pySpark Cheatsheet

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# Command Shell Execution Within iPython



## Examine Underlying HDFS Directory Structures in a Jupyter Notebook

%sx hdfs dfs -ls ../../lambda

Output:

['Found 6 items',

'drwxr-xr-x - saviops saviops 0 2017-08-09 16:59 ../../lambda/UNKNOWN',

'drwxr-xr-x - saviops saviops 0 2017-08-23 03:44 ../../lambda/definitions-parquet',

'drwxr-xr-x - saviops saviops 0 2017-07-31 13:06 ../../lambda/smf-json',

'drwxr-xr-x - saviops saviops 0 2017-08-23 03:25 ../../lambda/smf-parquet',

'drwxr-xr-x - hdfs saviops 0 2017-06-28 15:44 ../../lambda/summaries-json',

'drwxr-xr-x - saviops saviops 0 2017-08-23 04:11 ../../lambda/summaries-parquet']

Logout[Control Panel](https://10.200.4.13/hub/home)Untitled Last Checkpoint: a few seconds ago (autosaved)

pySpark Basic (Spark 1.4.1)

* [File](https://10.200.4.13/user/bbeauchamp/notebooks/Untitled.ipynb)
* [Edit](https://10.200.4.13/user/bbeauchamp/notebooks/Untitled.ipynb)
* [View](https://10.200.4.13/user/bbeauchamp/notebooks/Untitled.ipynb)
* [Insert](https://10.200.4.13/user/bbeauchamp/notebooks/Untitled.ipynb)
* [Cell](https://10.200.4.13/user/bbeauchamp/notebooks/Untitled.ipynb)
* [Kernel](https://10.200.4.13/user/bbeauchamp/notebooks/Untitled.ipynb)
* [Help](https://10.200.4.13/user/bbeauchamp/notebooks/Untitled.ipynb)

CodeMarkdownRaw NBConvertHeading

Cell Toolbar:NoneEdit MetadataRaw Cell FormatSlideshow

In [1]:

**print** "test"

test

In [17]:

**%**sx ls

Out[17]:

['derby.log',

'Getting Started with SparkSQL.ipynb',

'metastore\_db',

'output2.csv',

'Untitled.ipynb']

In [8]:

**%**sx hdfs dfs **-**ls

Out[8]:

['Found 2 items',

'-rw-r--r-- 3 bbeauchamp bbeauchamp 185038 2016-03-04 14:03 output\_file.json',

'drwxr-xr-x - bbeauchamp bbeauchamp 0 2016-03-04 14:25 test\_parquet.txt']

In [18]:

test = sqlContext.read.json("output\_file.json")

In [19]:

**print** test.take(1)

[Row(CORRIDOR=u'1701-PB340', DRIVER\_ETA\_MINS\_REM=369.0, HOUR\_OF\_DAY=19.0, KM\_REMAINING=139.03697714753346, LATITUDE=33.543056, LAT\_LON\_CORR=u'33.40\_-82.00\_33.58\_-84.52', LONGITUDE=-83.01861099999999, MINS\_REMAINING=95.0, SHIPMENT\_ID=u'304716814', carrier=u'USXI', currentLocationTime=u'2015-02-07T19:51:00.000Z', dest\_lat=33.576, dest\_lon=-84.5154, hour\_of\_day\_local=14.0, plannedArrivalTime=u'2015-02-08T02:00:00.000Z')]

In [6]:

test.printSchema()

root

|-- CORRIDOR: string (nullable = true)

|-- DRIVER\_ETA\_MINS\_REM: double (nullable = true)

|-- HOUR\_OF\_DAY: double (nullable = true)

|-- KM\_REMAINING: double (nullable = true)

|-- LATITUDE: double (nullable = true)

|-- LAT\_LON\_CORR: string (nullable = true)

|-- LONGITUDE: double (nullable = true)

|-- MINS\_REMAINING: double (nullable = true)

|-- SHIPMENT\_ID: string (nullable = true)

|-- carrier: string (nullable = true)

|-- currentLocationTime: string (nullable = true)

|-- dest\_lat: double (nullable = true)

|-- dest\_lon: double (nullable = true)

|-- hour\_of\_day\_local: double (nullable = true)

|-- plannedArrivalTime: string (nullable = true)

