_values: Optional[Dict[str, str]] = None, projection_intervals: Optional[Dict[str, str]] = None, projection_digits: Optional[Dict[str, str]] = None, catalog_id: Optional[str] = None) → Any`

Write Parquet file or dataset on Amazon S3.

The concept of Dataset goes beyond the simple idea of ordinary files and enable more complex features like partitioning and catalog integration (Amazon Athena/AWS Glue Catalog).

---

**Note:** This operation may mutate the original pandas dataframe in-place. To avoid this behaviour please pass in a deep copy instead (i.e. `df.copy()`)

---



---

**Note:** If *database* and *table* arguments are passed, the table name and all column names will be automatically sanitized using *wr.catalog.sanitize\_table\_name* and *wr.catalog.sanitize\_column\_name*. Please, pass *sanitize\_columns=True* to enforce this behaviour always.

---



---

**Note:** In case of *use\_threads=True* the number of threads that will be spawned will be gotten from *os.cpu\_count()*.

---



---

**Note:** This function has arguments which can be configured globally through *wr.config* or environment variables:

- *catalog\_id*
- *concurrent\_partitioning*
- *database*

Check out the [Global Configurations Tutorial](#) for details.

---

### Parameters

- **df** (*pandas.DataFrame*) – Pandas DataFrame <https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.html>
- **path** (*str, optional*) – S3 path (for file e.g. *s3://bucket/prefix/filename.parquet*) (for dataset e.g. *s3://bucket/prefix*). Required if *dataset=False* or when *dataset=True* and creating a new dataset
- **index** (*bool*) – True to store the DataFrame index in file, otherwise False to ignore it.
- **compression** (*str, optional*) – Compression style (None, snappy, gzip).
- **pyarrow\_additional\_kwargs** (*Optional[Dict[str, Any]]*) – Additional parameters forwarded to pyarrow. e.g. *pyarrow\_additional\_kwargs={'coerce\_timestamps': 'ns', 'use\_deprecated\_int96\_timestamps': False, 'allow\_truncated\_timestamps'=False}*
- **max\_rows\_by\_file** (*int*) – Max number of rows in each file. Default is None i.e. don't split the files. (e.g. 33554432, 268435456)
- **use\_threads** (*bool, int*) – True to enable concurrent requests, False to disable multiple threads. If enabled *os.cpu\_count()* will be used as the max number of threads. If integer is provided, specified number is used.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if *boto3\_session* receive None.
- **s3\_additional\_kwargs** (*Optional[Dict[str, Any]]*) – Forwarded to botocore requests. e.g. *s3\_additional\_kwargs={'ServerSideEncryption': 'aws:kms', 'SSEKMSKeyId': 'YOUR\_KMS\_KEY\_ARN'}*
- **sanitize\_columns** (*bool*) – True to sanitize columns names (using *wr.catalog.sanitize\_table\_name* and *wr.catalog.sanitize\_column\_name*) or False to keep it as is. True value behaviour is enforced if *database* and *table* arguments are passed.
- **dataset** (*bool*) – If True store a parquet dataset instead of a ordinary file(s) If True, enable all follow arguments: *partition\_cols*, *mode*, *database*, *table*, *description*, *parameters*,

columns\_comments, concurrent\_partitioning, catalog\_versioning, projection\_enabled, projection\_types, projection\_ranges, projection\_values, projection\_intervals, projection\_digits, catalog\_id, schema\_evolution.

- **filename\_prefix**(*str*, *optional*) – If dataset=True, add a filename prefix to the output files.
- **partition\_cols**(*List[str]*, *optional*) – List of column names that will be used to create partitions. Only takes effect if dataset=True.
- **bucketing\_info**(*Tuple[List[str], int]*, *optional*) – Tuple consisting of the column names used for bucketing as the first element and the number of buckets as the second element. Only *str*, *int* and *bool* are supported as column data types for bucketing.
- **concurrent\_partitioning**(*bool*) – If True will increase the parallelism level during the partitions writing. It will decrease the writing time and increase the memory usage. <https://aws-data-wrangler.readthedocs.io/en/2.15.1/tutorials/022%20-%20Writing%20Partitions%20Concurrently.html>
- **mode**(*str*, *optional*) – append (Default), overwrite, overwrite\_partitions. Only takes effect if dataset=True. For details check the related tutorial: <https://aws-data-wrangler.readthedocs.io/en/2.15.1/tutorials/004%20-%20Parquet%20Datasets.html>
- **catalog\_versioning**(*bool*) – If True and mode="overwrite", creates an archived version of the table catalog before updating it.
- **schema\_evolution**(*bool*) – If True allows schema evolution (new or missing columns), otherwise a exception will be raised. True by default. (Only considered if dataset=True and mode in ("append", "overwrite\_partitions")) Related tutorial: <https://aws-data-wrangler.readthedocs.io/en/2.15.1/tutorials/014%20-%20Schema%20Evolution.html>
- **database**(*str*, *optional*) – Glue/Athena catalog: Database name.
- **table**(*str*, *optional*) – Glue/Athena catalog: Table name.
- **table\_type**(*str*, *optional*) – The type of the Glue Table. Set to EXTERNAL\_TABLE if None.
- **transaction\_id**(*str*, *optional*) – The ID of the transaction when writing to a Governed Table.
- **dtype**(*Dict[str, str]*, *optional*) – Dictionary of columns names and Athena/Glue types to be casted. Useful when you have columns with undetermined or mixed data types. (e.g. {'col name': 'bigint', 'col2 name': 'int'})
- **description**(*str*, *optional*) – Glue/Athena catalog: Table description
- **parameters**(*Dict[str, str]*, *optional*) – Glue/Athena catalog: Key/value pairs to tag the table.
- **columns\_comments**(*Dict[str, str]*, *optional*) – Glue/Athena catalog: Columns names and the related comments (e.g. {'col0': 'Column 0.', 'col1': 'Column 1.', 'col2': 'Partition.'}).
- **regular\_partitions**(*bool*) – Create regular partitions (Non projected partitions) on Glue Catalog. Disable when you will work only with Partition Projection. Keep enabled even when working with projections is useful to keep Redshift Spectrum working with the regular partitions.
- **projection\_enabled**(*bool*) – Enable Partition Projection on Athena (<https://docs.aws.amazon.com/athena/latest/ug/partition-projection.html>)

- **projection\_types** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections types. Valid types: “enum”, “integer”, “date”, “injected” <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. {'col\_name': 'enum', 'col2\_name': 'integer'})
- **projection\_ranges** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections ranges. <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. {'col\_name': '0,10', 'col2\_name': '-1,8675309'})
- **projection\_values** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections values. <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. {'col\_name': 'A,B,Unknown', 'col2\_name': 'foo,boo,bar'})
- **projection\_intervals** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections intervals. <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. {'col\_name': '1', 'col2\_name': '5'})
- **projection\_digits** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections digits. <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. {'col\_name': '1', 'col2\_name': '2'})
- **catalog\_id** (*str, optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.

**Returns** Dictionary with: 'paths': List of all stored files paths on S3. 'partitions\_values': Dictionary of partitions added with keys as S3 path locations and values as a list of partitions values as str.

**Return type** Dict[str, Union[List[str], Dict[str, List[str]]]]

## Examples

Writing single file

```
>>> import awswrangler as wr
>>> import pandas as pd
>>> wr.s3.to_parquet(
...     df=pd.DataFrame({'col': [1, 2, 3]}),
...     path='s3://bucket/prefix/my_file.parquet',
... )
{
  'paths': ['s3://bucket/prefix/my_file.parquet'],
  'partitions_values': {}
}
```

Writing single file encrypted with a KMS key

```
>>> import awswrangler as wr
>>> import pandas as pd
>>> wr.s3.to_parquet(
...     df=pd.DataFrame({'col': [1, 2, 3]}),
...     path='s3://bucket/prefix/my_file.parquet',
...     s3_additional_kwargs={
...         'ServerSideEncryption': 'aws:kms',
...         'SSEKMSKeyId': 'YOUR_KMS_KEY_ARN'
...     }
... )
```

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```

...     }
... )
{
  'paths': ['s3://bucket/prefix/my_file.parquet'],
  'partitions_values': {}
}

```

Writing partitioned dataset

```

>>> import awswrangler as wr
>>> import pandas as pd
>>> wr.s3.to_parquet(
...     df=pd.DataFrame({
...         'col': [1, 2, 3],
...         'col2': ['A', 'A', 'B']
...     }),
...     path='s3://bucket/prefix',
...     dataset=True,
...     partition_cols=['col2']
... )
{
  'paths': ['s3://.../col2=A/x.parquet', 's3://.../col2=B/y.parquet'],
  'partitions_values': {
    's3://.../col2=A/': ['A'],
    's3://.../col2=B/': ['B']
  }
}

```

Writing bucketed dataset

```

>>> import awswrangler as wr
>>> import pandas as pd
>>> wr.s3.to_parquet(
...     df=pd.DataFrame({
...         'col': [1, 2, 3],
...         'col2': ['A', 'A', 'B']
...     }),
...     path='s3://bucket/prefix',
...     dataset=True,
...     bucketing_info=(['col2'], 2)
... )
{
  'paths': ['s3://.../x_bucket-00000.csv', 's3://.../col2=B/x_bucket-00001.csv'],
  'partitions_values': {}
}

```

Writing dataset to S3 with metadata on Athena/Glue Catalog.

```

>>> import awswrangler as wr
>>> import pandas as pd
>>> wr.s3.to_parquet(
...     df=pd.DataFrame({
...         'col': [1, 2, 3],

```

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```

...     'col2': ['A', 'A', 'B']
...     }),
...     path='s3://bucket/prefix',
...     dataset=True,
...     partition_cols=['col2'],
...     database='default', # Athena/Glue database
...     table='my_table' # Athena/Glue table
... )
{
  'paths': ['s3://.../col2=A/x.parquet', 's3://.../col2=B/y.parquet'],
  'partitions_values': {
    's3://.../col2=A/': ['A'],
    's3://.../col2=B/': ['B']
  }
}

```

Writing dataset to Glue governed table

```

>>> import awswrangler as wr
>>> import pandas as pd
>>> wr.s3.to_parquet(
...     df=pd.DataFrame({
...         'col': [1, 2, 3],
...         'col2': ['A', 'A', 'B'],
...         'col3': [None, None, None]
...     }),
...     dataset=True,
...     mode='append',
...     database='default', # Athena/Glue database
...     table='my_table', # Athena/Glue table
...     table_type='GOVERNED',
...     transaction_id="xxx",
... )
{
  'paths': ['s3://.../x.parquet'],
  'partitions_values': {}
}

```

Writing dataset casting empty column data type

```

>>> import awswrangler as wr
>>> import pandas as pd
>>> wr.s3.to_parquet(
...     df=pd.DataFrame({
...         'col': [1, 2, 3],
...         'col2': ['A', 'A', 'B'],
...         'col3': [None, None, None]
...     }),
...     path='s3://bucket/prefix',
...     dataset=True,
...     database='default', # Athena/Glue database
...     table='my_table' # Athena/Glue table

```

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```

...     dtype={'col3': 'date'}
... )
{
    'paths': ['s3://.../x.parquet'],
    'partitions_values': {}
}

```

## awsrangler.s3.upload

`awsrangler.s3.upload(local_file: Union[str, Any], path: str, use_threads: Union[bool, int] = True, boto3_session: Optional[boto3.session.Session] = None, s3_additional_kwargs: Optional[Dict[str, Any]] = None) → None`

Upload file from a local file to received S3 path.

---

**Note:** In case of `use_threads=True` the number of threads that will be spawned will be gotten from `os.cpu_count()`.

---

### Parameters

- **local\_file** (`Union[str, Any]`) – A file-like object in binary mode or a path to local file (e.g. `./local/path/to/key0`).
- **path** (`str`) – S3 path (e.g. `s3://bucket/key0`).
- **use\_threads** (`bool`, `int`) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` will be used as the max number of threads. If integer is provided, specified number is used.
- **boto3\_session** (`boto3.Session()`, `optional`) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.
- **s3\_additional\_kwargs** (`Optional[Dict[str, Any]]`) – Forward to botocore requests, only “SSECustomerAlgorithm” and “SSECustomerKey” arguments will be considered.

**Return type** None

### Examples

Uploading a file using a path to local file

```

>>> import awswrangler as wr
>>> wr.s3.upload(local_file='./key', path='s3://bucket/key')

```

Uploading a file using a file-like object

```

>>> import awswrangler as wr
>>> with open(file='./key', mode='wb') as local_f:
>>>     wr.s3.upload(local_file=local_f, path='s3://bucket/key')

```

### aws wrangler.s3.wait\_objects\_exist

```
aws wrangler.s3.wait_objects_exist(paths: List[str], delay: Optional[float] = None, max_attempts:
Optional[int] = None, use_threads: Union[bool, int] = True,
boto3_session: Optional[boto3.session.Session] = None) → None
```

Wait Amazon S3 objects exist.

Polls S3.Client.head\_object() every 5 seconds (default) until a successful state is reached. An error is returned after 20 (default) failed checks. <https://boto3.amazonaws.com/v1/documentation/api/latest/reference/services/s3.html#S3.Waiter.ObjectExists>

---

**Note:** In case of `use_threads=True` the number of threads that will be spawned will be gotten from `os.cpu_count()`.

---

#### Parameters

- **paths** (`List[str]`) – List of S3 objects paths (e.g. `s3://bucket/key0`, `s3://bucket/key1`).
- **delay** (`Union[int, float]`, *optional*) – The amount of time in seconds to wait between attempts. Default: 5
- **max\_attempts** (`int`, *optional*) – The maximum number of attempts to be made. Default: 20
- **use\_threads** (`bool`, `int`) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` will be used as the max number of threads. If integer is provided, specified number is used.
- **boto3\_session** (`boto3.Session()`, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.

**Returns** None.

**Return type** None

#### Examples

```
>>> import aws wrangler as wr
>>> wr.s3.wait_objects_exist(['s3://bucket/key0', 's3://bucket/key1']) # wait both
↳ objects
```

### aws wrangler.s3.wait\_objects\_not\_exist

```
aws wrangler.s3.wait_objects_not_exist(paths: List[str], delay: Optional[float] = None, max_attempts:
Optional[int] = None, use_threads: Union[bool, int] = True,
boto3_session: Optional[boto3.session.Session] = None) → None
```

Wait Amazon S3 objects not exist.

Polls S3.Client.head\_object() every 5 seconds (default) until a successful state is reached. An error is returned after 20 (default) failed checks. <https://boto3.amazonaws.com/v1/documentation/api/latest/reference/services/s3.html#S3.Waiter.ObjectNotExists>

---

**Note:** In case of `use_threads=True` the number of threads that will be spawned will be gotten from `os.cpu_count()`.

---

### Parameters

- **paths** (*List[str]*) – List of S3 objects paths (e.g. [`s3://bucket/key0`, `s3://bucket/key1`]).
- **delay** (*Union[int, float]*, *optional*) – The amount of time in seconds to wait between attempts. Default: 5
- **max\_attempts** (*int*, *optional*) – The maximum number of attempts to be made. Default: 20
- **use\_threads** (*bool*, *int*) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` will be used as the max number of threads. If integer is provided, specified number is used.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.

**Returns** None.

**Return type** None

### Examples

```
>>> import awswrangler as wr
>>> wr.s3.wait_objects_not_exist(['s3://bucket/key0', 's3://bucket/key1']) # wait_
↳ both objects not exist
```

## 1.4.2 AWS Glue Catalog

<code>add_column(database, table, column_name[, ...])</code>	Add a column in a AWS Glue Catalog table.
<code>add_csv_partitions(database, table, ...[, ...])</code>	Add partitions (metadata) to a CSV Table in the AWS Glue Catalog.
<code>add_parquet_partitions(database, table, ...)</code>	Add partitions (metadata) to a Parquet Table in the AWS Glue Catalog.
<code>create_csv_table(database, table, path, ...)</code>	Create a CSV Table (Metadata Only) in the AWS Glue Catalog.
<code>create_database(name[, description, ...])</code>	Create a database in AWS Glue Catalog.
<code>create_parquet_table(database, table, path, ...)</code>	Create a Parquet Table (Metadata Only) in the AWS Glue Catalog.
<code>databases([limit, catalog_id, boto3_session])</code>	Get a Pandas DataFrame with all listed databases.
<code>delete_column(database, table, column_name)</code>	Delete a column in a AWS Glue Catalog table.
<code>delete_database(name[, catalog_id, ...])</code>	Delete a database in AWS Glue Catalog.
<code>delete_partitions(table, database, ...[, ...])</code>	Delete specified partitions in a AWS Glue Catalog table.
<code>delete_all_partitions(table, database[, ...])</code>	Delete all partitions in a AWS Glue Catalog table.
<code>delete_table_if_exists(database, table[, ...])</code>	Delete Glue table if exists.
<code>does_table_exist(database, table[, ...])</code>	Check if the table exists.
<code>drop_duplicated_columns(df)</code>	Drop all repeated columns (duplicated names).

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Table 2 – continued from previous page

<code>extract_athena_types(df[, index, ...])</code>	Extract columns and partitions types (Amazon Athena) from Pandas DataFrame.
<code>get_columns_comments(database, table[, ...])</code>	Get all columns comments.
<code>get_csv_partitions(database, table[, ...])</code>	Get all partitions from a Table in the AWS Glue Catalog.
<code>get_databases([catalog_id, boto3_session])</code>	Get an iterator of databases.
<code>get_parquet_partitions(database, table[, ...])</code>	Get all partitions from a Table in the AWS Glue Catalog.
<code>get_partitions(database, table[, ...])</code>	Get all partitions from a Table in the AWS Glue Catalog.
<code>get_table_description(database, table[, ...])</code>	Get table description.
<code>get_table_location(database, table[, ...])</code>	Get table's location on Glue catalog.
<code>get_table_number_of_versions(database, table)</code>	Get total number of versions.
<code>get_table_parameters(database, table[, ...])</code>	Get all parameters.
<code>get_table_types(database, table[, ...])</code>	Get all columns and types from a table.
<code>get_table_versions(database, table[, ...])</code>	Get all versions.
<code>get_tables([catalog_id, database, ...])</code>	Get an iterator of tables.
<code>overwrite_table_parameters(parameters, ...)</code>	Overwrite all existing parameters.
<code>sanitize_column_name(column)</code>	Convert the column name to be compatible with Amazon Athena and the AWS Glue Catalog.
<code>sanitize_dataframe_columns_names(df[, ...])</code>	Normalize all columns names to be compatible with Amazon Athena.
<code>sanitize_table_name(table)</code>	Convert the table name to be compatible with Amazon Athena and the AWS Glue Catalog.
<code>search_tables(text[, catalog_id, boto3_session])</code>	Get Pandas DataFrame of tables filtered by a search string.
<code>table(database, table[, transaction_id, ...])</code>	Get table details as Pandas DataFrame.
<code>tables([limit, catalog_id, database, ...])</code>	Get a DataFrame with tables filtered by a search term, prefix, suffix.
<code>upsert_table_parameters(parameters, ...[, ...])</code>	Insert or Update the received parameters.

### aws wrangler.catalog.add\_column

```
aws wrangler.catalog.add_column(database: str, table: str, column_name: str, column_type: str = 'string',
                                column_comment: Optional[str] = None, transaction_id: Optional[str] =
                                None, boto3_session: Optional[boto3.session.Session] = None, catalog_id:
                                Optional[str] = None) → Any
```

Add a column in a AWS Glue Catalog table.

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

- `catalog_id`
- `database`

Check out the [Global Configurations Tutorial](#) for details.

#### Parameters

- **database** (*str*) – Database name.
- **table** (*str*) – Table name.
- **column\_name** (*str*) – Column name

- **column\_type** (*str*) – Column type.
- **column\_comment** (*str*) – Column Comment
- **transaction\_id** (*str*, *optional*) – The ID of the transaction (i.e. used with GOVERNED tables).
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.
- **catalog\_id** (*str*, *optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.

**Returns** None

**Return type** None

### Examples

```
>>> import awswrangler as wr
>>> wr.catalog.add_column(
...     database='my_db',
...     table='my_table',
...     column_name='my_col',
...     column_type='int'
... )
```

### awswrangler.catalog.add\_csv\_partitions

**awswrangler.catalog.add\_csv\_partitions**(*database: str, table: str, partitions\_values: Dict[str, List[str]], bucketing\_info: Optional[Tuple[List[str], int]] = None, catalog\_id: Optional[str] = None, compression: Optional[str] = None, sep: str = ',', serde\_library: Optional[str] = None, serde\_parameters: Optional[Dict[str, str]] = None, boto3\_session: Optional[boto3.session.Session] = None, columns\_types: Optional[Dict[str, str]] = None, partitions\_parameters: Optional[Dict[str, str]] = None*) → Any

Add partitions (metadata) to a CSV Table in the AWS Glue Catalog.

---

**Note:** This function has arguments which can be configured globally through *wr.config* or environment variables:

- **catalog\_id**
- **database**

Check out the [Global Configurations Tutorial](#) for details.

---

### Parameters

- **database** (*str*) – Database name.
- **table** (*str*) – Table name.

- **partitions\_values** (*Dict[str, List[str]]*) – Dictionary with keys as S3 path locations and values as a list of partitions values as str (e.g. { 's3://bucket/prefix/y=2020/m=10/': ['2020', '10']}).
- **bucketing\_info** (*Tuple[List[str], int], optional*) – Tuple consisting of the column names used for bucketing as the first element and the number of buckets as the second element. Only *str*, *int* and *bool* are supported as column data types for bucketing.
- **catalog\_id** (*str, optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **compression** (*str, optional*) – Compression style (None, gzip, etc).
- **sep** (*str*) – String of length 1. Field delimiter for the output file.
- **serde\_library** (*Optional[str]*) – Specifies the SerDe Serialization library which will be used. You need to provide the Class library name as a string. If no library is provided the default is *org.apache.hadoop.hive.serde2.lazy.LazySimpleSerDe*.
- **serde\_parameters** (*Optional[Dict[str, str]]*) – Dictionary of initialization parameters for the SerDe. The default is { "field.delim": *sep*, "escape.delim": "\""}.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.
- **columns\_types** (*Optional[Dict[str, str]]*) – Only required for Hive compability. Dictionary with keys as column names and values as data types (e.g. { 'col0': 'bigint', 'col1': 'double' }). P.S. Only materialized columns please, not partition columns.
- **partitions\_parameters** (*Optional[Dict[str, str]]*) – Dictionary with key-value pairs defining partition parameters.

**Returns** None.

**Return type** None

## Examples

```
>>> import awswrangler as wr
>>> wr.catalog.add_csv_partitions(
...     database='default',
...     table='my_table',
...     partitions_values={
...         's3://bucket/prefix/y=2020/m=10/': ['2020', '10'],
...         's3://bucket/prefix/y=2020/m=11/': ['2020', '11'],
...         's3://bucket/prefix/y=2020/m=12/': ['2020', '12']
...     }
... )
```

**awswrangler.catalog.add\_parquet\_partitions**

```
awswrangler.catalog.add_parquet_partitions(database: str, table: str, partitions_values: Dict[str,
                                             List[str]], bucketing_info: Optional[Tuple[List[str], int]] =
                                             None, catalog_id: Optional[str] = None, compression:
                                             Optional[str] = None, boto3_session:
                                             Optional[boto3.session.Session] = None, columns_types:
                                             Optional[Dict[str, str]] = None, partitions_parameters:
                                             Optional[Dict[str, str]] = None) → Any
```

Add partitions (metadata) to a Parquet Table in the AWS Glue Catalog.

**Note:** This function has arguments which can be configured globally through *wr.config* or environment variables:

- `catalog_id`
- `database`

Check out the [Global Configurations Tutorial](#) for details.

**Parameters**

- **database** (*str*) – Database name.
- **table** (*str*) – Table name.
- **partitions\_values** (*Dict[str, List[str]]*) – Dictionary with keys as S3 path locations and values as a list of partitions values as str (e.g. {'s3://bucket/prefix/y=2020/m=10/': ['2020', '10']}).
- **bucketing\_info** (*Tuple[List[str], int], optional*) – Tuple consisting of the column names used for bucketing as the first element and the number of buckets as the second element. Only *str*, *int* and *bool* are supported as column data types for bucketing.
- **catalog\_id** (*str, optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **compression** (*str, optional*) – Compression style (None, snappy, gzip, etc).
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.
- **columns\_types** (*Optional[Dict[str, str]]*) – Only required for Hive compability. Dictionary with keys as column names and values as data types (e.g. {'col0': 'bigint', 'col1': 'double'}). P.S. Only materialized columns please, not partition columns.
- **partitions\_parameters** (*Optional[Dict[str, str]]*) – Dictionary with key-value pairs defining partition parameters.

**Returns** None.

**Return type** None

## Examples

```
>>> import awswrangler as wr
>>> wr.catalog.add_parquet_partitions(
...     database='default',
...     table='my_table',
...     partitions_values={
...         's3://bucket/prefix/y=2020/m=10/': ['2020', '10'],
...         's3://bucket/prefix/y=2020/m=11/': ['2020', '11'],
...         's3://bucket/prefix/y=2020/m=12/': ['2020', '12']
...     }
... )
```

## awswrangler.catalog.create\_csv\_table

`awswrangler.catalog.create_csv_table(database: str, table: str, path: str, columns_types: Dict[str, str], table_type: Optional[str] = None, partitions_types: Optional[Dict[str, str]] = None, bucketing_info: Optional[Tuple[List[str], int]] = None, compression: Optional[str] = None, description: Optional[str] = None, parameters: Optional[Dict[str, str]] = None, columns_comments: Optional[Dict[str, str]] = None, mode: str = 'overwrite', catalog_versioning: bool = False, schema_evolution: bool = False, sep: str = ',', skip_header_line_count: Optional[int] = None, serde_library: Optional[str] = None, serde_parameters: Optional[Dict[str, str]] = None, transaction_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None, projection_enabled: bool = False, projection_types: Optional[Dict[str, str]] = None, projection_ranges: Optional[Dict[str, str]] = None, projection_values: Optional[Dict[str, str]] = None, projection_intervals: Optional[Dict[str, str]] = None, projection_digits: Optional[Dict[str, str]] = None, projection_storage_location_template: Optional[str] = None, catalog_id: Optional[str] = None) → Any`

Create a CSV Table (Metadata Only) in the AWS Glue Catalog.

[‘https://docs.aws.amazon.com/athena/latest/ug/data-types.html’](https://docs.aws.amazon.com/athena/latest/ug/data-types.html)

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

- `catalog_id`
- `database`

Check out the [Global Configurations Tutorial](#) for details.

## Parameters

- **database** (*str*) – Database name.
- **table** (*str*) – Table name.

- **path** (*str*) – Amazon S3 path (e.g. `s3://bucket/prefix/`).
- **columns\_types** (*Dict[str, str]*) – Dictionary with keys as column names and values as data types (e.g. `{‘col0’: ‘bigint’, ‘col1’: ‘double’}`).
- **table\_type** (*str, optional*) – The type of the Glue Table (`EXTERNAL_TABLE`, `GOVERNED...`). Set to `EXTERNAL_TABLE` if `None`
- **partitions\_types** (*Dict[str, str], optional*) – Dictionary with keys as partition names and values as data types (e.g. `{‘col2’: ‘date’}`).
- **bucketing\_info** (*Tuple[List[str], int], optional*) – Tuple consisting of the column names used for bucketing as the first element and the number of buckets as the second element. Only *str*, *int* and *bool* are supported as column data types for bucketing.
- **compression** (*str, optional*) – Compression style (`None`, `gzip`, etc).
- **description** (*str, optional*) – Table description
- **parameters** (*Dict[str, str], optional*) – Key/value pairs to tag the table.
- **columns\_comments** (*Dict[str, str], optional*) – Columns names and the related comments (e.g. `{‘col0’: ‘Column 0.’, ‘col1’: ‘Column 1.’, ‘col2’: ‘Partition.’}`).
- **mode** (*str*) – ‘`overwrite`’ to recreate any possible existing table or ‘`append`’ to keep any possible existing table.
- **catalog\_versioning** (*bool*) – If `True` and *mode*=“`overwrite`”, creates an archived version of the table catalog before updating it.
- **schema\_evolution** (*bool*) – If `True` allows schema evolution (new or missing columns), otherwise a exception will be raised. (Only considered if *dataset*=`True` and *mode* in (“`append`”, “`overwrite_partitions`”)) Related tutorial: <https://aws-data-wrangler.readthedocs.io/en/2.11.0/tutorials/014%20-%20Schema%20Evolution.html>
- **sep** (*str*) – String of length 1. Field delimiter for the output file.
- **skip\_header\_line\_count** (*Optional[int]*) – Number of Lines to skip regarding to the header.
- **serde\_library** (*Optional[str]*) – Specifies the SerDe Serialization library which will be used. You need to provide the Class library name as a string. If no library is provided the default is `org.apache.hadoop.hive.serde2.lazy.LazySimpleSerDe`.
- **serde\_parameters** (*Optional[str]*) – Dictionary of initialization parameters for the SerDe. The default is `{“field.delim”: sep, “escape.delim”: “\”}`.
- **transaction\_id** (*str, optional*) – The ID of the transaction (i.e. used with `GOVERNED` tables).
- **projection\_enabled** (*bool*) – Enable Partition Projection on Athena (<https://docs.aws.amazon.com/athena/latest/ug/partition-projection.html>)
- **projection\_types** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections types. Valid types: “`enum`”, “`integer`”, “`date`”, “`injected`” <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. `{‘col_name’: ‘enum’, ‘col2_name’: ‘integer’}`)
- **projection\_ranges** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections ranges. <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. `{‘col_name’: ‘0,10’, ‘col2_name’: ‘-1,8675309’}`)

- **projection\_values** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections values. <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. {'col\_name': 'A,B,Unknown', 'col2\_name': 'foo,boo,bar'})
- **projection\_intervals** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections intervals. <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. {'col\_name': '1', 'col2\_name': '5'})
- **projection\_digits** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections digits. <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. {'col\_name': '1', 'col2\_name': '2'})
- **projection\_storage\_location\_template** (*Optional[str]*) – Value which allows Athena to properly map partition values if the S3 file locations do not follow a typical `.../column=value/...` pattern. <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-setting-up.html> (e.g. `s3://bucket/table_root/a=${a}/${b}/some_static_subdirectory/${c}/`)
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.
- **catalog\_id** (*str*, *optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.

**Returns** None.

**Return type** None

## Examples

```
>>> import awswrangler as wr
>>> wr.catalog.create_csv_table(
...     database='default',
...     table='my_table',
...     path='s3://bucket/prefix/',
...     columns_types={'col0': 'bigint', 'col1': 'double'},
...     partitions_types={'col2': 'date'},
...     compression='gzip',
...     description='My own table!',
...     parameters={'source': 'postgresql'},
...     columns_comments={'col0': 'Column 0.', 'col1': 'Column 1.', 'col2':
↪ 'Partition.'}
... )
```

## awswrangler.catalog.create\_database

`awswrangler.catalog.create_database(name: str, description: Optional[str] = None, catalog_id: Optional[str] = None, exist_ok: bool = False, boto3_session: Optional[boto3.session.Session] = None) → Any`

Create a database in AWS Glue Catalog.

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

- `catalog_id`

Check out the [Global Configurations Tutorial](#) for details.

---

### Parameters

- **name** (*str*) – Database name.
- **description** (*str*, *optional*) – A Description for the Database.
- **catalog\_id** (*str*, *optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **exist\_ok** (*bool*) – If set to True will not raise an Exception if a Database with the same already exists. In this case the description will be updated if it is different from the current one.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** None.

**Return type** None

### Examples

```
>>> import awswrangler as wr
>>> wr.catalog.create_database(
...     name='awswrangler_test'
... )
```

### `awswrangler.catalog.create_parquet_table`

`awswrangler.catalog.create_parquet_table(database: str, table: str, path: str, columns_types: Dict[str, str], table_type: Optional[str] = None, partitions_types: Optional[Dict[str, str]] = None, bucketing_info: Optional[Tuple[List[str], int]] = None, catalog_id: Optional[str] = None, compression: Optional[str] = None, description: Optional[str] = None, parameters: Optional[Dict[str, str]] = None, columns_comments: Optional[Dict[str, str]] = None, mode: str = 'overwrite', catalog_versioning: bool = False, transaction_id: Optional[str] = None, projection_enabled: bool = False, projection_types: Optional[Dict[str, str]] = None, projection_ranges: Optional[Dict[str, str]] = None, projection_values: Optional[Dict[str, str]] = None, projection_intervals: Optional[Dict[str, str]] = None, projection_digits: Optional[Dict[str, str]] = None, projection_storage_location_template: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → Any`

Create a Parquet Table (Metadata Only) in the AWS Glue Catalog.

[‘https://docs.aws.amazon.com/athena/latest/ug/data-types.html’](https://docs.aws.amazon.com/athena/latest/ug/data-types.html)



---

**Note:** This function has arguments which can be configured globally through *wr.config* or environment variables:

- `catalog_id`
- `database`

Check out the [Global Configurations Tutorial](#) for details.

---

### Parameters

- **database** (*str*) – Database name.
- **table** (*str*) – Table name.
- **path** (*str*) – Amazon S3 path (e.g. `s3://bucket/prefix/`).
- **columns\_types** (*Dict[str, str]*) – Dictionary with keys as column names and values as data types (e.g. `{‘col0’: ‘bigint’, ‘col1’: ‘double’}`).
- **table\_type** (*str, optional*) – The type of the Glue Table (`EXTERNAL_TABLE`, `GOVERNED...`). Set to `EXTERNAL_TABLE` if None
- **partitions\_types** (*Dict[str, str], optional*) – Dictionary with keys as partition names and values as data types (e.g. `{‘col2’: ‘date’}`).
- **bucketing\_info** (*Tuple[List[str], int], optional*) – Tuple consisting of the column names used for bucketing as the first element and the number of buckets as the second element. Only *str*, *int* and *bool* are supported as column data types for bucketing.
- **catalog\_id** (*str, optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **compression** (*str, optional*) – Compression style (`None`, `snappy`, `gzip`, etc).
- **description** (*str, optional*) – Table description
- **parameters** (*Dict[str, str], optional*) – Key/value pairs to tag the table.
- **columns\_comments** (*Dict[str, str], optional*) – Columns names and the related comments (e.g. `{‘col0’: ‘Column 0.’, ‘col1’: ‘Column 1.’, ‘col2’: ‘Partition.’}`).
- **mode** (*str*) – ‘`overwrite`’ to recreate any possible existing table or ‘`append`’ to keep any possible existing table.
- **catalog\_versioning** (*bool*) – If True and *mode*=“`overwrite`”, creates an archived version of the table catalog before updating it.
- **transaction\_id** (*str, optional*) – The ID of the transaction (i.e. used with `GOVERNED` tables).
- **projection\_enabled** (*bool*) – Enable Partition Projection on Athena (<https://docs.aws.amazon.com/athena/latest/ug/partition-projection.html>)
- **projection\_types** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections types. Valid types: “`enum`”, “`integer`”, “`date`”, “`injected`” <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. `{‘col_name’: ‘enum’, ‘col2_name’: ‘integer’}`)
- **projection\_ranges** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections ranges. <https://docs.aws.amazon.com/athena/latest/ug/>

`partition-projection-supported-types.html` (e.g. `{'col_name': '0,10', 'col2_name': '-1,8675309'}`)

- **projection\_values** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections values. <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. `{'col_name': 'A,B,Unknown', 'col2_name': 'foo,boo,bar'}`)
- **projection\_intervals** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections intervals. <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. `{'col_name': '1', 'col2_name': '5'}`)
- **projection\_digits** (*Optional[Dict[str, str]]*) – Dictionary of partitions names and Athena projections digits. <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-supported-types.html> (e.g. `{'col_name': '1', 'col2_name': '2'}`)
- **projection\_storage\_location\_template** (*Optional[str]*) – Value which allows Athena to properly map partition values if the S3 file locations do not follow a typical `.../column=value/...` pattern. <https://docs.aws.amazon.com/athena/latest/ug/partition-projection-setting-up.html> (e.g. `s3://bucket/table_root/a=${a}/${b}/some_static_subdirectory/${c}/`)
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive `None`.

**Returns** `None`.

**Return type** `None`

## Examples

```
>>> import awswrangler as wr
>>> wr.catalog.create_parquet_table(
...     database='default',
...     table='my_table',
...     path='s3://bucket/prefix/',
...     columns_types={'col0': 'bigint', 'col1': 'double'},
...     partitions_types={'col2': 'date'},
...     compression='snappy',
...     description='My own table!',
...     parameters={'source': 'postgresql'},
...     columns_comments={'col0': 'Column 0.', 'col1': 'Column 1.', 'col2':
↪ 'Partition.'}
... )
```

## awswrangler.catalog.databases

`awswrangler.catalog.databases`(*limit: int = 100, catalog\_id: Optional[str] = None, boto3\_session: Optional[boto3.session.Session] = None*) → `Any`

Get a Pandas DataFrame with all listed databases.

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

- `catalog_id`

Check out the [Global Configurations Tutorial](#) for details.

#### Parameters

- **limit** (*int*, *optional*) – Max number of tables to be returned.
- **catalog\_id** (*str*, *optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Pandas DataFrame filled by formatted infos.

**Return type** pandas.DataFrame

#### Examples

```
>>> import awswrangler as wr
>>> df_dbs = wr.catalog.databases()
```

### awswrangler.catalog.delete\_column

**awswrangler.catalog.delete\_column**(*database: str, table: str, column\_name: str, transaction\_id: Optional[str] = None, boto3\_session: Optional[boto3.session.Session] = None, catalog\_id: Optional[str] = None*) → Any

Delete a column in a AWS Glue Catalog table.

**Note:** This function has arguments which can be configured globally through *wr.config* or environment variables:

- catalog\_id
- database

Check out the [Global Configurations Tutorial](#) for details.

#### Parameters

- **database** (*str*) – Database name.
- **table** (*str*) – Table name.
- **column\_name** (*str*) – Column name
- **transaction\_id** (*str*, *optional*) – The ID of the transaction (i.e. used with GOVERNED tables).
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.
- **catalog\_id** (*str*, *optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.

**Returns** None

**Return type** None

## Examples

