Hadoop Map Reduce

Part Two: Movie Similarities

The objective of this part is to use a large corpus of movie data and provide recommendations of similar movies based on ratings by using statistical correlation and cosine similarity. Movies.csv and ratings.csv files are downloaded for this purpose.

Movies.csv file contains “Movie ID”, “Movie Title”, “Genre” The ratings.csv file contains “User ID”, “Movie ID”, “Rating”, “Timestamp”.

Following is the source code for all movie computations

I have used 1 mapper and 4 reducers in the source code

Description of each step written below with # symbol prior to the reducer and mapper.

# Installed respective packages and libraries required for computation

Source Code:

```
from mrjob.job import MRJob

from mrjob.step import MRStep

from itertools import combinations

import numpy

from scipy import spatial

class movies_count(MRJob):

 #  steps function determine the sequence of operations

    def steps(self):

        return [

            MRStep(mapper=self.moviedatasplit,

                reducer=self.joinfilereducer),

          MRStep(reducer=self.reducer_moviepairs),

          MRStep(reducer=self.reducer_pairs),
        MRStep(reducer=self.movie_similarity)
    ]

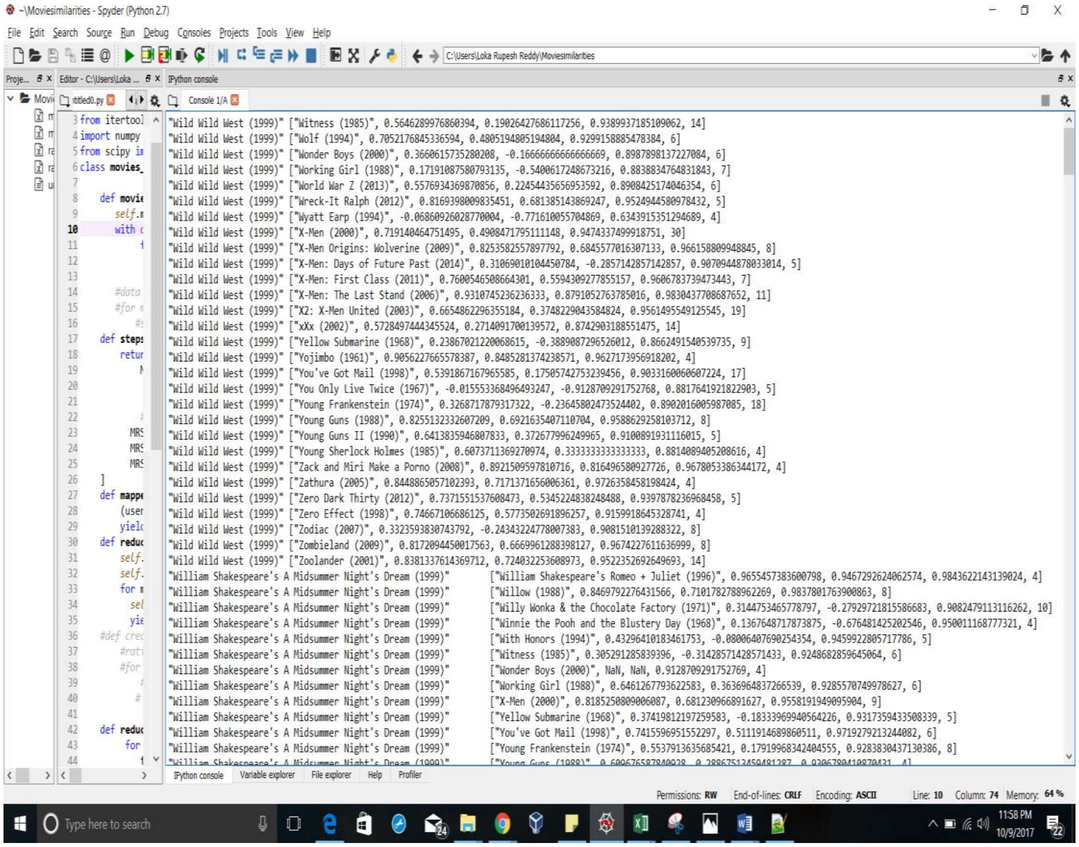
 # Passing two files (movies.csv and ratings.csv) to the first mapper
    def moviedatasplit(self, _, line):
            dsplit = line.split(",")
            if (len(dsplit) == 3): # movie data
                  yield dsplit[0], dsplit[1]
            else: # rating data
                  yield dsplit[1], (dsplit[0], dsplit[2])
# generating user id as key and movie title, movierating as values with the help of first reducer
    def joinfilereducer(self, _, values):
            movielist = list(values)
            movietitle = movielist[0]
            tuplevalue = movielist[1:]
            for val in tuplevalue:
                 userid = val[0]
                 movierating = val[1]
                 yield userid, (movietitle, movierating)
# generating combination of two movies as key and their respective ratings as value for each user id with the second reducer
    def reducer_moviepairs(self,userid,values):
        for pair1, pair2 in combinations(values,2):
          title1=pair1[0]
          rating1=pair1[1]
          title2=pair2[0]
          rating2=pair2[1]
```

```
            yield (title1,title2),(rating1,rating2)
# combining all the ratings for each movie pair by different users with the third reducer
    def reducer_pairs(self,titles,ratings):
        rating=[]
        for r in ratings:
            rating.append(r)
        yield titles,rating

# finding similarity between movies using statistical coorelation and cosine similarity
    def movie_similarity(self,titles,ratings):
        rating =list(ratings)
        for ratings in rating:
            n=len(ratings)
        q1=[]
        q2=[]
        for r1 in ratings:
            q1.append((float(r1[0])))
            q2.append((float(r1[1])))

        if(n>3):
                cor = numpy.corrcoef(q1,q2)[0,1]
                cos_cor = 1-spatial.distance.cosine(q1,q2)
                avg_cor = 0.5*(cor+cos_cor)
                yield titles[0], (titles[1],avg_cor,cor,cos_cor,n)
# main function
if __name__ == '__main__':
            movies_count.run()
```

