EECS 6893 Big Data Analytics
Homework Assignment 3

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Due: 11/1/2019

1. Screenshot of code to do all the tasks

1.1 hashtagCount()

```
def hashtagCount(words):
    """
    Calculate the accumulated hashtags count sum from the beginning of the stream
    and sort it by descending order of the count.
    Ignore case sensitivity when counting the hashtags:
        "#Ab" and "#ab" is considered to be a same hashtag
    You have to:
    1. Filter out the word that is hashtags.
       Hashtag usually start with "#" and followed by a series of alphanumeric
    2. map (hashtag) to (hashtag, 1)
    3. sum the count of current DStream state and previous state
    4. transform unordered DStream to a ordered Dstream
    Hints:
        you may use regular expression to filter the words
        You can take a look at updateStateByKey and transform transformations
    Args:
        dstream(DStream): stream of real time tweets
    Returns:
        DStream Object with inner structure (hashtag, count)
    """
    htc=words.map(lambda w:w.lower()).filter(lambda x:len(x)>2).filter(lambda x:x[0]=='#')
    htc=htc.map(lambda x:(x,1))
    htc_one=htc.reduceByKey(lambda x,y:x+y)
    htc_total=htc_one.updateStateByKey(lambda x,y:sum(x+(y or 0)))
    return htc_total
```

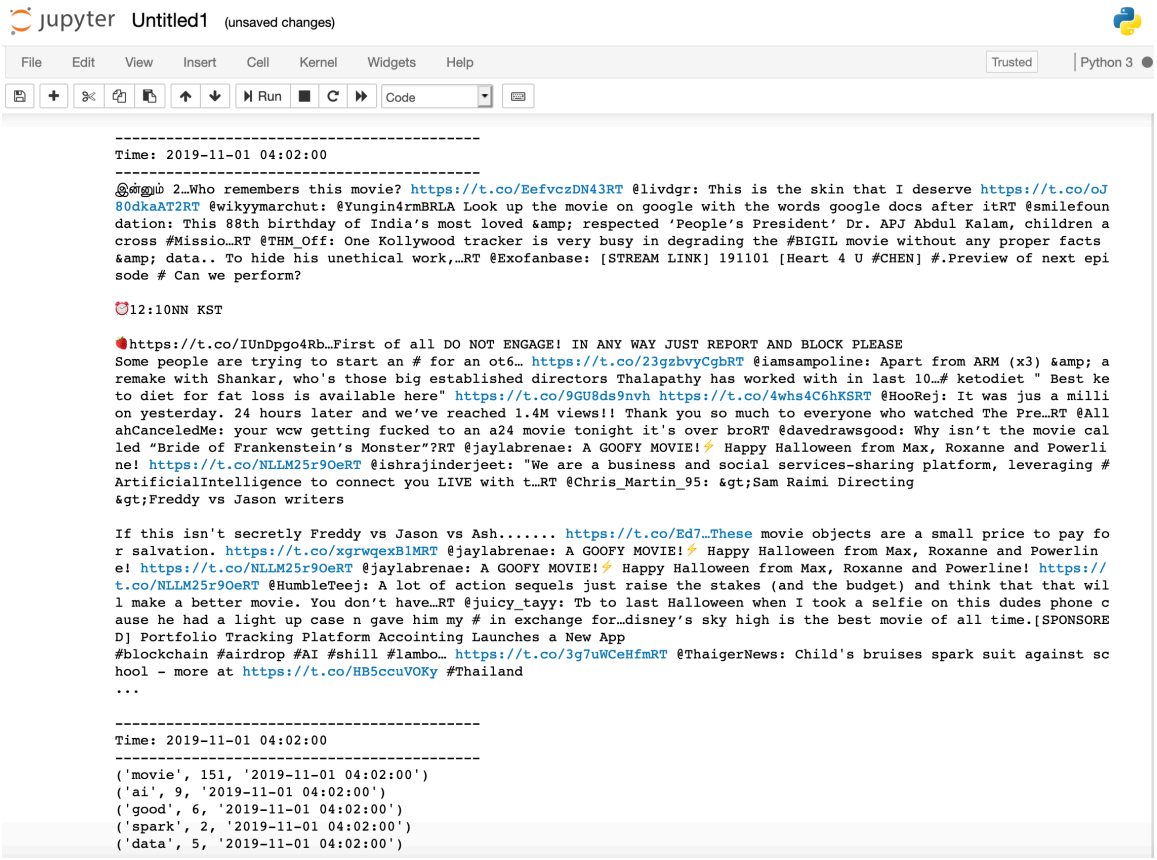
1.2 wordCount()

```
def wordCount(words):
    """
    Calculte the count of 5 sepcial words for every 60 seconds (window no overlap)
    You can choose your own words.
    Your should:
    1. filter the words
    2. count the word during a special window size
    3. add a time related mark to the output of each window, ex: a datetime type
    Hints:
        You can take a look at reduceByKeyAndWindow transformation
        Dstream is a serious of rdd, each RDD in a DStream contains data from a certain interval
        You may want to take a look of transform transformation of DStream when trying to add a time
    Args:
        dstream(DStream): stream of real time tweets
    Returns:
        DStream Object with inner structure (word, count, time)
    """
    wordcount=words.map(lambda w:w.lower()).filter(lambda w: w in WORD)
    wordcount=wordcount.map(lambda w:(w,1))
    wordcount=wordcount.reduceByKeyAndWindow(lambda x,y:x+y, lambda x,y:x-y,60,60)
    wordcounttime=wordcount.transform( lambda time, rdd: rdd.map(
            lambda x: (x[0], x[1], time.strftime("%Y-%m-%d %H:%M:%S"))))
    return wordcounttime
```