```
>>> import awswrangler as wr
>>> wr.catalog.delete_column(
...     database='my_db',
...     table='my_table',
...     column_name='my_col',
... )
```

## awswrangler.catalog.delete\_database

`awswrangler.catalog.delete_database(name: str, catalog_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → Any`

Delete a database in AWS Glue Catalog.

---

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

- `catalog_id`

Check out the [Global Configurations Tutorial](#) for details.

---

### Parameters

- **name** (*str*) – Database name.
- **catalog\_id** (*str, optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.

**Returns** None.

**Return type** None

## Examples

```
>>> import awswrangler as wr
>>> wr.catalog.delete_database(
...     name='awswrangler_test'
... )
```

**awswrangler.catalog.delete\_partitions**

**awswrangler.catalog.delete\_partitions**(*table: str, database: str, partitions\_values: List[List[str]], catalog\_id: Optional[str] = None, boto3\_session: Optional[boto3.session.Session] = None*) → Any

Delete specified partitions in a AWS Glue Catalog table.

**Note:** This function has arguments which can be configured globally through *wr.config* or environment variables:

- `catalog_id`
- `database`

Check out the [Global Configurations Tutorial](#) for details.

**Parameters**

- **table** (*str*) – Table name.
- **database** (*str*) – Table name.
- **catalog\_id** (*str, optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **partitions\_values** (*List[List[str]]*) – List of lists of partitions values as strings. (e.g. `[['2020', '10', '25'], ['2020', '11', '16'], ['2020', '12', '19']]`).
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.

**Returns** None.

**Return type** None

**Examples**

```
>>> import awswrangler as wr
>>> wr.catalog.delete_partitions(
...     table='my_table',
...     database='awswrangler_test',
...     partitions_values=[['2020', '10', '25'], ['2020', '11', '16'], ['2020', '12', '19']]
... )
```

**awswrangler.catalog.delete\_all\_partitions**

**awswrangler.catalog.delete\_all\_partitions**(*table: str, database: str, catalog\_id: Optional[str] = None, boto3\_session: Optional[boto3.session.Session] = None*) → Any

Delete all partitions in a AWS Glue Catalog table.

**Note:** This function has arguments which can be configured globally through *wr.config* or environment variables:

- `catalog_id`
- `database`

Check out the [Global Configurations Tutorial](#) for details.

---

#### Parameters

- **`table`** (*str*) – Table name.
- **`database`** (*str*) – Table name.
- **`catalog_id`** (*str*, *optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **`boto3_session`** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.

**Returns** Partitions values.

**Return type** List[List[str]]

#### Examples

```
>>> import awswrangler as wr
>>> partitions = wr.catalog.delete_all_partitions(
...     table='my_table',
...     database='awswrangler_test',
... )
```

### `awswrangler.catalog.delete_table_if_exists`

`awswrangler.catalog.delete_table_if_exists(database: str, table: str, transaction_id: Optional[str] = None, catalog_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → Any`

Delete Glue table if exists.

---

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

- `catalog_id`
- `database`

Check out the [Global Configurations Tutorial](#) for details.

---

#### Parameters

- **`database`** (*str*) – Database name.
- **`table`** (*str*) – Table name.
- **`transaction_id`** (*str*, *optional*) – The ID of the transaction (i.e. used with GOVERNED tables).

- **catalog\_id** (*str*, *optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** True if deleted, otherwise False.

**Return type** bool

### Examples

```
>>> import awswrangler as wr
>>> wr.catalog.delete_table_if_exists(database='default', table='my_table') #_
↪deleted
True
>>> wr.catalog.delete_table_if_exists(database='default', table='my_table') #_
↪Nothing to be deleted
False
```

### awswrangler.catalog.does\_table\_exist

**awswrangler.catalog.does\_table\_exist**(*database: str*, *table: str*, *boto3\_session: Optional[boto3.session.Session] = None*, *catalog\_id: Optional[str] = None*, *transaction\_id: Optional[str] = None*) → Any

Check if the table exists.

**Note:** This function has arguments which can be configured globally through *wr.config* or environment variables:

- catalog\_id
- database

Check out the [Global Configurations Tutorial](#) for details.

### Parameters

- **database** (*str*) – Database name.
- **table** (*str*) – Table name.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.
- **catalog\_id** (*str*, *optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **transaction\_id** (*str*, *optional*) – The ID of the transaction (i.e. used with GOVERNED tables).

**Returns** True if exists, otherwise False.

**Return type** bool

## Examples

```
>>> import awswrangler as wr
>>> wr.catalog.does_table_exist(database='default', table='my_table')
```

## awswrangler.catalog.drop\_duplicated\_columns

awswrangler.catalog.**drop\_duplicated\_columns**(df: pandas.core.frame.DataFrame) → pandas.core.frame.DataFrame

Drop all repeated columns (duplicated names).

---

**Note:** This transformation will run *inplace* and will make changes in the original DataFrame.

---



---

**Note:** It is different from Panda's `drop_duplicates()` function which considers the column values. `wr.catalog.drop_duplicated_columns()` will deduplicate by column name.

---

**Parameters** **df** (pandas.DataFrame) – Original Pandas DataFrame.

**Returns** Pandas DataFrame without duplicated columns.

**Return type** pandas.DataFrame

## Examples

```
>>> import awswrangler as wr
>>> df = pd.DataFrame({"A": [1, 2], "B": [3, 4]})
>>> df.columns = ["A", "A"]
>>> wr.catalog.drop_duplicated_columns(df=df)
   A
0  1
1  2
```

## awswrangler.catalog.extract\_athena\_types

awswrangler.catalog.**extract\_athena\_types**(df: pandas.core.frame.DataFrame, index: bool = False, partition\_cols: Optional[List[str]] = None, dtype: Optional[Dict[str, str]] = None, file\_format: str = 'parquet') → Tuple[Dict[str, str], Dict[str, str]]

Extract columns and partitions types (Amazon Athena) from Pandas DataFrame.

<https://docs.aws.amazon.com/athena/latest/ug/data-types.html>

### Parameters

- **df** (pandas.DataFrame) – Pandas DataFrame.
- **index** (bool) – Should consider the DataFrame index as a column?.
- **partition\_cols** (List[str], optional) – List of partitions names.



- **dtype** (*Dict[str, str], optional*) – Dictionary of columns names and Athena/Glue types to be casted. Useful when you have columns with undetermined or mixed data types. (e.g. {'col name': 'bigint', 'col2 name': 'int'})
- **file\_format** (*str, optional*) – File format to be considered to place the index column: "parquet" | "csv".

**Returns** `columns_types`: Dictionary with keys as column names and values as data types (e.g. {'col0': 'bigint', 'col1': 'double'}). / `partitions_types`: Dictionary with keys as partition names and values as data types (e.g. {'col2': 'date'}).

**Return type** `Tuple[Dict[str, str], Dict[str, str]]`

## Examples

```
>>> import awswrangler as wr
>>> columns_types, partitions_types = wr.catalog.extract_athena_types(
...     df=df, index=False, partition_cols=["par0", "par1"], file_format="csv"
... )
```

## awswrangler.catalog.get\_columns\_comments

`awswrangler.catalog.get_columns_comments(database: str, table: str, transaction_id: Optional[str] = None, query_as_of_time: Optional[str] = None, catalog_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → Any`

Get all columns comments.

---

**Note:** If reading from a governed table, pass only one of `transaction_id` or `query_as_of_time`.

---



---

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

- `catalog_id`
- `database`

Check out the [Global Configurations Tutorial](#) for details.

---

## Parameters

- **database** (*str*) – Database name.
- **table** (*str*) – Table name.
- **transaction\_id** (*str, optional*) – The ID of the transaction (i.e. used with GOVERNED tables).
- **query\_as\_of\_time** (*str, optional*) – The time as of when to read the table contents. Must be a valid Unix epoch timestamp. Cannot be specified alongside `transaction_id`.
- **catalog\_id** (*str, optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.

- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Columns comments. e.g. {"col1": "foo boo bar"}.

**Return type** Dict[str, str]

### Examples

```
>>> import awswrangler as wr
>>> pars = wr.catalog.get_columns_comments(database="...", table="...")
```

### awswrangler.catalog.get\_csv\_partitions

`awswrangler.catalog.get_csv_partitions(database: str, table: str, expression: Optional[str] = None, catalog_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → Any`

Get all partitions from a Table in the AWS Glue Catalog.

Expression argument instructions: [https://boto3.amazonaws.com/v1/documentation/api/latest/reference/services/glue.html#Glue.Client.get\\_partitions](https://boto3.amazonaws.com/v1/documentation/api/latest/reference/services/glue.html#Glue.Client.get_partitions)

---

**Note:** This function has arguments which can be configured globally through *wr.config* or environment variables:

- catalog\_id
- database

Check out the [Global Configurations Tutorial](#) for details.

---

### Parameters

- **database** (*str*) – Database name.
- **table** (*str*) – Table name.
- **expression** (*str*, *optional*) – An expression that filters the partitions to be returned.
- **catalog\_id** (*str*, *optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** partitions\_values: Dictionary with keys as S3 path locations and values as a list of partitions values as str (e.g. {'s3://bucket/prefix/y=2020/m=10/': ['2020', '10']}).

**Return type** Dict[str, List[str]]

## Examples

Fetch all partitions

```
>>> import awswrangler as wr
>>> wr.catalog.get_csv_partitions(
...     database='default',
...     table='my_table',
... )
{
  's3://bucket/prefix/y=2020/m=10/': ['2020', '10'],
  's3://bucket/prefix/y=2020/m=11/': ['2020', '11'],
  's3://bucket/prefix/y=2020/m=12/': ['2020', '12']
}
```

Filtering partitions

```
>>> import awswrangler as wr
>>> wr.catalog.get_csv_partitions(
...     database='default',
...     table='my_table',
...     expression='m=10'
... )
{
  's3://bucket/prefix/y=2020/m=10/': ['2020', '10']
}
```

## awswrangler.catalog.get\_databases

**awswrangler.catalog.get\_databases**(*catalog\_id: Optional[str] = None, boto3\_session: Optional[boto3.session.Session] = None*) → Iterator[Dict[str, Any]]

Get an iterator of databases.

### Parameters

- **catalog\_id** (*str, optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Iterator of Databases.

**Return type** Iterator[Dict[str, Any]]

## Examples

```
>>> import awswrangler as wr
>>> dbs = wr.catalog.get_databases()
```

## awswrangler.catalog.get\_parquet\_partitions

`awswrangler.catalog.get_parquet_partitions(database: str, table: str, expression: Optional[str] = None, catalog_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → Any`

Get all partitions from a Table in the AWS Glue Catalog.

Expression argument instructions: [https://boto3.amazonaws.com/v1/documentation/api/latest/reference/services/glue.html#Glue.Client.get\\_partitions](https://boto3.amazonaws.com/v1/documentation/api/latest/reference/services/glue.html#Glue.Client.get_partitions)

---

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

- `catalog_id`
- `database`

Check out the [Global Configurations Tutorial](#) for details.

---

### Parameters

- **database** (*str*) – Database name.
- **table** (*str*) – Table name.
- **expression** (*str*, *optional*) – An expression that filters the partitions to be returned.
- **catalog\_id** (*str*, *optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** `partitions_values`: Dictionary with keys as S3 path locations and values as a list of partitions values as str (e.g. `{'s3://bucket/prefix/y=2020/m=10/': ['2020', '10']}`).

**Return type** Dict[str, List[str]]

## Examples

Fetch all partitions

```
>>> import awswrangler as wr
>>> wr.catalog.get_parquet_partitions(
...     database='default',
...     table='my_table',
... )
{
  's3://bucket/prefix/y=2020/m=10/': ['2020', '10'],
  's3://bucket/prefix/y=2020/m=11/': ['2020', '11'],
}
```

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```
{
  's3://bucket/prefix/y=2020/m=12/': ['2020', '12']
}
```

Filtering partitions

```
>>> import awswrangler as wr
>>> wr.catalog.get_parquet_partitions(
...     database='default',
...     table='my_table',
...     expression='m=10'
... )
{
  's3://bucket/prefix/y=2020/m=10/': ['2020', '10']
}
```

### awswrangler.catalog.get\_partitions

`awswrangler.catalog.get_partitions(database: str, table: str, expression: Optional[str] = None, catalog_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → Any`

Get all partitions from a Table in the AWS Glue Catalog.

Expression argument instructions: [https://boto3.amazonaws.com/v1/documentation/api/latest/reference/services/glue.html#Glue.Client.get\\_partitions](https://boto3.amazonaws.com/v1/documentation/api/latest/reference/services/glue.html#Glue.Client.get_partitions)

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

- `catalog_id`
- `database`

Check out the [Global Configurations Tutorial](#) for details.

#### Parameters

- **database** (*str*) – Database name.
- **table** (*str*) – Table name.
- **expression** (*str*, *optional*) – An expression that filters the partitions to be returned.
- **catalog\_id** (*str*, *optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive `None`.

**Returns** `partitions_values`: Dictionary with keys as S3 path locations and values as a list of partitions values as `str` (e.g. `{ 's3://bucket/prefix/y=2020/m=10/': ['2020', '10'] }`).

**Return type** `Dict[str, List[str]]`

## Examples

Fetch all partitions

```
>>> import awswrangler as wr
>>> wr.catalog.get_partitions(
...     database='default',
...     table='my_table',
... )
{
  's3://bucket/prefix/y=2020/m=10/': ['2020', '10'],
  's3://bucket/prefix/y=2020/m=11/': ['2020', '11'],
  's3://bucket/prefix/y=2020/m=12/': ['2020', '12']
}
```

Filtering partitions

```
>>> import awswrangler as wr
>>> wr.catalog.get_partitions(
...     database='default',
...     table='my_table',
...     expression='m=10'
... )
{
  's3://bucket/prefix/y=2020/m=10/': ['2020', '10']
}
```

## awswrangler.catalog.get\_table\_description

`awswrangler.catalog.get_table_description(database: str, table: str, transaction_id: Optional[str] = None, query_as_of_time: Optional[str] = None, catalog_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → Optional[str]`

Get table description.

---

**Note:** If reading from a governed table, pass only one of *transaction\_id* or *query\_as\_of\_time*.

---

### Parameters

- **database** (*str*) – Database name.
- **table** (*str*) – Table name.
- **transaction\_id** (*str*, *optional*) – The ID of the transaction (i.e. used with GOVERNED tables).
- **query\_as\_of\_time** (*str*, *optional*) – The time as of when to read the table contents. Must be a valid Unix epoch timestamp. Cannot be specified alongside *transaction\_id*.
- **catalog\_id** (*str*, *optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if *boto3\_session* receive None.

**Returns** Description if exists.

**Return type** Optional[str]

### Examples

```
>>> import awswrangler as wr
>>> desc = wr.catalog.get_table_description(database="...", table="...")
```

### awswrangler.catalog.get\_table\_location

`awswrangler.catalog.get_table_location(database: str, table: str, transaction_id: Optional[str] = None, query_as_of_time: Optional[str] = None, catalog_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → Any`

Get table's location on Glue catalog.

---

**Note:** If reading from a governed table, pass only one of *transaction\_id* or *query\_as\_of\_time*.

---



---

**Note:** This function has arguments which can be configured globally through *wr.config* or environment variables:

- `catalog_id`
- `database`

Check out the [Global Configurations Tutorial](#) for details.

---

### Parameters

- **database** (*str*) – Database name.
- **table** (*str*) – Table name.
- **transaction\_id** (*str, optional*) – The ID of the transaction (i.e. used with GOVERNED tables).
- **query\_as\_of\_time** (*str, optional*) – The time as of when to read the table contents. Must be a valid Unix epoch timestamp. Cannot be specified alongside *transaction\_id*.
- **catalog\_id** (*str, optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if *boto3\_session* receive None.

**Returns** Table's location.

**Return type** str

## Examples

```
>>> import awswrangler as wr
>>> wr.catalog.get_table_location(database='default', table='my_table')
's3://bucket/prefix/'
```

## awswrangler.catalog.get\_table\_number\_of\_versions

`awswrangler.catalog.get_table_number_of_versions(database: str, table: str, catalog_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → Any`

Get total number of versions.

---

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

- `catalog_id`
- `database`

Check out the [Global Configurations Tutorial](#) for details.

---

### Parameters

- **database** (*str*) – Database name.
- **table** (*str*) – Table name.
- **catalog\_id** (*str*, *optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.

**Returns** Total number of versions.

**Return type** int

## Examples

```
>>> import awswrangler as wr
>>> num = wr.catalog.get_table_number_of_versions(database="...", table="...")
```

## awswrangler.catalog.get\_table\_parameters

`awswrangler.catalog.get_table_parameters(database: str, table: str, transaction_id: Optional[str] = None, query_as_of_time: Optional[str] = None, catalog_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → Dict[str, str]`

Get all parameters.



---

**Note:** If reading from a governed table, pass only one of *transaction\_id* or *query\_as\_of\_time*.

---

### Parameters

- **database** (*str*) – Database name.
- **table** (*str*) – Table name.
- **transaction\_id** (*str*, *optional*) – The ID of the transaction (i.e. used with GOVERNED tables).
- **query\_as\_of\_time** (*str*, *optional*) – The time as of when to read the table contents. Must be a valid Unix epoch timestamp. Cannot be specified alongside *transaction\_id*.
- **catalog\_id** (*str*, *optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if *boto3\_session* receive None.

**Returns** Dictionary of parameters.

**Return type** Dict[str, str]

### Examples

```
>>> import awswrangler as wr
>>> pars = wr.catalog.get_table_parameters(database="...", table="...")
```

### awswrangler.catalog.get\_table\_types

`awswrangler.catalog.get_table_types(database: str, table: str, transaction_id: Optional[str] = None, query_as_of_time: Optional[str] = None, catalog_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → Any`

Get all columns and types from a table.

---

**Note:** If reading from a governed table, pass only one of *transaction\_id* or *query\_as\_of\_time*.

---



---

**Note:** This function has arguments which can be configured globally through *wr.config* or environment variables:

- *catalog\_id*
- *database*

Check out the [Global Configurations Tutorial](#) for details.

---

### Parameters

- **database** (*str*) – Database name.
- **table** (*str*) – Table name.

- **transaction\_id** (*str*, *optional*) – The ID of the transaction (i.e. used with GOVERNED tables).
- **query\_as\_of\_time** (*str*, *optional*) – The time as of when to read the table contents. Must be a valid Unix epoch timestamp. Cannot be specified alongside `transaction_id`.
- **catalog\_id** (*str*, *optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.

**Returns** If table exists, a dictionary like {'col name': 'col data type'}. Otherwise None.

**Return type** Optional[Dict[str, str]]

### Examples

```
>>> import awswrangler as wr
>>> wr.catalog.get_table_types(database='default', table='my_table')
{'col0': 'int', 'col1': 'double'}
```

### awswrangler.catalog.get\_table\_versions

`awswrangler.catalog.get_table_versions(database: str, table: str, catalog_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → Any`

Get all versions.

---

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

- `catalog_id`
- `database`

Check out the [Global Configurations Tutorial](#) for details.

---

#### Parameters

- **database** (*str*) – Database name.
- **table** (*str*) – Table name.
- **catalog\_id** (*str*, *optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.

**Returns** List of table inputs: [https://boto3.amazonaws.com/v1/documentation/api/latest/reference/services/glue.html#Glue.Client.get\\_table\\_versions](https://boto3.amazonaws.com/v1/documentation/api/latest/reference/services/glue.html#Glue.Client.get_table_versions)

**Return type** List[Dict[str, Any]]

## Examples

```
>>> import awswrangler as wr
>>> tables_versions = wr.catalog.get_table_versions(database="...", table="...")
```

### awswrangler.catalog.get\_tables

`awswrangler.catalog.get_tables(catalog_id: Optional[str] = None, database: Optional[str] = None, transaction_id: Optional[str] = None, name_contains: Optional[str] = None, name_prefix: Optional[str] = None, name_suffix: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → Any`

Get an iterator of tables.

---

**Note:** Please, does not filter using `name_contains` and `name_prefix/name_suffix` at the same time. Only `name_prefix` and `name_suffix` can be combined together.

---



---

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

- `catalog_id`
- `database`

Check out the [Global Configurations Tutorial](#) for details.

---

#### Parameters

- **catalog\_id** (*str, optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **database** (*str, optional*) – Database name.
- **transaction\_id** (*str, optional*) – The ID of the transaction (i.e. used with GOVERNED tables).
- **name\_contains** (*str, optional*) – Select by a specific string on table name
- **name\_prefix** (*str, optional*) – Select by a specific prefix on table name
- **name\_suffix** (*str, optional*) – Select by a specific suffix on table name
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.

**Returns** Iterator of tables.

**Return type** Iterator[Dict[str, Any]]

## Examples

```
>>> import awswrangler as wr
>>> tables = wr.catalog.get_tables()
```

### awswrangler.catalog.overwrite\_table\_parameters

`awswrangler.catalog.overwrite_table_parameters(parameters: Dict[str, str], database: str, table: str, transaction_id: Optional[str] = None, catalog_versioning: bool = False, catalog_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → Any`

Overwrite all existing parameters.

---

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

- `catalog_id`
- `database`

Check out the [Global Configurations Tutorial](#) for details.

---

#### Parameters

- **parameters** (*Dict[str, str]*) – e.g. {"source": "mysql", "destination": "datalake"}
- **database** (*str*) – Database name.
- **table** (*str*) – Table name.
- **transaction\_id** (*str, optional*) – The ID of the transaction (i.e. used with GOVERNED tables).
- **catalog\_versioning** (*bool*) – If True and `mode="overwrite"`, creates an archived version of the table catalog before updating it.
- **catalog\_id** (*str, optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.

**Returns** All parameters after the overwrite (The same received).

**Return type** Dict[str, str]

## Examples

```
>>> import awswrangler as wr
>>> pars = wr.catalog.overwrite_table_parameters(
...     parameters={"source": "mysql", "destination": "datalake"},
...     database="...",
...     table="...")
```

### awswrangler.catalog.sanitize\_column\_name

awswrangler.catalog.sanitize\_column\_name(column: str) → str

Convert the column name to be compatible with Amazon Athena and the AWS Glue Catalog.

<https://docs.aws.amazon.com/athena/latest/ug/tables-databases-columns-names.html>

Possible transformations: - Strip accents - Remove non alphanumeric characters

**Parameters** column (str) – Column name.

**Returns** Normalized column name.

**Return type** str

## Examples

```
>>> import awswrangler as wr
>>> wr.catalog.sanitize_column_name('MyNewColumn')
'mynewcolumn'
```

### awswrangler.catalog.sanitize\_dataframe\_columns\_names

awswrangler.catalog.sanitize\_dataframe\_columns\_names(df: pandas.core.frame.DataFrame, handle\_duplicate\_columns: Optional[str] = 'warn') → pandas.core.frame.DataFrame

Normalize all columns names to be compatible with Amazon Athena.

<https://docs.aws.amazon.com/athena/latest/ug/tables-databases-columns-names.html>

Possible transformations: - Strip accents - Remove non alphanumeric characters

**Note:** After transformation, some column names might not be unique anymore. Example: the columns ["A", "a"] will be sanitized to ["a", "a"]

#### Parameters

- **df** (pandas.DataFrame) – Original Pandas DataFrame.
- **handle\_duplicate\_columns** (str, optional) – How to handle duplicate columns. Can be “warn” or “drop” or “rename”. “drop” will drop all but the first duplicated column. “rename” will rename all duplicated columns with an incremental number. Defaults to “warn”.

**Returns** Original Pandas DataFrame with columns names normalized.

**Return type** pandas.DataFrame

## Examples

```
>>> import awswrangler as wr
>>> df_normalized = wr.catalog.sanitize_dataframe_columns_names(df=pd.DataFrame({"A": [1, 2]}))
>>> df_normalized_drop = wr.catalog.sanitize_dataframe_columns_names(
    df=pd.DataFrame({"A": [1, 2], "a": [3, 4]}), handle_duplicate_columns="drop"
)
>>> df_normalized_rename = wr.catalog.sanitize_dataframe_columns_names(
    df=pd.DataFrame({"A": [1, 2], "a": [3, 4], "a_1": [4, 6]}), handle_
    duplicate_columns="rename"
)
```

## awswrangler.catalog.sanitize\_table\_name

awswrangler.catalog.**sanitize\_table\_name**(table: str) → str

Convert the table name to be compatible with Amazon Athena and the AWS Glue Catalog.

<https://docs.aws.amazon.com/athena/latest/ug/tables-databases-columns-names.html>

Possible transformations: - Strip accents - Remove non alphanumeric characters

**Parameters** table (str) – Table name.

**Returns** Normalized table name.

**Return type** str

## Examples

```
>>> import awswrangler as wr
>>> wr.catalog.sanitize_table_name('MyNewTable')
'mynewtable'
```

## awswrangler.catalog.search\_tables

awswrangler.catalog.**search\_tables**(text: str, catalog\_id: Optional[str] = None, boto3\_session: Optional[boto3.session.Session] = None) → Iterator[Dict[str, Any]]

Get Pandas DataFrame of tables filtered by a search string.

---

**Note:** Search feature is not supported for Governed tables.

---

### Parameters

- **text** (str, optional) – Select only tables with the given string in table's properties.
- **catalog\_id** (str, optional) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **boto3\_session** (boto3.Session(), optional) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Iterator of tables.

**Return type** Iterator[Dict[str, Any]]

### Examples

```
>>> import awswrangler as wr
>>> df_tables = wr.catalog.search_tables(text='my_property')
```

### awswrangler.catalog.table

`awswrangler.catalog.table(database: str, table: str, transaction_id: Optional[str] = None, query_as_of_time: Optional[str] = None, catalog_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → Any`

Get table details as Pandas DataFrame.

---

**Note:** If reading from a governed table, pass only one of *transaction\_id* or *query\_as\_of\_time*.

---



---

**Note:** This function has arguments which can be configured globally through *wr.config* or environment variables:

- `catalog_id`
- `database`

Check out the [Global Configurations Tutorial](#) for details.

---

### Parameters

- **database** (*str*) – Database name.
- **table** (*str*) – Table name.
- **transaction\_id** (*str*, *optional*) – The ID of the transaction (i.e. used with GOVERNED tables).
- **query\_as\_of\_time** (*str*, *optional*) – The time as of when to read the table contents. Must be a valid Unix epoch timestamp. Cannot be specified alongside *transaction\_id*.
- **catalog\_id** (*str*, *optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if *boto3\_session* receive None.

**Returns** Pandas DataFrame filled by formatted infos.

**Return type** `pandas.DataFrame`

## Examples

```
>>> import awswrangler as wr
>>> df_table = wr.catalog.table(database='default', table='my_table')
```

### awswrangler.catalog.tables

`awswrangler.catalog.tables`(*limit: int = 100, catalog\_id: Optional[str] = None, database: Optional[str] = None, transaction\_id: Optional[str] = None, search\_text: Optional[str] = None, name\_contains: Optional[str] = None, name\_prefix: Optional[str] = None, name\_suffix: Optional[str] = None, boto3\_session: Optional[boto3.session.Session] = None*) → Any

Get a DataFrame with tables filtered by a search term, prefix, suffix.

---

**Note:** Search feature is not supported for Governed tables.

---

---

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

- `catalog_id`
- `database`

Check out the [Global Configurations Tutorial](#) for details.

---

#### Parameters

- **limit** (*int, optional*) – Max number of tables to be returned.
- **catalog\_id** (*str, optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **database** (*str, optional*) – Database name.
- **transaction\_id** (*str, optional*) – The ID of the transaction (i.e. used with GOVERNED tables).
- **search\_text** (*str, optional*) – Select only tables with the given string in table's properties.
- **name\_contains** (*str, optional*) – Select by a specific string on table name
- **name\_prefix** (*str, optional*) – Select by a specific prefix on table name
- **name\_suffix** (*str, optional*) – Select by a specific suffix on table name
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.

**Returns** Pandas Dataframe filled by formatted infos.

**Return type** pandas.DataFrame



## Examples

```
>>> import awswrangler as wr
>>> df_tables = wr.catalog.tables()
```

### awswrangler.catalog.upsert\_table\_parameters

`awswrangler.catalog.upsert_table_parameters(parameters: Dict[str, str], database: str, table: str, transaction_id: Optional[str] = None, catalog_versioning: bool = False, catalog_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → Any`

Insert or Update the received parameters.

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

- `catalog_id`
- `database`

Check out the [Global Configurations Tutorial](#) for details.

#### Parameters

- **parameters** (`Dict[str, str]`) – e.g. {"source": "mysql", "destination": "datalake"}
- **database** (`str`) – Database name.
- **table** (`str`) – Table name.
- **transaction\_id** (`str`, *optional*) – The ID of the transaction (i.e. used with GOVERNED tables).
- **catalog\_versioning** (`bool`) – If True and `mode="overwrite"`, creates an archived version of the table catalog before updating it.
- **catalog\_id** (`str`, *optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **boto3\_session** (`boto3.Session()`, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.

**Returns** All parameters after the upsert.

**Return type** Dict[str, str]

## Examples

```
>>> import awswrangler as wr
>>> pars = wr.catalog.upsert_table_parameters(
...     parameters={"source": "mysql", "destination": "datalake"},
...     database="...",
...     table="...")
```

### 1.4.3 Amazon Athena

<code>create_athena_bucket([boto3_session])</code>	Create the default Athena bucket if it doesn't exist.
<code>create_ctas_table(sql, database[, ...])</code>	Create a new table populated with the results of a SELECT query.
<code>get_query_columns_types(query_execution_id)</code>	Get the data type of all columns queried.
<code>get_query_execution(query_execution_id[, ...])</code>	Fetch query execution details.
<code>get_named_query_statement(named_query_id[, ...])</code>	Get the named query statement string from a query ID.
<code>get_work_group(workgroup[, boto3_session])</code>	Return information about the workgroup with the specified name.
<code>read_sql_query(sql, database[, ...])</code>	Execute any SQL query on AWS Athena and return the results as a Pandas DataFrame.
<code>read_sql_table(table, database[, ...])</code>	Extract the full table AWS Athena and return the results as a Pandas DataFrame.
<code>repair_table(table[, database, s3_output, ...])</code>	Run the Hive's metastore consistency check: 'MSCK REPAIR TABLE table;'.
<code>start_query_execution(sql[, database, ...])</code>	Start a SQL Query against AWS Athena.
<code>stop_query_execution(query_execution_id[, ...])</code>	Stop a query execution.
<code>unload(sql, path, database[, file_format, ...])</code>	Write query results from a SELECT statement to the specified data format using UNLOAD.
<code>wait_query(query_execution_id[, boto3_session])</code>	Wait for the query end.

#### awswrangler.athena.create\_athena\_bucket

`awswrangler.athena.create_athena_bucket(boto3_session: Optional[boto3.session.Session] = None) → str`  
 Create the default Athena bucket if it doesn't exist.

**Parameters** `boto3_session` (`boto3.Session()`, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.

**Returns** Bucket s3 path (E.g. `s3://aws-athena-query-results-ACCOUNT-REGION/`)

**Return type** `str`

## Examples

```
>>> import awswrangler as wr
>>> wr.athena.create_athena_bucket()
's3://aws-athena-query-results-ACCOUNT-REGION/'
```

### awswrangler.athena.create\_ctas\_table

```
awswrangler.athena.create_ctas_table(sql: str, database: str, ctas_table: Optional[str] = None,
                                     ctas_database: Optional[str] = None, s3_output: Optional[str] =
                                     None, storage_format: Optional[str] = None, write_compression:
                                     Optional[str] = None, partitioning_info: Optional[List[str]] =
                                     None, bucketing_info: Optional[Tuple[List[str], int]] = None,
                                     field_delimiter: Optional[str] = None, schema_only: bool = False,
                                     workgroup: Optional[str] = None, data_source: Optional[str] =
                                     None, encryption: Optional[str] = None, kms_key: Optional[str] =
                                     None, categories: Optional[List[str]] = None, wait: bool = False,
                                     boto3_session: Optional[boto3.session.Session] = None) → Any
```

Create a new table populated with the results of a SELECT query.

<https://docs.aws.amazon.com/athena/latest/ug/create-table-as.html>

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

- database
- workgroup

Check out the [Global Configurations Tutorial](#) for details.

### Parameters

- **sql** (*str*) – SELECT SQL query.
- **database** (*str*) – The name of the database where the original table is stored.
- **ctas\_table** (*Optional[str]*, *optional*) – The name of the CTAS table. If None, a name with a random string is used.
- **ctas\_database** (*Optional[str]*, *optional*) – The name of the alternative database where the CTAS table should be stored. If None, *database* is used, that is the CTAS table is stored in the same database as the original table.
- **s3\_output** (*Optional[str]*, *optional*) – The output Amazon S3 path. If None, either the Athena workgroup or client-side location setting is used. If a workgroup enforces a query results location, then it overrides this argument.
- **storage\_format** (*Optional[str]*, *optional*) – The storage format for the CTAS query results, such as ORC, PARQUET, AVRO, JSON, or TEXTFILE. PARQUET by default.
- **write\_compression** (*Optional[str]*, *optional*) – The compression type to use for any storage format that allows compression to be specified.
- **partitioning\_info** (*Optional[List[str]]*, *optional*) – A list of columns by which the CTAS table will be partitioned.

- **bucketing\_info** (*Optional[Tuple[List[str], int]], optional*) – Tuple consisting of the column names used for bucketing as the first element and the number of buckets as the second element. Only *str*, *int* and *bool* are supported as column data types for bucketing.
- **field\_delimiter** (*Optional[str], optional*) – The single-character field delimiter for files in CSV, TSV, and text files.
- **schema\_only** (*bool, optional*) – *\_description\_*, by default *False*
- **workgroup** (*Optional[str], optional*) – Athena workgroup.
- **data\_source** (*Optional[str], optional*) – Data Source / Catalog name. If *None*, 'AwsDataCatalog' is used.
- **encryption** (*str, optional*) – Valid values: [*None*, 'SSE\_S3', 'SSE\_KMS']. Note: 'CSE\_KMS' is not supported.
- **kms\_key** (*str, optional*) – For SSE-KMS, this is the KMS key ARN or ID.
- **categories** (*List[str], optional*) – List of columns names that should be returned as *pandas.Categorical*. Recommended for memory restricted environments.
- **wait** (*bool, default False*) – Whether to wait for the query to finish and return a dictionary with the Query metadata.
- **boto3\_session** (*Optional[boto3.Session], optional*) – Boto3 Session. The default boto3 session is used if *boto3\_session* is *None*.

**Returns** A dictionary with the the CTAS database and table names. If *wait* is *False*, the query ID is included, otherwise a Query metadata object is added instead.

**Return type** Dict[str, Union[str, \_QueryMetadata]]

## Examples

Select all into a new table and encrypt the results

```
>>> import awswrangler as wr
>>> wr.athena.create_ctas_table(
...     sql="select * from table",
...     database="default",
...     encryption="SSE_KMS",
...     kms_key="1234abcd-12ab-34cd-56ef-1234567890ab",
... )
{'ctas_database': 'default', 'ctas_table': 'temp_table_5669340090094....', 'ctas_
↪query_id': 'cc7dfa81-831d-...'}

```

Create a table with schema only

```
>>> wr.athena.create_ctas_table(
...     sql="select col1, col2 from table",
...     database="default",
...     ctas_table="my_ctas_table",
...     schema_only=True,
...     wait=True,
... )

```

Partition data and save to alternative CTAS database

```
>>> wr.athena.create_ctas_table(
...     sql="select * from table",
...     database="default",
...     ctas_database="my_ctas_db",
...     storage_format="avro",
...     write_compression="snappy",
...     partitioning_info=["par0", "par1"],
...     wait=True,
... )
```

### awswrangler.athena.get\_query\_columns\_types

awswrangler.athena.get\_query\_columns\_types(query\_execution\_id: str, boto3\_session: Optional[boto3.session.Session] = None) → Dict[str, str]

Get the data type of all columns queried.

<https://docs.aws.amazon.com/athena/latest/ug/data-types.html>

#### Parameters

- **query\_execution\_id** (str) – Athena query execution ID.
- **boto3\_session** (boto3.Session(), optional) – Boto3 Session. If none, the default boto3 session is used.

**Returns** Dictionary with all data types.

**Return type** Dict[str, str]

#### Examples

```
>>> import awswrangler as wr
>>> wr.athena.get_query_columns_types('query-execution-id')
{'col0': 'int', 'col1': 'double'}
```

### awswrangler.athena.get\_query\_execution

awswrangler.athena.get\_query\_execution(query\_execution\_id: str, boto3\_session: Optional[boto3.session.Session] = None) → Dict[str, Any]

Fetch query execution details.

[https://boto3.amazonaws.com/v1/documentation/api/latest/reference/services/athena.html#Athena.Client.get\\_query\\_execution](https://boto3.amazonaws.com/v1/documentation/api/latest/reference/services/athena.html#Athena.Client.get_query_execution)

#### Parameters

- **query\_execution\_id** (str) – Athena query execution ID.
- **boto3\_session** (boto3.Session(), optional) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Dictionary with the get\_query\_execution response.

**Return type** Dict[str, Any]

## Examples

```
>>> import awswrangler as wr
>>> res = wr.athena.get_query_execution(query_execution_id='query-execution-id')
```

### awswrangler.athena.get\_named\_query\_statement

`awswrangler.athena.get_named_query_statement(named_query_id: str, boto3_session: Optional[boto3.session.Session] = None) → str`

Get the named query statement string from a query ID.

#### Parameters

- **named\_query\_id** (*str*) – The unique ID of the query. Used to get the query statement from a saved query. Requires access to the workgroup where the query is saved.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. If none, the default boto3 session is used.