- I have computer similarities for all movies, below is the screenshot that reinforces it. (with the condition being shared similarity>3), since for shared similarities <3, I could see Nan values, which happens in cases like num/0, inf/inf or 0/inf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IPython console
Console 1/A
IPython console
Variable explorer
File explorer
Help
Profiler
Type here to search

C:\Users\Loka Rupesh Reddy\Moviesimilarities

```
from itertool
import numpy
from scipy in
class movies_
```

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"Wild Wild West (1999)" ["Zack and Miri Make a Porno (2008)", 0.8921509597810716, 0.816496580927726, 0.9678053386344172, 4]
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```

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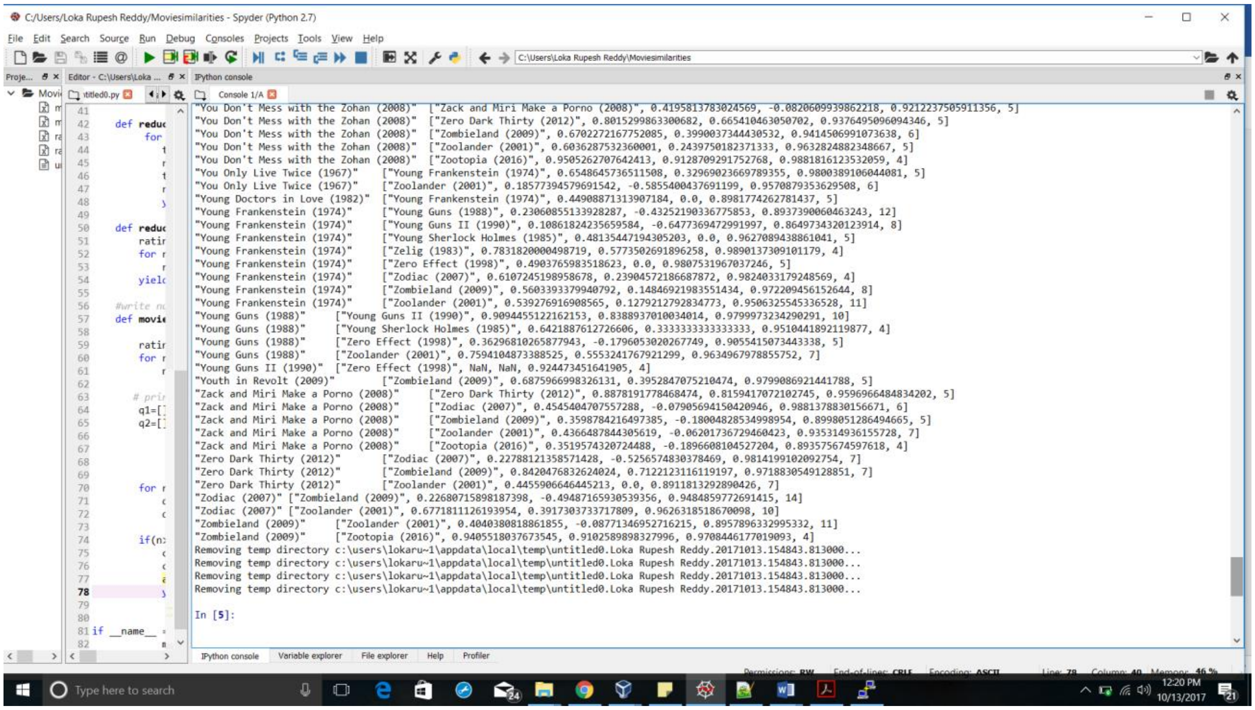
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Console 1/A
IPython console Variable explorer File explorer Help Profiler

