SparkSQL Cheatsheet

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# Array Queries

## Return the size of an array

SIZE(smfPayloadData.geolocation.detectedPois)

# Case Statements

shipment\_modes\_df = sqlContext.sql(''' SELECT poiFromId, poiToId,

truckCount / (truckCount + intermodalCount + unknownCount) as truckPct

FROM

(SELECT poiFromId, poiToId,

SUM(CASE WHEN mode = 'truck' THEN 1 ELSE 0 END) AS truckCount,

SUM(CASE WHEN mode = 'intermodal' THEN 1 ELSE 0 END) AS intermodalCount,

SUM(CASE WHEN mode = 'unknown' THEN 1 ELSE 0 END) AS unknownCount

FROM

(SELECT shipmentId, poiFromId, poiToId,

explode(modes) as mode

FROM shipment\_sums\_table

WHERE legCount = 1)

GROUP BY poiFromId, poiToId

ORDER BY poiFromId, poiToId

)

order by truckPct

''')

# Change a pyspark.sql.dataframe.DataFrame Data Type (CAST)

od\_pairs\_df = spark.sql('''SELECT DISTINCT a.prev\_poi, a.poi,

CONCAT(CAST(a.prev\_poi AS STRING), '-', CAST(a.poi as STRING)) as od\_pair

FROM leg\_2017\_transits a

LEFT OUTER JOIN pois\_data b ON a.prev\_poi = b.id

LIMIT 10''')

od\_pairs\_df.show(10)

Output:

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

|prev\_poi| poi| od\_pair|

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

| 4823| 5271| 4823-5271|

| 4823| 5003| 4823-5003|

...

# Constants

## pi()

# DataFrame (pyspark.sql.dataframe.DataFrame)

## Change a DataFrame’s Column Names

from pyspark.sql.functions import explode

df1.show()

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

| a|col| c|

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

| 1| 1| [7, 8, 9]|

| 1| 2| [7, 8, 9]|

| 1| 3| [7, 8, 9]|

| 2| 4|[10, 11, 12]|

| 2| 5|[10, 11, 12]|

| 2| 6|[10, 11, 12]|

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

df2 = df1.selectExpr("a as alph", "col as exploded", "c as age")

df2.show()

Output:

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

|alph|exploded| age|

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

| 1| 1| [7, 8, 9]|

| 1| 2| [7, 8, 9]|

| 1| 3| [7, 8, 9]|

| 2| 4|[10, 11, 12]|

| 2| 5|[10, 11, 12]|

| 2| 6|[10, 11, 12]|

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

## Create a DataFrame from Scratch

df = sqlContext.createDataFrame([Row(a=1, b=[1,2,3],c=[7,8,9]), Row(a=2, b=[4,5,6],c=[10,11,12])])

df.show()

Output:

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

| a| b| c|

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

| 1|[1, 2, 3]| [7, 8, 9]|

| 2|[4, 5, 6]|[10, 11, 12]|

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

Note: This is tyape pyspark.sql.dataframe.DataFrame

## Execute SQL on a DataFrame

sqlContext.registerDataFrameAsTable(data, "myTable")

df2 = sqlContext.sql("SELECT Name AS name, askdaosdka as age from myTable")

df2.show()

# Output

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

#| name|age|

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

#|Alberto| 2|

#| Dakota| 2|

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

## Explode a List inside a DataFrame column

df = sqlContext.createDataFrame([Row(a=1, b=[1,2,3],c=[7,8,9]), Row(a=2, b=[4,5,6],c=[10,11,12])])

df.show()

Output:

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

| a| b| c|

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

| 1|[1, 2, 3]| [7, 8, 9]|

| 2|[4, 5, 6]|[10, 11, 12]|

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

df1 = df.select(df.a, explode(df.b), df.c)

df.show()

Output:

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

| a|col| c|

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

| 1| 1| [7, 8, 9]|

| 1| 2| [7, 8, 9]|

| 1| 3| [7, 8, 9]|

| 2| 4|[10, 11, 12]|

| 2| 5|[10, 11, 12]|

| 2| 6|[10, 11, 12]|

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

# Joins

## Left Outer Join

llist = [('bob', '2015-01-13', 4), ('alice', '2015-04-23',10)]

left = spark.createDataFrame(llist, ['name','date','duration'])

right = spark.createDataFrame([('alice', 100),('bob', 23)],['name','upload'])

left.show()

right.show()

df\_015 = left.join(right, ['name'])

df\_015.show()

-or-

left.registerTempTable('left')

right.registerTempTable('right')

print "df\_017:"

df\_017 = spark.sql('''SELECT left.name, left.date, left.duration, right.upload

FROM left

LEFT OUTER JOIN right on left.name = right.name

''')

df\_017.show()

**Output:**

+-----+----------+--------+ “left”

| name| date|duration|

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

| bob|2015-01-13| 4|

|alice|2015-04-23| 10|

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

+-----+------+ “right”

| name|upload|

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

|alice| 100|

| bob| 23|

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

df\_017:

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

| name| date|duration|upload|

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

|alice|2015-04-23| 10| 100|

| bob|2015-01-13| 4| 23|

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

test\_300\_2 = spark.sql('''SELECT a.imo, a.prev\_timestamp as leg\_start\_ts, a.timestamp as leg\_end\_ts,

a.prev\_poi as leg\_orig\_poi, a.poi as leg\_dest\_poi, a.duration as leg\_duration\_hrs,

b.smfPayloadData.timestamp.asOf as timestamp,

unix\_timestamp(b.smfPayloadData.timestamp.asOf, "yyyy-MM-dd'T'HH:mm:ss.SSS'Z'") as unix\_ts,

b.smfPayloadData.geolocation.latitude,

b.smfPayloadData.geolocation.longitude, b.smfPayloadData.geolocation.speed,

c.centroid\_lat as dest\_lat, c.centroid\_lng as dest\_lon, c.radius\_km as dest\_poi\_radius\_km

FROM one\_leg\_transits\_test\_2017\_07 a

JOIN ais\_data\_2017\_07 b ON a.imo = b.smfPayloadData.paired.vesselId

AND unix\_timestamp(b.smfPayloadData.timestamp.asOf,

"yyyy-MM-dd'T'HH:mm:ss.SSS'Z'") >= a.prev\_timestamp

AND unix\_timestamp(b.smfPayloadData.timestamp.asOf,

"yyyy-MM-dd'T'HH:mm:ss.SSS'Z'") <= a.timestamp

JOIN pois\_data c ON a.poi = c.id

WHERE a.imo = '9189574'

ORDER BY unix\_ts

''')

test\_300\_2.show()

# LEAD and LAG

shipment\_lat\_lon\_df = sqlContext.sql('''

SELECT smfPayloadData.paired.deviceId,

smfPayloadData.paired.deviceMake,

smfPayloadData.paired.shipmentId,

smfPayloadData.paired.shipper,

smfPayloadData.paired.vesselId,

smfPayloadData.geolocation.asOf,

smfPayloadData.geolocation.latitude,

smfPayloadData.geolocation.longitude

FROM smurf\_processed

WHERE smfPayloadData.geolocation.latitude is not null

AND smfPayloadData.paired.deviceId is not null

AND smfPayloadData.paired.shipmentId is not null

AND smfPayloadData.paired.vesselId is not null

ORDER BY vesselId, asOf

LIMIT 100

''')

shipment\_lat\_lon\_df.show(100)

shipment\_lat\_lon\_df.registerTempTable('tbl\_shimpment\_lat\_lon\_df')

Output:

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

| deviceId| deviceMake|shipmentId|shipper|vesselId| asOf|latitude|longitude|

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

|86737803528965|sensor-savi-locate|0009424460| SYT|US--3113|2018-04-10T18:11:...| 40.6161| -89.4637|

|86737803528965|sensor-savi-locate|0009424460| SYT|US--3113|2018-04-10T18:31:...| 40.6161| -89.4637|

|86737803531687|sensor-savi-locate|0009427810| SYT|US--3114|2018-05-02T12:04:...| 40.6161| -89.4637|

|86737803531687|sensor-savi-locate|0009428134| SYT|US--3114|2018-05-02T12:04:...| 40.6161| -89.4637|

|86737803531687|sensor-savi-locate|0009428804| SYT|US--3114|2018-05-02T12:04:...| 40.6161| -89.4637|

|86737803531687|sensor-savi-locate|0009429154| SYT|US--3114|2018-05-02T13:03:...| 40.6161| -89.4637|

|86737803531687|sensor-savi-locate|0009427810| SYT|US--3114|2018-05-02T13:03:...| 40.6161| -89.4637|

shipment\_lat\_lon\_with\_prior\_df = sqlContext.sql('''

SELECT a.\*,

LAG(asOf, 1) OVER (PARTITION BY vesselId ORDER BY asOf) AS prev\_asOf

FROM tbl\_shimpment\_lat\_lon\_df a

''')

Output:

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

| deviceId| deviceMake|shipmentId|shipper|vesselId| asOf|latitude|longitude| last\_asOf|

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

|86737803528965|sensor-savi-locate|0009424460| SYT|US--3113|2018-04-10T18:11:...| 40.6161| -89.4637| null|

|86737803528965|sensor-savi-locate|0009424460| SYT|US--3113|2018-04-10T18:31:...| 40.6161| -89.4637|2018-04-10T18:11:...|

|86737803531687|sensor-savi-locate|0009428804| SYT|US--3114|2018-05-02T12:04:...| 40.6161| -89.4637| null|

|86737803531687|sensor-savi-locate|0009427810| SYT|US--3114|2018-05-02T12:04:...| 40.6161| -89.4637|2018-05-02T12:04:...|

|86737803531687|sensor-savi-locate|0009428134| SYT|US--3114|2018-05-02T12:04:...| 40.6161| -89.4637|2018-05-02T12:04:...|

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

## Loading a Schema while Correcting org.apache.parquet.io.ParquetDecodingException

This throws an Exception:

smf\_parquet = sqlContext.read.parquet( '/lambda/smf-parquet/POC/smurf-processed//quarter=2017-q1/\*',

'/lambda/smf-parquet/POC/smurf-processed//quarter=2017-q2/\*',

'/lambda/smf-parquet/POC/smurf-processed//quarter=2017-q3/\*')

smf\_parquet.registerTempTable('smurf\_processed')

test\_df = sqlContext.sql('''

SELECT \*

FROM smurf\_processed

LIMIT 10''')

test\_df.take(5)

but the following works:

merged\_df = spark.read.option("mergeSchema", "true").parquet( '/lambda/smf-parquet/POC/smurf-processed//quarter=2017-q1/\*',  
'/lambda/smf-parquet/POC/smurf-processed//quarter=2017-q2/\*')

## Read a Parquet File into a DataFrame

shipment\_summaries\_path = '/lambda/summaries-parquet/PG/shipment-summaries/\*'

shipment\_sums = sqlContext.read.parquet(shipment\_summaries\_path) # pyspark.sql.dataframe.DataFrame

## Store DataFrame as Temp Table for Later Querying

shipment\_sums.createOrReplaceTempView("shipment\_sums\_table")

Query from the Temp Table:

test\_df = sqlContext.sql('''SELECT shipmentId FROM shipment\_sums\_table limit 1''')

test\_df.head()

Output:

Row(shipmentId=u'0306098015')

# Select an Array Element

df.printSchema()

## root

## |-- stuff: array (nullable = true)

## | |-- element: struct (containsNull = true)

## | | |-- a: long (nullable = true)

## | | |-- b: long (nullable = true)

## | | |-- c: long (nullable = true)

sqlContext.sql("SELECT stuff[0].a FROM df").show()