**Returns** The named query statement string

**Return type** *str*

### awswrangler.athena.get\_work\_group

`awswrangler.athena.get_work_group(workgroup: str, boto3_session: Optional[boto3.session.Session] = None) → Dict[str, Any]`

Return information about the workgroup with the specified name.

#### Parameters

- **workgroup** (*str*) – Work Group name.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive `None`.

**Returns** [https://boto3.amazonaws.com/v1/documentation/api/latest/reference/services/athena.html#Athena.Client.get\\_work\\_group](https://boto3.amazonaws.com/v1/documentation/api/latest/reference/services/athena.html#Athena.Client.get_work_group)

**Return type** *Dict[str, Any]*

## Examples

```
>>> import awswrangler as wr
>>> res = wr.athena.get_work_group(workgroup='workgroup_name')
```

**aws wrangler.athena.read\_sql\_query**

```
aws wrangler.athena.read_sql_query(sql: str, database: str, ctas_approach: bool = True, unload_approach:
    bool = False, unload_parameters: Optional[Dict[str, Any]] = None,
    categories: Optional[List[str]] = None, chunksize: Optional[Union[int,
    bool]] = None, s3_output: Optional[str] = None, workgroup:
    Optional[str] = None, encryption: Optional[str] = None, kms_key:
    Optional[str] = None, keep_files: bool = True, ctas_database_name:
    Optional[str] = None, ctas_temp_table_name: Optional[str] = None,
    ctas_bucketing_info: Optional[Tuple[List[str], int]] = None,
    use_threads: Union[bool, int] = True, boto3_session:
    Optional[boto3.session.Session] = None, max_cache_seconds: int = 0,
    max_cache_query_inspections: int = 50, max_remote_cache_entries:
    int = 50, max_local_cache_entries: int = 100, data_source:
    Optional[str] = None, params: Optional[Dict[str, Any]] = None,
    s3_additional_kwargs: Optional[Dict[str, Any]] = None,
    pyarrow_additional_kwargs: Optional[Dict[str, Any]] = None) → Any
```

Execute any SQL query on AWS Athena and return the results as a Pandas DataFrame.

**Related tutorial:**

- [Amazon Athena](#)
- [Athena Cache](#)
- [Global Configurations](#)

**There are three approaches available through `ctas_approach` and `unload_approach` parameters:**

**1 - `ctas_approach=True` (Default):**

Wrap the query with a CTAS and then reads the table data as parquet directly from s3.

**PROS:**

- Faster for mid and big result sizes.
- Can handle some level of nested types.

**CONS:**

- Requires create/delete table permissions on Glue.
- Does not support timestamp with time zone
- Does not support columns with repeated names.
- Does not support columns with undefined data types.
- A temporary table will be created and then deleted immediately.
- Does not support custom `data_source/catalog_id`.

**2 - `unload_approach=True` and `ctas_approach=False`:**

Does an UNLOAD query on Athena and parse the Parquet result on s3.

**PROS:**

- Faster for mid and big result sizes.
- Can handle some level of nested types.
- Does not modify Glue Data Catalog

**CONS:**

- Output S3 path must be empty.
- Does not support timestamp with time zone.
- Does not support columns with repeated names.
- Does not support columns with undefined data types.
- Does not support custom data\_source/catalog\_id.

**3** - ctas\_approach=False:

Does a regular query on Athena and parse the regular CSV result on s3.

PROS:

- Faster for small result sizes (less latency).
- Does not require create/delete table permissions on Glue
- Supports timestamp with time zone.
- Support custom data\_source/catalog\_id.

CONS:

- Slower for big results (But stills faster than other libraries that uses the regular Athena's API)
- Does not handle nested types at all.

---

**Note:** The resulting DataFrame (or every DataFrame in the returned Iterator for chunked queries) have a *query\_metadata* attribute, which brings the query result metadata returned by [Boto3/Athena](#) .

For a practical example check out the [related tutorial](#)!

---

---

**Note:** Valid encryption modes: [None, 'SSE\_S3', 'SSE\_KMS'].

*P.S. 'CSE\_KMS' is not supported.*

---

---

**Note:** Create the default Athena bucket if it doesn't exist and s3\_output is None.

(E.g. s3://aws-athena-query-results-ACCOUNT-REGION/)

---

---

**Note:** *chunksize* argument (Memory Friendly) (i.e batching):

Return an Iterable of DataFrames instead of a regular DataFrame.

There are two batching strategies:

- If **chunksize=True**, a new DataFrame will be returned for each file in the query result.
- If **chunksize=INTEGER**, Wrangler will iterate on the data by number of rows igual the received INTEGER.

*P.S. chunksize=True* is faster and uses less memory while *chunksize=INTEGER* is more precise in number of rows for each Dataframe.

*P.P.S.* If *ctas\_approach=False* and *chunksize=True*, you will always receive an iterator with a single DataFrame because regular Athena queries only produces a single output file.

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**Note:** In case of `use_threads=True` the number of threads that will be spawned will be gotten from `os.cpu_count()`.

---



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**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

- `ctas_approach`
- `database`
- `max_cache_query_inspections`
- `max_cache_seconds`
- `max_remote_cache_entries`
- `max_local_cache_entries`
- `workgroup`
- `chunksize`

Check out the [Global Configurations Tutorial](#) for details.

---

### Parameters

- **sql** (*str*) – SQL query.
- **database** (*str*) – AWS Glue/Athena database name - It is only the origin database from where the query will be launched. You can still using and mixing several databases writing the full table name within the sql (e.g. `database.table`).
- **ctas\_approach** (*bool*) – Wraps the query using a CTAS, and read the resulted parquet data on S3. If false, read the regular CSV on S3.
- **unload\_approach** (*bool*) – Wraps the query using UNLOAD, and read the results from S3. Only PARQUET format is supported.
- **unload\_parameters** (*Optional[Dict[str, Any]]*) – Params of the UNLOAD such as format, compression, field\_delimiter, and partitioned\_by.
- **categories** (*List[str], optional*) – List of columns names that should be returned as `pandas.Categorical`. Recommended for memory restricted environments.
- **chunksize** (*Union[int, bool], optional*) – If passed will split the data in a Iterable of DataFrames (Memory friendly). If `True` wrangler will iterate on the data by files in the most efficient way without guarantee of chunksize. If an `INTEGER` is passed Wrangler will iterate on the data by number of rows equal the received `INTEGER`.
- **s3\_output** (*str, optional*) – Amazon S3 path.
- **workgroup** (*str, optional*) – Athena workgroup.
- **encryption** (*str, optional*) – Valid values: `[None, 'SSE_S3', 'SSE_KMS']`. Notice: `'CSE_KMS'` is not supported.
- **kms\_key** (*str, optional*) – For SSE-KMS, this is the KMS key ARN or ID.
- **keep\_files** (*bool*) – Whether staging files produced by Athena are retained. `'True'` by default.

- **ctas\_database\_name**(*str*, *optional*) – The name of the alternative database where the CTAS temporary table is stored. If None, the default *database* is used.
- **ctas\_temp\_table\_name**(*str*, *optional*) – The name of the temporary table and also the directory name on S3 where the CTAS result is stored. If None, it will use the follow random pattern: `f"temp_table_{uuid.uuid4().hex()}"`. On S3 this directory will be under under the pattern: `f"{s3_output}/{ctas_temp_table_name}"`.
- **ctas\_bucketing\_info**(*Tuple[List[str], int]*, *optional*) – Tuple consisting of the column names used for bucketing as the first element and the number of buckets as the second element. Only *str*, *int* and *bool* are supported as column data types for bucketing.
- **use\_threads**(*bool*, *int*) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` will be used as the max number of threads. If integer is provided, specified number is used.
- **boto3\_session**(*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.
- **max\_cache\_seconds**(*int*) – Wrangler can look up in Athena's history if this query has been run before. If so, and its completion time is less than *max\_cache\_seconds* before now, wrangler skips query execution and just returns the same results as last time. If cached results are valid, wrangler ignores the *ctas\_approach*, *s3\_output*, *encryption*, *kms\_key*, *keep\_files* and *ctas\_temp\_table\_name* params. If reading cached data fails for any reason, execution falls back to the usual query run path.
- **max\_cache\_query\_inspections**(*int*) – Max number of queries that will be inspected from the history to try to find some result to reuse. The bigger the number of inspection, the bigger will be the latency for not cached queries. Only takes effect if *max\_cache\_seconds* > 0.
- **max\_remote\_cache\_entries**(*int*) – Max number of queries that will be retrieved from AWS for cache inspection. The bigger the number of inspection, the bigger will be the latency for not cached queries. Only takes effect if *max\_cache\_seconds* > 0 and default value is 50.
- **max\_local\_cache\_entries**(*int*) – Max number of queries for which metadata will be cached locally. This will reduce the latency and also enables keeping more than *max\_remote\_cache\_entries* available for the cache. This value should not be smaller than *max\_remote\_cache\_entries*. Only takes effect if *max\_cache\_seconds* > 0 and default value is 100.
- **data\_source**(*str*, *optional*) – Data Source/Catalog name. If None, 'AwsDataCatalog' will be used by default.
- **params**(*Dict[str, any]*, *optional*) – Dict of parameters that will be used for constructing the SQL query. Only named parameters are supported. The dict needs to contain the information in the form {'name': 'value'} and the SQL query needs to contain `:name;`. Note that for varchar columns and similar, you must surround the value in single quotes.
- **s3\_additional\_kwargs**(*Optional[Dict[str, Any]]*) – Forwarded to botocore requests. e.g. `s3_additional_kwargs={'RequestPayer': 'requester'}`
- **pyarrow\_additional\_kwargs**(*Optional[Dict[str, Any]]*) – Forward to the ParquetFile class or converting an Arrow table to Pandas, currently only an "coerce\_int96\_timestamp\_unit" or "timestamp\_as\_object" argument will be considered. If reading parquet files where you cannot convert a timestamp to pandas Timestamp[ns] consider setting `timestamp_as_object=True`, to allow for timestamp units larger than "ns". If reading parquet data that still uses INT96 (like Athena outputs) you can use `coerce_int96_timestamp_unit` to specify what timestamp unit to encode INT96 to (by default

this is “ns”, if you know the output parquet came from a system that encodes timestamp to a particular unit then set this to that same unit e.g. `coerce_int96_timestamp_unit="ms"`).

**Returns** Pandas DataFrame or Generator of Pandas DataFrames if chunksize is passed.

**Return type** Union[pd.DataFrame, Iterator[pd.DataFrame]]

### Examples

```
>>> import awswrangler as wr
>>> df = wr.athena.read_sql_query(sql="...", database="...")
>>> scanned_bytes = df.query_metadata["Statistics"]["DataScannedInBytes"]
```

```
>>> import awswrangler as wr
>>> df = wr.athena.read_sql_query(
...     sql="SELECT * FROM my_table WHERE name=:name; AND city=:city;",
...     params={"name": "'filtered_name'", "city": "'filtered_city'"}
... )
```

### awswrangler.athena.read\_sql\_table

`awswrangler.athena.read_sql_table`(*table: str, database: str, ctas\_approach: bool = True, categories: Optional[List[str]] = None, chunksize: Optional[Union[int, bool]] = None, s3\_output: Optional[str] = None, workgroup: Optional[str] = None, encryption: Optional[str] = None, kms\_key: Optional[str] = None, keep\_files: bool = True, ctas\_database\_name: Optional[str] = None, ctas\_temp\_table\_name: Optional[str] = None, ctas\_bucketing\_info: Optional[Tuple[List[str], int]] = None, use\_threads: Union[bool, int] = True, boto3\_session: Optional[boto3.session.Session] = None, max\_cache\_seconds: int = 0, max\_cache\_query\_inspections: int = 50, max\_remote\_cache\_entries: int = 50, max\_local\_cache\_entries: int = 100, data\_source: Optional[str] = None, s3\_additional\_kwargs: Optional[Dict[str, Any]] = None, pyarrow\_additional\_kwargs: Optional[Dict[str, Any]] = None) → Any*

Extract the full table AWS Athena and return the results as a Pandas DataFrame.

#### Related tutorial:

- [Amazon Athena](#)
- [Athena Cache](#)
- [Global Configurations](#)

**There are two approaches to be defined through `ctas_approach` parameter:**

**1 - `ctas_approach=True` (Default):**

Wrap the query with a CTAS and then reads the table data as parquet directly from s3.

**PROS:**

- Faster for mid and big result sizes.
- Can handle some level of nested types.

**CONS:**

- Requires create/delete table permissions on Glue.
- Does not support timestamp with time zone
- Does not support columns with repeated names.
- Does not support columns with undefined data types.
- A temporary table will be created and then deleted immediately.

**2** - `ctas_approach=False`:

Does a regular query on Athena and parse the regular CSV result on s3.

PROS:

- Faster for small result sizes (less latency).
- Does not require create/delete table permissions on Glue
- Supports timestamp with time zone.

CONS:

- Slower for big results (But stills faster than other libraries that uses the regular Athena's API)
- Does not handle nested types at all.

---

**Note:** The resulting DataFrame (or every DataFrame in the returned Iterator for chunked queries) have a `query_metadata` attribute, which brings the query result metadata returned by [Boto3/Athena](#) .

For a practical example check out the [related tutorial](#)!

---

---

**Note:** Valid encryption modes: [None, 'SSE\_S3', 'SSE\_KMS'].

*P.S. 'CSE\_KMS' is not supported.*

---

---

**Note:** Create the default Athena bucket if it doesn't exist and `s3_output` is None.

(E.g. `s3://aws-athena-query-results-ACCOUNT-REGION/`)

---

---

**Note:** `chunksize` argument (Memory Friendly) (i.e batching):

Return an Iterable of DataFrames instead of a regular DataFrame.

There are two batching strategies:

- If **`chunksize=True`**, a new DataFrame will be returned for each file in the query result.
- If **`chunksize=INTEGER`**, Wrangler will iterate on the data by number of rows igual the received INTEGER.

*P.S. `chunksize=True` is faster and uses less memory while `chunksize=INTEGER` is more precise in number of rows for each Dataframe.*

*P.P.S. If `ctas_approach=False` and `chunksize=True`, you will always receive an interador with a single DataFrame because regular Athena queries only produces a single output file.*

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**Note:** In case of `use_threads=True` the number of threads that will be spawned will be gotten from `os.cpu_count()`.

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**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

- `ctas_approach`
- `database`
- `max_cache_query_inspections`
- `max_cache_seconds`
- `max_remote_cache_entries`
- `max_local_cache_entries`
- `workgroup`
- `chunksize`

Check out the [Global Configurations Tutorial](#) for details.

---

### Parameters

- **table** (*str*) – Table name.
- **database** (*str*) – AWS Glue/Athena database name.
- **ctas\_approach** (*bool*) – Wraps the query using a CTAS, and read the resulted parquet data on S3. If false, read the regular CSV on S3.
- **categories** (*List[str], optional*) – List of columns names that should be returned as `pandas.Categorical`. Recommended for memory restricted environments.
- **chunksize** (*Union[int, bool], optional*) – If passed will split the data in a Iterable of DataFrames (Memory friendly). If `True` wrangler will iterate on the data by files in the most efficient way without guarantee of chunksize. If an `INTEGER` is passed Wrangler will iterate on the data by number of rows equal the received `INTEGER`.
- **s3\_output** (*str, optional*) – AWS S3 path.
- **workgroup** (*str, optional*) – Athena workgroup.
- **encryption** (*str, optional*) – Valid values: `[None, 'SSE_S3', 'SSE_KMS']`. Notice: `'CSE_KMS'` is not supported.
- **kms\_key** (*str, optional*) – For SSE-KMS, this is the KMS key ARN or ID.
- **keep\_files** (*bool*) – Should Wrangler delete or keep the staging files produced by Athena?
- **ctas\_database\_name** (*str, optional*) – The name of the alternative database where the CTAS temporary table is stored. If `None`, the default `database` is used.
- **ctas\_temp\_table\_name** (*str, optional*) – The name of the temporary table and also the directory name on S3 where the CTAS result is stored. If `None`, it will use the follow random pattern: `f"temp_table_{uuid.uuid4().hex}"`. On S3 this directory will be under under the pattern: `f"{s3_output}/{ctas_temp_table_name}"`.

- **ctas\_bucketing\_info** (*Tuple[List[str], int], optional*) – Tuple consisting of the column names used for bucketing as the first element and the number of buckets as the second element. Only *str*, *int* and *bool* are supported as column data types for bucketing.
- **use\_threads** (*bool, int*) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` will be used as the max number of threads. If integer is provided, specified number is used.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.
- **max\_cache\_seconds** (*int*) – Wrangler can look up in Athena's history if this table has been read before. If so, and its completion time is less than *max\_cache\_seconds* before now, wrangler skips query execution and just returns the same results as last time. If cached results are valid, wrangler ignores the *ctas\_approach*, *s3\_output*, *encryption*, *kms\_key*, *keep\_files* and *ctas\_temp\_table\_name* params. If reading cached data fails for any reason, execution falls back to the usual query run path.
- **max\_cache\_query\_inspections** (*int*) – Max number of queries that will be inspected from the history to try to find some result to reuse. The bigger the number of inspection, the bigger will be the latency for not cached queries. Only takes effect if `max_cache_seconds > 0`.
- **max\_remote\_cache\_entries** (*int*) – Max number of queries that will be retrieved from AWS for cache inspection. The bigger the number of inspection, the bigger will be the latency for not cached queries. Only takes effect if `max_cache_seconds > 0` and default value is 50.
- **max\_local\_cache\_entries** (*int*) – Max number of queries for which metadata will be cached locally. This will reduce the latency and also enables keeping more than *max\_remote\_cache\_entries* available for the cache. This value should not be smaller than `max_remote_cache_entries`. Only takes effect if `max_cache_seconds > 0` and default value is 100.
- **data\_source** (*str, optional*) – Data Source / Catalog name. If None, 'AwsDataCatalog' will be used by default.
- **s3\_additional\_kwargs** (*Optional[Dict[str, Any]]*) – Forwarded to botocore requests. e.g. `s3_additional_kwargs={'RequestPayer': 'requester'}`
- **pyarrow\_additional\_kwargs** (*Optional[Dict[str, Any]]*) – Forward to the ParquetFile class or converting an Arrow table to Pandas, currently only an "coerce\_int96\_timestamp\_unit" or "timestamp\_as\_object" argument will be considered. If reading parquet files where you cannot convert a timestamp to pandas Timestamp[ns] consider setting `timestamp_as_object=True`, to allow for timestamp units > NS. If reading parquet data that still uses INT96 (like Athena outputs) you can use `coerce_int96_timestamp_unit` to specify what timestamp unit to encode INT96 to (by default this is "ns", if you know the output parquet came from a system that encodes timestamp to a particular unit then set this to that same unit e.g. `coerce_int96_timestamp_unit="ms"`).

**Returns** Pandas DataFrame or Generator of Pandas DataFrames if chunksize is passed.

**Return type** Union[pd.DataFrame, Iterator[pd.DataFrame]]

## Examples

```
>>> import awswrangler as wr
>>> df = wr.athena.read_sql_table(table="...", database="...")
>>> scanned_bytes = df.query_metadata["Statistics"]["DataScannedInBytes"]
```

## awswrangler.athena.repair\_table

**awswrangler.athena.repair\_table**(*table: str, database: Optional[str] = None, s3\_output: Optional[str] = None, workgroup: Optional[str] = None, encryption: Optional[str] = None, kms\_key: Optional[str] = None, boto3\_session: Optional[boto3.session.Session] = None*) → Any

Run the Hive's metastore consistency check: 'MSCK REPAIR TABLE table;'.

Recovers partitions and data associated with partitions. Use this statement when you add partitions to the catalog. It is possible it will take some time to add all partitions. If this operation times out, it will be in an incomplete state where only a few partitions are added to the catalog.

---

**Note:** Create the default Athena bucket if it doesn't exist and `s3_output` is `None`. (E.g. `s3://aws-athena-query-results-ACCOUNT-REGION/`)

---



---

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

- `database`
- `workgroup`

Check out the [Global Configurations Tutorial](#) for details.

---

### Parameters

- **table** (*str*) – Table name.
- **database** (*str, optional*) – AWS Glue/Athena database name.
- **s3\_output** (*str, optional*) – AWS S3 path.
- **workgroup** (*str, optional*) – Athena workgroup.
- **encryption** (*str, optional*) – `None`, 'SSE\_S3', 'SSE\_KMS', 'CSE\_KMS'.
- **kms\_key** (*str, optional*) – For SSE-KMS and CSE-KMS, this is the KMS key ARN or ID.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive `None`.

**Returns** Query final state ('SUCCEEDED', 'FAILED', 'CANCELLED').

**Return type** `str`

## Examples

```
>>> import awswrangler as wr
>>> query_final_state = wr.athena.repair_table(table='...', database='...')
```

## awswrangler.athena.start\_query\_execution

**awswrangler.athena.start\_query\_execution**(*sql: str, database: Optional[str] = None, s3\_output: Optional[str] = None, workgroup: Optional[str] = None, encryption: Optional[str] = None, kms\_key: Optional[str] = None, params: Optional[Dict[str, Any]] = None, boto3\_session: Optional[boto3.session.Session] = None, max\_cache\_seconds: int = 0, max\_cache\_query\_inspections: int = 50, max\_remote\_cache\_entries: int = 50, max\_local\_cache\_entries: int = 100, data\_source: Optional[str] = None, wait: bool = False*) → Any

Start a SQL Query against AWS Athena.

---

**Note:** Create the default Athena bucket if it doesn't exist and `s3_output` is `None`. (E.g. `s3://aws-athena-query-results-ACCOUNT-REGION/`)

---

---

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

- `database`
- `max_cache_query_inspections`
- `max_cache_seconds`
- `max_remote_cache_entries`
- `max_local_cache_entries`
- `workgroup`

Check out the [Global Configurations Tutorial](#) for details.

---

### Parameters

- **sql** (*str*) – SQL query.
- **database** (*str, optional*) – AWS Glue/Athena database name.
- **s3\_output** (*str, optional*) – AWS S3 path.
- **workgroup** (*str, optional*) – Athena workgroup.
- **encryption** (*str, optional*) – `None`, `'SSE_S3'`, `'SSE_KMS'`, `'CSE_KMS'`.
- **kms\_key** (*str, optional*) – For SSE-KMS and CSE-KMS, this is the KMS key ARN or ID.
- **params** (*Dict[str, any], optional*) – Dict of parameters that will be used for constructing the SQL query. Only named parameters are supported. The dict needs to contain



the information in the form `{'name': 'value'}` and the SQL query needs to contain `:name`. Note that for varchar columns and similar, you must surround the value in single quotes.

- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.
- **max\_cache\_seconds** (*int*) – Wrangler can look up in Athena's history if this query has been run before. If so, and its completion time is less than *max\_cache\_seconds* before now, wrangler skips query execution and just returns the same results as last time. If cached results are valid, wrangler ignores the *s3\_output*, *encryption* and *kms\_key* params. If reading cached data fails for any reason, execution falls back to the usual query run path.
- **max\_cache\_query\_inspections** (*int*) – Max number of queries that will be inspected from the history to try to find some result to reuse. The bigger the number of inspection, the bigger will be the latency for not cached queries. Only takes effect if *max\_cache\_seconds* > 0.
- **max\_remote\_cache\_entries** (*int*) – Max number of queries that will be retrieved from AWS for cache inspection. The bigger the number of inspection, the bigger will be the latency for not cached queries. Only takes effect if *max\_cache\_seconds* > 0 and default value is 50.
- **max\_local\_cache\_entries** (*int*) – Max number of queries for which metadata will be cached locally. This will reduce the latency and also enables keeping more than *max\_remote\_cache\_entries* available for the cache. This value should not be smaller than *max\_remote\_cache\_entries*. Only takes effect if *max\_cache\_seconds* > 0 and default value is 100.
- **data\_source** (*str*, *optional*) – Data Source / Catalog name. If None, 'AwsDataCatalog' will be used by default.
- **wait** (*bool*, *default False*) – Indicates whether to wait for the query to finish and return a dictionary with the query execution response.

**Returns** Query execution ID if *wait* is set to *False*, dictionary with the *get\_query\_execution* response otherwise.

**Return type** Union[str, Dict[str, Any]]

## Examples

Querying into the default data source (Amazon s3 - 'AwsDataCatalog')

```
>>> import awswrangler as wr
>>> query_exec_id = wr.athena.start_query_execution(sql='...', database='...')
```

Querying into another data source (PostgreSQL, Redshift, etc)

```
>>> import awswrangler as wr
>>> query_exec_id = wr.athena.start_query_execution(sql='...', database='...', data_
↪source='...')
```

### awswrangler.athena.stop\_query\_execution

`awswrangler.athena.stop_query_execution(query_execution_id: str, boto3_session: Optional[boto3.session.Session] = None) → None`

Stop a query execution.

Requires you to have access to the workgroup in which the query ran.

#### Parameters

- **query\_execution\_id** (*str*) – Athena query execution ID.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** None.

**Return type** None

#### Examples

```
>>> import awswrangler as wr
>>> wr.athena.stop_query_execution(query_execution_id='query-execution-id')
```

### awswrangler.athena.unload

`awswrangler.athena.unload(sql: str, path: str, database: str, file_format: str = 'PARQUET', compression: Optional[str] = None, field_delimiter: Optional[str] = None, partitioned_by: Optional[List[str]] = None, workgroup: Optional[str] = None, encryption: Optional[str] = None, kms_key: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None, data_source: Optional[str] = None, params: Optional[Dict[str, Any]] = None) → Any`

Write query results from a SELECT statement to the specified data format using UNLOAD.

<https://docs.aws.amazon.com/athena/latest/ug/unload.html>

---

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

- database
- workgroup

Check out the [Global Configurations Tutorial](#) for details.

---

#### Parameters

- **sql** (*str*) – SQL query.
- **path** (*str*, *optional*) – Amazon S3 path.
- **database** (*str*) – AWS Glue/Athena database name - It is only the origin database from where the query will be launched. You can still using and mixing several databases writing the full table name within the sql (e.g. `database.table`).
- **file\_format** (*str*) – File format of the output. Possible values are ORC, PARQUET, AVRO, JSON, or TEXTFILE

- **compression** (*Optional[str]*) – This option is specific to the ORC and Parquet formats. For ORC, possible values are lz4, snappy, zlib, or zstd. For Parquet, possible values are gzip or snappy. For ORC, the default is zlib, and for Parquet, the default is gzip.
- **field\_delimiter** (*str*) – A single-character field delimiter for files in CSV, TSV, and other text formats.
- **partitioned\_by** (*Optional[List[str]]*) – An array list of columns by which the output is partitioned.
- **workgroup** (*str, optional*) – Athena workgroup.
- **encryption** (*str, optional*) – Valid values: [None, 'SSE\_S3', 'SSE\_KMS']. Notice: 'CSE\_KMS' is not supported.
- **kms\_key** (*str, optional*) – For SSE-KMS, this is the KMS key ARN or ID.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.
- **data\_source** (*str, optional*) – Data Source/Catalog name. If None, 'AwsDataCatalog' will be used by default.
- **params** (*Dict[str, any], optional*) – Dict of parameters that will be used for constructing the SQL query. Only named parameters are supported. The dict needs to contain the information in the form {'name': 'value'} and the SQL query needs to contain :name;. Note that for varchar columns and similar, you must surround the value in single quotes.

**Returns** Query metadata including query execution id, dtypes, manifest & output location.

**Return type** \_QueryMetadata

### Examples

```
>>> import awswrangler as wr
>>> res = wr.athena.unload(
...     sql="SELECT * FROM my_table WHERE name=:name; AND city=:city;",
...     params={"name": "'filtered_name'", "city": "'filtered_city'"}
... )
```

### awswrangler.athena.wait\_query

**awswrangler.athena.wait\_query**(*query\_execution\_id: str, boto3\_session: Optional[boto3.session.Session] = None*) → Dict[str, Any]

Wait for the query end.

#### Parameters

- **query\_execution\_id** (*str*) – Athena query execution ID.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Dictionary with the get\_query\_execution response.

**Return type** Dict[str, Any]

## Examples

```
>>> import awswrangler as wr
>>> res = wr.athena.wait_query(query_execution_id='query-execution-id')
```

### 1.4.4 AWS Lake Formation

<code>read_sql_query(sql, database[, ...])</code>	Execute PartiQL query on AWS Glue Table (Transaction ID or time travel timestamp).
<code>read_sql_table(table, database[, ...])</code>	Extract all rows from AWS Glue Table (Transaction ID or time travel timestamp).
<code>cancel_transaction(transaction_id[, ...])</code>	Cancel the specified transaction.
<code>commit_transaction(transaction_id[, ...])</code>	Commit the specified transaction.
<code>describe_transaction(transaction_id[, ...])</code>	Return the status of a single transaction.
<code>extend_transaction(transaction_id[, ...])</code>	Indicate to the service that the specified transaction is still active and should not be canceled.
<code>start_transaction([read_only, time_out, ...])</code>	Start a new transaction and returns its transaction ID.
<code>wait_query(query_id[, boto3_session])</code>	Wait for the query to end.

#### awswrangler.lakeformation.read\_sql\_query

`awswrangler.lakeformation.read_sql_query(sql: str, database: str, transaction_id: Optional[str] = None, query_as_of_time: Optional[str] = None, catalog_id: Optional[str] = None, categories: Optional[List[str]] = None, safe: bool = True, map_types: bool = True, use_threads: bool = True, boto3_session: Optional[boto3.session.Session] = None, params: Optional[Dict[str, Any]] = None) → Any`

Execute PartiQL query on AWS Glue Table (Transaction ID or time travel timestamp). Return Pandas DataFrame.

**Note:** ORDER BY operations are not honoured. i.e. `sql="SELECT * FROM my_table ORDER BY my_column"` is NOT valid

**Note:** The database must NOT be explicitly defined in the PartiQL statement. i.e. `sql="SELECT * FROM my_table"` is valid but `sql="SELECT * FROM my_db.my_table"` is NOT valid

**Note:** Pass one of `transaction_id` or `query_as_of_time`, not both.

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

- `catalog_id`
- `database`

Check out the [Global Configurations Tutorial](#) for details.

**Parameters**

- **sql** (*str*) – partiQL query.
- **database** (*str*) – AWS Glue database name
- **transaction\_id** (*str*, *optional*) – The ID of the transaction at which to read the table contents. Cannot be specified alongside `query_as_of_time`
- **query\_as\_of\_time** (*str*, *optional*) – The time as of when to read the table contents. Must be a valid Unix epoch timestamp. Cannot be specified alongside `transaction_id`
- **catalog\_id** (*str*, *optional*) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **categories** (*Optional[List[str]]*, *optional*) – List of columns names that should be returned as `pandas.Categorical`. Recommended for memory restricted environments.
- **safe** (*bool*, *default True*) – For certain data types, a cast is needed in order to store the data in a pandas DataFrame or Series (e.g. timestamps are always stored as nanoseconds in pandas). This option controls whether it is a safe cast or not.
- **map\_types** (*bool*, *default True*) – True to convert pyarrow DataTypes to pandas ExtensionDtypes. It is used to override the default pandas type for conversion of built-in pyarrow types or in absence of `pandas_metadata` in the Table schema.
- **use\_threads** (*bool*) – True to enable concurrent requests, False to disable multiple threads. When enabled, `os.cpu_count()` is used as the max number of threads.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session is used if `boto3_session` receives None.
- **params** (*Dict[str, any]*, *optional*) – Dict of parameters used to format the partiQL query. Only named parameters are supported. The dict must contain the information in the form `{"name": "value"}` and the SQL query must contain `:name`.

**Returns** Pandas DataFrame.

**Return type** `pd.DataFrame`

**Examples**

```
>>> import awswrangler as wr
>>> df = wr.lakeformation.read_sql_query(
...     sql="SELECT * FROM my_table;",
...     database="my_db",
...     catalog_id="111111111111"
... )
```

```
>>> import awswrangler as wr
>>> df = wr.lakeformation.read_sql_query(
...     sql="SELECT * FROM my_table LIMIT 10;",
...     database="my_db",
...     transaction_id=
↪ "1b62811fa3e02c4e5fdbaa642b752030379c4a8a70da1f8732ce6ccca47afdc9"
... )
```

```
>>> import awswrangler as wr
>>> df = wr.lakeformation.read_sql_query(
...     sql="SELECT * FROM my_table WHERE name=:name; AND city=:city;",
...     database="my_db",
...     query_as_of_time="1611142914",
...     params={"name": "'filtered_name'", "city": "'filtered_city'"}
... )
```

### awswrangler.lakeformation.read\_sql\_table

`awswrangler.lakeformation.read_sql_table`(*table*: str, *database*: str, *transaction\_id*: Optional[str] = None, *query\_as\_of\_time*: Optional[str] = None, *catalog\_id*: Optional[str] = None, *categories*: Optional[List[str]] = None, *safe*: bool = True, *map\_types*: bool = True, *use\_threads*: bool = True, *boto3\_session*: Optional[boto3.session.Session] = None) → Any

Extract all rows from AWS Glue Table (Transaction ID or time travel timestamp). Return Pandas DataFrame.

---

**Note:** ORDER BY operations are not honoured. i.e. `sql="SELECT * FROM my_table ORDER BY my_column"` is NOT valid

---

---

**Note:** Pass one of *transaction\_id* or *query\_as\_of\_time*, not both.

---

---

**Note:** This function has arguments which can be configured globally through *wr.config* or environment variables:

- `catalog_id`
- `database`

Check out the [Global Configurations Tutorial](#) for details.

---

#### Parameters

- **table** (str) – AWS Glue table name.
- **database** (str) – AWS Glue database name
- **transaction\_id** (str, optional) – The ID of the transaction at which to read the table contents. Cannot be specified alongside `query_as_of_time`
- **query\_as\_of\_time** (str, optional) – The time as of when to read the table contents. Must be a valid Unix epoch timestamp. Cannot be specified alongside `transaction_id`
- **catalog\_id** (str, optional) – The ID of the Data Catalog from which to retrieve Databases. If none is provided, the AWS account ID is used by default.
- **categories** (Optional[List[str]], optional) – List of columns names that should be returned as `pandas.Categorical`. Recommended for memory restricted environments.

- **safe** (*bool*, *default True*) – For certain data types, a cast is needed in order to store the data in a pandas DataFrame or Series (e.g. timestamps are always stored as nanoseconds in pandas). This option controls whether it is a safe cast or not.
- **map\_types** (*bool*, *default True*) – True to convert pyarrow DataTypes to pandas ExtensionDtypes. It is used to override the default pandas type for conversion of built-in pyarrow types or in absence of pandas\_metadata in the Table schema.
- **use\_threads** (*bool*) – True to enable concurrent requests, False to disable multiple threads. When enabled, `os.cpu_count()` is used as the max number of threads.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session is used if `boto3_session` receives None.

**Returns** Pandas DataFrame.

**Return type** `pd.DataFrame`

### Examples

```
>>> import awswrangler as wr
>>> df = wr.lakeformation.read_sql_table(
...     table="my_table",
...     database="my_db",
...     catalog_id="111111111111",
... )
```

```
>>> import awswrangler as wr
>>> df = wr.lakeformation.read_sql_table(
...     table="my_table",
...     database="my_db",
...     transaction_id=
↳ "1b62811fa3e02c4e5fdbaa642b752030379c4a8a70da1f8732ce6ccca47afdc9",
... )
```

```
>>> import awswrangler as wr
>>> df = wr.lakeformation.read_sql_table(
...     table="my_table",
...     database="my_db",
...     query_as_of_time="1611142914",
...     use_threads=True,
... )
```

### `awswrangler.lakeformation.cancel_transaction`

`awswrangler.lakeformation.cancel_transaction(transaction_id: str, boto3_session: Optional[boto3.session.Session] = None) → None`

Cancel the specified transaction. Returns exception if the transaction was previously committed.

#### Parameters

- **transaction\_id** (*str*) – The ID of the transaction.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` received None.

**Returns** None.

**Return type** None

### Examples

```
>>> import awswrangler as wr
>>> wr.lakeformation.cancel_transaction(transaction_id="...")
```

## awswrangler.lakeformation.commit\_transaction

`awswrangler.lakeformation.commit_transaction(transaction_id: str, boto3_session: Optional[boto3.session.Session] = None) → None`

Commit the specified transaction. Returns exception if the transaction was previously canceled.

### Parameters

- **transaction\_id** (*str*) – The ID of the transaction.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session received None.

**Returns** None.

**Return type** None

### Examples

```
>>> import awswrangler as wr
>>> wr.lakeformation.commit_transaction(transaction_id="...")
```

## awswrangler.lakeformation.describe\_transaction

`awswrangler.lakeformation.describe_transaction(transaction_id: str, boto3_session: Optional[boto3.session.Session] = None) → str`

Return the status of a single transaction.

### Parameters

- **transaction\_id** (*str*) – The ID of the transaction.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session received None.

**Returns** Transaction status (i.e. active|committed|aborted).

**Return type** str



## Examples

```
>>> import awswrangler as wr
>>> status = wr.lakeformation.describe_transaction(transaction_id="...")
```

### awswrangler.lakeformation.extend\_transaction

**awswrangler.lakeformation.extend\_transaction**(*transaction\_id: str, boto3\_session: Optional[boto3.session.Session] = None*) → None

Indicate to the service that the specified transaction is still active and should not be canceled.

#### Parameters

- **transaction\_id** (*str*) – The ID of the transaction.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session received None.

**Returns** None.

**Return type** None

## Examples

```
>>> import awswrangler as wr
>>> wr.lakeformation.extend_transaction(transaction_id="...")
```

### awswrangler.lakeformation.start\_transaction

**awswrangler.lakeformation.start\_transaction**(*read\_only: Optional[bool] = False, time\_out: Optional[float] = inf, boto3\_session: Optional[boto3.session.Session] = None*) → str

Start a new transaction and returns its transaction ID.

The transaction is periodically extended until it's committed, canceled or the defined time-out is reached.