1.3 Save hashtags count and word count to google storage

```
# save hashtags count and word count to google storage.
topTags.foreachRDD(lambda rdd: saveToStorage(rdd, output_directory_hashtags,columns_name_hashtags,mode="overwrite"))
wordCount.foreachRDD(lambda rdd: saveToStorage(rdd, output_directory_wordcount,columns_name_wordcount, mode="append"))
```

1.4 Demo of real-time output when executing sparkStreaming.py in Jupyter

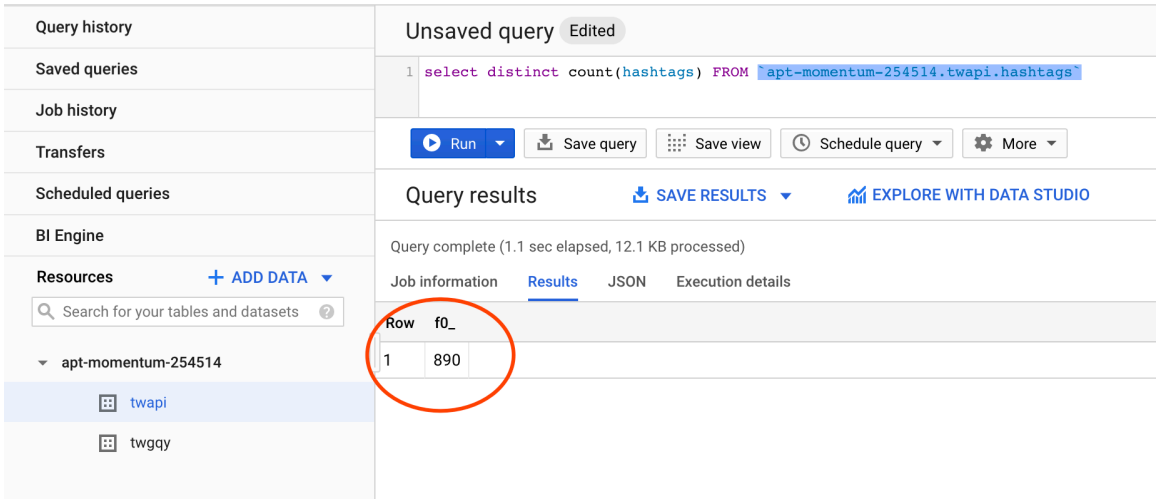


2. Screenshot of data stored in BigQuery

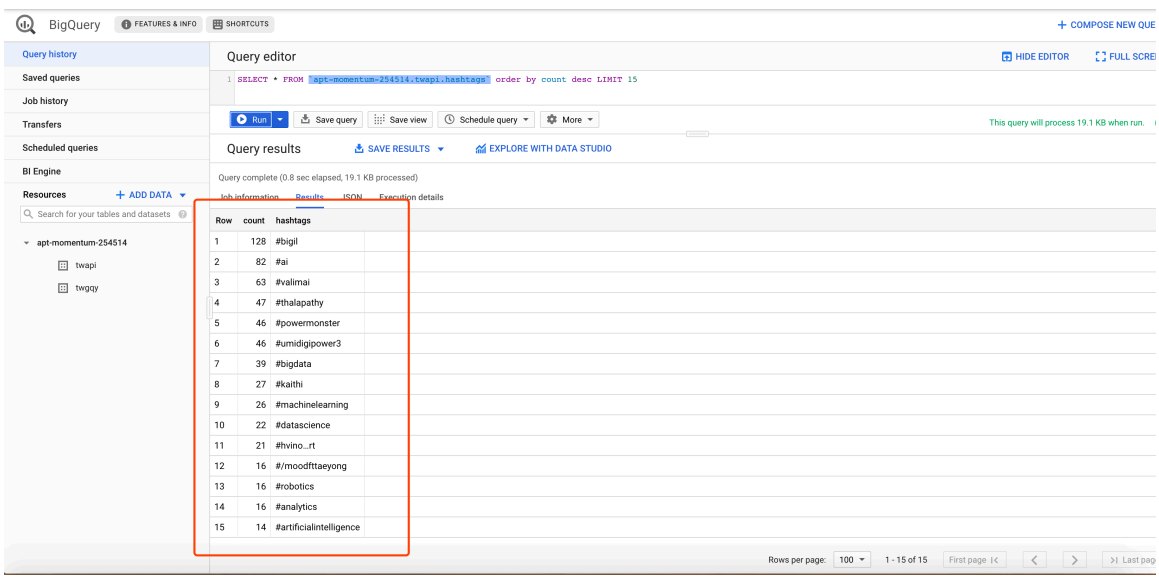
2.1 Table Hashtags

First, I count total number of distinct hashtags appeared in the last 600 seconds.

There are 890 hashtags.



Secondly, we list top 10 hashtags with the highest frequency. As is seen from the figure below, **#bigil** is the one appeared most in last 10 minutes.



2.1 Table Wordcount

In this part, I filter 5 chosen words and calculate the appearance frequency of them with the interval of 60 seconds and length of 600 seconds. Next, I will show each of these five words one by one.

One thing I want to mention here is that some of words may have no

appearance in some of intervals.

a. ai

Query editor

```
SELECT * FROM `apt-momentum-254514.twapi.wordcount` where word="ai" order by time
```

Run | Save query | Save view | Schedule query | More

Query results | SAVE RESULTS | EXPLORE WITH DATA STUDIO

Query complete (0.7 sec elapsed, 1 KB processed)

Job information | Results | JSON | Execution details

Row	time	count	word
1	2019-11-01 02:34:00 UTC	4	ai
2	2019-11-01 02:35:00 UTC	13	ai
3	2019-11-01 02:36:00 UTC	7	ai
4	2019-11-01 02:37:00 UTC	14	ai
5	2019-11-01 02:38:00 UTC	11	ai
6	2019-11-01 02:39:00 UTC	16	ai
7	2019-11-01 02:40:00 UTC	13	ai
8	2019-11-01 02:41:00 UTC	15	ai
9	2019-11-01 02:42:00 UTC	13	ai
10	2019-11-01 02:43:00 UTC	15	ai

b. data

Query editor

```
SELECT * FROM `apt-momentum-254514.twapi.wordcount` where word="data" order by time
```