## +---+

## |\_c0|

## +---+

## | 1|

## +---+

# Parameterized Queries

q25 = 500

var2 = 50

Q1 = spark.sql("SELECT col1 from table where col2>{0} limit {1}".format(var2,q25))

## Passing a List or Tuple in a Parameterized Query

Hint: Convert the List to a tuple

syngenta\_truck\_df = sqlContext.sql('''

SELECT smfPayloadData.paired.shipper,

smfPayloadData.paired.shipmentId,

smfPayloadData.paired.vesselId,

smfPayloadData.paired.vesselName,

smfPayloadData.timestamp.asOf,

smfPayloadData.geolocation.latitude,

smfPayloadData.geolocation.longitude,

smfPayloadData.geolocation.detectedPois,

smfPayloadData.computations.CurrentShipmentState.humanizedState.motion,

smfPayloadData.computations.CurrentShipmentState.humanizedState.currentLeg,

smfPayloadData.computations.CurrentShipmentState.humanizedState.totalLegs,

smfPayloadData.computations.CurrentShipmentState.humanizedState.lastSpName,

smfPayloadData.computations.CurrentShipmentState.humanizedState.nextSpName,

smfPayloadData.computations.CurrentShipmentState.detectedPoiState,

smfPayloadData.computations.CurrentShipmentState.departureTimesAtShippingPoint

FROM smurf\_processed

WHERE smfPayloadData.paired.shipmentId in {0}

ORDER BY smfPayloadData.timestamp.asOf

'''.format(tuple(shipment\_ids))

)

# Parquet

## Explode a list or array data field

shipment\_df = sqlContext.sql('''SELECT shipmentId, modes

FROM shipment\_sums\_table

where legCount = 2

limit 5

''')

shipment\_df.show()

Output:

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

|shipmentId| modes|

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

|0306080481|[truck, truck]|

|0306120361|[truck, truck]|

|0306120411|[truck, truck]|

|0306103320|[truck, truck]|

|0306078031|[truck, truck]|

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

# What modes are available?

modes\_df = sqlContext.sql('''SELECT shipmentId,

explode(distinct modes)as mode

FROM shipment\_sums\_table

WHERE legCount = 2

limit 6

''')

modes\_df.show()

Output:

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

|shipmentId| mode|

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

|0306080481|truck|

|0306080481|truck|

|0306120361|truck|

|0306120361|truck|

|0306120411|truck|

|0306120411|truck|

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

**Exploding an Array stored in a Column**

Unexploded:

start\_moored = sqlContext.sql('''

SELECT timestamp, mmsi, pois

FROM (

SELECT \*

FROM pos\_data

WHERE moored = 1 and prev\_moored = 0 and prev2\_moored = 0 and prev3\_moored = 0 and prev4\_moored = 0 and prev5\_moored = 0 and prev6\_moored = 0 and prev7\_moored = 0

) a

'''

)

Output:

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

| timestamp| mmsi| pois|

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

|1493653149|212370000| [12223]|

|1493847898|212370000|[14952, 15249]|

|1493949978|212370000| [12223]|

|1494075847|212370000| [12275]|

|1494258522|212370000| [12223]|

Exploded:

start\_moored = sqlContext.sql('''

SELECT timestamp, mmsi, poi

FROM (

SELECT \*

FROM pos\_data

WHERE moored = 1 and prev\_moored = 0 and prev2\_moored = 0 and prev3\_moored = 0 and prev4\_moored = 0 and prev5\_moored = 0 and prev6\_moored = 0 and prev7\_moored = 0

) a

LATERAL VIEW OUTER EXPLODE(pois) zzz AS poi

'''

Output:

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

| timestamp| mmsi| poi|

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

|1493653149|212370000|12223|

|1493847898|212370000|14952| # These were

|1493847898|212370000|15249| # exploded

|1493949978|212370000|12223|

|1494075847|212370000|12275|

|1494258522|212370000|12223|

|1494419315|212370000|14952|

|1494419315|212370000|15249|

|1494621881|212370000|12275|

|1494913457|212370000|12223|

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

# Statistics

## Average

outliers\_df = sqlContext.sql('''

SELECT prev\_poi, poi,

avg(duration)

FROM legSummaries

GROUP BY prev\_poi, poi

LIMIT 5

''')

outliers\_df.show(5)

Output:

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

|prev\_poi| poi|avg(duration)|

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

| 7361|11322|55.1361110000|

| 9991| 9469| 4.3386058879|

...

## Median

stats\_df = sqlContext.sql('''

SELECT imo, prev\_poi, poi,

avg(duration) as leg\_mean\_hrs,

**percentile\_approx(duration, 0.5) as median\_hrs**,

stddev(duration) as leg\_stddev\_hrs,

count(\*)

FROM legSummaries

WHERE imo is not null

AND poi != -1

GROUP BY imo, prev\_poi, poi

HAVING count(\*) > 1

AND median\_hrs >= 8.0

LIMIT 10

''')

stats\_df.registerTempTable('stats')

stats\_df.show(10)

Output:

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

| imo|prev\_poi| poi| leg\_mean\_hrs|median\_hrs| leg\_stddev\_hrs|count(1)|

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

|135206012| 5749| 5634|20.8236110000| 21.241389|0.5908273136611072| 2|

|402653322| 5863| 5862|36.6962036667| 46.911944|31.852472485088068| 3|

| 6507983| 6757|17133| 9.1079170000| 11.863056| 3.896354940023047| 2|

# Strings

## Concatenate strings

ais\_imo\_750\_df = spark.sql(

''' SELECT (concat(string(1234), '-', string(2345))) as test

'''

)

ais\_imo\_750\_df.show()

print ais\_imo\_750\_df.dtypes

Output:

+---------+

| test|

+---------+

|1234-2345|

+---------+

[('test', 'string')]

## Convert a numeric field to a string

ais\_imo\_750\_df = spark.sql(

''' SELECT (concat(string(1234), '-', string(2345))) as test

'''

)

ais\_imo\_750\_df.show()

print ais\_imo\_750\_df.dtypes

Output:

+---------+

| test|

+---------+

|1234-2345|

+---------+

[('test', 'string')]

test = sqlContext.sql('''

SELECT DISTINCT format\_string("%s", poiFromId) as originId,

format\_string("%s", poiToId) as destId,

format\_string("%s-%s", poiFromId, poiToId) as od\_pair

FROM shipment\_sums

LIMIT 5

''')

print type(test)

test.show(5)

Output:

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

|originId|destId|od\_pair|

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

| 39| 981| 39-981|

| 31| 1056|31-1056|

| 38| 547| 38-547|

| 33| 174| 33-174|

| 37| 40| 37-40|

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

## Substring

SUBSTR(smfPayloadData.timestamp.asOf,1,10)

output: “2016-03-01”

# Time Intervals

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

| shipment\_id| port\_start\_ts| port\_end\_ts|

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

| 27690030954076|2018-03-11T18:26:...|2018-03-13T08:14:...|

|27690031135535\_YM...|2018-02-20T18:55:...|2018-02-22T01:00:...|

|27690030954052\_YM...|2018-03-03T21:57:...|2018-03-05T08:20:...|

|27690030954069\_YM...|2018-03-05T20:49:...|2018-03-07T18:51:...|

|27690030699786\_YM...|2018-02-04T19:59:...|2018-02-06T09:26:...|

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

timeFmt = "yyyy-MM-dd'T'HH:mm:ss.SSS"

timeDiff = (unix\_timestamp('port\_end\_ts', format=timeFmt)