#### Parameters

- **read\_only** (*bool, optional*) – Indicates that that this transaction should be read only. Writes made using a read-only transaction ID will be rejected. Read-only transactions do not need to be committed.
- **time\_out** (*float, optional*) – Maximum duration over which a transaction is extended.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session received None.

**Returns** An opaque identifier for the transaction.

**Return type** str

## Examples

```
>>> import awswrangler as wr
>>> transaction_id = wr.lakeformation.start_transaction(read_only=False)
```

## awswrangler.lakeformation.wait\_query

`awswrangler.lakeformation.wait_query(query_id: str, boto3_session: Optional[boto3.session.Session] = None) → Dict[str, Any]`

Wait for the query to end.

### Parameters

- **query\_id** (*str*) – Lake Formation query execution ID.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session received None.

**Returns** Dictionary with the get\_query\_state response.

**Return type** Dict[str, Any]

## Examples

```
>>> import awswrangler as wr
>>> res = wr.lakeformation.wait_query(query_id='query-id')
```

## 1.4.5 Amazon Redshift

<code>connect([connection, secret_id, catalog_id, ...])</code>	Return a redshift_connector connection from a Glue Catalog or Secret Manager.
<code>connect_temp(cluster_identifier, user[, ...])</code>	Return a redshift_connector temporary connection (No password required).
<code>copy(df, path, con, table, schema[, ...])</code>	Load Pandas DataFrame as a Table on Amazon Redshift using parquet files on S3 as stage.
<code>copy_from_files(path, con, table, schema[, ...])</code>	Load Parquet files from S3 to a Table on Amazon Redshift (Through COPY command).
<code>read_sql_query(sql, con[, index_col, ...])</code>	Return a DataFrame corresponding to the result set of the query string.
<code>read_sql_table(table, con[, schema, ...])</code>	Return a DataFrame corresponding the table.
<code>to_sql(df, con, table, schema[, mode, ...])</code>	Write records stored in a DataFrame into Redshift.
<code>unload(sql, path, con[, iam_role, ...])</code>	Load Pandas DataFrame from a Amazon Redshift query result using Parquet files on s3 as stage.
<code>unload_to_files(sql, path, con[, iam_role, ...])</code>	Unload Parquet files on s3 from a Redshift query result (Through the UNLOAD command).

**awswrangler.redshift.connect**

```
awswrangler.redshift.connect(connection: Optional[str] = None, secret_id: Optional[str] = None,
                             catalog_id: Optional[str] = None, dbname: Optional[str] = None,
                             boto3_session: Optional[boto3.session.Session] = None, ssl: bool = True,
                             timeout: Optional[int] = None, max_prepared_statements: int = 1000,
                             tcp_keepalive: bool = True) → redshift_connector.core.Connection
```

Return a redshift\_connector connection from a Glue Catalog or Secret Manager.

---

**Note:** You MUST pass a *connection* OR *secret\_id*. Here is an example of the secret structure in Secrets Manager: { "host": "my-host.us-east-1.redshift.amazonaws.com", "username": "test", "password": "test", "engine": "redshift", "port": "5439", "dbname": "mydb" }

---

<https://github.com/aws/amazon-redshift-python-driver>

**Parameters**

- **connection** (*Optional[str]*) – Glue Catalog Connection name.
- **secret\_id** (*Optional[str]*) – Specifies the secret containing the connection details that you want to retrieve. You can specify either the Amazon Resource Name (ARN) or the friendly name of the secret.
- **catalog\_id** (*str, optional*) – The ID of the Data Catalog. If none is provided, the AWS account ID is used by default.
- **dbname** (*Optional[str]*) – Optional database name to overwrite the stored one.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.
- **ssl** (*bool*) – This governs SSL encryption for TCP/IP sockets. This parameter is forward to redshift\_connector. <https://github.com/aws/amazon-redshift-python-driver>
- **timeout** (*Optional[int]*) – This is the time in seconds before the connection to the server will time out. The default is None which means no timeout. This parameter is forward to redshift\_connector. <https://github.com/aws/amazon-redshift-python-driver>
- **max\_prepared\_statements** (*int*) – This parameter is forward to redshift\_connector. <https://github.com/aws/amazon-redshift-python-driver>
- **tcp\_keepalive** (*bool*) – If True then use TCP keepalive. The default is True. This parameter is forward to redshift\_connector. <https://github.com/aws/amazon-redshift-python-driver>

**Returns** redshift\_connector connection.

**Return type** redshift\_connector.Connection

## Examples

Fetching Redshift connection from Glue Catalog

```
>>> import awswrangler as wr
>>> con = wr.redshift.connect("MY_GLUE_CONNECTION")
>>> with con.cursor() as cursor:
>>>     cursor.execute("SELECT 1")
>>>     print(cursor.fetchall())
>>> con.close()
```

Fetching Redshift connection from Secrets Manager

```
>>> import awswrangler as wr
>>> con = wr.redshift.connect(secret_id="MY_SECRET")
>>> with con.cursor() as cursor:
>>>     cursor.execute("SELECT 1")
>>>     print(cursor.fetchall())
>>> con.close()
```

## awswrangler.redshift.connect\_temp

`awswrangler.redshift.connect_temp`(*cluster\_identifier: str, user: str, database: Optional[str] = None, duration: int = 900, auto\_create: bool = True, db\_groups: Optional[List[str]] = None, boto3\_session: Optional[boto3.session.Session] = None, ssl: bool = True, timeout: Optional[int] = None, max\_prepared\_statements: int = 1000, tcp\_keepalive: bool = True*) → `redshift_connector.core.Connection`

Return a redshift\_connector temporary connection (No password required).

<https://github.com/aws/amazon-redshift-python-driver>

### Parameters

- **cluster\_identifier** (*str*) – The unique identifier of a cluster. This parameter is case sensitive.
- **user** (*str, optional*) – The name of a database user.
- **database** (*str, optional*) – Database name. If None, the default Database is used.
- **duration** (*int, optional*) – The number of seconds until the returned temporary password expires. Constraint: minimum 900, maximum 3600. Default: 900
- **auto\_create** (*bool*) – Create a database user with the name specified for the user named in user if one does not exist.
- **db\_groups** (*List[str], optional*) – A list of the names of existing database groups that the user named in user will join for the current session, in addition to any group memberships for an existing user. If not specified, a new user is added only to PUBLIC.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.
- **ssl** (*bool*) – This governs SSL encryption for TCP/IP sockets. This parameter is forward to redshift\_connector. <https://github.com/aws/amazon-redshift-python-driver>

- **timeout** (*Optional[int]*) – This is the time in seconds before the connection to the server will time out. The default is None which means no timeout. This parameter is forward to `redshift_connector`. <https://github.com/aws/amazon-redshift-python-driver>
- **max\_prepared\_statements** (*int*) – This parameter is forward to `redshift_connector`. <https://github.com/aws/amazon-redshift-python-driver>
- **tcp\_keepalive** (*bool*) – If True then use TCP keepalive. The default is True. This parameter is forward to `redshift_connector`. <https://github.com/aws/amazon-redshift-python-driver>

**Returns** `redshift_connector` connection.

**Return type** `redshift_connector.Connection`

### Examples

```
>>> import awswrangler as wr
>>> con = wr.redshift.connect_temp(cluster_identifier="my-cluster", user="test")
>>> with con.cursor() as cursor:
>>>     cursor.execute("SELECT 1")
>>>     print(cursor.fetchall())
>>> con.close()
```

### awswrangler.redshift.copy

`awswrangler.redshift.copy`(*df: pandas.core.frame.DataFrame, path: str, con: redshift\_connector.core.Connection, table: str, schema: str, iam\_role: Optional[str] = None, aws\_access\_key\_id: Optional[str] = None, aws\_secret\_access\_key: Optional[str] = None, aws\_session\_token: Optional[str] = None, index: bool = False, dtype: Optional[Dict[str, str]] = None, mode: str = 'append', overwrite\_method: str = 'drop', diststyle: str = 'AUTO', distkey: Optional[str] = None, sortstyle: str = 'COMPOUND', sortkey: Optional[List[str]] = None, primary\_keys: Optional[List[str]] = None, varchar\_lengths\_default: int = 256, varchar\_lengths: Optional[Dict[str, int]] = None, serialize\_to\_json: bool = False, keep\_files: bool = False, use\_threads: Union[bool, int] = True, lock: bool = False, sql\_copy\_extra\_params: Optional[List[str]] = None, boto3\_session: Optional[boto3.session.Session] = None, s3\_additional\_kwargs: Optional[Dict[str, str]] = None, max\_rows\_by\_file: Optional[int] = 10000000) → None*

Load Pandas DataFrame as a Table on Amazon Redshift using parquet files on S3 as stage.

This is a **HIGH** latency and **HIGH** throughput alternative to `wr.redshift.to_sql()` to load large DataFrames into Amazon Redshift through the **\*\* SQL COPY command\*\***.

This strategy has more overhead and requires more IAM privileges than the regular `wr.redshift.to_sql()` function, so it is only recommended to inserting +1K rows at once.

[https://docs.aws.amazon.com/redshift/latest/dg/r\\_COPY.html](https://docs.aws.amazon.com/redshift/latest/dg/r_COPY.html)

**Note:** If the table does not exist yet, it will be automatically created for you using the Parquet metadata to infer the columns data types.

---

**Note:** In case of `use_threads=True` the number of threads that will be spawned will be gotten from `os.cpu_count()`.

---

### Parameters

- **df** (*pandas.DataFrame*) – Pandas DataFrame.
- **path** (*str*) – S3 path to write stage files (e.g. `s3://bucket_name/any_name/`). Note: This path must be empty.
- **con** (*redshift\_connector.Connection*) – Use `redshift_connector.connect()` to use "credentials directly or `wr.redshift.connect()` to fetch it from the Glue Catalog.
- **table** (*str*) – Table name
- **schema** (*str*) – Schema name
- **iam\_role** (*str, optional*) – AWS IAM role with the related permissions.
- **aws\_access\_key\_id** (*str, optional*) – The access key for your AWS account.
- **aws\_secret\_access\_key** (*str, optional*) – The secret key for your AWS account.
- **aws\_session\_token** (*str, optional*) – The session key for your AWS account. This is only needed when you are using temporary credentials.
- **index** (*bool*) – True to store the DataFrame index in file, otherwise False to ignore it.
- **dtype** (*Dict[str, str], optional*) – Dictionary of columns names and Athena/Glue types to be casted. Useful when you have columns with undetermined or mixed data types. Only takes effect if `dataset=True`. (e.g. `{'col name': 'bigint', 'col2 name': 'int'}`)
- **mode** (*str*) – Append, overwrite or upsert.
- **overwrite\_method** (*str*) – Drop, cascade, truncate, or delete. Only applicable in overwrite mode.  
 "drop" - DROP ... RESTRICT - drops the table. Fails if there are any views that depend on it.  
 "cascade" - DROP ... CASCADE - drops the table, and all views that depend on it. "truncate"  
 - TRUNCATE ... - truncates the table, but immediatly commits current transaction & starts a new one, hence the overwrite happens in two transactions and is not atomic. "delete" - DELETE FROM ... - deletes all rows from the table. Slow relative to the other methods.
- **diststyle** (*str*) – Redshift distribution styles. Must be in ["AUTO", "EVEN", "ALL", "KEY"]. [https://docs.aws.amazon.com/redshift/latest/dg/t\\_Distributing\\_data.html](https://docs.aws.amazon.com/redshift/latest/dg/t_Distributing_data.html)
- **distkey** (*str, optional*) – Specifies a column name or positional number for the distribution key.
- **sortstyle** (*str*) – Sorting can be "COMPOUND" or "INTERLEAVED". [https://docs.aws.amazon.com/redshift/latest/dg/t\\_Sorting\\_data.html](https://docs.aws.amazon.com/redshift/latest/dg/t_Sorting_data.html)
- **sortkey** (*List[str], optional*) – List of columns to be sorted.
- **primary\_keys** (*List[str], optional*) – Primary keys.
- **varchar\_lengths\_default** (*int*) – The size that will be set for all VARCHAR columns not specified with `varchar_lengths`.
- **varchar\_lengths** (*Dict[str, int], optional*) – Dict of VARCHAR length by columns. (e.g. `{'col1': 10, 'col5': 200}`).
- **keep\_files** (*bool*) – Should keep stage files?

- **use\_threads** (*bool*, *int*) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` will be used as the max number of threads. If integer is provided, specified number is used.
- **lock** (*bool*) – True to execute LOCK command inside the transaction to force serializable isolation.
- **sql\_copy\_extra\_params** (*Optional[List[str]]*) – Additional copy parameters to pass to the command. For example: ["STATUPDATE ON"]
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.
- **s3\_additional\_kwargs** – Forwarded to botocore requests. e.g. `s3_additional_kwargs={'ServerSideEncryption': 'aws:kms', 'SSEKMSKeyId': 'YOUR_KMS_KEY_ARN'}`
- **max\_rows\_by\_file** (*int*) – Max number of rows in each file. Default is None i.e. dont split the files. (e.g. 33554432, 268435456)

**Returns** None.

**Return type** None

### Examples

```
>>> import awswrangler as wr
>>> import pandas as pd
>>> con = wr.redshift.connect("MY_GLUE_CONNECTION")
>>> wr.redshift.copy(
...     df=pd.DataFrame({'col': [1, 2, 3]}),
...     path="s3://bucket/my_parquet_files/",
...     con=con,
...     table="my_table",
...     schema="public",
...     iam_role="arn:aws:iam::XXX:role/XXX"
... )
>>> con.close()
```

**awswrangler.redshift.copy\_from\_files**

```
awswrangler.redshift.copy_from_files(path: str, con: redshift_connector.core.Connection, table: str,
                                     schema: str, iam_role: Optional[str] = None, aws_access_key_id:
                                     Optional[str] = None, aws_secret_access_key: Optional[str] =
                                     None, aws_session_token: Optional[str] = None,
                                     parquet_infer_sampling: float = 1.0, mode: str = 'append',
                                     overwrite_method: str = 'drop', diststyle: str = 'AUTO', distkey:
                                     Optional[str] = None, sortstyle: str = 'COMPOUND', sortkey:
                                     Optional[List[str]] = None, primary_keys: Optional[List[str]] =
                                     None, varchar_lengths_default: int = 256, varchar_lengths:
                                     Optional[Dict[str, int]] = None, serialize_to_json: bool = False,
                                     path_suffix: Optional[str] = None, path_ignore_suffix: Optional[str]
                                     = None, use_threads: Union[bool, int] = True, lock: bool = False,
                                     commit_transaction: bool = True, manifest: Optional[bool] = False,
                                     sql_copy_extra_params: Optional[List[str]] = None, boto3_session:
                                     Optional[boto3.session.Session] = None, s3_additional_kwargs:
                                     Optional[Dict[str, str]] = None) → None
```

Load Parquet files from S3 to a Table on Amazon Redshift (Through COPY command).

[https://docs.aws.amazon.com/redshift/latest/dg/r\\_COPY.html](https://docs.aws.amazon.com/redshift/latest/dg/r_COPY.html)

---

**Note:** If the table does not exist yet, it will be automatically created for you using the Parquet metadata to infer the columns data types.

---



---

**Note:** In case of `use_threads=True` the number of threads that will be spawned will be gotten from `os.cpu_count()`.

---

**Parameters**

- **path** (*str*) – S3 prefix (e.g. `s3://bucket/prefix/`)
- **con** (*redshift\_connector.Connection*) – Use `redshift_connector.connect()` to use ”credentials directly or `wr.redshift.connect()` to fetch it from the Glue Catalog.
- **table** (*str*) – Table name
- **schema** (*str*) – Schema name
- **iam\_role** (*str*, *optional*) – AWS IAM role with the related permissions.
- **aws\_access\_key\_id** (*str*, *optional*) – The access key for your AWS account.
- **aws\_secret\_access\_key** (*str*, *optional*) – The secret key for your AWS account.
- **aws\_session\_token** (*str*, *optional*) – The session key for your AWS account. This is only needed when you are using temporary credentials.
- **parquet\_infer\_sampling** (*float*) – Random sample ratio of files that will have the meta-data inspected. Must be  $0.0 < sampling \leq 1.0$ . The higher, the more accurate. The lower, the faster.
- **mode** (*str*) – Append, overwrite or upsert.
- **overwrite\_method** (*str*) – Drop, cascade, truncate, or delete. Only applicable in overwrite mode.



- ”drop” - DROP ... RESTRICT - drops the table. Fails if there are any views that depend on it.  
 “cascade” - DROP ... CASCADE - drops the table, and all views that depend on it. “truncate”  
 - TRUNCATE ... - truncates the table, but immediately commits current transaction & starts  
 a new one, hence the overwrite happens in two transactions and is not atomic. “delete” -  
 DELETE FROM ... - deletes all rows from the table. Slow relative to the other methods.
- **diststyle** (*str*) – Redshift distribution styles. Must be in [“AUTO”, “EVEN”, “ALL”, “KEY”]. [https://docs.aws.amazon.com/redshift/latest/dg/t\\_Distributing\\_data.html](https://docs.aws.amazon.com/redshift/latest/dg/t_Distributing_data.html)
  - **distkey** (*str*, *optional*) – Specifies a column name or positional number for the distribution key.
  - **sortstyle** (*str*) – Sorting can be “COMPOUND” or “INTERLEAVED”. [https://docs.aws.amazon.com/redshift/latest/dg/t\\_Sorting\\_data.html](https://docs.aws.amazon.com/redshift/latest/dg/t_Sorting_data.html)
  - **sortkey** (*List[str]*, *optional*) – List of columns to be sorted.
  - **primary\_keys** (*List[str]*, *optional*) – Primary keys.
  - **varchar\_lengths\_default** (*int*) – The size that will be set for all VARCHAR columns not specified with `varchar_lengths`.
  - **varchar\_lengths** (*Dict[str, int]*, *optional*) – Dict of VARCHAR length by columns. (e.g. {“col1”: 10, “col5”: 200}).
  - **serialize\_to\_json** (*bool*) – Should Wrangler add SERIALIZETOJSON parameter into the COPY command? SERIALIZETOJSON is necessary to load nested data [https://docs.aws.amazon.com/redshift/latest/dg/ingest-super.html#copy\\_json](https://docs.aws.amazon.com/redshift/latest/dg/ingest-super.html#copy_json)
  - **path\_suffix** (*Union[str, List[str], None]*) – Suffix or List of suffixes to be scanned on s3 for the schema extraction (e.g. [“.gz.parquet”, “.snappy.parquet”]). Only has effect during the table creation. If None, will try to read all files. (default)
  - **path\_ignore\_suffix** (*Union[str, List[str], None]*) – Suffix or List of suffixes for S3 keys to be ignored during the schema extraction. (e.g. [“.csv”, “\_SUCCESS”]). Only has effect during the table creation. If None, will try to read all files. (default)
  - **use\_threads** (*bool*, *int*) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` will be used as the max number of threads. If integer is provided, specified number is used.
  - **lock** (*bool*) – True to execute LOCK command inside the transaction to force serializable isolation.
  - **commit\_transaction** (*bool*) – Whether to commit the transaction. True by default.
  - **manifest** (*bool*) – If set to true path argument accepts a S3 uri to a manifest file.
  - **sql\_copy\_extra\_params** (*Optional[List[str]]*) – Additional copy parameters to pass to the command. For example: [“STATUPDATE ON”]
  - **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.
  - **s3\_additional\_kwargs** – Forwarded to botocore requests. e.g.  
`s3_additional_kwargs={ ‘ServerSideEncryption’: ‘aws:kms’, ‘SSEKMSKeyId’: ‘YOUR_KMS_KEY_ARN’ }`

**Returns** None.

**Return type** None

## Examples

```
>>> import awswrangler as wr
>>> con = wr.redshift.connect("MY_GLUE_CONNECTION")
>>> wr.redshift.copy_from_files(
...     path="s3://bucket/my_parquet_files/",
...     con=con,
...     table="my_table",
...     schema="public",
...     iam_role="arn:aws:iam::XXX:role/XXX"
... )
>>> con.close()
```

## awswrangler.redshift.read\_sql\_query

**awswrangler.redshift.read\_sql\_query**(*sql: str, con: redshift\_connector.core.Connection, index\_col: Optional[Union[str, List[str]]] = None, params: Optional[Union[List[Any], Tuple[Any, ...], Dict[Any, Any]]] = None, chunksize: Optional[int] = None, dtype: Optional[Dict[str, pyarrow.lib.DataType]] = None, safe: bool = True, timestamp\_as\_object: bool = False) → Union[pandas.core.frame.DataFrame, Iterator[pandas.core.frame.DataFrame]]*

Return a DataFrame corresponding to the result set of the query string.

---

**Note:** For large extractions (1K+ rows) consider the function **wr.redshift.unload()**.

---

### Parameters

- **sql** (*str*) – SQL query.
- **con** (*redshift\_connector.Connection*) – Use `redshift_connector.connect()` to use “credentials directly or `wr.redshift.connect()` to fetch it from the Glue Catalog.
- **index\_col** (*Union[str, List[str]], optional*) – Column(s) to set as index(MultiIndex).
- **params** (*Union[List, Tuple, Dict], optional*) – List of parameters to pass to execute method. The syntax used to pass parameters is database driver dependent. Check your database driver documentation for which of the five syntax styles, described in PEP 249’s paramstyle, is supported.
- **chunksize** (*int, optional*) – If specified, return an iterator where chunksize is the number of rows to include in each chunk.
- **dtype** (*Dict[str, pyarrow.DataType], optional*) – Specifying the datatype for columns. The keys should be the column names and the values should be the PyArrow types.
- **safe** (*bool*) – Check for overflows or other unsafe data type conversions.
- **timestamp\_as\_object** (*bool*) – Cast non-nanosecond timestamps (`np.datetime64`) to objects.

**Returns** Result as Pandas DataFrame(s).

**Return type** Union[pandas.DataFrame, Iterator[pandas.DataFrame]]

## Examples

Reading from Redshift using a Glue Catalog Connections

```
>>> import awswrangler as wr
>>> con = wr.redshift.connect("MY_GLUE_CONNECTION")
>>> df = wr.redshift.read_sql_query(
...     sql="SELECT * FROM public.my_table",
...     con=con
... )
>>> con.close()
```

## awswrangler.redshift.read\_sql\_table

**awswrangler.redshift.read\_sql\_table**(*table: str, con: redshift\_connector.core.Connection, schema: Optional[str] = None, index\_col: Optional[Union[str, List[str]]] = None, params: Optional[Union[List[Any], Tuple[Any, ...], Dict[Any, Any]]] = None, chunksize: Optional[int] = None, dtype: Optional[Dict[str, pyarrow.lib.DataType]] = None, safe: bool = True, timestamp\_as\_object: bool = False) → Union[pandas.core.frame.DataFrame, Iterator[pandas.core.frame.DataFrame]]*

Return a DataFrame corresponding the table.

---

**Note:** For large extractions (1K+ rows) consider the function **wr.redshift.unload()**.

---

### Parameters

- **table** (*str*) – Table name.
- **con** (*redshift\_connector.Connection*) – Use `redshift_connector.connect()` to use "credentials directly or `wr.redshift.connect()` to fetch it from the Glue Catalog.
- **schema** (*str, optional*) – Name of SQL schema in database to query (if database flavor supports this). Uses default schema if None (default).
- **index\_col** (*Union[str, List[str]], optional*) – Column(s) to set as index(MultiIndex).
- **params** (*Union[List, Tuple, Dict], optional*) – List of parameters to pass to execute method. The syntax used to pass parameters is database driver dependent. Check your database driver documentation for which of the five syntax styles, described in PEP 249's paramstyle, is supported.
- **chunksize** (*int, optional*) – If specified, return an iterator where chunksize is the number of rows to include in each chunk.
- **dtype** (*Dict[str, pyarrow.DataType], optional*) – Specifying the datatype for columns. The keys should be the column names and the values should be the PyArrow types.
- **safe** (*bool*) – Check for overflows or other unsafe data type conversions.

- **timestamp\_as\_object** (*bool*) – Cast non-nanosecond timestamps (*np.datetime64*) to objects.

**Returns** Result as Pandas *DataFrame*(s).

**Return type** *Union*[*pandas.DataFrame*, *Iterator*[*pandas.DataFrame*]]

## Examples

Reading from Redshift using a Glue Catalog Connections

```
>>> import awswrangler as wr
>>> con = wr.redshift.connect("MY_GLUE_CONNECTION")
>>> df = wr.redshift.read_sql_table(
...     table="my_table",
...     schema="public",
...     con=con
... )
>>> con.close()
```

## awswrangler.redshift.to\_sql

*awswrangler.redshift.to\_sql(df: pandas.core.frame.DataFrame, con: redshift\_connector.core.Connection, table: str, schema: str, mode: str = 'append', overwrite\_method: str = 'drop', index: bool = False, dtype: Optional[Dict[str, str]] = None, diststyle: str = 'AUTO', distkey: Optional[str] = None, sortstyle: str = 'COMPOUND', sortkey: Optional[List[str]] = None, primary\_keys: Optional[List[str]] = None, varchar\_lengths\_default: int = 256, varchar\_lengths: Optional[Dict[str, int]] = None, use\_column\_names: bool = False, lock: bool = False, chunksize: int = 200, commit\_transaction: bool = True) → Any*

Write records stored in a *DataFrame* into Redshift.

---

**Note:** For large *DataFrames* (1K+ rows) consider the function **wr.redshift.copy()**.

---

**Note:** This function has arguments which can be configured globally through *wr.config* or environment variables:

- *chunksize*

Check out the [Global Configurations Tutorial](#) for details.

---

### Parameters

- **df** (*pandas.DataFrame*) – Pandas *DataFrame* <https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.html>
- **con** (*redshift\_connector.Connection*) – Use *redshift\_connector.connect()* to use “credentials directly or *wr.redshift.connect()* to fetch it from the Glue Catalog.
- **table** (*str*) – Table name
- **schema** (*str*) – Schema name

- **mode** (*str*) – Append, overwrite or upsert.
- **overwrite\_method** (*str*) – Drop, cascade, truncate, or delete. Only applicable in overwrite mode.  
 ”drop” - DROP ... RESTRICT - drops the table. Fails if there are any views that depend on it.  
 “cascade” - DROP ... CASCADE - drops the table, and all views that depend on it. “truncate” - TRUNCATE ... - truncates the table, but immediatly commits current transaction & starts a new one, hence the overwrite happens in two transactions and is not atomic. “delete” - DELETE FROM ... - deletes all rows from the table. Slow relative to the other methods.
- **index** (*bool*) – True to store the DataFrame index as a column in the table, otherwise False to ignore it.
- **dtype** (*Dict[str, str], optional*) – Dictionary of columns names and Redshift types to be casted. Useful when you have columns with undetermined or mixed data types. (e.g. {'col name': 'VARCHAR(10)', 'col2 name': 'FLOAT'}) *diststyle* : *str* Redshift distribution styles. Must be in ["AUTO", "EVEN", "ALL", "KEY"]. [https://docs.aws.amazon.com/redshift/latest/dg/t\\_Distributing\\_data.html](https://docs.aws.amazon.com/redshift/latest/dg/t_Distributing_data.html)
- **distkey** (*str, optional*) – Specifies a column name or positional number for the distribution key.
- **sortstyle** (*str*) – Sorting can be “COMPOUND” or “INTERLEAVED”. [https://docs.aws.amazon.com/redshift/latest/dg/t\\_Sorting\\_data.html](https://docs.aws.amazon.com/redshift/latest/dg/t_Sorting_data.html)
- **sortkey** (*List[str], optional*) – List of columns to be sorted.
- **primary\_keys** (*List[str], optional*) – Primary keys.
- **varchar\_lengths\_default** (*int*) – The size that will be set for all VARCHAR columns not specified with *varchar\_lengths*.
- **varchar\_lengths** (*Dict[str, int], optional*) – Dict of VARCHAR length by columns. (e.g. {"col1": 10, "col5": 200}).
- **use\_column\_names** (*bool*) – If set to True, will use the column names of the DataFrame for generating the INSERT SQL Query. E.g. If the DataFrame has two columns *col1* and *col3* and *use\_column\_names* is True, data will only be inserted into the database columns *col1* and *col3*.
- **lock** (*bool*) – True to execute LOCK command inside the transaction to force serializable isolation.
- **chunksize** (*int*) – Number of rows which are inserted with each SQL query. Defaults to inserting 200 rows per query.
- **commit\_transaction** (*bool*) – Whether to commit the transaction. True by default.

**Returns** None.

**Return type** None

## Examples

Writing to Redshift using a Glue Catalog Connections

```
>>> import awswrangler as wr
>>> con = wr.redshift.connect("MY_GLUE_CONNECTION")
>>> wr.redshift.to_sql(
...     df=df,
...     table="my_table",
...     schema="public",
...     con=con
... )
>>> con.close()
```

## awswrangler.redshift.unload

`awswrangler.redshift.unload(sql: str, path: str, con: redshift_connector.core.Connection, iam_role: Optional[str] = None, aws_access_key_id: Optional[str] = None, aws_secret_access_key: Optional[str] = None, aws_session_token: Optional[str] = None, region: Optional[str] = None, max_file_size: Optional[float] = None, kms_key_id: Optional[str] = None, categories: Optional[List[str]] = None, chunked: Union[bool, int] = False, keep_files: bool = False, use_threads: Union[bool, int] = True, boto3_session: Optional[boto3.session.Session] = None, s3_additional_kwargs: Optional[Dict[str, str]] = None) → Union[pandas.core.frame.DataFrame, Iterator[pandas.core.frame.DataFrame]]`

Load Pandas DataFrame from a Amazon Redshift query result using Parquet files on s3 as stage.

This is a **HIGH** latency and **HIGH** throughput alternative to `wr.redshift.read_sql_query()/wr.redshift.read_sql_table()` to extract large Amazon Redshift data into a Pandas DataFrames through the **UNLOAD command**.

This strategy has more overhead and requires more IAM privileges than the regular `wr.redshift.read_sql_query()/wr.redshift.read_sql_table()` function, so it is only recommended to fetch 1k+ rows at once.

[https://docs.aws.amazon.com/redshift/latest/dg/r\\_UNLOAD.html](https://docs.aws.amazon.com/redshift/latest/dg/r_UNLOAD.html)

---

**Note:** *Batching* (*chunked* argument) (Memory Friendly):

Will enable the function to return an Iterable of DataFrames instead of a regular DataFrame.

There are two batching strategies on Wrangler:

- If **chunked=True**, a new DataFrame will be returned for each file in your path/dataset.
- If **chunked=INTEGER**, Wrangler will iterate on the data by number of rows (equal to the received **INTEGER**).

*P.S. chunked=True* is faster and uses less memory while *chunked=INTEGER* is more precise in the number of rows for each Dataframe.

---

**Note:** In case of *use\_threads=True* the number of threads that will be spawned will be gotten from `os.cpu_count()`.

---

**Parameters**

- **sql** (*str*) – SQL query.
- **path** (*Union[str, List[str]]*) – S3 path to write stage files (e.g. `s3://bucket_name/any_name/`)
- **con** (*redshift\_connector.Connection*) – Use `redshift_connector.connect()` to use ”credentials directly or `wr.redshift.connect()` to fetch it from the Glue Catalog.
- **iam\_role** (*str, optional*) – AWS IAM role with the related permissions.
- **aws\_access\_key\_id** (*str, optional*) – The access key for your AWS account.
- **aws\_secret\_access\_key** (*str, optional*) – The secret key for your AWS account.
- **aws\_session\_token** (*str, optional*) – The session key for your AWS account. This is only needed when you are using temporary credentials.
- **region** (*str, optional*) – Specifies the AWS Region where the target Amazon S3 bucket is located. REGION is required for UNLOAD to an Amazon S3 bucket that isn’t in the same AWS Region as the Amazon Redshift cluster. By default, UNLOAD assumes that the target Amazon S3 bucket is located in the same AWS Region as the Amazon Redshift cluster.
- **max\_file\_size** (*float, optional*) – Specifies the maximum size (MB) of files that UNLOAD creates in Amazon S3. Specify a decimal value between 5.0 MB and 6200.0 MB. If None, the default maximum file size is 6200.0 MB.
- **kms\_key\_id** (*str, optional*) – Specifies the key ID for an AWS Key Management Service (AWS KMS) key to be used to encrypt data files on Amazon S3.
- **categories** (*List[str], optional*) – List of columns names that should be returned as `pandas.Categorical`. Recommended for memory restricted environments.
- **keep\_files** (*bool*) – Should keep stage files?
- **chunked** (*Union[int, bool]*) – If passed will split the data in a Iterable of DataFrames (Memory friendly). If *True* wrangler will iterate on the data by files in the most efficient way without guarantee of chunksize. If an *INTEGER* is passed Wrangler will iterate on the data by number of rows igual the received *INTEGER*.
- **use\_threads** (*bool, int*) – True to enable concurrent requests, False to disable multiple threads. If enabled `os.cpu_count()` will be used as the max number of threads. If integer is provided, specified number is used.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.
- **s3\_additional\_kwargs** – Forward to botocore requests, only “SSECustomerAlgorithm” and “SSECustomerKey” arguments will be considered.

**Returns** Result as Pandas DataFrame(s).

**Return type** `Union[pandas.DataFrame, Iterator[pandas.DataFrame]]`

## Examples

```
>>> import awswrangler as wr
>>> con = wr.redshift.connect("MY_GLUE_CONNECTION")
>>> df = wr.redshift.unload(
...     sql="SELECT * FROM public.mytable",
...     path="s3://bucket/extracted_parquet_files/",
...     con=con,
...     iam_role="arn:aws:iam::XXX:role/XXX"
... )
>>> con.close()
```

## awswrangler.redshift.unload\_to\_files

`awswrangler.redshift.unload_to_files(sql: str, path: str, con: redshift_connector.core.Connection, iam_role: Optional[str] = None, aws_access_key_id: Optional[str] = None, aws_secret_access_key: Optional[str] = None, aws_session_token: Optional[str] = None, region: Optional[str] = None, unload_format: Optional[str] = None, max_file_size: Optional[float] = None, kms_key_id: Optional[str] = None, manifest: bool = False, partition_cols: Optional[List[str]] = None, boto3_session: Optional[boto3.session.Session] = None) → None`

Unload Parquet files on s3 from a Redshift query result (Through the UNLOAD command).

[https://docs.aws.amazon.com/redshift/latest/dg/r\\_UNLOAD.html](https://docs.aws.amazon.com/redshift/latest/dg/r_UNLOAD.html)

---

**Note:** In case of `use_threads=True` the number of threads that will be spawned will be gotten from `os.cpu_count()`.

---

### Parameters

- **sql** (*str*) – SQL query.
- **path** (*Union[str, List[str]]*) – S3 path to write stage files (e.g. `s3://bucket_name/any_name/`)
- **con** (*redshift\_connector.Connection*) – Use `redshift_connector.connect()` to use “credentials directly or `wr.redshift.connect()` to fetch it from the Glue Catalog.
- **iam\_role** (*str, optional*) – AWS IAM role with the related permissions.
- **aws\_access\_key\_id** (*str, optional*) – The access key for your AWS account.
- **aws\_secret\_access\_key** (*str, optional*) – The secret key for your AWS account.
- **aws\_session\_token** (*str, optional*) – The session key for your AWS account. This is only needed when you are using temporary credentials.
- **region** (*str, optional*) – Specifies the AWS Region where the target Amazon S3 bucket is located. REGION is required for UNLOAD to an Amazon S3 bucket that isn’t in the same AWS Region as the Amazon Redshift cluster. By default, UNLOAD assumes that the target Amazon S3 bucket is located in the same AWS Region as the Amazon Redshift cluster.
- **unload\_format** (*str, optional*) – Format of the unloaded S3 objects from the query. Valid values: “CSV”, “PARQUET”. Case sensitive. Defaults to PARQUET.



- **max\_file\_size** (*float, optional*) – Specifies the maximum size (MB) of files that UNLOAD creates in Amazon S3. Specify a decimal value between 5.0 MB and 6200.0 MB. If None, the default maximum file size is 6200.0 MB.
- **kms\_key\_id** (*str, optional*) – Specifies the key ID for an AWS Key Management Service (AWS KMS) key to be used to encrypt data files on Amazon S3.
- **manifest** (*bool*) – Unload a manifest file on S3.
- **partition\_cols** (*List[str], optional*) – Specifies the partition keys for the unload operation.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Return type** None

### Examples

```
>>> import awswrangler as wr
>>> con = wr.redshift.connect("MY_GLUE_CONNECTION")
>>> wr.redshift.unload_to_files(
...     sql="SELECT * FROM public.mytable",
...     path="s3://bucket/extracted_parquet_files/",
...     con=con,
...     iam_role="arn:aws:iam::XXX:role/XXX"
... )
>>> con.close()
```

## 1.4.6 PostgreSQL

<code>connect([connection, secret_id, catalog_id, ...])</code>	Return a pg8000 connection from a Glue Catalog Connection.
<code>read_sql_query(sql, con[, index_col, ...])</code>	Return a DataFrame corresponding to the result set of the query string.
<code>read_sql_table(table, con[, schema, ...])</code>	Return a DataFrame corresponding the table.
<code>to_sql(df, con, table, schema[, mode, ...])</code>	Write records stored in a DataFrame into PostgreSQL.

### awswrangler.postgresql.connect

`awswrangler.postgresql.connect(connection: Optional[str] = None, secret_id: Optional[str] = None, catalog_id: Optional[str] = None, dbname: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None, ssl_context: Optional[Union[bool, ssl.SSLContext]] = None, timeout: Optional[int] = None, tcp_keepalive: bool = True) → pg8000.legacy.Connection`

Return a pg8000 connection from a Glue Catalog Connection.