In [7]:

test.write.save("test\_parquet.txt", format="parquet")

In [9]:

df = sqlContext.read.parquet("test\_parquet.txt")

In [10]:

df.count()

​

Out[10]:

408

In [11]:

**print** df

DataFrame[CORRIDOR: string, DRIVER\_ETA\_MINS\_REM: double, HOUR\_OF\_DAY: double, KM\_REMAINING: double, LATITUDE: double, LAT\_LON\_CORR: string, LONGITUDE: double, MINS\_REMAINING: double, SHIPMENT\_ID: string, carrier: string, currentLocationTime: string, dest\_lat: double, dest\_lon: double, hour\_of\_day\_local: double, plannedArrivalTime: string]

In [12]:

pdf = df.toPandas()

In [13]:

type(pdf)

​

Out[13]:

pandas.core.frame.DataFrame

In [14]:

**import** pandas **as** pd

​

In [15]:

pdf.to\_csv("output2.csv", header=0)

In [ ]:

​

## Transfer a CSV file to HDFS

file name after upload via jupyter filename in HDFS home

%sx hdfs dfs -put /home/bbeauchamp/pg\_lanes\_export\_2017-05-18.csv pg\_lanes\_export\_2017-05-18.csv

# DataFrames (pyspark.sql.dataframe.DataFrame)

## Concatenate 2 pySpark DataFrames, row-wise

df1 = spark.range(3)

df1.show()

df2 = spark.range(4)

df2.show()

df = df1.union(df2)

df.show()

Output:

+---+

| id|

+---+

| 0|

| 1|

| 2|

+---+

+---+

| id|

+---+

| 0|

| 1|

| 2|

| 3|

+---+

+---+

| id|

+---+

| 0|

| 1|

| 2|

| 0|

| 1|

| 2|

| 3|

+---+

## Display DataFrame Columns and Types

df = sqlContext.sql("SELECT \* from shipment\_sums limit 5")

display(df)

Output:

DataFrame[carriers: array<string>, computedTimeUtc: string, countDeliveryLocationArrivals: bigint, countDeliveryLocationDepartures: bigint, countGeolocationUpdates: bigint, countPickupLocationArrivals: bigint, countPickupLocationDepartures: bigint, countRestatedPickupLocationArrivals: bigint, countRestatedPickupLocationDepartures: bigint, customers: array<string>, kmsDirectShipment: double, kmsTraversedShipment: double, legCount: bigint, modes: array<string>, poiFromId: bigint, poiFromLatitude: double, poiFromLongitude: double, poiFromName: string, poiToId: bigint, poiToLatitude: double, poiToLongitude: double, poiToName: string, routePoiIds: array<bigint>, routePoiNames: array<string>, secsDurationLifeCycle: double, secsMovingInTransit: double, secsStationaryInTransit: double, secsStationaryMax: double, shipmentDestinationArrivalAnalyticUtc: string, shipmentDestinationArrivalDetectedUtc: string, shipmentDestinationArrivalReportedUtc: string, shipmentDestinationDepartureAnalyticUtc: string, shipmentDestinationDepartureReportedUtc: string, shipmentEndActualUtc: string, shipmentEndLocalDate: string, shipmentEndLocalDow: bigint, shipmentEndLocalHour: bigint, shipmentEndLocalMonth: bigint, shipmentEndLocalTime: string, shipmentEndLocalTimeZone: string, shipmentEndLocalYear: bigint, shipmentId: string, shipmentOriginArrivalAnalyticUtc: string, shipmentOriginArrivalDetectedUtc: string, shipmentOriginArrivalReportedUtc: string, shipmentOriginDepartureAnalyticUtc: string, shipmentOriginDepartureDetectedUtc: string, shipmentOriginDepartureReportedUtc: string, shipmentScheduleStatus: string, shipmentStartActualUtc: string, shipmentStartLocalDate: string, shipmentStartLocalDow: bigint, shipmentStartLocalHour: bigint, shipmentStartLocalMonth: bigint, shipmentStartLocalTime: string, shipmentStartLocalTimeZone: string, shipmentStartLocalYear: bigint, shipmentSummaryId: string, shipper: string]