- unix\_timestamp('port\_start\_ts', format=timeFmt))

df = df.withColumn("Duration", timeDiff)

df.show()

Output:

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

| shipment\_id| port\_start\_ts| port\_end\_ts|Duration|

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

| 27690030954076|2018-03-11T18:26:...|2018-03-13T08:14:...| 136058|

|27690031135535\_YM...|2018-02-20T18:55:...|2018-02-22T01:00:...| 108287|

|27690030954052\_YM...|2018-03-03T21:57:...|2018-03-05T08:20:...| 123786|

|27690030954069\_YM...|2018-03-05T20:49:...|2018-03-07T18:51:...| 165738|

|27690030699786\_YM...|2018-02-04T19:59:...|2018-02-06T09:26:...| 134809|

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

# Timestamps

## Convert string to timestamp

shipment\_carr = sqlContext.sql('''

SELECT smfPayloadData.paired.shipmentId,

smfPayloadData.paired.shipper,

smfPayloadData.paired.carrier,

smfPayloadData.timestamp.asOf as dest\_arr\_utc,

to\_utc\_timestamp('2016-03-01 00:00:00','UTC') as example\_timestamp

FROM mapped

where smfPayloadData.events.DeliveryLocationArrival is not null

and smfPayloadData.timestamp.asOf >= to\_utc\_timestamp('2016-03-01 00:00:00','UTC')

and smfPayloadData.timestamp.asOf < to\_utc\_timestamp('2016-03-02 00:00:00','UTC')

limit 1

''')

printResultsAsJson(shipment\_carr)

output:

{

**"example\_timestamp": "2016-03-01 00:00:00.0"**,

"carrier": "SCNN",

"shipper": "PG",

"dest\_arr\_utc": "2016-03-01T23:51:00.000Z",

"shipmentId": "Jackie will add"

}

## Convert ISO 8601 Standard DateTime to unix Timestamp

test\_ais\_data\_135206012\_df = spark.sql(

'''SELECT smfPayloadData.timestamp.asOf,

**unix\_timestamp(smfPayloadData.timestamp.asOf, "yyyy-MM-dd'T'HH:mm:ss.SSS'Z'") as unix\_ts**,

outputs a unix\_ts like:

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

| asOf| unix\_ts| imo|vesselName|vesselTelematicsId|latitude|longitude|speed|heading|detectedPois|

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

|2017-07-01T00:08:...|**1498867725**|135206012| JINLUN| 4122

## Convert Unix Timestamp to Formatted Date

mooring\_exp\_df = sqlContext.sql('''

SELECT \*,

from\_unixtime(timestamp, 'YYYY-MM-dd') as timestamp\_dt

FROM start\_moored

ORDER BY mmsi, timestamp

LIMIT 10

'''

)

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

| timestamp| mmsi| poi|timestamp\_dt|

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

|1493942222|173313120|12052| 2017-05-04|

|1494196603|173313120|12043| 2017-05-07|

|1494472207|173313120|12052| 2017-05-11|

...

## Convert Unix Epoch Timestamp to ISO Standard Date and Time

one\_leg\_transits\_test\_2017\_07\_df = spark.sql(

'''SELECT \*,

from\_unixtime(prev\_timestamp, "y-MM-dd'T'hh:mm:ss'Z'") as origin\_datetime

FROM one\_leg\_2017\_07

WHERE prev\_poi != 0

AND prev\_timestamp is not null

AND prev\_poi != poi

''')

one\_leg\_transits\_test\_2017\_07\_df.show(10)

Output:

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

| mmsi| imo|prev\_timestamp| timestamp|prev\_poi| poi|prev\_arrive|arrive| duration| origin\_datetime|

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

|212370000|9189574| 1498906282|1499099051| 12275|15643| 0| 1|53.546944|**2017-07-01T10:51:22Z**|

|212370000|9189574| 1499246131|1499453431| 15643|14952| 0| 1|57.583333|2017-07-05T09:15:31Z|