<https://github.com/tlocke/pg8000>

**Note:** You MUST pass a *connection* OR *secret\_id*. Here is an example of the secret structure in Secrets Manager: { "host": "postgresql-instance-wrangler.dr8vkeyrb9m1.us-east-1.rds.amazonaws.com", "username": "test",

---

```
“password”: “test”, “engine”: “postgresql”, “port”: “3306”, “dbname”: “mydb” # Optional }
```

---

### Parameters

- **connection** (*Optional[str]*) – Glue Catalog Connection name.
- **secret\_id** (*Optional[str]*) – Specifies the secret containing the connection details that you want to retrieve. You can specify either the Amazon Resource Name (ARN) or the friendly name of the secret.
- **catalog\_id** (*str, optional*) – The ID of the Data Catalog. If none is provided, the AWS account ID is used by default.
- **dbname** (*Optional[str]*) – Optional database name to overwrite the stored one.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.
- **ssl\_context** (*Optional[Union[bool, SSLContext]]*) – This governs SSL encryption for TCP/IP sockets. This parameter is forward to pg8000. <https://github.com/tlocke/pg8000#functions>
- **timeout** (*Optional[int]*) – This is the time in seconds before the connection to the server will time out. The default is None which means no timeout. This parameter is forward to pg8000. <https://github.com/tlocke/pg8000#functions>
- **tcp\_keepalive** (*bool*) – If True then use TCP keepalive. The default is True. This parameter is forward to pg8000. <https://github.com/tlocke/pg8000#functions>

**Returns** pg8000 connection.

**Return type** pg8000.Connection

### Examples

```
>>> import awswrangler as wr
>>> con = wr.postgresql.connect("MY_GLUE_CONNECTION")
>>> with con.cursor() as cursor:
>>>     cursor.execute("SELECT 1")
>>>     print(cursor.fetchall())
>>> con.close()
```

### awswrangler.postgresql.read\_sql\_query

```
awswrangler.postgresql.read_sql_query(sql: str, con: pg8000.legacy.Connection, index_col:
    Optional[Union[str, List[str]]] = None, params:
    Optional[Union[List[Any], Tuple[Any, ...], Dict[Any, Any]]] =
    None, chunksize: Optional[int] = None, dtype: Optional[Dict[str,
    pyarrow.lib.DataType]] = None, safe: bool = True,
    timestamp_as_object: bool = False) →
    Union[pandas.core.frame.DataFrame,
    Iterator[pandas.core.frame.DataFrame]]
```

Return a DataFrame corresponding to the result set of the query string.

### Parameters

- **sql** (*str*) – SQL query.
- **con** (*pg8000.Connection*) – Use `pg8000.connect()` to use credentials directly or `wr.postgresql.connect()` to fetch it from the Glue Catalog.
- **index\_col** (*Union[str, List[str]], optional*) – Column(s) to set as index(`MultiIndex`).
- **params** (*Union[List, Tuple, Dict], optional*) – List of parameters to pass to execute method. The syntax used to pass parameters is database driver dependent. Check your database driver documentation for which of the five syntax styles, described in PEP 249's paramstyle, is supported.
- **chunksize** (*int, optional*) – If specified, return an iterator where chunksize is the number of rows to include in each chunk.
- **dtype** (*Dict[str, pyarrow.DataType], optional*) – Specifying the datatype for columns. The keys should be the column names and the values should be the PyArrow types.
- **safe** (*bool*) – Check for overflows or other unsafe data type conversions.
- **timestamp\_as\_object** (*bool*) – Cast non-nanosecond timestamps (`np.datetime64`) to objects.

**Returns** Result as Pandas DataFrame(s).

**Return type** `Union[pandas.DataFrame, Iterator[pandas.DataFrame]]`

## Examples

Reading from PostgreSQL using a Glue Catalog Connections

```
>>> import awswrangler as wr
>>> con = wr.postgresql.connect("MY_GLUE_CONNECTION")
>>> df = wr.postgresql.read_sql_query(
...     sql="SELECT * FROM public.my_table",
...     con=con
... )
>>> con.close()
```

## awswrangler.postgresql.read\_sql\_table

`awswrangler.postgresql.read_sql_table`(*table: str, con: pg8000.legacy.Connection, schema: Optional[str] = None, index\_col: Optional[Union[str, List[str]]] = None, params: Optional[Union[List[Any], Tuple[Any, ...], Dict[Any, Any]]] = None, chunksize: Optional[int] = None, dtype: Optional[Dict[str, pyarrow.lib.DataType]] = None, safe: bool = True, timestamp\_as\_object: bool = False) → `Union[pandas.core.frame.DataFrame, Iterator[pandas.core.frame.DataFrame]]`*

Return a DataFrame corresponding the table.

### Parameters

- **table** (*str*) – Table name.

- **con** (*pg8000.Connection*) – Use `pg8000.connect()` to use credentials directly or `wr.postgresql.connect()` to fetch it from the Glue Catalog.
- **schema** (*str, optional*) – Name of SQL schema in database to query (if database flavor supports this). Uses default schema if None (default).
- **index\_col** (*Union[str, List[str]], optional*) – Column(s) to set as index(*MultiIndex*).
- **params** (*Union[List, Tuple, Dict], optional*) – List of parameters to pass to execute method. The syntax used to pass parameters is database driver dependent. Check your database driver documentation for which of the five syntax styles, described in PEP 249's *paramstyle*, is supported.
- **chunksize** (*int, optional*) – If specified, return an iterator where *chunksize* is the number of rows to include in each chunk.
- **dtype** (*Dict[str, pyarrow.DataType], optional*) – Specifying the datatype for columns. The keys should be the column names and the values should be the PyArrow types.
- **safe** (*bool*) – Check for overflows or other unsafe data type conversions.
- **timestamp\_as\_object** (*bool*) – Cast non-nanosecond timestamps (*np.datetime64*) to objects.

**Returns** Result as Pandas *DataFrame*(s).

**Return type** *Union[pandas.DataFrame, Iterator[pandas.DataFrame]]*

## Examples

Reading from PostgreSQL using a Glue Catalog Connections

```
>>> import awswrangler as wr
>>> con = wr.postgresql.connect("MY_GLUE_CONNECTION")
>>> df = wr.postgresql.read_sql_table(
...     table="my_table",
...     schema="public",
...     con=con
... )
>>> con.close()
```

## awswrangler.postgresql.to\_sql

`awswrangler.postgresql.to_sql(df: pandas.core.frame.DataFrame, con: pg8000.legacy.Connection, table: str, schema: str, mode: str = 'append', index: bool = False, dtype: Optional[Dict[str, str]] = None, varchar_lengths: Optional[Dict[str, int]] = None, use_column_names: bool = False, chunksize: int = 200, upsert_conflict_columns: Optional[List[str]] = None, insert_conflict_columns: Optional[List[str]] = None) → Any`

Write records stored in a *DataFrame* into PostgreSQL.

**Note:** This function has arguments which can be configured globally through *wr.config* or environment variables:

- `chunksize`

Check out the [Global Configurations Tutorial](#) for details.

### Parameters

- **df** (*pandas.DataFrame*) – Pandas DataFrame <https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.html>
- **con** (*pg8000.Connection*) – Use `pg8000.connect()` to use credentials directly or `wr.postgresql.connect()` to fetch it from the Glue Catalog.
- **table** (*str*) – Table name
- **schema** (*str*) – Schema name
- **mode** (*str*) –  
**Append, overwrite or upsert.** `append`: Inserts new records into table. `overwrite`: Drops table and recreates. `upsert`: Perform an upsert which checks for conflicts on columns given by `upsert_conflict_columns` and sets the new values on conflicts. Note that `upsert_conflict_columns` is required for this mode.
- **index** (*bool*) – True to store the DataFrame index as a column in the table, otherwise False to ignore it.
- **dtype** (*Dict[str, str], optional*) – Dictionary of columns names and PostgreSQL types to be casted. Useful when you have columns with undetermined or mixed data types. (e.g. `{'col name': 'TEXT', 'col2 name': 'FLOAT'}`)
- **varchar\_lengths** (*Dict[str, int], optional*) – Dict of VARCHAR length by columns. (e.g. `{'col1': 10, 'col5': 200}`).
- **use\_column\_names** (*bool*) – If set to True, will use the column names of the DataFrame for generating the INSERT SQL Query. E.g. If the DataFrame has two columns `col1` and `col3` and `use_column_names` is True, data will only be inserted into the database columns `col1` and `col3`.
- **chunksize** (*int*) – Number of rows which are inserted with each SQL query. Defaults to inserting 200 rows per query.
- **upsert\_conflict\_columns** (*List[str], optional*) – This parameter is only supported if `mode` is set top `upsert`. In this case conflicts for the given columns are checked for evaluating the upsert.
- **insert\_conflict\_columns** (*List[str], optional*) – This parameter is only supported if `mode` is set top `append`. In this case conflicts for the given columns are checked for evaluating the insert `'ON CONFLICT DO NOTHING'`.

**Returns** None.

**Return type** None

## Examples

Writing to PostgreSQL using a Glue Catalog Connections

```
>>> import awswrangler as wr
>>> con = wr.postgresql.connect("MY_GLUE_CONNECTION")
>>> wr.postgresql.to_sql(
...     df=df,
...     table="my_table",
...     schema="public",
...     con=con
... )
>>> con.close()
```

### 1.4.7 MySQL

<code>connect([connection, secret_id, catalog_id, ...])</code>	Return a pymysql connection from a Glue Catalog Connection or Secrets Manager.
<code>read_sql_query(sql, con[, index_col, ...])</code>	Return a DataFrame corresponding to the result set of the query string.
<code>read_sql_table(table, con[, schema, ...])</code>	Return a DataFrame corresponding the table.
<code>to_sql(df, con, table, schema[, mode, ...])</code>	Write records stored in a DataFrame into MySQL.

#### awswrangler.mysql.connect

`awswrangler.mysql.connect(connection: typing.Optional[str] = None, secret_id: typing.Optional[str] = None, catalog_id: typing.Optional[str] = None, dbname: typing.Optional[str] = None, boto3_session: typing.Optional[boto3.session.Session] = None, read_timeout: typing.Optional[int] = None, write_timeout: typing.Optional[int] = None, connect_timeout: int = 10, cursorclass: typing.Type[pymysql.cursors.Cursor] = <class 'pymysql.cursors.Cursor'>) → pymysql.connections.Connection[Any]`

Return a pymysql connection from a Glue Catalog Connection or Secrets Manager.

<https://pymysql.readthedocs.io>

**Note:** You MUST pass a *connection* OR *secret\_id*. Here is an example of the secret structure in Secrets Manager: { "host": "mysql-instance-wrangler.dr8vkeyrb9m1.us-east-1.rds.amazonaws.com", "username": "test", "password": "test", "engine": "mysql", "port": "3306", "dbname": "mydb" # Optional }

**Note:** It is only possible to configure SSL using Glue Catalog Connection. More at: <https://docs.aws.amazon.com/glue/latest/dg/connection-defining.html>

#### Parameters

- **connection** (*str*) – Glue Catalog Connection name.
- **secret\_id** (*Optional[str]*) – Specifies the secret containing the connection details that you want to retrieve. You can specify either the Amazon Resource Name (ARN) or the friendly name of the secret.

- **catalog\_id** (*str*, *optional*) – The ID of the Data Catalog. If none is provided, the AWS account ID is used by default.
- **dbname** (*Optional[str]*) – Optional database name to overwrite the stored one.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.
- **read\_timeout** (*Optional[int]*) – The timeout for reading from the connection in seconds (default: None - no timeout). This parameter is forward to pymysql. <https://pymysql.readthedocs.io/en/latest/modules/connections.html>
- **write\_timeout** (*Optional[int]*) – The timeout for writing to the connection in seconds (default: None - no timeout) This parameter is forward to pymysql. <https://pymysql.readthedocs.io/en/latest/modules/connections.html>
- **connect\_timeout** (*int*) – Timeout before throwing an exception when connecting. (default: 10, min: 1, max: 31536000) This parameter is forward to pymysql. <https://pymysql.readthedocs.io/en/latest/modules/connections.html>
- **cursorclass** (*Cursor*) – Cursor class to use, e.g. SSCursor; defaults to pymysql.cursors.Cursor <https://pymysql.readthedocs.io/en/latest/modules/cursors.html>

**Returns** pymysql connection.

**Return type** pymysql.connections.Connection

## Examples

```
>>> import awswrangler as wr
>>> con = wr.mysql.connect("MY_GLUE_CONNECTION")
>>> with con.cursor() as cursor:
>>>     cursor.execute("SELECT 1")
>>>     print(cursor.fetchall())
>>> con.close()
```

## awswrangler.mysql.read\_sql\_query

**awswrangler.mysql.read\_sql\_query** (*sql: str*, *con: pymysql.connections.Connection[Any]*, *index\_col: Optional[Union[str, List[str]]] = None*, *params: Optional[Union[List[Any], Tuple[Any, ...], Dict[Any, Any]]] = None*, *chunksize: Optional[int] = None*, *dtype: Optional[Dict[str, pyarrow.lib.DataType]] = None*, *safe: bool = True*, *timestamp\_as\_object: bool = False*) → Union[pandas.core.frame.DataFrame, Iterator[pandas.core.frame.DataFrame]]

Return a DataFrame corresponding to the result set of the query string.

### Parameters

- **sql** (*str*) – SQL query.
- **con** (*pymysql.connections.Connection*) – Use pymysql.connect() to use credentials directly or wr.mysql.connect() to fetch it from the Glue Catalog.
- **index\_col** (*Union[str, List[str]]*, *optional*) – Column(s) to set as index(MultiIndex).

- **params** (*Union[List, Tuple, Dict], optional*) – List of parameters to pass to execute method. The syntax used to pass parameters is database driver dependent. Check your database driver documentation for which of the five syntax styles, described in PEP 249's paramstyle, is supported.
- **chunksize** (*int, optional*) – If specified, return an iterator where chunksize is the number of rows to include in each chunk.
- **dtype** (*Dict[str, pyarrow.DataType], optional*) – Specifying the datatype for columns. The keys should be the column names and the values should be the PyArrow types.
- **safe** (*bool*) – Check for overflows or other unsafe data type conversions.
- **timestamp\_as\_object** (*bool*) – Cast non-nanosecond timestamps (np.datetime64) to objects.

**Returns** Result as Pandas DataFrame(s).

**Return type** Union[pandas.DataFrame, Iterator[pandas.DataFrame]]

## Examples

Reading from MySQL using a Glue Catalog Connections

```
>>> import awswrangler as wr
>>> con = wr.mysql.connect("MY_GLUE_CONNECTION")
>>> df = wr.mysql.read_sql_query(
...     sql="SELECT * FROM test.my_table",
...     con=con
... )
>>> con.close()
```

## awswrangler.mysql.read\_sql\_table

**awswrangler.mysql.read\_sql\_table**(*table: str, con: pymysql.connections.Connection[Any], schema: Optional[str] = None, index\_col: Optional[Union[str, List[str]]] = None, params: Optional[Union[List[Any], Tuple[Any, ...], Dict[Any, Any]]] = None, chunksize: Optional[int] = None, dtype: Optional[Dict[str, pyarrow.lib.DataType]] = None, safe: bool = True, timestamp\_as\_object: bool = False*) → Union[pandas.core.frame.DataFrame, Iterator[pandas.core.frame.DataFrame]]

Return a DataFrame corresponding the table.

### Parameters

- **table** (*str*) – Table name.
- **con** (*pymysql.connections.Connection*) – Use pymysql.connect() to use credentials directly or wr.mysql.connect() to fetch it from the Glue Catalog.
- **schema** (*str, optional*) – Name of SQL schema in database to query. Uses default schema if None.
- **index\_col** (*Union[str, List[str]], optional*) – Column(s) to set as index(MultiIndex).



- **params** (*Union[List, Tuple, Dict], optional*) – List of parameters to pass to execute method. The syntax used to pass parameters is database driver dependent. Check your database driver documentation for which of the five syntax styles, described in PEP 249's paramstyle, is supported.
- **chunksize** (*int, optional*) – If specified, return an iterator where chunksize is the number of rows to include in each chunk.
- **dtype** (*Dict[str, pyarrow.DataType], optional*) – Specifying the datatype for columns. The keys should be the column names and the values should be the PyArrow types.
- **safe** (*bool*) – Check for overflows or other unsafe data type conversions.
- **timestamp\_as\_object** (*bool*) – Cast non-nanosecond timestamps (np.datetime64) to objects.

**Returns** Result as Pandas DataFrame(s).

**Return type** Union[pandas.DataFrame, Iterator[pandas.DataFrame]]

## Examples

Reading from MySQL using a Glue Catalog Connections

```
>>> import awswrangler as wr
>>> con = wr.mysql.connect("MY_GLUE_CONNECTION")
>>> df = wr.mysql.read_sql_table(
...     table="my_table",
...     schema="test",
...     con=con
... )
>>> con.close()
```

## awswrangler.mysql.to\_sql

**awswrangler.mysql.to\_sql**(*df: pandas.core.frame.DataFrame, con: pymysql.connections.Connection[Any], table: str, schema: str, mode: str = 'append', index: bool = False, dtype: typing.Optional[typing.Dict[str, str]] = None, varchar\_lengths: typing.Optional[typing.Dict[str, int]] = None, use\_column\_names: bool = False, chunksize: int = 200, cursorclass: typing.Type[pymysql.cursors.Cursor] = <class 'pymysql.cursors.Cursor'> → Any*

Write records stored in a DataFrame into MySQL.

**Note:** This function has arguments which can be configured globally through *wr.config* or environment variables:

- chunksize

Check out the [Global Configurations Tutorial](#) for details.

### Parameters

- **df** (*pandas.DataFrame*) – Pandas DataFrame <https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.html>

- **con** (*pymysql.connections.Connection*) – Use `pymysql.connect()` to use credentials directly or `wr.mysql.connect()` to fetch it from the Glue Catalog.
- **table** (*str*) – Table name
- **schema** (*str*) – Schema name
- **mode** (*str*) –

**Append, overwrite, upsert\_duplicate\_key, upsert\_replace\_into, upsert\_distinct.**

**append:** Inserts new records into table. **overwrite:** Drops table and recreates. **upsert\_duplicate\_key:** Performs an upsert using *ON DUPLICATE KEY* clause. Requires table schema to have defined keys, otherwise duplicate records will be inserted. **upsert\_replace\_into:** Performs upsert using *REPLACE INTO* clause. Less efficient and still requires the table schema to have keys or else duplicate records will be inserted. **upsert\_distinct:** Inserts new records, including duplicates, then recreates the table and inserts *DISTINCT* records from old table. This is the least efficient approach but handles scenarios where there are no keys on table.

- **index** (*bool*) – True to store the DataFrame index as a column in the table, otherwise False to ignore it.
- **dtype** (*Dict[str, str], optional*) – Dictionary of columns names and MySQL types to be casted. Useful when you have columns with undetermined or mixed data types. (e.g. {'col name': 'TEXT', 'col2 name': 'FLOAT'})
- **varchar\_lengths** (*Dict[str, int], optional*) – Dict of VARCHAR length by columns. (e.g. {"col1": 10, "col5": 200}).
- **use\_column\_names** (*bool*) – If set to True, will use the column names of the DataFrame for generating the INSERT SQL Query. E.g. If the DataFrame has two columns *col1* and *col3* and *use\_column\_names* is True, data will only be inserted into the database columns *col1* and *col3*.
- **chunksize** (*int*) – Number of rows which are inserted with each SQL query. Defaults to inserting 200 rows per query.
- **cursorclass** (*Cursor*) – Cursor class to use, e.g. `SSCursor`; defaults to `pymysql.cursors.Cursor` <https://pymysql.readthedocs.io/en/latest/modules/cursors.html>

**Returns** None.

**Return type** None

## Examples

Writing to MySQL using a Glue Catalog Connections

```
>>> import awswrangler as wr
>>> con = wr.mysql.connect("MY_GLUE_CONNECTION")
>>> wr.mysql.to_sql(
...     df=df,
...     table="my_table",
...     schema="test",
...     con=con
... )
>>> con.close()
```

## Microsoft SQL Server

<code>connect(connection, secret_id, catalog_id, ...)</code>	Return a pyodbc connection from a Glue Catalog Connection.
<code>read_sql_query(sql, con[, index_col, ...])</code>	Return a DataFrame corresponding to the result set of the query string.
<code>read_sql_table(table, con[, schema, ...])</code>	Return a DataFrame corresponding the table.
<code>to_sql(df, con, table, schema[, mode, ...])</code>	Write records stored in a DataFrame into Microsoft SQL Server.

## aws wrangler.sqlserver.connect

`aws wrangler.sqlserver.connect(connection: Optional[str] = None, secret_id: Optional[str] = None, catalog_id: Optional[str] = None, dbname: Optional[str] = None, odbc_driver_version: int = 17, boto3_session: Optional[boto3.session.Session] = None, timeout: Optional[int] = 0) → Any`

Return a pyodbc connection from a Glue Catalog Connection.

<https://github.com/mkleehammer/pyodbc>

**Note:** You MUST pass a *connection* OR *secret\_id*. Here is an example of the secret structure in Secrets Manager: { "host": "sqlserver-instance-wrangler.dr8vkeyrb9m1.us-east-1.rds.amazonaws.com", "username": "test", "password": "test", "engine": "sqlserver", "port": "1433", "dbname": "mydb" # Optional }

### Parameters

- **connection** (*Optional[str]*) – Glue Catalog Connection name.
- **secret\_id** (*Optional[str]*) – Specifies the secret containing the connection details that you want to retrieve. You can specify either the Amazon Resource Name (ARN) or the friendly name of the secret.
- **catalog\_id** (*str, optional*) – The ID of the Data Catalog. If none is provided, the AWS account ID is used by default.
- **dbname** (*Optional[str]*) – Optional database name to overwrite the stored one.
- **odbc\_driver\_version** (*int*) – Major version of the ODBC Driver version that is installed and should be used.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if *boto3\_session* receive None.
- **timeout** (*Optional[int]*) – This is the time in seconds before the connection to the server will time out. The default is None which means no timeout. This parameter is forwarded to pyodbc. <https://github.com/mkleehammer/pyodbc/wiki/The-pyodbc-Module#connect>

**Returns** pyodbc connection.

**Return type** pyodbc.Connection

## Examples

```
>>> import awswrangler as wr
>>> con = wr.sqlserver.connect(connection="MY_GLUE_CONNECTION", odbc_driver_
↳ version=17)
>>> with con.cursor() as cursor:
>>>     cursor.execute("SELECT 1")
>>>     print(cursor.fetchall())
>>> con.close()
```

## awswrangler.sqlserver.read\_sql\_query

`awswrangler.sqlserver.read_sql_query(sql: str, con: pyodbc.Connection, index_col: Optional[Union[str, List[str]]] = None, params: Optional[Union[List[Any], Tuple[Any, ...], Dict[Any, Any]]] = None, chunksize: Optional[int] = None, dtype: Optional[Dict[str, pyarrow.lib.DataType]] = None, safe: bool = True, timestamp_as_object: bool = False) → Any`

Return a DataFrame corresponding to the result set of the query string.

### Parameters

- **sql** (*str*) – SQL query.
- **con** (*pyodbc.Connection*) – Use `pyodbc.connect()` to use credentials directly or `wr.sqlserver.connect()` to fetch it from the Glue Catalog.
- **index\_col** (*Union[str, List[str]]*, *optional*) – Column(s) to set as index(MultiIndex).
- **params** (*Union[List, Tuple, Dict]*, *optional*) – List of parameters to pass to execute method. The syntax used to pass parameters is database driver dependent. Check your database driver documentation for which of the five syntax styles, described in PEP 249's paramstyle, is supported.
- **chunksize** (*int*, *optional*) – If specified, return an iterator where chunksize is the number of rows to include in each chunk.
- **dtype** (*Dict[str, pyarrow.DataType]*, *optional*) – Specifying the datatype for columns. The keys should be the column names and the values should be the PyArrow types.
- **safe** (*bool*) – Check for overflows or other unsafe data type conversions.
- **timestamp\_as\_object** (*bool*) – Cast non-nanosecond timestamps (`np.datetime64`) to objects.

**Returns** Result as Pandas DataFrame(s).

**Return type** `Union[pandas.DataFrame, Iterator[pandas.DataFrame]]`

## Examples

Reading from Microsoft SQL Server using a Glue Catalog Connections

```
>>> import awswrangler as wr
>>> con = wr.sqlserver.connect(connection="MY_GLUE_CONNECTION", odbc_driver_
↳ version=17)
>>> df = wr.sqlserver.read_sql_query(
...     sql="SELECT * FROM dbo.my_table",
...     con=con
... )
>>> con.close()
```

### awswrangler.sqlserver.read\_sql\_table

`awswrangler.sqlserver.read_sql_table`(*table: str, con: pyodbc.Connection, schema: Optional[str] = None, index\_col: Optional[Union[str, List[str]]] = None, params: Optional[Union[List[Any], Tuple[Any, ...], Dict[Any, Any]]] = None, chunksize: Optional[int] = None, dtype: Optional[Dict[str, pyarrow.lib.DataType]] = None, safe: bool = True, timestamp\_as\_object: bool = False*) → Any

Return a DataFrame corresponding the table.

#### Parameters

- **table** (*str*) – Table name.
- **con** (*pyodbc.Connection*) – Use `pyodbc.connect()` to use credentials directly or `wr.sqlserver.connect()` to fetch it from the Glue Catalog.
- **schema** (*str, optional*) – Name of SQL schema in database to query (if database flavor supports this). Uses default schema if None (default).
- **index\_col** (*Union[str, List[str]], optional*) – Column(s) to set as index(MultiIndex).
- **params** (*Union[List, Tuple, Dict], optional*) – List of parameters to pass to execute method. The syntax used to pass parameters is database driver dependent. Check your database driver documentation for which of the five syntax styles, described in PEP 249's paramstyle, is supported.
- **chunksize** (*int, optional*) – If specified, return an iterator where chunksize is the number of rows to include in each chunk.
- **dtype** (*Dict[str, pyarrow.DataType], optional*) – Specifying the datatype for columns. The keys should be the column names and the values should be the PyArrow types.
- **safe** (*bool*) – Check for overflows or other unsafe data type conversions.
- **timestamp\_as\_object** (*bool*) – Cast non-nanosecond timestamps (`np.datetime64`) to objects.

**Returns** Result as Pandas DataFrame(s).

**Return type** Union[pandas.DataFrame, Iterator[pandas.DataFrame]]

## Examples

Reading from Microsoft SQL Server using a Glue Catalog Connections

```
>>> import awswrangler as wr
>>> con = wr.sqlserver.connect(connection="MY_GLUE_CONNECTION", odbc_driver_
↳ version=17)
>>> df = wr.sqlserver.read_sql_table(
...     table="my_table",
...     schema="dbo",
...     con=con
... )
>>> con.close()
```

## awswrangler.sqlserver.to\_sql

`awswrangler.sqlserver.to_sql(df: pandas.core.frame.DataFrame, con: pyodbc.Connection, table: str, schema: str, mode: str = 'append', index: bool = False, dtype: Optional[Dict[str, str]] = None, varchar_lengths: Optional[Dict[str, int]] = None, use_column_names: bool = False, chunksize: int = 200) → Any`

Write records stored in a DataFrame into Microsoft SQL Server.

---

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

- `chunksize`

Check out the [Global Configurations Tutorial](#) for details.

---

### Parameters

- **df** (*pandas.DataFrame*) – Pandas DataFrame <https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.html>
- **con** (*pyodbc.Connection*) – Use `pyodbc.connect()` to use credentials directly or `wr.sqlserver.connect()` to fetch it from the Glue Catalog.
- **table** (*str*) – Table name
- **schema** (*str*) – Schema name
- **mode** (*str*) – Append or overwrite.
- **index** (*bool*) – True to store the DataFrame index as a column in the table, otherwise False to ignore it.
- **dtype** (*Dict[str, str], optional*) – Dictionary of columns names and Microsoft SQL Server types to be casted. Useful when you have columns with undetermined or mixed data types. (e.g. {'col name': 'TEXT', 'col2 name': 'FLOAT'})
- **varchar\_lengths** (*Dict[str, int], optional*) – Dict of VARCHAR length by columns. (e.g. {"col1": 10, "col5": 200}).
- **use\_column\_names** (*bool*) – If set to True, will use the column names of the DataFrame for generating the INSERT SQL Query. E.g. If the DataFrame has two columns `col1` and

`col3` and `use_column_names` is `True`, data will only be inserted into the database columns `col1` and `col3`.

- **chunksize** (*int*) – Number of rows which are inserted with each SQL query. Defaults to inserting 200 rows per query.

**Returns** `None`.

**Return type** `None`

## Examples

Writing to Microsoft SQL Server using a Glue Catalog Connections

```
>>> import awswrangler as wr
>>> con = wr.sqlserver.connect(connection="MY_GLUE_CONNECTION", odbc_driver_
↳ version=17)
>>> wr.sqlserver.to_sql(
...     df=df,
...     table="table",
...     schema="dbo",
...     con=con
... )
>>> con.close()
```

## 1.4.8 Data API Redshift

<code>RedshiftDataApi</code> ( <i>cluster_id</i> , <i>database</i> [, ...])	Provides access to a Redshift cluster via the Data API.
<code>connect</code> ( <i>cluster_id</i> , <i>database</i> [, <i>secret_arn</i> , ...])	Create a Redshift Data API connection.
<code>read_sql_query</code> ( <i>sql</i> , <i>con</i> [, <i>database</i> ])	Run an SQL query on a RedshiftDataApi connection and return the result as a dataframe.

### awswrangler.data\_api.redshift.RedshiftDataApi

```
class awswrangler.data_api.redshift.RedshiftDataApi(cluster_id: str, database: str, secret_arn: str =
    "", db_user: str = "", sleep: float = 0.25, backoff:
    float = 1.5, retries: int = 15, boto3_session:
    Optional[boto3.session.Session] = None)
```

Provides access to a Redshift cluster via the Data API.

#### Parameters

- **cluster\_id** (*str*) – Id for the target Redshift cluster.
- **database** (*str*) – Target database name.
- **secret\_arn** (*str*) – The ARN for the secret to be used for authentication - only required if `db_user` not provided.
- **db\_user** (*str*) – The database user to generate temporary credentials for - only required if `secret_arn` not provided.
- **sleep** (*float*) – Number of seconds to sleep between result fetch attempts - defaults to 0.25.

- **backoff** (*float*) – Factor by which to increase the sleep between result fetch attempts - defaults to 1.5.
- **retries** (*int*) – Maximum number of result fetch attempts - defaults to 15.
- **boto3\_session** (*boto3.Session()*, *optional*) – The boto3 session. If *None*, the default boto3 session is used.

**\_\_init\_\_** (*cluster\_id: str, database: str, secret\_arn: str = "", db\_user: str = "", sleep: float = 0.25, backoff: float = 1.5, retries: int = 15, boto3\_session: Optional[boto3.session.Session] = None*) → *None*

## Methods

---

**\_\_init\_\_** (*cluster\_id, database[, secret\_arn, ...]*)

---

**execute** (*sql[, database]*) Execute SQL statement against a Data API Service.

---

## awswrangler.data\_api.redshift.connect

**awswrangler.data\_api.redshift.connect** (*cluster\_id: str, database: str, secret\_arn: str = "", db\_user: str = "", boto3\_session: Optional[boto3.session.Session] = None, \*\*kwargs: Any*) → *awswrangler.data\_api.redshift.RedshiftDataApi*

Create a Redshift Data API connection.

### Parameters

- **cluster\_id** (*str*) – Id for the target Redshift cluster.
- **database** (*str*) – Target database name.
- **secret\_arn** (*str*) – The ARN for the secret to be used for authentication - only required if *db\_user* not provided.
- **db\_user** (*str*) – The database user to generate temporary credentials for - only required if *secret\_arn* not provided.
- **boto3\_session** (*boto3.Session()*, *optional*) – The boto3 session. If *None*, the default boto3 session is used.
- **\*\*kwargs** – Any additional kwargs are passed to the underlying RedshiftDataApi class.

**Return type** A *RedshiftDataApi* connection instance that can be used with *wr.redshift.data\_api.read\_sql\_query*.

## awswrangler.data\_api.redshift.read\_sql\_query

**awswrangler.data\_api.redshift.read\_sql\_query** (*sql: str, con: awswrangler.data\_api.redshift.RedshiftDataApi, database: Optional[str] = None*) → *pandas.core.frame.DataFrame*

Run an SQL query on a RedshiftDataApi connection and return the result as a dataframe.

### Parameters

- **sql** (*str*) – SQL query to run.



- **con** (*RedshiftDataApi*) – A *RedshiftDataApi* connection instance
- **database** (*str*) – Database to run query on - defaults to the database specified by *con*.

**Return type** A Pandas dataframe containing the query results.

## 1.4.9 Data API RDS

<i>RdsDataApi</i> (resource_arn, database[, ...])	Provides access to the RDS Data API.
<i>connect</i> (resource_arn, database[, ...])	Create a RDS Data API connection.
<i>read_sql_query</i> (sql, con[, database])	Run an SQL query on an <i>RdsDataApi</i> connection and return the result as a dataframe.

### awswrangler.data\_api.rds.RdsDataApi

```
class awswrangler.data_api.rds.RdsDataApi(resource_arn: str, database: str, secret_arn: str = "", sleep:
float = 0.5, backoff: float = 1.0, retries: int = 30,
boto3_session: Optional[boto3.session.Session] = None)
```

Provides access to the RDS Data API.

#### Parameters

- **resource\_arn** (*str*) – ARN for the RDS resource.
- **database** (*str*) – Target database name.
- **secret\_arn** (*str*) – The ARN for the secret to be used for authentication.
- **sleep** (*float*) – Number of seconds to sleep between connection attempts to paused clusters - defaults to 0.5.
- **backoff** (*float*) – Factor by which to increase the sleep between connection attempts to paused clusters - defaults to 1.0.
- **retries** (*int*) – Maximum number of connection attempts to paused clusters - defaults to 10.
- **boto3\_session** (*boto3.Session()*, *optional*) – The boto3 session. If *None*, the default boto3 session is used.

```
__init__(resource_arn: str, database: str, secret_arn: str = "", sleep: float = 0.5, backoff: float = 1.0,
retries: int = 30, boto3_session: Optional[boto3.session.Session] = None) → None
```

#### Methods

<i>__init__</i> (resource_arn, database[, ...])	
<i>execute</i> (sql[, database])	Execute SQL statement against a Data API Service.

**awswrangler.data\_api.rds.connect**

**awswrangler.data\_api.rds.connect**(*resource\_arn: str, database: str, secret\_arn: str = "", boto3\_session: Optional[boto3.session.Session] = None, \*\*kwargs: Any*) → *awswrangler.data\_api.rds.RdsDataApi*

Create a RDS Data API connection.

**Parameters**

- **resource\_arn** (*str*) – ARN for the RDS resource.
- **database** (*str*) – Target database name.
- **secret\_arn** (*str*) – The ARN for the secret to be used for authentication.
- **boto3\_session** (*boto3.Session()*, *optional*) – The boto3 session. If *None*, the default boto3 session is used.
- **\*\*kwargs** – Any additional kwargs are passed to the underlying *RdsDataApi* class.

**Return type** A *RdsDataApi* connection instance that can be used with *wr.rds.data\_api.read\_sql\_query*.

**awswrangler.data\_api.rds.read\_sql\_query**

**awswrangler.data\_api.rds.read\_sql\_query**(*sql: str, con: awswrangler.data\_api.rds.RdsDataApi, database: Optional[str] = None*) → *pandas.core.frame.DataFrame*

Run an SQL query on an *RdsDataApi* connection and return the result as a dataframe.

**Parameters**

- **sql** (*str*) – SQL query to run.
- **con** (*RdsDataApi*) – A *RdsDataApi* connection instance
- **database** (*str*) – Database to run query on - defaults to the database specified by *con*.

**Return type** A Pandas dataframe containing the query results.

**1.4.10 OpenSearch**

<i>connect</i> ( <i>host[, port, boto3_session, region, ...]</i> )	Create a secure connection to the specified Amazon OpenSearch domain.
<i>create_index</i> ( <i>client, index[, doc_type, ...]</i> )	Create an index.
<i>delete_index</i> ( <i>client, index</i> )	Delete an index.
<i>index_csv</i> ( <i>client, path, index[, doc_type, ...]</i> )	Index all documents from a CSV file to OpenSearch index.
<i>index_documents</i> ( <i>client, documents, index[, ...]</i> )	Index all documents to OpenSearch index.
<i>index_df</i> ( <i>client, df, index[, doc_type]</i> )	Index all documents from a DataFrame to OpenSearch index.
<i>index_json</i> ( <i>client, path, index[, doc_type, ...]</i> )	Index all documents from JSON file to OpenSearch index.
<i>search</i> ( <i>client[, index, search_body, ...]</i> )	Return results matching query DSL as pandas dataframe.
<i>search_by_sql</i> ( <i>client, sql_query, **kwargs</i> )	Return results matching SQL query as pandas dataframe.

## awswrangler.opensearch.connect

`awswrangler.opensearch.connect`(*host: str, port: Optional[int] = 443, boto3\_session: Optional[boto3.session.Session] = Session(region\_name=None), region: Optional[str] = None, username: Optional[str] = None, password: Optional[str] = None*) → `opensearchpy.client.OpenSearch`

Create a secure connection to the specified Amazon OpenSearch domain.

---

**Note:** We use `opensearch-py`, an OpenSearch python client.

The username and password are mandatory if the OS Cluster uses [Fine Grained Access Control](#). If fine grained access control is disabled, session access key and secret keys are used.

---

### Parameters

- **host** (*str*) – Amazon OpenSearch domain, for example: `my-test-domain.us-east-1.es.amazonaws.com`.
- **port** (*int*) – OpenSearch Service only accepts connections over port 80 (HTTP) or 443 (HTTPS)
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 Session will be used if `boto3_session` receive `None`.
- **region** – AWS region of the Amazon OS domain. If not provided will be extracted from `boto3_session`.
- **username** – Fine-grained access control username. Mandatory if OS Cluster uses Fine Grained Access Control.
- **password** – Fine-grained access control password. Mandatory if OS Cluster uses Fine Grained Access Control.