Run | Save query | Save view | Schedule query | More

Query results | SAVE RESULTS | EXPLORE WITH DATA STUDIO

Query complete (0.8 sec elapsed, 1 KB processed)

Job information | Results | JSON | Execution details

Row	time	count	word
1	2019-11-01 02:34:00 UTC	1	data
2	2019-11-01 02:36:00 UTC	2	data
3	2019-11-01 02:37:00 UTC	2	data
4	2019-11-01 02:38:00 UTC	1	data
5	2019-11-01 02:39:00 UTC	1	data
6	2019-11-01 02:42:00 UTC	2	data
7	2019-11-01 02:43:00 UTC	2	data

c. good

Query editor

```
SELECT * FROM `apt-momentum-254514.twapi.wordcount` where word="good" order by time
```

Run | Save query | Save view | Schedule query | More

Query results | SAVE RESULTS | EXPLORE WITH DATA STUDIO

Query complete (0.8 sec elapsed, 1 KB processed)

Job information | Results | JSON | Execution details

Row	time	count	word
1	2019-11-01 02:34:00 UTC	3	good
2	2019-11-01 02:35:00 UTC	13	good
3	2019-11-01 02:36:00 UTC	14	good
4	2019-11-01 02:37:00 UTC	11	good
5	2019-11-01 02:38:00 UTC	8	good
6	2019-11-01 02:39:00 UTC	6	good
7	2019-11-01 02:40:00 UTC	14	good
8	2019-11-01 02:41:00 UTC	21	good
9	2019-11-01 02:42:00 UTC	5	good
10	2019-11-01 02:43:00 UTC	12	good

d. movie

Query editor

```
SELECT * FROM `apt-momentum-254514.twapi.wordcount` where word="movie" order by time
```

Run | Save query | Save view | Schedule query | More

Query results | SAVE RESULTS | EXPLORE WITH DATA STUDIO

Query complete (0.6 sec elapsed, 1 KB processed)

Job information | Results | JSON | Execution details

Row	time	count	word
1	2019-11-01 02:34:00 UTC	51	movie
2	2019-11-01 02:35:00 UTC	152	movie
3	2019-11-01 02:36:00 UTC	156	movie
4	2019-11-01 02:37:00 UTC	131	movie
5	2019-11-01 02:38:00 UTC	171	movie
6	2019-11-01 02:39:00 UTC	140	movie
7	2019-11-01 02:40:00 UTC	146	movie
8	2019-11-01 02:41:00 UTC	140	movie
9	2019-11-01 02:42:00 UTC	124	movie
10	2019-11-01 02:43:00 UTC	141	movie

e. spark

Query editor

```
SELECT * FROM `apt-momentum-254514.twapi.wordcount` where word="spark" order by time
```

Run | Save query | Save view | Schedule query | More

Query results | SAVE RESULTS | EXPLORE WITH DATA STUDIO

Query complete (0.9 sec elapsed, 1 KB processed)

Job information | Results | JSON | Execution details

Row	time	count	word
1	2019-11-01 02:34:00 UTC	1	spark
2	2019-11-01 02:35:00 UTC	1	spark
3	2019-11-01 02:36:00 UTC	8	spark
4	2019-11-01 02:37:00 UTC	7	spark
5	2019-11-01 02:38:00 UTC	3	spark
6	2019-11-01 02:39:00 UTC	6	spark
7	2019-11-01 02:40:00 UTC	6	spark
8	2019-11-01 02:41:00 UTC	6	spark
9	2019-11-01 02:42:00 UTC	6	spark
10	2019-11-01 02:43:00 UTC	5	spark