## DataFrame Schema

smurf\_processed\_df.printSchema()

Output:

root

|-- smfMetaData: struct (nullable = true)

| |-- defaultProcessMode: string (nullable = true)

| |-- deviceId: string (nullable = true)

| |-- endpointReceiptTime: string (nullable = true)

| |-- endpointResponseCode: string (nullable = true)

| |-- ipAddress: string (nullable = true)

## Export a Spark Data Frame to CSV

Three ways:

df.toPandas().to\_csv('mycsv.csv')

df.write.csv('mycsv.csv')

df.coalesce(1).write.csv('mycsv.csv')

## Extract a column from a pyspark DataFrame as a List

grp\_list = final\_df.rdd.map(lambda r: r.grp).collect()

print grp\_list

Returns:

[u'14979844271498287624', u'14979844271498287624', u'14979844271498287624',...]

## Extract a struct (structure) as a DataFrame

Note: In this example, ‘poi\_state’ is the column name of a column which is a struct.

poi\_state\_df\_2 = test\_result\_df.select('poi\_state.\*')

poi\_state\_df\_2.show(n=3, truncate = 25)

## Extract Distinct Values from a DataFrame

df.select("columnname").distinct().show()

## Extract Nested JSON Data in Spark

<http://bigdatums.net/2016/02/12/how-to-extract-nested-json-data-in-spark/>

## Register a DataFrame as a Temporary Table

vessel\_poi\_count\_df = sqlContext.sql('''

SELECT mmsi, imo, count(distinct(poi)) as poi\_count

FROM vessel\_poi

GROUP BY mmsi, imo

ORDER BY count(distinct(poi)) DESC

''')

vessel\_poi\_count\_df.registerTempTable('vessel\_poi\_count')

print vessel\_poi\_count\_df.count()

vessel\_poi\_count\_df.show(5)

# Output # of pois traversed by a ship, in a year

# 25883

#+---------+-------+-------------------+

#| mmsi| imo|count(DISTINCT poi)|

#+---------+-------+-------------------+

#|311913000|9118006| 131|

#|311007600|9073892| 129|

#|314220000|9005742| 129|

#|244890901|9760407| 127|

#|245219000|8915756| 127|

#+---------+-------+-------------------+

## Sample a DataFrame (approximate sample)

od\_sample = od.sample(withReplacement=False, fraction=0.04, seed=13) # Sample 4% of data

## Sort a DataFrame

od\_sample = od\_sample.sort("od\_pair", ascending=True)

Output:

+---------+-------+-------+

|source\_id|dest\_id|od\_pair|

+---------+-------+-------+

| 10| 1077|10-1077|

| 10| 1171|10-1171|

| 10| 136| 10-136|

+---------+-------+-------+

## Statistics on pyspark.sql.dataframe.DataFrame columns

### Calculate Mean and Median of a Column

import numpy as np

vessel\_poi\_count\_df.show(5)

+---------+-------+---------+

| mmsi| imo|poi\_count|

+---------+-------+---------+

|311913000|9118006| 131|

|311007600|9073892| 129|

|314220000|9005742| 129|

|244890901|9760407| 127|

|245219000|8915756| 127|

+---------+-------+---------+

poi\_count\_list = vessel\_poi\_count\_df.rdd.map(lambda r: r.poi\_count).collect()

print "median=", np.median(poi\_count\_list)

print "mean=", np.mean(poi\_count\_list)

Output:

median= 21.0

mean= 24.9121044701

### Statistics Summary for a pySpark DataFrame

vessel\_poi\_count\_df.describe().show()

+-------+-------------------+--------------------+------------------+

|summary| mmsi| imo| poi\_count|

+-------+-------------------+--------------------+------------------+

| count| 25883| 24839| 25883|

| mean|4.114968495927829E8|1.4876571290188815E7| 24.91210447011552|

| stddev| 1.37569361042951E8| 6.857711122390723E7|19.900553546011217|

| min| 112| 103558307| 1|

| max| 886092406| 995467000| 131|

+-------+-------------------+--------------------+------------------+

# pyspark.sql

Select a Field from a Row

print take\_out[0]

take\_out[0].SAPShipmentID

Output:

Row(SAPShipmentID=u'0305463905')

u'0305463905'