**Returns** OpenSearch low-level client. [https://github.com/opensearch-project/opensearch-py/blob/main/opensearchpy/client/\\_\\_init\\_\\_.py](https://github.com/opensearch-project/opensearch-py/blob/main/opensearchpy/client/__init__.py)

**Return type** `opensearchpy.OpenSearch`

## awswrangler.opensearch.create\_index

`awswrangler.opensearch.create_index`(*client: opensearchpy.client.OpenSearch, index: str, doc\_type: Optional[str] = None, settings: Optional[Dict[str, Any]] = None, mappings: Optional[Dict[str, Any]] = None*) → `Dict[str, Any]`

Create an index.

### Parameters

- **client** (*OpenSearch*) – instance of `opensearchpy.OpenSearch` to use.
- **index** (*str*) – Name of the index.
- **doc\_type** (*str*, *optional*) – Name of the document type (for Elasticsearch versions 5.x and earlier).
- **settings** (*Dict[str, Any]*, *optional*) – Index settings <https://opensearch.org/docs/opensearch/rest-api/create-index/#index-settings>
- **mappings** (*Dict[str, Any]*, *optional*) – Index mappings <https://opensearch.org/docs/opensearch/rest-api/create-index/#mappings>

**Returns** OpenSearch rest api response <https://opensearch.org/docs/opensearch/rest-api/create-index/#response>.

**Return type** Dict[str, Any]

### Examples

Creating an index.

```
>>> import awswrangler as wr
>>> client = wr.opensearch.connect(host='DOMAIN-ENDPOINT')
>>> response = wr.opensearch.create_index(
...     client=client,
...     index="sample-index1",
...     mappings={
...         "properties": {
...             "age": { "type" : "integer" }
...         }
...     },
...     settings={
...         "index": {
...             "number_of_shards": 2,
...             "number_of_replicas": 1
...         }
...     }
... )
```

### awswrangler.opensearch.delete\_index

awswrangler.opensearch.delete\_index(client: opensearchpy.client.OpenSearch, index: str) → Dict[str, Any]

Create an index.

#### Parameters

- **client** (*OpenSearch*) – instance of opensearchpy.OpenSearch to use.
- **index** (*str*) – Name of the index.

**Returns** OpenSearch rest api response

**Return type** Dict[str, Any]

### Examples

Creating an index.

```
>>> import awswrangler as wr
>>> client = wr.opensearch.connect(host='DOMAIN-ENDPOINT')
>>> response = wr.opensearch.delete_index(
...     client=client,
...     index="sample-index1"
... )
```

**awswrangler.opensearch.index\_csv**

`awswrangler.opensearch.index_csv(client: opensearchpy.client.OpenSearch, path: str, index: str, doc_type: Optional[str] = None, pandas_kwargs: Optional[Dict[str, Any]] = None, **kwargs: Any) → Dict[str, Any]`

Index all documents from a CSV file to OpenSearch index.

**Parameters**

- **client** (*OpenSearch*) – instance of `opensearchpy.OpenSearch` to use.
- **path** (*str*) – s3 or local path to the CSV file which contains the documents.
- **index** (*str*) – Name of the index.
- **doc\_type** (*str, optional*) – Name of the document type (for Elasticsearch versions 5.x and earlier).
- **pandas\_kwargs** (*Dict[str, Any], optional*) – Dictionary of arguments forwarded to `pandas.read_csv()`. e.g. `pandas_kwargs={'sep': '|', 'na_values': ['null', 'none']}` [https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.read\\_csv.html](https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.read_csv.html) Note: these params values are enforced: `skip_blank_lines=True`
- **\*\*kwargs** – KEYWORD arguments forwarded to `index_documents()` which is used to execute the operation

**Returns** Response payload <https://opensearch.org/docs/opensearch/rest-api/document-apis/bulk/#response>.

**Return type** Dict[str, Any]

**Examples**

Writing contents of CSV file

```
>>> import awswrangler as wr
>>> client = wr.opensearch.connect(host='DOMAIN-ENDPOINT')
>>> wr.opensearch.index_csv(
...     client=client,
...     path='docs.csv',
...     index='sample-index1'
... )
```

Writing contents of CSV file using `pandas_kwargs`

```
>>> import awswrangler as wr
>>> client = wr.opensearch.connect(host='DOMAIN-ENDPOINT')
>>> wr.opensearch.index_csv(
...     client=client,
...     path='docs.csv',
...     index='sample-index1',
...     pandas_kwargs={'sep': '|', 'na_values': ['null', 'none']}
... )
```

**awswrangler.opensearch.index\_documents**

```
awswrangler.opensearch.index_documents(client: opensearchpy.client.OpenSearch, documents:
    Iterable[Mapping[str, Any]], index: str, doc_type: Optional[str]
    = None, keys_to_write: Optional[List[str]] = None, id_keys:
    Optional[List[str]] = None, ignore_status:
    Optional[Union[List[Any], Tuple[Any]]] = None, bulk_size: int =
    1000, chunk_size: Optional[int] = 500, max_chunk_bytes:
    Optional[int] = 104857600, max_retries: Optional[int] = 5,
    initial_backoff: Optional[int] = 2, max_backoff: Optional[int] =
    600, **kwargs: Any) → Dict[str, Any]
```

Index all documents to OpenSearch index.

**Note:** Some of the args are referenced from opensearch-py client library (bulk helpers) <https://opensearch-py.readthedocs.io/en/latest/helpers.html#opensearchpy.helpers.bulk> [https://opensearch-py.readthedocs.io/en/latest/helpers.html#opensearchpy.helpers.streaming\\_bulk](https://opensearch-py.readthedocs.io/en/latest/helpers.html#opensearchpy.helpers.streaming_bulk)

If you receive *Error 429 (Too Many Requests)* / *\_bulk* please to to decrease *bulk\_size* value. Please also consider modifying the cluster size and instance type - Read more here: <https://aws.amazon.com/premiumsupport/knowledge-center/resolve-429-error-es/>

**Parameters**

- **client** (*OpenSearch*) – instance of opensearchpy.OpenSearch to use.
- **documents** (*Iterable[Mapping[str, Any]]*) – List which contains the documents that will be inserted.
- **index** (*str*) – Name of the index.
- **doc\_type** (*str, optional*) – Name of the document type (for Elasticsearch versions 5.x and earlier).
- **keys\_to\_write** (*List[str], optional*) – list of keys to index. If not provided all keys will be indexed
- **id\_keys** (*List[str], optional*) – list of keys that compound document unique id. If not provided will use *\_id* key if exists, otherwise will generate unique identifier for each document.
- **ignore\_status** (*Union[List[Any], Tuple[Any]], optional*) – list of HTTP status codes that you want to ignore (not raising an exception)
- **bulk\_size** (*int,*) – number of docs in each *\_bulk* request (default: 1000)
- **chunk\_size** (*int, optional*) – number of docs in one chunk sent to es (default: 500)
- **max\_chunk\_bytes** (*int, optional*) – the maximum size of the request in bytes (default: 100MB)
- **max\_retries** (*int, optional*) – maximum number of times a document will be retried when 429 is received, set to 0 (default) for no retries on 429 (default: 2)
- **initial\_backoff** (*int, optional*) – number of seconds we should wait before the first retry. Any subsequent retries will be powers of *initial\_backoff\*2\*\*retry\_number* (default: 2)
- **max\_backoff** (*int, optional*) – maximum number of seconds a retry will wait (default: 600)

- **\*\*kwargs** – KEYWORD arguments forwarded to bulk operation `elasticsearch >= 7.10.2` / `opensearch: https://opensearch.org/docs/opensearch/rest-api/document-apis/bulk/#url-parameters` `elasticsearch < 7.10.2: https://opendistro.github.io/for-elasticsearch-docs/docs/elasticsearch/rest-api-reference/#url-parameters`

**Returns** Response payload <https://opensearch.org/docs/opensearch/rest-api/document-apis/bulk/#response>.

**Return type** Dict[str, Any]

## Examples

Writing documents

```
>>> import awswrangler as wr
>>> client = wr.opensearch.connect(host='DOMAIN-ENDPOINT')
>>> wr.opensearch.index_documents(
...     documents=[{'_id': '1', 'value': 'foo'}, {'_id': '2', 'value': 'bar'}],
...     index='sample-index1'
... )
```

## awswrangler.opensearch.index\_df

`awswrangler.opensearch.index_df(client: opensearchpy.client.OpenSearch, df: pandas.core.frame.DataFrame, index: str, doc_type: Optional[str] = None, **kwargs: Any) → Dict[str, Any]`

Index all documents from a DataFrame to OpenSearch index.

### Parameters

- **client** (*OpenSearch*) – instance of `opensearchpy.OpenSearch` to use.
- **df** (*pd.DataFrame*) – Pandas DataFrame <https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.html>
- **index** (*str*) – Name of the index.
- **doc\_type** (*str, optional*) – Name of the document type (for Elasticsearch versions 5.x and earlier).
- **\*\*kwargs** – KEYWORD arguments forwarded to `index_documents()` which is used to execute the operation

**Returns** Response payload <https://opensearch.org/docs/opensearch/rest-api/document-apis/bulk/#response>.

**Return type** Dict[str, Any]

## Examples

Writing rows of DataFrame

```
>>> import awswrangler as wr
>>> import pandas as pd
>>> client = wr.opensearch.connect(host='DOMAIN-ENDPOINT')
>>> wr.opensearch.index_df(
...     client=client,
...     df=pd.DataFrame([{'_id': '1'}, {'_id': '2'}, {'_id': '3'}]),
...     index='sample-index1'
... )
```

## awswrangler.opensearch.index\_json

`awswrangler.opensearch.index_json`(*client*: *opensearchpy.client.OpenSearch*, *path*: *str*, *index*: *str*, *doc\_type*: *Optional[str]* = *None*, *boto3\_session*: *Optional[boto3.session.Session]* = *Session(region\_name=None)*, *json\_path*: *Optional[str]* = *None*, *\*\*kwargs*: *Any*) → *Dict[str, Any]*

Index all documents from JSON file to OpenSearch index.

The JSON file should be in a JSON-Lines text format (newline-delimited JSON) - <https://jsonlines.org/> OR if the is a single large JSON please provide *json\_path*.

### Parameters

- **client** (*OpenSearch*) – instance of *opensearchpy.OpenSearch* to use.
- **path** (*str*) – s3 or local path to the JSON file which contains the documents.
- **index** (*str*) – Name of the index.
- **doc\_type** (*str*, *optional*) – Name of the document type (for Elasticsearch versions 5.x and earlier).
- **json\_path** (*str*, *optional*) – JsonPath expression to specify explicit path to a single name element in a JSON hierarchical data structure. Read more about [JsonPath](#)
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session to be used to access s3 if s3 path is provided. The default boto3 Session will be used if *boto3\_session* receive *None*.
- **\*\*kwargs** – KEYWORD arguments forwarded to *index\_documents()* which is used to execute the operation

**Returns** Response payload <https://opensearch.org/docs/opensearch/rest-api/document-apis/bulk/#response>.

**Return type** *Dict[str, Any]*



## Examples

Writing contents of JSON file

```
>>> import awswrangler as wr
>>> client = wr.opensearch.connect(host='DOMAIN-ENDPOINT')
>>> wr.opensearch.index_json(
...     client=client,
...     path='docs.json',
...     index='sample-index1'
... )
```

## awswrangler.opensearch.search

`awswrangler.opensearch.search`(*client: opensearchpy.client.OpenSearch, index: Optional[str] = '\_all', search\_body: Optional[Dict[str, Any]] = None, doc\_type: Optional[str] = None, is\_scroll: Optional[bool] = False, filter\_path: Optional[Union[str, Collection[str]]] = None, \*\*kwargs: Any*) → `pandas.core.frame.DataFrame`

Return results matching query DSL as pandas dataframe.

### Parameters

- **client** (*OpenSearch*) – instance of `opensearchpy.OpenSearch` to use.
- **index** (*str, optional*) – A comma-separated list of index names to search. use `_all` or empty string to perform the operation on all indices.
- **search\_body** (*Dict[str, Any], optional*) – The search definition using the [Query DSL](#).
- **doc\_type** (*str, optional*) – Name of the document type (for Elasticsearch versions 5.x and earlier).
- **is\_scroll** (*bool, optional*) – Allows to retrieve a large numbers of results from a single search request using [scroll](#) for example, for machine learning jobs. Because scroll search contexts consume a lot of memory, we suggest you don't use the scroll operation for frequent user queries.
- **filter\_path** (*Union[str, Collection[str]], optional*) – Use the `filter_path` parameter to reduce the size of the OpenSearch Service response (default: `['hits.hits._id','hits.hits._source']`)
- **\*\*kwargs** – KEYWORD arguments forwarded to `opensearchpy.OpenSearch.search` and also to `opensearchpy.helpers.scan`  
if `is_scroll=True`

**Returns** Results as Pandas DataFrame

**Return type** Union[pandas.DataFrame, Iterator[pandas.DataFrame]]

## Examples

Searching an index using query DSL

```
>>> import awswrangler as wr
>>> client = wr.opensearch.connect(host='DOMAIN-ENDPOINT')
>>> df = wr.opensearch.search(
...     client=client,
...     index='movies',
...     search_body={
...         "query": {
...             "match": {
...                 "title": "wind"
...             }
...         }
...     }
... )
```

## awswrangler.opensearch.search\_by\_sql

`awswrangler.opensearch.search_by_sql(client: opensearchpy.client.OpenSearch, sql_query: str, **kwargs: Any) → pandas.core.frame.DataFrame`

Return results matching [SQL query](#) as pandas dataframe.

### Parameters

- **client** (*OpenSearch*) – instance of `opensearchpy.OpenSearch` to use.
- **sql\_query** (*str*) – SQL query
- **\*\*kwargs** – KEYWORD arguments forwarded to request url (e.g.: `filter_path`, etc.)

**Returns** Results as Pandas DataFrame

**Return type** `Union[pandas.DataFrame, Iterator[pandas.DataFrame]]`

## Examples

Searching an index using SQL query

```
>>> import awswrangler as wr
>>> client = wr.opensearch.connect(host='DOMAIN-ENDPOINT')
>>> df = wr.opensearch.search_by_sql(
>>>     client=client,
>>>     sql_query='SELECT * FROM my-index LIMIT 50'
>>> )
```

### 1.4.11 Amazon Neptune

<code>connect(host, port[, iam_enabled])</code>	Create a connection to a Neptune cluster.
<code>execute_gremlin(client, query)</code>	Return results of a Gremlin traversal as pandas dataframe.
<code>execute_opencypher(client, query)</code>	Return results of a openCypher traversal as pandas dataframe.
<code>execute_sparql(client, query)</code>	Return results of a SPARQL query as pandas dataframe.
<code>flatten_nested_df(df[, include_prefix, ...])</code>	Flatten the lists and dictionaries of the input data frame.
<code>to_property_graph(client, df[, batch_size, ...])</code>	Write records stored in a DataFrame into Amazon Neptune.
<code>to_rdf_graph(client, df[, batch_size, ...])</code>	Write records stored in a DataFrame into Amazon Neptune.

#### aws wrangler.neptune.connect

`aws wrangler.neptune.connect(host: str, port: int, iam_enabled: bool = False, **kwargs: Any) → aws wrangler.neptune.client.NeptuneClient`

Create a connection to a Neptune cluster.

##### Parameters

- **host** (*str*) – The host endpoint to connect to
- **port** (*int*) – The port endpoint to connect to
- **iam\_enabled** (*bool*, *optional*) – True if IAM is enabled on the cluster. Defaults to False.

**Returns** [description]

**Return type** NeptuneClient

#### aws wrangler.neptune.execute\_gremlin

`aws wrangler.neptune.execute_gremlin(client: aws wrangler.neptune.client.NeptuneClient, query: str) → pandas.core.frame.DataFrame`

Return results of a Gremlin traversal as pandas dataframe.

##### Parameters

- **client** (*neptune.Client*) – instance of the neptune client to use
- **traversal** (*str*) – The gremlin traversal to execute

**Returns** Results as Pandas DataFrame

**Return type** Union[pandas.DataFrame, Iterator[pandas.DataFrame]]

## Examples

Run a Gremlin Query

```
>>> import awswrangler as wr
>>> client = wr.neptune.connect(neptune_endpoint, neptune_port, iam_
↳enabled=False)
>>> df = wr.neptune.execute_gremlin(client, "g.V().limit(1)")
```

## awswrangler.neptune.execute\_opencypher

`awswrangler.neptune.execute_opencypher`(*client*: *awswrangler.neptune.client.NeptuneClient*, *query*: *str*) → *pandas.core.frame.DataFrame*

Return results of a openCypher traversal as pandas dataframe.

### Parameters

- **client** (*NeptuneClient*) – instance of the neptune client to use
- **query** (*str*) – The openCypher query to execute

**Returns** Results as Pandas DataFrame

**Return type** Union[pandas.DataFrame, Iterator[pandas.DataFrame]]

## Examples

Run an openCypher query

```
>>> import awswrangler as wr
>>> client = wr.neptune.connect(neptune_endpoint, neptune_port, iam_enabled=False)
>>> resp = wr.neptune.execute_opencypher(client, "MATCH (n) RETURN n LIMIT 1")
```

## awswrangler.neptune.execute\_sparql

`awswrangler.neptune.execute_sparql`(*client*: *awswrangler.neptune.client.NeptuneClient*, *query*: *str*) → *Any*

Return results of a SPARQL query as pandas dataframe.

### Parameters

- **client** (*NeptuneClient*) – instance of the neptune client to use
- **query** (*str*) – The SPARQL traversal to execute

**Returns** Results as Pandas DataFrame

**Return type** Union[pandas.DataFrame, Iterator[pandas.DataFrame]]

## Examples

Run a SPARQL query

```
>>> import awswrangler as wr
>>> client = wr.neptune.connect(neptune_endpoint, neptune_port, iam_enabled=False)
>>> df = wr.neptune.execute_sparql(client, "PREFIX foaf: <http://xmlns.com/foaf/0.1/>
SELECT ?name
WHERE {
    ?person foaf:name ?name .
```

### awswrangler.neptune.flatten\_nested\_df

`awswrangler.neptune.flatten_nested_df(df: pandas.core.frame.DataFrame, include_prefix: bool = True, separator: str = '_', recursive: bool = True) → pandas.core.frame.DataFrame`

Flatten the lists and dictionaries of the input data frame.

#### Parameters

- **df** (*pd.DataFrame*) – The input data frame
- **include\_prefix** (*bool, optional*) – If True, then it will prefix the new column name with the original column name. Defaults to True.
- **separator** (*str, optional*) – The separator to use between field names when a dictionary is exploded. Defaults to “\_”.
- **recursive** (*bool, optional*) – If True, then this will recurse the fields in the data frame. Defaults to True.

#### Returns `pd.DataFrame`

**Return type** The flattened data frame

### awswrangler.neptune.to\_property\_graph

`awswrangler.neptune.to_property_graph(client: awswrangler.neptune.client.NeptuneClient, df: pandas.core.frame.DataFrame, batch_size: int = 50, use_header_cardinality: bool = True) → bool`

Write records stored in a DataFrame into Amazon Neptune.

If writing to a property graph then DataFrames for vertices and edges must be written separately. DataFrames for vertices must have a `~label` column with the label and a `~id` column for the vertex id. If the `~id` column does not exist, the specified id does not exist, or is empty then a new vertex will be added. If no `~label` column exists an exception will be thrown. DataFrames for edges must have a `~id`, `~label`, `~to`, and `~from` column. If the `~id` column does not exist the specified id does not exist, or is empty then a new edge will be added. If no `~label`, `~to`, or `~from` column exists an exception will be thrown.

If you would like to save data using *single* cardinality then you can postfix (single) to the column header and set `use_header_cardinality=True` (default). e.g. A column named `name(single)` will save the `name` property as single cardinality. You can disable this by setting by setting `use_header_cardinality=False`.

#### Parameters

- **client** (*NeptuneClient*) – instance of the neptune client to use

- **df** (*pandas.DataFrame*) – Pandas DataFrame <https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.html>
- **batch\_size** (*int*) – The number of rows to save at a time. Default 50
- **use\_header\_cardinality** (*bool*) – If True, then the header cardinality will be used to save the data. Default True

**Returns** True if records were written

**Return type** bool

## Examples

Writing to Amazon Neptune

```
>>> import awswrangler as wr
>>> client = wr.neptune.connect(neptune_endpoint, neptune_port, iam_enabled=False)
>>> wr.neptune.gremlin.to_property_graph(
...     df=df
... )
```

## awswrangler.neptune.to\_rdf\_graph

**awswrangler.neptune.to\_rdf\_graph**(*client: awswrangler.neptune.client.NeptuneClient, df: pandas.core.frame.DataFrame, batch\_size: int = 50, subject\_column: str = 's', predicate\_column: str = 'p', object\_column: str = 'o', graph\_column: str = 'g'*) → Any

Write records stored in a DataFrame into Amazon Neptune.

The DataFrame must consist of triples with column names for the subject, predicate, and object specified. If you want to add data into a named graph then you will also need the graph column.

### Parameters

- **(NeptuneClient)** (*client*) – instance of the neptune client to use
- **(pandas.DataFrame)** (*df*) – Pandas DataFrame <https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.html>
- **(str (graph\_column))** – The column name in the dataframe for the subject. Defaults to 's'
- **optional** – The column name in the dataframe for the subject. Defaults to 's'
- **(str** – The column name in the dataframe for the predicate. Defaults to 'p'
- **optional** – The column name in the dataframe for the predicate. Defaults to 'p'
- **(str** – The column name in the dataframe for the object. Defaults to 'o'
- **optional** – The column name in the dataframe for the object. Defaults to 'o'
- **(str** – The column name in the dataframe for the graph if sending across quads. Defaults to 'g'
- **optional** – The column name in the dataframe for the graph if sending across quads. Defaults to 'g'

**Returns** True if records were written

**Return type** bool

## Examples

Writing to Amazon Neptune

```
>>> import awswrangler as wr
>>> client = wr.neptune.connect(neptune_endpoint, neptune_port, iam_enabled=False)
>>> wr.neptune.gremlin.to_rdf_graph(
...     df=df
... )
```

### 1.4.12 DynamoDB

<code>delete_items</code> (items, table_name[, boto3_session])	Delete all items in the specified DynamoDB table.
<code>get_table</code> (table_name[, boto3_session])	Get DynamoDB table object for specified table name.
<code>put_csv</code> (path, table_name[, boto3_session])	Write all items from a CSV file to a DynamoDB.
<code>put_df</code> (df, table_name[, boto3_session])	Write all items from a DataFrame to a DynamoDB.
<code>put_items</code> (items, table_name[, boto3_session])	Insert all items to the specified DynamoDB table.
<code>put_json</code> (path, table_name[, boto3_session])	Write all items from JSON file to a DynamoDB.

#### awswrangler.dynamodb.delete\_items

`awswrangler.dynamodb.delete_items`(items: List[Dict[str, Any]], table\_name: str, boto3\_session: Optional[boto3.session.Session] = None) → Any

Delete all items in the specified DynamoDB table.

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

Check out the [Global Configurations Tutorial](#) for details.

#### Parameters

- **items** (List[Dict[str, Any]]) – List which contains the items that will be deleted.
- **table\_name** (str) – Name of the Amazon DynamoDB table.
- **boto3\_session** (boto3.Session(), optional) – Boto3 Session. The default boto3 Session will be used if boto3\_session receive None.

**Returns** None.

**Return type** None

## Examples

Writing rows of DataFrame

```
>>> import awswrangler as wr
>>> wr.dynamodb.delete_items(
...     items=[{'key': 1}, {'key': 2, 'value': 'Hello'}],
...     table_name='table'
... )
```

## awswrangler.dynamodb.get\_table

`awswrangler.dynamodb.get_table(table_name: str, boto3_session: Optional[boto3.session.Session] = None)`  
→ Any

Get DynamoDB table object for specified table name.

---

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

---

Check out the [Global Configurations Tutorial](#) for details.

### Parameters

- **table\_name** (*str*) – Name of the Amazon DynamoDB table.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 Session will be used if `boto3_session` receive None.

**Returns** `dynamodb_table` – Boto3 `DynamoDB.Table` object. <https://boto3.amazonaws.com/v1/documentation/api/latest/reference/services/dynamodb.html#DynamoDB.Table>

**Return type** `boto3.resources.dynamodb.Table`

## awswrangler.dynamodb.put\_csv

`awswrangler.dynamodb.put_csv(path: Union[str, pathlib.Path], table_name: str, boto3_session: Optional[boto3.session.Session] = None, **pandas_kwargs: Any) → Any`

Write all items from a CSV file to a DynamoDB.

---

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

---

Check out the [Global Configurations Tutorial](#) for details.

### Parameters

- **path** (*Union[str, Path]*) – Path as str or Path object to the CSV file which contains the items.
- **table\_name** (*str*) – Name of the Amazon DynamoDB table.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 Session will be used if `boto3_session` receive None.



- **pandas\_kwargs** – KEYWORD arguments forwarded to `pandas.read_csv()`. You can NOT pass `pandas_kwargs` explicit, just add valid Pandas arguments in the function call and Wrangler will accept it. e.g. `wr.dynamodb.put_csv('items.csv', 'my_table', sep='|', na_values=['null', 'none'], skip_blank_lines=True)` [https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.read\\_csv.html](https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.read_csv.html)

**Returns** None.

**Return type** None

## Examples

Writing contents of CSV file

```
>>> import awswrangler as wr
>>> wr.dynamodb.put_csv(
...     path='items.csv',
...     table_name='table'
... )
```

Writing contents of CSV file using `pandas_kwargs`

```
>>> import awswrangler as wr
>>> wr.dynamodb.put_csv(
...     path='items.csv',
...     table_name='table',
...     sep='|',
...     na_values=['null', 'none']
... )
```

## awswrangler.dynamodb.put\_df

`awswrangler.dynamodb.put_df(df: pandas.core.frame.DataFrame, table_name: str, boto3_session: Optional[boto3.session.Session] = None) → Any`

Write all items from a DataFrame to a DynamoDB.

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

Check out the [Global Configurations Tutorial](#) for details.

### Parameters

- **df** (`pd.DataFrame`) – Pandas DataFrame <https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.html>
- **table\_name** (`str`) – Name of the Amazon DynamoDB table.
- **boto3\_session** (`boto3.Session()`, *optional*) – Boto3 Session. The default boto3 Session will be used if `boto3_session` receive None.

**Returns** None.

**Return type** None

## Examples

Writing rows of DataFrame

```
>>> import awswrangler as wr
>>> import pandas as pd
>>> wr.dynamodb.put_df(
...     df=pd.DataFrame({'key': [1, 2, 3]}),
...     table_name='table'
... )
```

## awswrangler.dynamodb.put\_items

`awswrangler.dynamodb.put_items` (*items: Union[List[Dict[str, Any]], List[Mapping[str, Any]]*, *table\_name: str*, *boto3\_session: Optional[boto3.session.Session] = None*) → Any

Insert all items to the specified DynamoDB table.

---

**Note:** This function has arguments which can be configured globally through *wr.config* or environment variables:

---

Check out the [Global Configurations Tutorial](#) for details.

### Parameters

- **items** (*Union[List[Dict[str, Any]], List[Mapping[str, Any]]*) – List which contains the items that will be inserted.
- **table\_name** (*str*) – Name of the Amazon DynamoDB table.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 Session will be used if *boto3\_session* receive None.

**Returns** None.

**Return type** None

## Examples

Writing items

```
>>> import awswrangler as wr
>>> wr.dynamodb.put_items(
...     items=[{'key': 1}, {'key': 2, 'value': 'Hello'}],
...     table_name='table'
... )
```

**awswrangler.dynamodb.put\_json**

`awswrangler.dynamodb.put_json(path: Union[str, pathlib.Path], table_name: str, boto3_session: Optional[boto3.session.Session] = None) → Any`

Write all items from JSON file to a DynamoDB.

The JSON file can either contain a single item which will be inserted in the DynamoDB or an array of items which all be inserted.

**Note:** This function has arguments which can be configured globally through `wr.config` or environment variables:

Check out the [Global Configurations Tutorial](#) for details.

**Parameters**

- **path** (`Union[str, Path]`) – Path as str or Path object to the JSON file which contains the items.
- **table\_name** (`str`) – Name of the Amazon DynamoDB table.
- **boto3\_session** (`boto3.Session()`, *optional*) – Boto3 Session. The default boto3 Session will be used if boto3\_session receive None.

**Returns** None.

**Return type** None

**Examples**

Writing contents of JSON file

```
>>> import awswrangler as wr
>>> wr.dynamodb.put_json(
...     path='items.json',
...     table_name='table'
... )
```

**1.4.13 Amazon Timestream**

<code>create_database(database[, kms_key_id, ...])</code>	Create a new Timestream database.
<code>create_table(database, table, ...[, tags, ...])</code>	Create a new Timestream database.
<code>delete_database(database[, boto3_session])</code>	Delete a given Timestream database.
<code>delete_table(database, table[, boto3_session])</code>	Delete a given Timestream table.
<code>query(sql[, chunked, pagination_config, ...])</code>	Run a query and retrieve the result as a Pandas DataFrame.
<code>write(df, database, table, time_col, ...[, ...])</code>	Store a Pandas DataFrame into a Amazon Timestream table.

### awswrangler.timestream.create\_database

```
awswrangler.timestream.create_database(database: str, kms_key_id: Optional[str] = None, tags:
                                     Optional[Dict[str, str]] = None, boto3_session:
                                     Optional[boto3.session.Session] = None) → str
```

Create a new Timestream database.

---

**Note:** If the KMS key is not specified, the database will be encrypted with a Timestream managed KMS key located in your account.

---

#### Parameters

- **database** (*str*) – Database name.
- **kms\_key\_id** (*Optional[str]*) – The KMS key for the database. If the KMS key is not specified, the database will be encrypted with a Timestream managed KMS key located in your account.
- **tags** (*Optional[Dict[str, str]]*) – Key/Value dict to put on the database. Tags enable you to categorize databases and/or tables, for example, by purpose, owner, or environment. e.g. {"foo": "boo", "bar": "xoo"}
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 Session will be used if boto3\_session receive None.

**Returns** The Amazon Resource Name that uniquely identifies this database. (ARN)

**Return type** str

#### Examples

Creating a database.

```
>>> import awswrangler as wr
>>> arn = wr.timestream.create_database("MyDatabase")
```

### awswrangler.timestream.create\_table

```
awswrangler.timestream.create_table(database: str, table: str, memory_retention_hours: int,
                                    magnetic_retention_days: int, tags: Optional[Dict[str, str]] = None,
                                    boto3_session: Optional[boto3.session.Session] = None) → str
```

Create a new Timestream database.

---

**Note:** If the KMS key is not specified, the database will be encrypted with a Timestream managed KMS key located in your account.

---

#### Parameters

- **database** (*str*) – Database name.
- **table** (*str*) – Table name.

- **memory\_retention\_hours** (*int*) – The duration for which data must be stored in the memory store.
- **magnetic\_retention\_days** (*int*) – The duration for which data must be stored in the magnetic store.
- **tags** (*Optional[Dict[str, str]]*) – Key/Value dict to put on the table. Tags enable you to categorize databases and/or tables, for example, by purpose, owner, or environment. e.g. {"foo": "boo", "bar": "xoo"}
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 Session will be used if boto3\_session receive None.

**Returns** The Amazon Resource Name that uniquely identifies this database. (ARN)

**Return type** str

## Examples

Creating a table.

```
>>> import awswrangler as wr
>>> arn = wr.timestream.create_table(
...     database="MyDatabase",
...     table="MyTable",
...     memory_retention_hours=3,
...     magnetic_retention_days=7
... )
```

## awswrangler.timestream.delete\_database

`awswrangler.timestream.delete_database(database: str, boto3_session: Optional[boto3.session.Session] = None) → None`

Delete a given Timestream database. This is an irreversible operation.

After a database is deleted, the time series data from its tables cannot be recovered.

All tables in the database must be deleted first, or a `ValidationException` error will be thrown.

Due to the nature of distributed retries, the operation can return either success or a `ResourceNotFoundException`. Clients should consider them equivalent.

### Parameters

- **database** (*str*) – Database name.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 Session will be used if boto3\_session receive None.

**Returns** None.

**Return type** None

## Examples

Deleting a database

```
>>> import awswrangler as wr
>>> arn = wr.timestream.delete_database("MyDatabase")
```

### awswrangler.timestream.delete\_table

`awswrangler.timestream.delete_table(database: str, table: str, boto3_session: Optional[boto3.session.Session] = None) → None`

Delete a given Timestream table.

This is an irreversible operation.

After a Timestream database table is deleted, the time series data stored in the table cannot be recovered.

Due to the nature of distributed retries, the operation can return either success or a `ResourceNotFoundException`. Clients should consider them equivalent.

#### Parameters

- **database** (*str*) – Database name.
- **table** (*str*) – Table name.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 Session will be used if `boto3_session` receive `None`.

**Returns** `None`.

**Return type** `None`

## Examples

Deleting a table

```
>>> import awswrangler as wr
>>> arn = wr.timestream.delete_table("MyDatabase", "MyTable")
```

### awswrangler.timestream.query

`awswrangler.timestream.query(sql: str, chunked: bool = False, pagination_config: Optional[Dict[str, Any]] = None, boto3_session: Optional[boto3.session.Session] = None) → Union[pandas.core.frame.DataFrame, Iterator[pandas.core.frame.DataFrame]]`

Run a query and retrieve the result as a Pandas DataFrame.

#### Parameters

- **sql** (*str*) – SQL query.
- **chunked** (*bool*) – If `True` returns dataframe iterator, and a single dataframe otherwise. `False` by default.
- **pagination\_config** (*Dict[str, Any]*, *optional*) – Pagination configuration dictionary of a form `{ 'MaxItems': 10, 'PageSize': 10, 'StartingToken': '...' }`

- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 Session will be used if boto3\_session receive None.

**Returns** Pandas DataFrame <https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.html>

**Return type** Union[pd.DataFrame, Iterator[pd.DataFrame]]

## Examples

Run a query and return the result as a Pandas DataFrame or an iterable.

```
>>> import awswrangler as wr
>>> df = wr.timestream.query('SELECT * FROM "sampleDB"."sampleTable" ORDER BY time_
↳DESC LIMIT 10')
```

## awswrangler.timestream.write

`awswrangler.timestream.write(df: pandas.core.frame.DataFrame, database: str, table: str, time_col: str, measure_col: Union[str, List[str]], dimensions_cols: List[str], version: int = 1, num_threads: int = 32, boto3_session: Optional[boto3.session.Session] = None) → List[Dict[str, str]]`

Store a Pandas DataFrame into a Amazon Timestream table.

### Parameters

- **df** (*pandas.DataFrame*) – Pandas DataFrame <https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.html>
- **database** (*str*) – Amazon Timestream database name.
- **table** (*str*) – Amazon Timestream table name.
- **time\_col** (*str*) – DataFrame column name to be used as time. MUST be a timestamp column.
- **measure\_col** (*Union[str, List[str]]*) – DataFrame column name(s) to be used as measure.
- **dimensions\_cols** (*List[str]*) – List of DataFrame column names to be used as dimensions.
- **version** (*int*) – Version number used for upserts. Documentation [https://docs.aws.amazon.com/timestream/latest/developerguide/API\\_WriteRecords.html](https://docs.aws.amazon.com/timestream/latest/developerguide/API_WriteRecords.html).
- **num\_threads** (*str*) – Number of thread to be used for concurrent writing.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 Session will be used if boto3\_session receive None.

**Returns** Rejected records.

**Return type** List[Dict[str, str]]

## Examples

Store a Pandas DataFrame into a Amazon Timestream table.

```
>>> import awswrangler as wr
>>> import pandas as pd
>>> df = pd.DataFrame(
>>>     {
>>>         "time": [datetime.now(), datetime.now(), datetime.now()],
>>>         "dim0": ["foo", "boo", "bar"],
>>>         "dim1": [1, 2, 3],
>>>         "measure": [1.0, 1.1, 1.2],
>>>     }
>>> )
>>> rejected_records = wr.timestream.write(
>>>     df=df,
>>>     database="sampleDB",
>>>     table="sampleTable",
>>>     time_col="time",
>>>     measure_col="measure",
>>>     dimensions_cols=["dim0", "dim1"],
>>> )
>>> assert len(rejected_records) == 0
```

### 1.4.14 Amazon EMR

<code>build_spark_step(path[, deploy_mode, ...])</code>	Build the Step structure (dictionary).
<code>build_step(command[, name, ...])</code>	Build the Step structure (dictionary).
<code>create_cluster(subnet_id[, cluster_name, ...])</code>	Create a EMR cluster with instance fleets configuration.
<code>get_cluster_state(cluster_id[, boto3_session])</code>	Get the EMR cluster state.
<code>get_step_state(cluster_id, step_id[, ...])</code>	Get EMR step state.
<code>submit_ecr_credentials_refresh(cluster_id, path)</code>	Update internal ECR credentials.
<code>submit_spark_step(cluster_id, path[, ...])</code>	Submit Spark Step.
<code>submit_step(cluster_id, command[, name, ...])</code>	Submit new job in the EMR Cluster.
<code>submit_steps(cluster_id, steps[, boto3_session])</code>	Submit a list of steps.
<code>terminate_cluster(cluster_id[, boto3_session])</code>	Terminate EMR cluster.

#### awswrangler.emr.build\_spark\_step

`awswrangler.emr.build_spark_step(path: str, deploy_mode: str = 'cluster', docker_image: Optional[str] = None, name: str = 'my-step', action_on_failure: str = 'CONTINUE', region: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → Dict[str, Any]`

Build the Step structure (dictionary).

##### Parameters

- **path** (str) – Script path. (e.g. s3://bucket/app.py)
- **deploy\_mode** (str) – “cluster” | “client”



- **docker\_image**(*str*, *optional*) – e.g. “{ACCOUNT\_ID}.dkr.ecr.{REGION}.amazonaws.com/{IMAGE\_NAME}”
- **name**(*str*, *optional*) – Step name.
- **action\_on\_failure**(*str*) – ‘TERMINATE\_JOB\_FLOW’, ‘TERMINATE\_CLUSTER’, ‘CANCEL\_AND\_WAIT’, ‘CONTINUE’
- **region**(*str*, *optional*) – Region name to not get it from boto3.Session. (e.g. *us-east-1*)
- **boto3\_session**(*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Step structure.

**Return type** Dict[str, Any]

### Examples

```
>>> import awswrangler as wr
>>> step_id = wr.emr.submit_steps(
>>>     cluster_id="cluster-id",
>>>     steps=[
>>>         wr.emr.build_spark_step(path="s3://bucket/app.py")
>>>     ]
>>> )
```

### awswrangler.emr.build\_step

**awswrangler.emr.build\_step**(*command: str*, *name: str* = 'my-step', *action\_on\_failure: str* = 'CONTINUE', *script: bool* = False, *region: Optional[str]* = None, *boto3\_session: Optional[boto3.session.Session]* = None) → Dict[str, Any]

Build the Step structure (dictionary).

#### Parameters

- **command**(*str*) – e.g. ‘echo “Hello!”’ e.g. for script ‘s3://.../script.sh arg1 arg2’
- **name**(*str*, *optional*) – Step name.
- **action\_on\_failure**(*str*) – ‘TERMINATE\_JOB\_FLOW’, ‘TERMINATE\_CLUSTER’, ‘CANCEL\_AND\_WAIT’, ‘CONTINUE’
- **script**(*bool*) – False for raw command or True for script runner. <https://docs.aws.amazon.com/emr/latest/ReleaseGuide/emr-commandrunner.html>
- **region**(*str*, *optional*) – Region name to not get it from boto3.Session. (e.g. *us-east-1*)
- **boto3\_session**(*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Step structure.

**Return type** Dict[str, Any]

## Examples

```
>>> import awswrangler as wr
>>> steps = []
>>> for cmd in ['echo "Hello"', 'ls -la']:
...     steps.append(wr.emr.build_step(name=cmd, command=cmd))
>>> wr.emr.submit_steps(cluster_id="cluster-id", steps=steps)
```

## awswrangler.emr.create\_cluster

`awswrangler.emr.create_cluster`(*subnet\_id*: str, *cluster\_name*: str = 'my-emr-cluster', *logging\_s3\_path*: Optional[str] = None, *emr\_release*: str = 'emr-6.0.0', *emr\_ec2\_role*: str = 'EMR\_EC2\_DefaultRole', *emr\_role*: str = 'EMR\_DefaultRole', *instance\_type\_master*: str = 'r5.xlarge', *instance\_type\_core*: str = 'r5.xlarge', *instance\_type\_task*: str = 'r5.xlarge', *instance\_ebs\_size\_master*: int = 64, *instance\_ebs\_size\_core*: int = 64, *instance\_ebs\_size\_task*: int = 64, *instance\_num\_on\_demand\_master*: int = 1, *instance\_num\_on\_demand\_core*: int = 0, *instance\_num\_on\_demand\_task*: int = 0, *instance\_num\_spot\_master*: int = 0, *instance\_num\_spot\_core*: int = 0, *instance\_num\_spot\_task*: int = 0, *spot\_bid\_percentage\_of\_on\_demand\_master*: int = 100, *spot\_bid\_percentage\_of\_on\_demand\_core*: int = 100, *spot\_bid\_percentage\_of\_on\_demand\_task*: int = 100, *spot\_provisioning\_timeout\_master*: int = 5, *spot\_provisioning\_timeout\_core*: int = 5, *spot\_provisioning\_timeout\_task*: int = 5, *spot\_timeout\_to\_on\_demand\_master*: bool = True, *spot\_timeout\_to\_on\_demand\_core*: bool = True, *spot\_timeout\_to\_on\_demand\_task*: bool = True, *python3*: bool = True, *spark\_glue\_catalog*: bool = True, *hive\_glue\_catalog*: bool = True, *presto\_glue\_catalog*: bool = True, *consistent\_view*: bool = False, *consistent\_view\_retry\_seconds*: int = 10, *consistent\_view\_retry\_count*: int = 5, *consistent\_view\_table\_name*: str = 'EmrFSMetadata', *bootstraps\_paths*: Optional[List[str]] = None, *debugging*: bool = True, *applications*: Optional[List[str]] = None, *visible\_to\_all\_users*: bool = True, *key\_pair\_name*: Optional[str] = None, *security\_group\_master*: Optional[str] = None, *security\_groups\_master\_additional*: Optional[List[str]] = None, *security\_group\_slave*: Optional[str] = None, *security\_groups\_slave\_additional*: Optional[List[str]] = None, *security\_group\_service\_access*: Optional[str] = None, *docker*: bool = False, *extra\_public\_registries*: Optional[List[str]] = None, *spark\_log\_level*: str = 'WARN', *spark\_jars\_path*: Optional[List[str]] = None, *spark\_defaults*: Optional[Dict[str, str]] = None, *spark\_pyarrow*: bool = False, *custom\_classifications*: Optional[List[Dict[str, Any]]] = None, *maximize\_resource\_allocation*: bool = False, *steps*: Optional[List[Dict[str, Any]]] = None, *custom\_ami\_id*: Optional[str] = None, *step\_concurrency\_level*: int = 1, *keep\_cluster\_alive\_when\_no\_steps*: bool = True, *termination\_protected*: bool = False, *tags*: Optional[Dict[str, str]] = None, *boto3\_session*: Optional[boto3.session.Session] = None) → str

Create a EMR cluster with instance fleets configuration.

<https://docs.aws.amazon.com/emr/latest/ManagementGuide/emr-instance-fleet.html>

## Parameters

- **subnet\_id** (*str*) – VPC subnet ID.
- **cluster\_name** (*str*) – Cluster name.
- **logging\_s3\_path** (*str, optional*) – Logging s3 path (e.g. `s3://BUCKET_NAME/DIRECTORY_NAME/`). If None, the default is `s3://aws-logs-{AccountId}-{RegionId}/elasticmapreduce/`
- **emr\_release** (*str*) – EMR release (e.g. `emr-5.28.0`).
- **emr\_ec2\_role** (*str*) – IAM role name.
- **emr\_role** (*str*) – IAM role name.
- **instance\_type\_master** (*str*) – EC2 instance type.
- **instance\_type\_core** (*str*) – EC2 instance type.
- **instance\_type\_task** (*str*) – EC2 instance type.
- **instance\_ebs\_size\_master** (*int*) – Size of EBS in GB.
- **instance\_ebs\_size\_core** (*int*) – Size of EBS in GB.
- **instance\_ebs\_size\_task** (*int*) – Size of EBS in GB.
- **instance\_num\_on\_demand\_master** (*int*) – Number of on demand instances.
- **instance\_num\_on\_demand\_core** (*int*) – Number of on demand instances.
- **instance\_num\_on\_demand\_task** (*int*) – Number of on demand instances.
- **instance\_num\_spot\_master** (*int*) – Number of spot instances.
- **instance\_num\_spot\_core** (*int*) – Number of spot instances.
- **instance\_num\_spot\_task** (*int*) – Number of spot instances.
- **spot\_bid\_percentage\_of\_on\_demand\_master** (*int*) – The bid price, as a percentage of On-Demand price.
- **spot\_bid\_percentage\_of\_on\_demand\_core** (*int*) – The bid price, as a percentage of On-Demand price.
- **spot\_bid\_percentage\_of\_on\_demand\_task** (*int*) – The bid price, as a percentage of On-Demand price.
- **spot\_provisioning\_timeout\_master** (*int*) – The spot provisioning timeout period in minutes. If Spot instances are not provisioned within this time period, the `TimeOutAction` is taken. Minimum value is 5 and maximum value is 1440. The timeout applies only during initial provisioning, when the cluster is first created.
- **spot\_provisioning\_timeout\_core** (*int*) – The spot provisioning timeout period in minutes. If Spot instances are not provisioned within this time period, the `TimeOutAction` is taken. Minimum value is 5 and maximum value is 1440. The timeout applies only during initial provisioning, when the cluster is first created.
- **spot\_provisioning\_timeout\_task** (*int*) – The spot provisioning timeout period in minutes. If Spot instances are not provisioned within this time period, the `TimeOutAction` is taken. Minimum value is 5 and maximum value is 1440. The timeout applies only during initial provisioning, when the cluster is first created.
- **spot\_timeout\_to\_on\_demand\_master** (*bool*) – After a provisioning timeout should the cluster switch to on demand or shutdown?

- **spot\_timeout\_to\_on\_demand\_core** (*bool*) – After a provisioning timeout should the cluster switch to on demand or shutdown?
- **spot\_timeout\_to\_on\_demand\_task** (*bool*) – After a provisioning timeout should the cluster switch to on demand or shutdown?
- **python3** (*bool*) – Python 3 Enabled?
- **spark\_glue\_catalog** (*bool*) – Spark integration with Glue Catalog?
- **hive\_glue\_catalog** (*bool*) – Hive integration with Glue Catalog?
- **presto\_glue\_catalog** (*bool*) – Presto integration with Glue Catalog?
- **consistent\_view** (*bool*) – Consistent view allows EMR clusters to check for list and read-after-write consistency for Amazon S3 objects written by or synced with EMRFS. <https://docs.aws.amazon.com/emr/latest/ManagementGuide/emr-plan-consistent-view.html>
- **consistent\_view\_retry\_seconds** (*int*) – Delay between the tries (seconds).
- **consistent\_view\_retry\_count** (*int*) – Number of tries.
- **consistent\_view\_table\_name** (*str*) – Name of the DynamoDB table to store the consistent view data.
- **bootstraps\_paths** (*List[str], optional*) – Bootstraps paths (e.g. ["s3://BUCKET\_NAME/script.sh"]).
- **debugging** (*bool*) – Debugging enabled?
- **applications** (*List[str], optional*) – List of applications (e.g. ["Hadoop", "Spark", "Ganglia", "Hive"]). If None, ["Spark"] will be considered.
- **visible\_to\_all\_users** (*bool*) – True or False.
- **key\_pair\_name** (*str, optional*) – Key pair name.
- **security\_group\_master** (*str, optional*) – The identifier of the Amazon EC2 security group for the master node.
- **security\_groups\_master\_additional** (*str, optional*) – A list of additional Amazon EC2 security group IDs for the master node.
- **security\_group\_slave** (*str, optional*) – The identifier of the Amazon EC2 security group for the core and task nodes.
- **security\_groups\_slave\_additional** (*str, optional*) – A list of additional Amazon EC2 security group IDs for the core and task nodes.
- **security\_group\_service\_access** (*str, optional*) – The identifier of the Amazon EC2 security group for the Amazon EMR service to access clusters in VPC private subnets.
- **docker** (*bool*) – Enable Docker Hub and ECR registries access.
- **extra\_public\_registries** (*List[str], optional*) – Additional docker registries.
- **spark\_log\_level** (*str*) – log4j.rootCategory log level (ALL, DEBUG, INFO, WARN, ERROR, FATAL, OFF, TRACE).
- **spark\_jars\_path** (*List[str], optional*) – spark.jars e.g. ["s3://.../foo.jar, s3://.../boo.jar"] <https://spark.apache.org/docs/latest/configuration.html>
- **spark\_defaults** (*Dict[str, str], optional*) – <https://docs.aws.amazon.com/emr/latest/ReleaseGuide/emr-spark-configure.html#spark-defaults>

- **spark\_pyarrow** (*bool*) – Enable PySpark to use PyArrow behind the scenes. P.S. You must install pyarrow by your self via bootstrap
- **custom\_classifications** (*List[Dict[str, Any]], optional*) – Extra classifications.
- **maximize\_resource\_allocation** (*bool*) – Configure your executors to utilize the maximum resources possible <https://docs.aws.amazon.com/emr/latest/ReleaseGuide/emr-spark-configure.html#emr-spark-maximizeresourceallocation>
- **custom\_ami\_id** (*Optional[str]*) – The custom AMI ID to use for the provisioned instance group
- **steps** (*List[Dict[str, Any]], optional*) – Steps definitions (Obs : str Use EMR.build\_step() to build it)
- **keep\_cluster\_alive\_when\_no\_steps** (*bool*) – Specifies whether the cluster should remain available after completing all steps
- **termination\_protected** (*bool*) – Specifies whether the Amazon EC2 instances in the cluster are protected from termination by API calls, user intervention, or in the event of a job-flow error.
- **tags** (*Dict[str, str], optional*) – Key/Value collection to put on the Cluster. e.g. {"foo": "boo", "bar": "xoo"}
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Cluster ID.

**Return type** str

## Examples

Minimal Example

```
>>> import awswrangler as wr
>>> cluster_id = wr.emr.create_cluster("SUBNET_ID")
```

Minimal Example With Custom Classification

```
>>> import awswrangler as wr
>>> cluster_id = wr.emr.create_cluster(
>>>     subnet_id="SUBNET_ID",
>>>     custom_classifications=[
>>>         {
>>>             "Classification": "livy-conf",
>>>             "Properties": {
>>>                 "livy.spark.master": "yarn",
>>>                 "livy.spark.deploy-mode": "cluster",
>>>                 "livy.server.session.timeout": "16h",
>>>             },
>>>         },
>>>     ],
>>> )
```

Full Example

```

>>> import awswrangler as wr
>>> cluster_id = wr.emr.create_cluster(
...     cluster_name="wrangler_cluster",
...     logging_s3_path=f"s3://BUCKET_NAME/emr-logs/",
...     emr_release="emr-5.28.0",
...     subnet_id="SUBNET_ID",
...     emr_ec2_role="EMR_EC2_DefaultRole",
...     emr_role="EMR_DefaultRole",
...     instance_type_master="m5.xlarge",
...     instance_type_core="m5.xlarge",
...     instance_type_task="m5.xlarge",
...     instance_ebs_size_master=50,
...     instance_ebs_size_core=50,
...     instance_ebs_size_task=50,
...     instance_num_on_demand_master=1,
...     instance_num_on_demand_core=1,
...     instance_num_on_demand_task=1,
...     instance_num_spot_master=0,
...     instance_num_spot_core=1,
...     instance_num_spot_task=1,
...     spot_bid_percentage_of_on_demand_master=100,
...     spot_bid_percentage_of_on_demand_core=100,
...     spot_bid_percentage_of_on_demand_task=100,
...     spot_provisioning_timeout_master=5,
...     spot_provisioning_timeout_core=5,
...     spot_provisioning_timeout_task=5,
...     spot_timeout_to_on_demand_master=True,
...     spot_timeout_to_on_demand_core=True,
...     spot_timeout_to_on_demand_task=True,
...     python3=True,
...     spark_glue_catalog=True,
...     hive_glue_catalog=True,
...     presto_glue_catalog=True,
...     bootstraps_paths=None,
...     debugging=True,
...     applications=["Hadoop", "Spark", "Ganglia", "Hive"],
...     visible_to_all_users=True,
...     key_pair_name=None,
...     spark_jars_path=[f"s3://...jar"],
...     maximize_resource_allocation=True,
...     keep_cluster_alive_when_no_steps=True,
...     termination_protected=False,
...     spark_pyarrow=True,
...     tags={
...         "foo": "boo"
...     })

```

**aws wrangler.emr.get\_cluster\_state**

`aws wrangler.emr.get_cluster_state(cluster_id: str, boto3_session: Optional[boto3.session.Session] = None) → str`

Get the EMR cluster state.

Possible states: 'STARTING', 'BOOTSTRAPPING', 'RUNNING', 'WAITING', 'TERMINATING', 'TERMINATED', 'TERMINATED\_WITH\_ERRORS'

**Parameters**

- **cluster\_id** (*str*) – Cluster ID.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** State.

**Return type** str

**Examples**

```
>>> import aws wrangler as wr
>>> state = wr.emr.get_cluster_state("cluster-id")
```

**aws wrangler.emr.get\_step\_state**

`aws wrangler.emr.get_step_state(cluster_id: str, step_id: str, boto3_session: Optional[boto3.session.Session] = None) → str`

Get EMR step state.

Possible states: 'PENDING', 'CANCEL\_PENDING', 'RUNNING', 'COMPLETED', 'CANCELLED', 'FAILED', 'INTERRUPTED'

**Parameters**

- **cluster\_id** (*str*) – Cluster ID.
- **step\_id** (*str*) – Step ID.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** State.

**Return type** str

**Examples**

```
>>> import aws wrangler as wr
>>> state = wr.emr.get_step_state("cluster-id", "step-id")
```

### awswrangler.emr.submit\_ecr\_credentials\_refresh

`awswrangler.emr.submit_ecr_credentials_refresh(cluster_id: str, path: str, action_on_failure: str = 'CONTINUE', boto3_session: Optional[boto3.session.Session] = None) → str`

Update internal ECR credentials.

#### Parameters

- **cluster\_id** (*str*) – Cluster ID.
- **path** (*str*) – Amazon S3 path where Wrangler will stage the script `ecr_credentials_refresh.py` (e.g. `s3://bucket/emr/`)
- **action\_on\_failure** (*str*) – ‘TERMINATE\_JOB\_FLOW’, ‘TERMINATE\_CLUSTER’, ‘CANCEL\_AND\_WAIT’, ‘CONTINUE’
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive `None`.

**Returns** Step ID.

**Return type** *str*

#### Examples

```
>>> import awswrangler as wr
>>> step_id = wr.emr.submit_ecr_credentials_refresh("cluster_id", "s3://bucket/emr/
↳ ")
```

### awswrangler.emr.submit\_spark\_step

`awswrangler.emr.submit_spark_step(cluster_id: str, path: str, deploy_mode: str = 'cluster', docker_image: Optional[str] = None, name: str = 'my-step', action_on_failure: str = 'CONTINUE', region: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → str`

Submit Spark Step.

#### Parameters

- **cluster\_id** (*str*) – Cluster ID.
- **path** (*str*) – Script path. (e.g. `s3://bucket/app.py`)
- **deploy\_mode** (*str*) – “cluster” | “client”
- **docker\_image** (*str*, *optional*) – e.g. “{ACCOUNT\_ID}.dkr.ecr.{REGION}.amazonaws.com/{IMAGE\_NAME}”
- **name** (*str*, *optional*) – Step name.
- **action\_on\_failure** (*str*) – ‘TERMINATE\_JOB\_FLOW’, ‘TERMINATE\_CLUSTER’, ‘CANCEL\_AND\_WAIT’, ‘CONTINUE’
- **region** (*str*, *optional*) – Region name to not get it from `boto3.Session`. (e.g. `us-east-1`)
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive `None`.

**Returns** Step ID.



**Return type** str

### Examples

```
>>> import awswrangler as wr
>>> step_id = wr.emr.submit_spark_step(
>>>     cluster_id="cluster-id",
>>>     path="s3://bucket/emr/app.py"
>>> )
```

### awswrangler.emr.submit\_step

`awswrangler.emr.submit_step(cluster_id: str, command: str, name: str = 'my-step', action_on_failure: str = 'CONTINUE', script: bool = False, boto3_session: Optional[boto3.session.Session] = None) → str`

Submit new job in the EMR Cluster.

#### Parameters

- **cluster\_id** (str) – Cluster ID.
- **command** (str) – e.g. 'echo "Hello!"' e.g. for script 's3://.../script.sh arg1 arg2'
- **name** (str, optional) – Step name.
- **action\_on\_failure** (str) – 'TERMINATE\_JOB\_FLOW', 'TERMINATE\_CLUSTER', 'CANCEL\_AND\_WAIT', 'CONTINUE'
- **script** (bool) – True for raw command or False for script runner. <https://docs.aws.amazon.com/emr/latest/ReleaseGuide/emr-commandrunner.html>
- **boto3\_session** (boto3.Session(), optional) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Step ID.

**Return type** str

### Examples

```
>>> import awswrangler as wr
>>> step_id = wr.emr.submit_step(
...     cluster_id=cluster_id,
...     name="step_test",
...     command="s3://...script.sh arg1 arg2",
...     script=True)
```

### `aws wrangler.emr.submit_steps`

`aws wrangler.emr.submit_steps(cluster_id: str, steps: List[Dict[str, Any]], boto3_session: Optional[boto3.session.Session] = None) → List[str]`

Submit a list of steps.

#### Parameters

- **cluster\_id** (*str*) – Cluster ID.
- **steps** (*List[Dict[str, Any]]*) – Steps definitions (Obs: Use `EMR.build_step()` to build it).
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive `None`.

**Returns** List of step IDs.

**Return type** List[str]

#### Examples

```
>>> import aws wrangler as wr
>>> for cmd in ['echo "Hello"', 'ls -la']:
...     steps.append(wr.emr.build_step(name=cmd, command=cmd))
>>> wr.emr.submit_steps(cluster_id="cluster-id", steps=steps)
```

### `aws wrangler.emr.terminate_cluster`

`aws wrangler.emr.terminate_cluster(cluster_id: str, boto3_session: Optional[boto3.session.Session] = None) → None`

Terminate EMR cluster.

#### Parameters

- **cluster\_id** (*str*) – Cluster ID.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive `None`.

**Returns** None.

**Return type** None

#### Examples

```
>>> import aws wrangler as wr
>>> wr.emr.terminate_cluster("cluster-id")
```

### 1.4.15 Amazon CloudWatch Logs

<code>read_logs(query, log_group_names[, ...])</code>	Run a query against AWS CloudWatchLogs Insights and convert the results to Pandas DataFrame.
<code>run_query(query, log_group_names[, ...])</code>	Run a query against AWS CloudWatchLogs Insights and wait the results.
<code>start_query(query, log_group_names[, ...])</code>	Run a query against AWS CloudWatchLogs Insights.
<code>wait_query(query_id[, boto3_session])</code>	Wait query ends.

#### awswrangler.cloudwatch.read\_logs

`awswrangler.cloudwatch.read_logs(query: str, log_group_names: List[str], start_time: datetime.datetime = datetime.datetime(1970, 1, 1, 0, 0, tzinfo=datetime.timezone.utc), end_time: datetime.datetime = datetime.datetime(2022, 4, 11, 15, 41, 33, 17195), limit: Optional[int] = None, boto3_session: Optional[boto3.session.Session] = None) → pandas.core.frame.DataFrame`

Run a query against AWS CloudWatchLogs Insights and convert the results to Pandas DataFrame.

[https://docs.aws.amazon.com/AmazonCloudWatch/latest/logs/CWL\\_QuerySyntax.html](https://docs.aws.amazon.com/AmazonCloudWatch/latest/logs/CWL_QuerySyntax.html)

#### Parameters

- **query** (*str*) – The query string.
- **log\_group\_names** (*str*) – The list of log groups to be queried. You can include up to 20 log groups.
- **start\_time** (*datetime.datetime*) – The beginning of the time range to query.
- **end\_time** (*datetime.datetime*) – The end of the time range to query.
- **limit** (*Optional[int]*) – The maximum number of log events to return in the query.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Result as a Pandas DataFrame.

**Return type** `pandas.DataFrame`

#### Examples

```
>>> import awswrangler as wr
>>> df = wr.cloudwatch.read_logs(
...     log_group_names=["loggroup"],
...     query="fields @timestamp, @message | sort @timestamp desc | limit 5",
... )
```

### aws wrangler.cloudwatch.run\_query

```
aws wrangler.cloudwatch.run_query(query: str, log_group_names: List[str], start_time: datetime.datetime =
    datetime.datetime(1970, 1, 1, 0, 0, tzinfo=datetime.timezone.utc),
    end_time: datetime.datetime = datetime.datetime(2022, 4, 11, 15, 41, 33,
    17146), limit: Optional[int] = None, boto3_session:
    Optional[boto3.session.Session] = None) → List[List[Dict[str, str]]]
```

Run a query against AWS CloudWatchLogs Insights and wait the results.

[https://docs.aws.amazon.com/AmazonCloudWatch/latest/logs/CWL\\_QuerySyntax.html](https://docs.aws.amazon.com/AmazonCloudWatch/latest/logs/CWL_QuerySyntax.html)

#### Parameters

- **query** (*str*) – The query string.
- **log\_group\_names** (*str*) – The list of log groups to be queried. You can include up to 20 log groups.
- **start\_time** (*datetime.datetime*) – The beginning of the time range to query.
- **end\_time** (*datetime.datetime*) – The end of the time range to query.
- **limit** (*Optional[int]*) – The maximum number of log events to return in the query.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Result.

**Return type** List[List[Dict[str, str]]]

#### Examples

```
>>> import aws wrangler as wr
>>> result = wr.cloudwatch.run_query(
...     log_group_names=["loggroup"],
...     query="fields @timestamp, @message | sort @timestamp desc | limit 5",
... )
```

### aws wrangler.cloudwatch.start\_query

```
aws wrangler.cloudwatch.start_query(query: str, log_group_names: List[str], start_time: datetime.datetime
    = datetime.datetime(1970, 1, 1, 0, 0, tzinfo=datetime.timezone.utc),
    end_time: datetime.datetime = datetime.datetime(2022, 4, 11, 15, 41,
    33, 17138), limit: Optional[int] = None, boto3_session:
    Optional[boto3.session.Session] = None) → str
```

Run a query against AWS CloudWatchLogs Insights.

[https://docs.aws.amazon.com/AmazonCloudWatch/latest/logs/CWL\\_QuerySyntax.html](https://docs.aws.amazon.com/AmazonCloudWatch/latest/logs/CWL_QuerySyntax.html)

#### Parameters

- **query** (*str*) – The query string.
- **log\_group\_names** (*str*) – The list of log groups to be queried. You can include up to 20 log groups.
- **start\_time** (*datetime.datetime*) – The beginning of the time range to query.

- **end\_time** (*datetime.datetime*) – The end of the time range to query.
- **limit** (*Optional[int]*) – The maximum number of log events to return in the query.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Query ID.

**Return type** str

### Examples

```
>>> import awswrangler as wr
>>> query_id = wr.cloudwatch.start_query(
...     log_group_names=["loggroup"],
...     query="fields @timestamp, @message | sort @timestamp desc | limit 5",
... )
```

### awswrangler.cloudwatch.wait\_query

**awswrangler.cloudwatch.wait\_query**(*query\_id: str*, *boto3\_session: Optional[boto3.session.Session] = None*)  
→ Dict[str, Any]

Wait query ends.

[https://docs.aws.amazon.com/AmazonCloudWatch/latest/logs/CWL\\_QuerySyntax.html](https://docs.aws.amazon.com/AmazonCloudWatch/latest/logs/CWL_QuerySyntax.html)

#### Parameters

- **query\_id** (*str*) – Query ID.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Query result payload.

**Return type** Dict[str, Any]

### Examples

```
>>> import awswrangler as wr
>>> query_id = wr.cloudwatch.start_query(
...     log_group_names=["loggroup"],
...     query="fields @timestamp, @message | sort @timestamp desc | limit 5",
... )
... response = wr.cloudwatch.wait_query(query_id=query_id)
```

### 1.4.16 Amazon QuickSight

<code>cancel_ingestion(ingestion_id[, ...])</code>	Cancel an ongoing ingestion of data into SPICE.
<code>create_athena_data_source(name[, workgroup, ...])</code>	Create a QuickSight data source pointing to an Athena/Workgroup.
<code>create_athena_dataset(name[, database, ...])</code>	Create a QuickSight dataset.
<code>create_ingestion([dataset_name, dataset_id, ...])</code>	Create and starts a new SPICE ingestion on a dataset.
<code>delete_all_dashboards([account_id, ...])</code>	Delete all dashboards.
<code>delete_all_data_sources([account_id, ...])</code>	Delete all data sources.
<code>delete_all_datasets([account_id, boto3_session])</code>	Delete all datasets.
<code>delete_all_templates([account_id, boto3_session])</code>	Delete all templates.
<code>delete_dashboard([name, dashboard_id, ...])</code>	Delete a dashboard.
<code>delete_data_source([name, data_source_id, ...])</code>	Delete a data source.
<code>delete_dataset([name, dataset_id, ...])</code>	Delete a dataset.
<code>delete_template([name, template_id, ...])</code>	Delete a template.
<code>describe_dashboard([name, dashboard_id, ...])</code>	Describe a QuickSight dashboard by name or ID.
<code>describe_data_source([name, data_source_id, ...])</code>	Describe a QuickSight data source by name or ID.
<code>describe_data_source_permissions([name, ...])</code>	Describe a QuickSight data source permissions by name or ID.
<code>describe_dataset([name, dataset_id, ...])</code>	Describe a QuickSight dataset by name or ID.
<code>describe_ingestion(ingestion_id[, ...])</code>	Describe a QuickSight ingestion by ID.
<code>get_dashboard_id(name[, account_id, ...])</code>	Get QuickSight dashboard ID given a name and fails if there is more than 1 ID associated with this name.
<code>get_dashboard_ids(name[, account_id, ...])</code>	Get QuickSight dashboard IDs given a name.
<code>get_data_source_arn(name[, account_id, ...])</code>	Get QuickSight data source ARN given a name and fails if there is more than 1 ARN associated with this name.
<code>get_data_source_arns(name[, account_id, ...])</code>	Get QuickSight Data source ARNs given a name.
<code>get_data_source_id(name[, account_id, ...])</code>	Get QuickSight data source ID given a name and fails if there is more than 1 ID associated with this name.
<code>get_data_source_ids(name[, account_id, ...])</code>	Get QuickSight data source IDs given a name.
<code>get_dataset_id(name[, account_id, boto3_session])</code>	Get QuickSight Dataset ID given a name and fails if there is more than 1 ID associated with this name.
<code>get_dataset_ids(name[, account_id, ...])</code>	Get QuickSight dataset IDs given a name.
<code>get_template_id(name[, account_id, ...])</code>	Get QuickSight template ID given a name and fails if there is more than 1 ID associated with this name.
<code>get_template_ids(name[, account_id, ...])</code>	Get QuickSight template IDs given a name.
<code>list_dashboards([account_id, boto3_session])</code>	List dashboards in an AWS account.
<code>list_data_sources([account_id, boto3_session])</code>	List all QuickSight Data sources summaries.
<code>list_datasets([account_id, boto3_session])</code>	List all QuickSight datasets summaries.
<code>list_groups([namespace, account_id, ...])</code>	List all QuickSight Groups.
<code>list_group_memberships(group_name[, ...])</code>	List all QuickSight Group memberships.
<code>list_iam_policy_assignments([status, ...])</code>	List IAM policy assignments in the current Amazon QuickSight account.
<code>list_iam_policy_assignments_for_user(user_name)</code>	List all the IAM policy assignments.
<code>list_ingestions([dataset_name, dataset_id, ...])</code>	List the history of SPICE ingestions for a dataset.
<code>list_templates([account_id, boto3_session])</code>	List all QuickSight templates.
<code>list_users([namespace, account_id, ...])</code>	Return a list of all of the Amazon QuickSight users belonging to this account.
<code>list_user_groups(user_name[, namespace, ...])</code>	List the Amazon QuickSight groups that an Amazon QuickSight user is a member of.

**awswrangler.quicksight.cancel\_ingestion**

```
awswrangler.quicksight.cancel_ingestion(ingestion_id: str, dataset_name: Optional[str] = None,
                                         dataset_id: Optional[str] = None, account_id: Optional[str] =
                                         None, boto3_session: Optional[boto3.session.Session] = None)
                                         → None
```

Cancel an ongoing ingestion of data into SPICE.

---

**Note:** You must pass a not None value for `dataset_name` or `dataset_id` argument.

---

**Parameters**

- **ingestion\_id** (*str*) – Ingestion ID.
- **dataset\_name** (*str*, *optional*) – Dataset name.
- **dataset\_id** (*str*, *optional*) – Dataset ID.
- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** None.

**Return type** None

**Examples**

```
>>> import awswrangler as wr
>>> wr.quicksight.cancel_ingestion(ingestion_id="...", dataset_name="...")
```

**awswrangler.quicksight.create\_athena\_data\_source**

```
awswrangler.quicksight.create_athena_data_source(name: str, workgroup: str = 'primary',
                                                  allowed_to_use: Optional[List[str]] = None,
                                                  allowed_to_manage: Optional[List[str]] = None,
                                                  tags: Optional[Dict[str, str]] = None, account_id:
                                                  Optional[str] = None, boto3_session:
                                                  Optional[boto3.session.Session] = None,
                                                  namespace: str = 'default') → None
```

Create a QuickSight data source pointing to an Athena/Workgroup.

---

**Note:** You will not be able to see the the data source in the console if you not pass your user to one of the `allowed_*` arguments.

---

**Parameters**

- **name** (*str*) – Data source name.
- **workgroup** (*str*) – Athena workgroup.

- **tags** (*Dict[str, str]*, *optional*) – Key/Value collection to put on the Cluster. e.g. {"foo": "boo", "bar": "xoo"}
- **allowed\_to\_use** (*optional*) – List of principals that will be allowed to see and use the data source. e.g. ["John"]
- **allowed\_to\_manage** (*optional*) – List of principals that will be allowed to see, use, update and delete the data source. e.g. ["Mary"]
- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.
- **namespace** (*str*) – The namespace. Currently, you should set this to default.

**Returns** None.

**Return type** None

### Examples

```
>>> import awswrangler as wr
>>> wr.quicksight.create_athena_data_source(
...     name="...",
...     allowed_to_manage=["john"]
... )
```

### awswrangler.quicksight.create\_athena\_dataset

`awswrangler.quicksight.create_athena_dataset`(*name: str, database: Optional[str] = None, table: Optional[str] = None, sql: Optional[str] = None, sql\_name: str = 'CustomSQL', data\_source\_name: Optional[str] = None, data\_source\_arn: Optional[str] = None, import\_mode: str = 'DIRECT\_QUERY', allowed\_to\_use: Optional[List[str]] = None, allowed\_to\_manage: Optional[List[str]] = None, logical\_table\_alias: str = 'LogicalTable', rename\_columns: Optional[Dict[str, str]] = None, cast\_columns\_types: Optional[Dict[str, str]] = None, tags: Optional[Dict[str, str]] = None, account\_id: Optional[str] = None, boto3\_session: Optional[boto3.session.Session] = None, namespace: str = 'default') → str*

Create a QuickSight dataset.

---

**Note:** You will not be able to see the the dataset in the console if you not pass your username to one of the `allowed_*` arguments.

---

---

**Note:** You must pass database/table OR sql argument.

---



---

**Note:** You must pass `data_source_name` OR `data_source_arn` argument.

---

### Parameters

- **name** (*str*) – Dataset name.
- **database** (*str*) – Athena’s database name.
- **table** (*str*) – Athena’s table name.
- **sql** (*str*) – Use a SQL query to define your table.
- **sql\_name** (*str*) – Query name.
- **data\_source\_name** (*str*, *optional*) – QuickSight data source name.
- **data\_source\_arn** (*str*, *optional*) – QuickSight data source ARN.
- **import\_mode** (*str*) – Indicates whether you want to import the data into SPICE. ‘SPICE’|‘DIRECT\_QUERY’
- **tags** (*Dict[str, str]*, *optional*) – Key/Value collection to put on the Cluster. e.g. {“foo”: “boo”, “bar”: “xoo”}
- **allowed\_to\_use** (*optional*) – List of usernames that will be allowed to see and use the data source. e.g. [“john”, “Mary”]
- **allowed\_to\_manage** (*optional*) – List of usernames that will be allowed to see, use, update and delete the data source. e.g. [“Mary”]
- **logical\_table\_alias** (*str*) – A display name for the logical table.
- **rename\_columns** (*Dict[str, str]*, *optional*) – Dictionary to map column renames. e.g. {“old\_name”: “new\_name”, “old\_name2”: “new\_name2”}
- **cast\_columns\_types** (*Dict[str, str]*, *optional*) – Dictionary to map column casts. e.g. {“col\_name”: “STRING”, “col\_name2”: “DECIMAL”} Valid types: ‘STRING’|‘INTEGER’|‘DECIMAL’|‘DATETIME’
- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.
- **namespace** (*str*) – The namespace. Currently, you should set this to default.

**Returns** Dataset ID.

**Return type** `str`

## Examples

```
>>> import awswrangler as wr
>>> dataset_id = wr.quicksight.create_athena_dataset(
...     name="...",
...     database="...",
...     table="..."
...     data_source_name="..."
...     allowed_to_manage=["Mary"]
... )
```

## awswrangler.quicksight.create\_ingestion

`awswrangler.quicksight.create_ingestion(dataset_name: Optional[str] = None, dataset_id: Optional[str] = None, ingestion_id: Optional[str] = None, account_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → str`

Create and starts a new SPICE ingestion on a dataset.

---

**Note:** You must pass `dataset_name` OR `dataset_id` argument.

---

### Parameters

- **dataset\_name** (*str, optional*) – Dataset name.
- **dataset\_id** (*str, optional*) – Dataset ID.
- **ingestion\_id** (*str, optional*) – Ingestion ID.
- **account\_id** (*str, optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.

**Returns** Ingestion ID

**Return type** str

## Examples

```
>>> import awswrangler as wr
>>> status = wr.quicksight.create_ingestion("my_dataset")
```

**awswrangler.quicksight.delete\_all\_dashboards**

`awswrangler.quicksight.delete_all_dashboards(account_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → None`

Delete all dashboards.

**Parameters**

- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** None.

**Return type** None

**Examples**

```
>>> import awswrangler as wr
>>> wr.quicksight.delete_all_dashboards()
```

**awswrangler.quicksight.delete\_all\_data\_sources**

`awswrangler.quicksight.delete_all_data_sources(account_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → None`

Delete all data sources.

**Parameters**

- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** None.

**Return type** None

**Examples**

```
>>> import awswrangler as wr
>>> wr.quicksight.delete_all_data_sources()
```

### `awswrangler.quicksight.delete_all_datasets`

`awswrangler.quicksight.delete_all_datasets(account_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → None`

Delete all datasets.

#### Parameters

- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** None.

**Return type** None

#### Examples

```
>>> import awswrangler as wr
>>> wr.quicksight.delete_all_datasets()
```

### `awswrangler.quicksight.delete_all_templates`

`awswrangler.quicksight.delete_all_templates(account_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → None`

Delete all templates.

#### Parameters

- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** None.

**Return type** None

#### Examples

```
>>> import awswrangler as wr
>>> wr.quicksight.delete_all_templates()
```

**aws wrangler quicksight.delete\_dashboard**

`aws wrangler quicksight.delete_dashboard(name: Optional[str] = None, dashboard_id: Optional[str] = None, version_number: Optional[int] = None, account_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → None`

Delete a dashboard.

---

**Note:** You must pass a not None name or dashboard\_id argument.

---

**Parameters**

- **name** (*str, optional*) – Dashboard name.
- **dashboard\_id** (*str, optional*) – The ID for the dashboard.
- **version\_number** (*int, optional*) – The version number of the dashboard. If the version number property is provided, only the specified version of the dashboard is deleted.
- **account\_id** (*str, optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** None.

**Return type** None

**Examples**

```
>>> import aws wrangler as wr
>>> wr.quicksight.delete_dashboard(name="...")
```

**aws wrangler quicksight.delete\_data\_source**

`aws wrangler quicksight.delete_data_source(name: Optional[str] = None, data_source_id: Optional[str] = None, account_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → None`

Delete a data source.

---

**Note:** You must pass a not None name or data\_source\_id argument.

---

**Parameters**

- **name** (*str, optional*) – Dashboard name.
- **data\_source\_id** (*str, optional*) – The ID for the data source.
- **account\_id** (*str, optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** None.

**Return type** None

### Examples

```
>>> import awswrangler as wr
>>> wr.quicksight.delete_data_source(name="...")
```

### awswrangler.quicksight.delete\_dataset

`awswrangler.quicksight.delete_dataset(name: Optional[str] = None, dataset_id: Optional[str] = None, account_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → None`

Delete a dataset.

---

**Note:** You must pass a not None name or dataset\_id argument.

---

#### Parameters

- **name** (*str, optional*) – Dashboard name.
- **dataset\_id** (*str, optional*) – The ID for the dataset.
- **account\_id** (*str, optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** None.

**Return type** None

### Examples

```
>>> import awswrangler as wr
>>> wr.quicksight.delete_dataset(name="...")
```

### awswrangler.quicksight.delete\_template

`awswrangler.quicksight.delete_template(name: Optional[str] = None, template_id: Optional[str] = None, version_number: Optional[int] = None, account_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → None`

Delete a tamplate.

---

**Note:** You must pass a not None name or template\_id argument.

---

**Parameters**

- **name** (*str*, *optional*) – Dashboard name.
- **template\_id** (*str*, *optional*) – The ID for the dashboard.
- **version\_number** (*int*, *optional*) – Specifies the version of the template that you want to delete. If you don't provide a version number, it deletes all versions of the template.
- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** None.**Return type** None**Examples**

```
>>> import awswrangler as wr
>>> wr.quicksight.delete_template(name="...")
```

**awswrangler.quicksight.describe\_dashboard**

**awswrangler.quicksight.describe\_dashboard**(*name: Optional[str] = None, dashboard\_id: Optional[str] = None, account\_id: Optional[str] = None, boto3\_session: Optional[boto3.session.Session] = None*) → Dict[str, Any]

Describe a QuickSight dashboard by name or ID.

---

**Note:** You must pass a not None name or dashboard\_id argument.

---

**Parameters**

- **name** (*str*, *optional*) – Dashboard name.
- **dashboard\_id** (*str*, *optional*) – Dashboard ID.
- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Dashboad Description.**Return type** Dict[str, Any]

## Examples

```
>>> import awswrangler as wr
>>> description = wr.quicksight.describe_dashboard(name="my-dashboard")
```

## awswrangler.quicksight.describe\_data\_source

`awswrangler.quicksight.describe_data_source`(*name: Optional[str] = None, data\_source\_id: Optional[str] = None, account\_id: Optional[str] = None, boto3\_session: Optional[boto3.session.Session] = None*)  
→ Dict[str, Any]

Describe a QuickSight data source by name or ID.

---

**Note:** You must pass a not None name or data\_source\_id argument.

---

### Parameters

- **name** (*str, optional*) – Data source name.
- **data\_source\_id** (*str, optional*) – Data source ID.
- **account\_id** (*str, optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Data source Description.

**Return type** Dict[str, Any]

## Examples

```
>>> import awswrangler as wr
>>> description = wr.quicksight.describe_data_source("...")
```

## awswrangler.quicksight.describe\_data\_source\_permissions

`awswrangler.quicksight.describe_data_source_permissions`(*name: Optional[str] = None, data\_source\_id: Optional[str] = None, account\_id: Optional[str] = None, boto3\_session: Optional[boto3.session.Session] = None*)  
→ Dict[str, Any]

Describe a QuickSight data source permissions by name or ID.

---

**Note:** You must pass a not None name or data\_source\_id argument.

---

### Parameters



- **name** (*str*, *optional*) – Data source name.
- **data\_source\_id** (*str*, *optional*) – Data source ID.
- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Data source Permissions Description.

**Return type** Dict[str, Any]

### Examples

```
>>> import awswrangler as wr
>>> description = wr.quicksight.describe_data_source_permissions("my-data-source")
```

### awswrangler.quicksight.describe\_dataset

`awswrangler.quicksight.describe_dataset` (*name: Optional[str] = None, dataset\_id: Optional[str] = None, account\_id: Optional[str] = None, boto3\_session: Optional[boto3.session.Session] = None*) → Dict[str, Any]

Describe a QuickSight dataset by name or ID.

---

**Note:** You must pass a not None `name` or `dataset_id` argument.

---

#### Parameters

- **name** (*str*, *optional*) – Dataset name.
- **dataset\_id** (*str*, *optional*) – Dataset ID.
- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Dataset Description.

**Return type** Dict[str, Any]

### Examples

```
>>> import awswrangler as wr
>>> description = wr.quicksight.describe_dataset("my-dataset")
```

### aws wrangler quicksight describe\_ingestion

```
aws wrangler quicksight describe_ingestion(ingestion_id: str, dataset_name: Optional[str] = None,
                                             dataset_id: Optional[str] = None, account_id: Optional[str]
                                             = None, boto3_session: Optional[boto3.session.Session] =
                                             None) → Dict[str, Any]
```

Describe a QuickSight ingestion by ID.

---

**Note:** You must pass a not None value for `dataset_name` or `dataset_id` argument.

---

#### Parameters

- **ingestion\_id** (*str*) – Ingestion ID.
- **dataset\_name** (*str*, *optional*) – Dataset name.
- **dataset\_id** (*str*, *optional*) – Dataset ID.
- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.

**Returns** Ingestion Description.

**Return type** Dict[str, Any]

#### Examples

```
>>> import aws wrangler as wr
>>> description = wr quicksight describe_dataset(ingestion_id="...", dataset_name="
↪ ...")
```

### aws wrangler quicksight get\_dashboard\_id

```
aws wrangler quicksight get_dashboard_id(name: str, account_id: Optional[str] = None, boto3_session:
                                          Optional[boto3.session.Session] = None) → str
```

Get QuickSight dashboard ID given a name and fails if there is more than 1 ID associated with this name.

#### Parameters

- **name** (*str*) – Dashboard name.
- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.

**Returns** Dashboard ID.

**Return type** str

## Examples

```
>>> import awswrangler as wr
>>> my_id = wr.quicksight.get_dashboard_id(name="...")
```

### awswrangler.quicksight.get\_dashboard\_ids

`awswrangler.quicksight.get_dashboard_ids(name: str, account_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → List[str]`

Get QuickSight dashboard IDs given a name.

**Note:** This function returns a list of ID because Quicksight accepts duplicated dashboard names, so you may have more than 1 ID for a given name.

#### Parameters

- **name** (*str*) – Dashboard name.
- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Dashboard IDs.

**Return type** List[str]

## Examples

```
>>> import awswrangler as wr
>>> ids = wr.quicksight.get_dashboard_ids(name="...")
```

### awswrangler.quicksight.get\_data\_source\_arn

`awswrangler.quicksight.get_data_source_arn(name: str, account_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → str`

Get QuickSight data source ARN given a name and fails if there is more than 1 ARN associated with this name.

**Note:** This function returns a list of ARNs because Quicksight accepts duplicated data source names, so you may have more than 1 ARN for a given name.

#### Parameters

- **name** (*str*) – Data source name.
- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.

- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Data source ARN.

**Return type** str

### Examples

```
>>> import awswrangler as wr
>>> arn = wr.quicksight.get_data_source_arn("...")
```

## awswrangler.quicksight.get\_data\_source\_arns

`awswrangler.quicksight.get_data_source_arns(name: str, account_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → List[str]`

Get QuickSight Data source ARNs given a name.

---

**Note:** This function returns a list of ARNs because QuickSight accepts duplicated data source names, so you may have more than 1 ARN for a given name.

---

### Parameters

- **name** (*str*) – Data source name.
- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Data source ARNs.

**Return type** List[str]

### Examples

```
>>> import awswrangler as wr
>>> arns = wr.quicksight.get_data_source_arns(name="...")
```

## awswrangler.quicksight.get\_data\_source\_id

`awswrangler.quicksight.get_data_source_id(name: str, account_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → str`

Get QuickSight data source ID given a name and fails if there is more than 1 ID associated with this name.

### Parameters

- **name** (*str*) – Data source name.
- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.

- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Dataset ID.

**Return type** str

### Examples

```
>>> import awswrangler as wr
>>> my_id = wr.quicksight.get_data_source_id(name="...")
```

### awswrangler.quicksight.get\_data\_source\_ids

`awswrangler.quicksight.get_data_source_ids(name: str, account_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → List[str]`

Get QuickSight data source IDs given a name.

---

**Note:** This function returns a list of ID because QuickSight accepts duplicated data source names, so you may have more than 1 ID for a given name.

---

#### Parameters

- **name** (*str*) – Data source name.
- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Data source IDs.

**Return type** List[str]

### Examples

```
>>> import awswrangler as wr
>>> ids = wr.quicksight.get_data_source_ids(name="...")
```

### awswrangler.quicksight.get\_dataset\_id

`awswrangler.quicksight.get_dataset_id(name: str, account_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → str`

Get QuickSight Dataset ID given a name and fails if there is more than 1 ID associated with this name.

#### Parameters

- **name** (*str*) – Dataset name.
- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.

- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Dataset ID.

**Return type** str

### Examples

```
>>> import awswrangler as wr
>>> my_id = wr.quicksight.get_dataset_id(name="...")
```

## awswrangler.quicksight.get\_dataset\_ids

`awswrangler.quicksight.get_dataset_ids(name: str, account_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → List[str]`

Get QuickSight dataset IDs given a name.

---

**Note:** This function returns a list of ID because QuickSight accepts duplicated datasets names, so you may have more than 1 ID for a given name.

---

### Parameters

- **name** (*str*) – Dataset name.
- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Datasets IDs.

**Return type** List[str]

### Examples

```
>>> import awswrangler as wr
>>> ids = wr.quicksight.get_dataset_ids(name="...")
```

## awswrangler.quicksight.get\_template\_id

`awswrangler.quicksight.get_template_id(name: str, account_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → str`

Get QuickSight template ID given a name and fails if there is more than 1 ID associated with this name.

### Parameters

- **name** (*str*) – Template name.
- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.

- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Template ID.

**Return type** str

### Examples

```
>>> import awswrangler as wr
>>> my_id = wr.quicksight.get_template_id(name="...")
```

### awswrangler.quicksight.get\_template\_ids

**awswrangler.quicksight.get\_template\_ids**(*name: str*, *account\_id: Optional[str] = None*, *boto3\_session: Optional[boto3.session.Session] = None*) → List[str]

Get QuickSight template IDs given a name.

---

**Note:** This function returns a list of ID because QuickSight accepts duplicated templates names, so you may have more than 1 ID for a given name.

---

#### Parameters

- **name** (*str*) – Template name.
- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Template IDs.

**Return type** List[str]

### Examples

```
>>> import awswrangler as wr
>>> ids = wr.quicksight.get_template_ids(name="...")
```

### awswrangler.quicksight.list\_dashboards

**awswrangler.quicksight.list\_dashboards**(*account\_id: Optional[str] = None*, *boto3\_session: Optional[boto3.session.Session] = None*) → List[Dict[str, Any]]

List dashboards in an AWS account.

#### Parameters

- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Dashboards.

**Return type** List[Dict[str, Any]]

### Examples

```
>>> import awswrangler as wr
>>> dashboards = wr.quicksight.list_dashboards()
```

## awswrangler.quicksight.list\_data\_sources

`awswrangler.quicksight.list_data_sources(account_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → List[Dict[str, Any]]`

List all QuickSight Data sources summaries.

### Parameters

- **account\_id** (*str, optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Data sources summaries.

**Return type** List[Dict[str, Any]]

### Examples

```
>>> import awswrangler as wr
>>> sources = wr.quicksight.list_data_sources()
```

## awswrangler.quicksight.list\_datasets

`awswrangler.quicksight.list_datasets(account_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → List[Dict[str, Any]]`

List all QuickSight datasets summaries.

### Parameters

- **account\_id** (*str, optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Datasets summaries.

**Return type** List[Dict[str, Any]]



## Examples

```
>>> import awswrangler as wr
>>> datasets = wr.quicksight.list_datasets()
```

### awswrangler.quicksight.list\_groups

`awswrangler.quicksight.list_groups(namespace: str = 'default', account_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → List[Dict[str, Any]]`

List all QuickSight Groups.

#### Parameters

- **namespace** (*str*) – The namespace. Currently, you should set this to default .
- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Groups.

**Return type** List[Dict[str, Any]]

## Examples

```
>>> import awswrangler as wr
>>> groups = wr.quicksight.list_groups()
```

### awswrangler.quicksight.list\_group\_memberships

`awswrangler.quicksight.list_group_memberships(group_name: str, namespace: str = 'default', account_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → List[Dict[str, Any]]`

List all QuickSight Group memberships.

#### Parameters

- **group\_name** (*str*) – The name of the group that you want to see a membership list of.
- **namespace** (*str*) – The namespace. Currently, you should set this to default .
- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Group memberships.

**Return type** List[Dict[str, Any]]

## Examples

```
>>> import awswrangler as wr
>>> memberships = wr.quicksight.list_group_memberships()
```

## awswrangler.quicksight.list\_iam\_policy\_assignments

`awswrangler.quicksight.list_iam_policy_assignments`(*status: Optional[str] = None, namespace: str = 'default', account\_id: Optional[str] = None, boto3\_session: Optional[boto3.session.Session] = None*) → List[Dict[str, Any]]

List IAM policy assignments in the current Amazon QuickSight account.

### Parameters

- **status** (*str, optional*) – The status of the assignments. 'ENABLED'|'DRAFT'|'DISABLED'
- **namespace** (*str*) – The namespace. Currently, you should set this to default .
- **account\_id** (*str, optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session(), optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** IAM policy assignments.

**Return type** List[Dict[str, Any]]

## Examples

```
>>> import awswrangler as wr
>>> assigns = wr.quicksight.list_iam_policy_assignments()
```

## awswrangler.quicksight.list\_iam\_policy\_assignments\_for\_user

`awswrangler.quicksight.list_iam_policy_assignments_for_user`(*user\_name: str, namespace: str = 'default', account\_id: Optional[str] = None, boto3\_session: Optional[boto3.session.Session] = None*) → List[Dict[str, Any]]

List all the IAM policy assignments.

Including the Amazon Resource Names (ARNs) for the IAM policies assigned to the specified user and group or groups that the user belongs to.

### Parameters

- **user\_name** (*str*) – The name of the user.
- **namespace** (*str*) – The namespace. Currently, you should set this to default .
- **account\_id** (*str, optional*) – If None, the account ID will be inferred from your boto3 session.

- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** IAM policy assignments.

**Return type** List[Dict[str, Any]]

### Examples

```
>>> import awswrangler as wr
>>> assigns = wr.quicksight.list_iam_policy_assignments_for_user()
```

### awswrangler.quicksight.list\_ingestions

**awswrangler.quicksight.list\_ingestions**(*dataset\_name: Optional[str] = None*, *dataset\_id: Optional[str] = None*, *account\_id: Optional[str] = None*, *boto3\_session: Optional[boto3.session.Session] = None*) → List[Dict[str, Any]]

List the history of SPICE ingestions for a dataset.

#### Parameters

- **dataset\_name** (*str*, *optional*) – Dataset name.
- **dataset\_id** (*str*, *optional*) – The ID of the dataset used in the ingestion.
- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** IAM policy assignments.

**Return type** List[Dict[str, Any]]

### Examples

```
>>> import awswrangler as wr
>>> ingestions = wr.quicksight.list_ingestions()
```

### awswrangler.quicksight.list\_templates

**awswrangler.quicksight.list\_templates**(*account\_id: Optional[str] = None*, *boto3\_session: Optional[boto3.session.Session] = None*) → List[Dict[str, Any]]

List all QuickSight templates.

#### Parameters

- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Templates summaries.

**Return type** List[Dict[str, Any]]

### Examples

```
>>> import awswrangler as wr
>>> templates = wr.quicksight.list_templates()
```

### awswrangler.quicksight.list\_users

`awswrangler.quicksight.list_users(namespace: str = 'default', account_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → List[Dict[str, Any]]`

Return a list of all of the Amazon QuickSight users belonging to this account.

#### Parameters

- **namespace** (*str*) – The namespace. Currently, you should set this to default.
- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Groups.

**Return type** List[Dict[str, Any]]

### Examples

```
>>> import awswrangler as wr
>>> users = wr.quicksight.list_users()
```

### awswrangler.quicksight.list\_user\_groups

`awswrangler.quicksight.list_user_groups(user_name: str, namespace: str = 'default', account_id: Optional[str] = None, boto3_session: Optional[boto3.session.Session] = None) → List[Dict[str, Any]]`

List the Amazon QuickSight groups that an Amazon QuickSight user is a member of.

#### Parameters

- **user\_name** (*str:*) – The Amazon QuickSight user name that you want to list group memberships for.
- **namespace** (*str*) – The namespace. Currently, you should set this to default .
- **account\_id** (*str*, *optional*) – If None, the account ID will be inferred from your boto3 session.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Groups.

**Return type** List[Dict[str, Any]]

## Examples

```
>>> import awswrangler as wr
>>> groups = wr.quicksight.list_user_groups()
```

### 1.4.17 AWS STS

<code>get_account_id([boto3_session])</code>	Get Account ID.
<code>get_current_identity_arn([boto3_session])</code>	Get current user/role ARN.
<code>get_current_identity_name([boto3_session])</code>	Get current user/role name.

#### `awswrangler.sts.get_account_id`

`awswrangler.sts.get_account_id(boto3_session: Optional[boto3.session.Session] = None) → str`

Get Account ID.

**Parameters** `boto3_session` (`boto3.Session()`, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.

**Returns** Account ID.

**Return type** str

## Examples

```
>>> import awswrangler as wr
>>> account_id = wr.sts.get_account_id()
```

#### `awswrangler.sts.get_current_identity_arn`

`awswrangler.sts.get_current_identity_arn(boto3_session: Optional[boto3.session.Session] = None) → str`

Get current user/role ARN.

**Parameters** `boto3_session` (`boto3.Session()`, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.

**Returns** User/role ARN.

**Return type** str

## Examples

```
>>> import awswrangler as wr
>>> arn = wr.sts.get_current_identity_arn()
```

**aws wrangler.sts.get\_current\_identity\_name**

`aws wrangler.sts.get_current_identity_name(boto3_session: Optional[boto3.session.Session] = None) → str`

Get current user/role name.

**Parameters** `boto3_session` (`boto3.Session()`, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.

**Returns** User/role name.

**Return type** str

**Examples**

```
>>> import aws wrangler as wr
>>> name = wr.sts.get_current_identity_name()
```

**1.4.18 AWS Secrets Manager**

<code>get_secret(name[, boto3_session])</code>	Get secret value.
<code>get_secret_json(name[, boto3_session])</code>	Get JSON secret value.

**aws wrangler.secretsmanager.get\_secret**

`aws wrangler.secretsmanager.get_secret(name: str, boto3_session: Optional[boto3.session.Session] = None) → Union[str, bytes]`

Get secret value.

**Parameters**

- **name** (*str*:): – Specifies the secret containing the version that you want to retrieve. You can specify either the Amazon Resource Name (ARN) or the friendly name of the secret.
- **boto3\_session** (`boto3.Session()`, *optional*) – Boto3 Session. The default boto3 session will be used if `boto3_session` receive None.

**Returns** Secret value.

**Return type** Union[str, bytes]

**Examples**

```
>>> import aws wrangler as wr
>>> value = wr.secretsmanager.get_secret("my-secret")
```

**aws wrangler.secretsmanager.get\_secret\_json**

`aws wrangler.secretsmanager.get_secret_json(name: str, boto3_session: Optional[boto3.session.Session] = None) → Dict[str, Any]`

Get JSON secret value.

**Parameters**

- **name** (*str*:) – Specifies the secret containing the version that you want to retrieve. You can specify either the Amazon Resource Name (ARN) or the friendly name of the secret.
- **boto3\_session** (*boto3.Session()*, *optional*) – Boto3 Session. The default boto3 session will be used if boto3\_session receive None.

**Returns** Secret JSON value parsed as a dictionary.

**Return type** Dict[str, Any]

**Examples**

```
>>> import aws wrangler as wr
>>> value = wr.secretsmanager.get_secret_json("my-secret-with-json-content")
```

**1.4.19 Amazon Chime**

<code>post_message(webhook, message)</code>	Send message on an existing Chime Chat rooms.
---	---

**aws wrangler.chime.post\_message**

`aws wrangler.chime.post_message(webhook: str, message: str) → Optional[Any]`

Send message on an existing Chime Chat rooms.

:param : Webhook: This contains all the authentication information to send the message :type : param webhook  
: webhook :param : The actual message which needs to be posted on Slack channel :type : param message :  
message

**Returns** Represents the response from Chime

**Return type** dict

**1.4.20 Global Configurations**

<code>reset([item])</code>	Reset one or all (if None is received) configuration values.
<code>to_pandas()</code>	Load all configurations on a Pandas DataFrame.

**aws wrangler.config.reset**

`config.reset(item: Optional[str] = None) → None`

Reset one or all (if None is received) configuration values.

**Parameters** `item` (`str`, *optional*) – Configuration item name.

**Returns** None.

**Return type** None

**Examples**

```
>>> import aws wrangler as wr
>>> wr.config.reset("database") # Reset one specific configuration
>>> wr.config.reset() # Reset all
```

**aws wrangler.config.to\_pandas**

`config.to_pandas() → pandas.core.frame.DataFrame`

Load all configurations on a Pandas DataFrame.

**Returns** Configuration DataFrame.

**Return type** `pd.DataFrame`

**Examples**

```
>>> import aws wrangler as wr
>>> wr.config.to_pandas()
```



## Symbols

`__init__()` (*aws wrangler.data\_api.rds.RdsDataApi* method), 261

`__init__()` (*aws wrangler.data\_api.redshift.RedshiftDataApi* method), 260

## A

`add_column()` (*in module aws wrangler.catalog*), 173

`add_csv_partitions()` (*in module aws wrangler.catalog*), 174

`add_parquet_partitions()` (*in module aws wrangler.catalog*), 176

## B

`build_spark_step()` (*in module aws wrangler.emr*), 284

`build_step()` (*in module aws wrangler.emr*), 285

## C

`cancel_ingestion()` (*in module aws wrangler.quicksight*), 299

`cancel_transaction()` (*in module aws wrangler.lakeformation*), 227

`commit_transaction()` (*in module aws wrangler.lakeformation*), 228

`connect()` (*in module aws wrangler.data\_api.rds*), 262

`connect()` (*in module aws wrangler.data\_api.redshift*), 260

`connect()` (*in module aws wrangler.mysql*), 250

`connect()` (*in module aws wrangler.neptune*), 271

`connect()` (*in module aws wrangler.opensearch*), 263

`connect()` (*in module aws wrangler.postgresql*), 245

`connect()` (*in module aws wrangler.redshift*), 231

`connect()` (*in module aws wrangler.sqlserver*), 255

`connect_temp()` (*in module aws wrangler.redshift*), 232

`copy()` (*in module aws wrangler.redshift*), 233

`copy_from_files()` (*in module aws wrangler.redshift*), 236

`copy_objects()` (*in module aws wrangler.s3*), 125

`create_athena_bucket()` (*in module aws wrangler.athena*), 206

`create_athena_data_source()` (*in module aws wrangler.quicksight*), 299

`create_athena_dataset()` (*in module aws wrangler.quicksight*), 300

`create_cluster()` (*in module aws wrangler.emr*), 286

`create_csv_table()` (*in module aws wrangler.catalog*), 177

`create_ctas_table()` (*in module aws wrangler.athena*), 207

`create_database()` (*in module aws wrangler.catalog*), 179

`create_database()` (*in module aws wrangler.timestream*), 280

`create_index()` (*in module aws wrangler.opensearch*), 263

`create_ingestion()` (*in module aws wrangler.quicksight*), 302

`create_parquet_table()` (*in module aws wrangler.catalog*), 180

`create_table()` (*in module aws wrangler.timestream*), 280

## D

`databases()` (*in module aws wrangler.catalog*), 182

`delete_all_dashboards()` (*in module aws wrangler.quicksight*), 303

`delete_all_data_sources()` (*in module aws wrangler.quicksight*), 303

`delete_all_datasets()` (*in module aws wrangler.quicksight*), 304

`delete_all_partitions()` (*in module aws wrangler.catalog*), 185

`delete_all_templates()` (*in module aws wrangler.quicksight*), 304

`delete_column()` (*in module aws wrangler.catalog*), 183

`delete_dashboard()` (*in module aws wrangler.quicksight*), 305

`delete_data_source()` (*in module aws wrangler.quicksight*), 305

`delete_database()` (*in module aws wrangler.catalog*), 184

`delete_database()` (in module `aws wrangler.timestream`), 281  
`delete_dataset()` (in module `aws wrangler.quicksight`), 306  
`delete_index()` (in module `aws wrangler.opensearch`), 264  
`delete_items()` (in module `aws wrangler.dynamodb`), 275  
`delete_objects()` (in module `aws wrangler.s3`), 126  
`delete_partitions()` (in module `aws wrangler.catalog`), 185  
`delete_table()` (in module `aws wrangler.timestream`), 282  
`delete_table_if_exists()` (in module `aws wrangler.catalog`), 186  
`delete_template()` (in module `aws wrangler.quicksight`), 306  
`describe_dashboard()` (in module `aws wrangler.quicksight`), 307  
`describe_data_source()` (in module `aws wrangler.quicksight`), 308  
`describe_data_source_permissions()` (in module `aws wrangler.quicksight`), 308  
`describe_dataset()` (in module `aws wrangler.quicksight`), 309  
`describe_ingestion()` (in module `aws wrangler.quicksight`), 310  
`describe_objects()` (in module `aws wrangler.s3`), 127  
`describe_transaction()` (in module `aws wrangler.lakeformation`), 228  
`does_object_exist()` (in module `aws wrangler.s3`), 128  
`does_table_exist()` (in module `aws wrangler.catalog`), 187  
`download()` (in module `aws wrangler.s3`), 129  
`drop_duplicated_columns()` (in module `aws wrangler.catalog`), 188

## E

`execute_gremlin()` (in module `aws wrangler.neptune`), 271  
`execute_opencypher()` (in module `aws wrangler.neptune`), 272  
`execute_sparql()` (in module `aws wrangler.neptune`), 272  
`extend_transaction()` (in module `aws wrangler.lakeformation`), 229  
`extract_athena_types()` (in module `aws wrangler.catalog`), 188

## F

`flatten_nested_df()` (in module `aws wrangler.neptune`), 273

## G

`get_account_id()` (in module `aws wrangler.sts`), 321  
`get_bucket_region()` (in module `aws wrangler.s3`), 130  
`get_cluster_state()` (in module `aws wrangler.emr`), 291  
`get_columns_comments()` (in module `aws wrangler.catalog`), 189  
`get_csv_partitions()` (in module `aws wrangler.catalog`), 190  
`get_current_identity_arn()` (in module `aws wrangler.sts`), 321  
`get_current_identity_name()` (in module `aws wrangler.sts`), 322  
`get_dashboard_id()` (in module `aws wrangler.quicksight`), 310  
`get_dashboard_ids()` (in module `aws wrangler.quicksight`), 311  
`get_data_source_arn()` (in module `aws wrangler.quicksight`), 311  
`get_data_source_arns()` (in module `aws wrangler.quicksight`), 312  
`get_data_source_id()` (in module `aws wrangler.quicksight`), 312  
`get_data_source_ids()` (in module `aws wrangler.quicksight`), 313  
`get_databases()` (in module `aws wrangler.catalog`), 191  
`get_dataset_id()` (in module `aws wrangler.quicksight`), 313  
`get_dataset_ids()` (in module `aws wrangler.quicksight`), 314  
`get_named_query_statement()` (in module `aws wrangler.athena`), 210  
`get_parquet_partitions()` (in module `aws wrangler.catalog`), 192  
`get_partitions()` (in module `aws wrangler.catalog`), 193  
`get_query_columns_types()` (in module `aws wrangler.athena`), 209  
`get_query_execution()` (in module `aws wrangler.athena`), 209  
`get_secret()` (in module `aws wrangler.secretsmanager`), 322  
`get_secret_json()` (in module `aws wrangler.secretsmanager`), 323  
`get_step_state()` (in module `aws wrangler.emr`), 291  
`get_table()` (in module `aws wrangler.dynamodb`), 276  
`get_table_description()` (in module `aws wrangler.catalog`), 194  
`get_table_location()` (in module `aws wrangler.catalog`), 195  
`get_table_number_of_versions()` (in module `aws wrangler.catalog`), 196

[get\\_table\\_parameters\(\)](#) (in module `aws wrangler.catalog`), 196  
[get\\_table\\_types\(\)](#) (in module `aws wrangler.catalog`), 197  
[get\\_table\\_versions\(\)](#) (in module `aws wrangler.catalog`), 198  
[get\\_tables\(\)](#) (in module `aws wrangler.catalog`), 199  
[get\\_template\\_id\(\)](#) (in module `aws wrangler.quicksight`), 314  
[get\\_template\\_ids\(\)](#) (in module `aws wrangler.quicksight`), 315  
[get\\_work\\_group\(\)](#) (in module `aws wrangler.athena`), 210

## I

[index\\_csv\(\)](#) (in module `aws wrangler.opensearch`), 265  
[index\\_df\(\)](#) (in module `aws wrangler.opensearch`), 267  
[index\\_documents\(\)](#) (in module `aws wrangler.opensearch`), 266  
[index\\_json\(\)](#) (in module `aws wrangler.opensearch`), 268

## L

[list\\_buckets\(\)](#) (in module `aws wrangler.s3`), 130  
[list\\_dashboards\(\)](#) (in module `aws wrangler.quicksight`), 315  
[list\\_data\\_sources\(\)](#) (in module `aws wrangler.quicksight`), 316  
[list\\_datasets\(\)](#) (in module `aws wrangler.quicksight`), 316  
[list\\_directories\(\)](#) (in module `aws wrangler.s3`), 130  
[list\\_group\\_memberships\(\)](#) (in module `aws wrangler.quicksight`), 317  
[list\\_groups\(\)](#) (in module `aws wrangler.quicksight`), 317  
[list\\_iam\\_policy\\_assignments\(\)](#) (in module `aws wrangler.quicksight`), 318  
[list\\_iam\\_policy\\_assignments\\_for\\_user\(\)](#) (in module `aws wrangler.quicksight`), 318  
[list\\_ingestions\(\)](#) (in module `aws wrangler.quicksight`), 319  
[list\\_objects\(\)](#) (in module `aws wrangler.s3`), 131  
[list\\_templates\(\)](#) (in module `aws wrangler.quicksight`), 319  
[list\\_user\\_groups\(\)](#) (in module `aws wrangler.quicksight`), 320  
[list\\_users\(\)](#) (in module `aws wrangler.quicksight`), 320

## M

[merge\\_datasets\(\)](#) (in module `aws wrangler.s3`), 132  
[merge\\_upsert\\_table\(\)](#) (in module `aws wrangler.s3`), 134

## O

[overwrite\\_table\\_parameters\(\)](#) (in module

[aws wrangler.catalog](#)), 200

## P

[post\\_message\(\)](#) (in module `aws wrangler.chime`), 323  
[put\\_csv\(\)](#) (in module `aws wrangler.dynamodb`), 276  
[put\\_df\(\)](#) (in module `aws wrangler.dynamodb`), 277  
[put\\_items\(\)](#) (in module `aws wrangler.dynamodb`), 278  
[put\\_json\(\)](#) (in module `aws wrangler.dynamodb`), 279

## Q

[query\(\)](#) (in module `aws wrangler.timestream`), 282

## R

[RdsDataApi](#) (class in `aws wrangler.data_api.rds`), 261  
[read\\_csv\(\)](#) (in module `aws wrangler.s3`), 134  
[read\\_excel\(\)](#) (in module `aws wrangler.s3`), 136  
[read\\_fwf\(\)](#) (in module `aws wrangler.s3`), 137  
[read\\_json\(\)](#) (in module `aws wrangler.s3`), 140  
[read\\_logs\(\)](#) (in module `aws wrangler.cloudwatch`), 295  
[read\\_parquet\(\)](#) (in module `aws wrangler.s3`), 142  
[read\\_parquet\\_metadata\(\)](#) (in module `aws wrangler.s3`), 145  
[read\\_parquet\\_table\(\)](#) (in module `aws wrangler.s3`), 147  
[read\\_sql\\_query\(\)](#) (in module `aws wrangler.athena`), 211  
[read\\_sql\\_query\(\)](#) (in module `aws wrangler.data_api.rds`), 262  
[read\\_sql\\_query\(\)](#) (in module `aws wrangler.data_api.redshift`), 260  
[read\\_sql\\_query\(\)](#) (in module `aws wrangler.lakeformation`), 224  
[read\\_sql\\_query\(\)](#) (in module `aws wrangler.mysql`), 251  
[read\\_sql\\_query\(\)](#) (in module `aws wrangler.postgresql`), 246  
[read\\_sql\\_query\(\)](#) (in module `aws wrangler.redshift`), 238  
[read\\_sql\\_query\(\)](#) (in module `aws wrangler.sqlserver`), 256  
[read\\_sql\\_table\(\)](#) (in module `aws wrangler.athena`), 215  
[read\\_sql\\_table\(\)](#) (in module `aws wrangler.lakeformation`), 226  
[read\\_sql\\_table\(\)](#) (in module `aws wrangler.mysql`), 252  
[read\\_sql\\_table\(\)](#) (in module `aws wrangler.postgresql`), 247  
[read\\_sql\\_table\(\)](#) (in module `aws wrangler.redshift`), 239  
[read\\_sql\\_table\(\)](#) (in module `aws wrangler.sqlserver`), 257  
[RedshiftDataApi](#) (class in `aws wrangler.data_api.redshift`), 259  
[repair\\_table\(\)](#) (in module `aws wrangler.athena`), 219

`reset()` (*aws wrangler.config method*), 324

`run_query()` (*in module aws wrangler.cloudwatch*), 296

## S

`sanitize_column_name()` (*in module aws wrangler.catalog*), 201

`sanitize_dataframe_columns_names()` (*in module aws wrangler.catalog*), 201

`sanitize_table_name()` (*in module aws wrangler.catalog*), 202

`search()` (*in module aws wrangler.opensearch*), 269

`search_by_sql()` (*in module aws wrangler.opensearch*), 270

`search_tables()` (*in module aws wrangler.catalog*), 202

`select_query()` (*in module aws wrangler.s3*), 149

`size_objects()` (*in module aws wrangler.s3*), 150

`start_query()` (*in module aws wrangler.cloudwatch*), 296

`start_query_execution()` (*in module aws wrangler.athena*), 220

`start_transaction()` (*in module aws wrangler.lakeformation*), 229

`stop_query_execution()` (*in module aws wrangler.athena*), 222

`store_parquet_metadata()` (*in module aws wrangler.s3*), 151

`submit_ecr_credentials_refresh()` (*in module aws wrangler.emr*), 292

`submit_spark_step()` (*in module aws wrangler.emr*), 292

`submit_step()` (*in module aws wrangler.emr*), 293

`submit_steps()` (*in module aws wrangler.emr*), 294

## T

`table()` (*in module aws wrangler.catalog*), 203

`tables()` (*in module aws wrangler.catalog*), 204

`terminate_cluster()` (*in module aws wrangler.emr*), 294

`to_csv()` (*in module aws wrangler.s3*), 154

`to_excel()` (*in module aws wrangler.s3*), 160

`to_json()` (*in module aws wrangler.s3*), 161

`to_pandas()` (*aws wrangler.config method*), 324

`to_parquet()` (*in module aws wrangler.s3*), 164

`to_property_graph()` (*in module aws wrangler.neptune*), 273

`to_rdf_graph()` (*in module aws wrangler.neptune*), 274

`to_sql()` (*in module aws wrangler.mysql*), 253

`to_sql()` (*in module aws wrangler.postgresql*), 248

`to_sql()` (*in module aws wrangler.redshift*), 240

`to_sql()` (*in module aws wrangler.sqlserver*), 258

## U

`unload()` (*in module aws wrangler.athena*), 222

`unload()` (*in module aws wrangler.redshift*), 242

`unload_to_files()` (*in module aws wrangler.redshift*), 244

`upload()` (*in module aws wrangler.s3*), 170

`upsert_table_parameters()` (*in module aws wrangler.catalog*), 205

## W

`wait_objects_exist()` (*in module aws wrangler.s3*), 171

`wait_objects_not_exist()` (*in module aws wrangler.s3*), 171

`wait_query()` (*in module aws wrangler.athena*), 223

`wait_query()` (*in module aws wrangler.cloudwatch*), 297

`wait_query()` (*in module aws wrangler.lakeformation*), 230

`write()` (*in module aws wrangler.timestream*), 283