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In [5]:
```

Filter and format the output:

I have used 1 mapper and 4 reducers in the source code

Description of each step written below with # symbol prior to the reducer and mapper.

Source Code:

# Imported packages and libraries required for computation

from mrjob.job import MRJob

from mrjob.step import MRStep

from itertools import combinations

import numpy

from scipy import spatial

class movies_count(MRJob):

  # Configure_options function is used to customize the output

    def configure_options(self):

        super(movies_count, self).configure_options()

        self.add_passthrough_option(

```
        '-m', '--moviename', action="append", type='str', default=[], help='Expressions to search for.')
    self.add_passthrough_option(
        '-p', '--rating_pairs', type='int', default=1, help='minimum rating pairs')
    self.add_passthrough_option(
        '-k', '--items', type='int', default=25, help='number of items to looks for')
    self.add_passthrough_option(
                  '-l', '-bound', type ='float', default=0.4, help ='similarity bound to look for')
  # steps determine the sequence of functions to be executed
  def steps(self):
    return [
      MRStep(mapper=self.moviedatasplit,
        reducer=self.joinfilereducer),
     MRStep(reducer=self.reducer_moviepairs),
     MRStep(reducer=self.reducer_pairs),
     MRStep(reducer=self.movie_similarity)
  ]

 # Passing two files (movies.csv and ratings.csv) to the first mapper
  def moviedatasplit(self, _, line):
        dsplit = line.split(",")
        if (len(dsplit) == 3): # movie data
             yield dsplit[0], dsplit[1]
        else: # rating data
             yield dsplit[1], (dsplit[0], dsplit[2])
# generating user id as key and movie title, movierating as values with the help of first reducer
  def joinfilereducer(self, _, values):
```

```
            movielist = list(values)

            movietitle = movielist[0]

            tuplevalue = movielist[1:]

            for val in tuplevalue:

                  userid = val[0]

                  movierating = val[1]


                  yield userid, (movietitle, movierating)

# generating combination of two movies as key and their respective ratings  as value for each user id with the second reducer

   def reducer_moviepairs(self,userid,values):

       for pair1,pair2 in combinations(values,2):

         title1=pair1[0]

         rating1=pair1[1]

         title2=pair2[0]

         rating2=pair2[1]

         yield (title1,title2),(rating1,rating2)

# combining all the ratings for each movie pair by different users with the third reducer

   def reducer_pairs(self,titles,ratings):

      rating=[]

      for r in ratings:

         rating.append(r)

      yield titles,rating


# finding similarity between movies using Cosine Similarity and Corelation

   def movie_similarity(self,titles,ratings):

      k= self.options.items
```

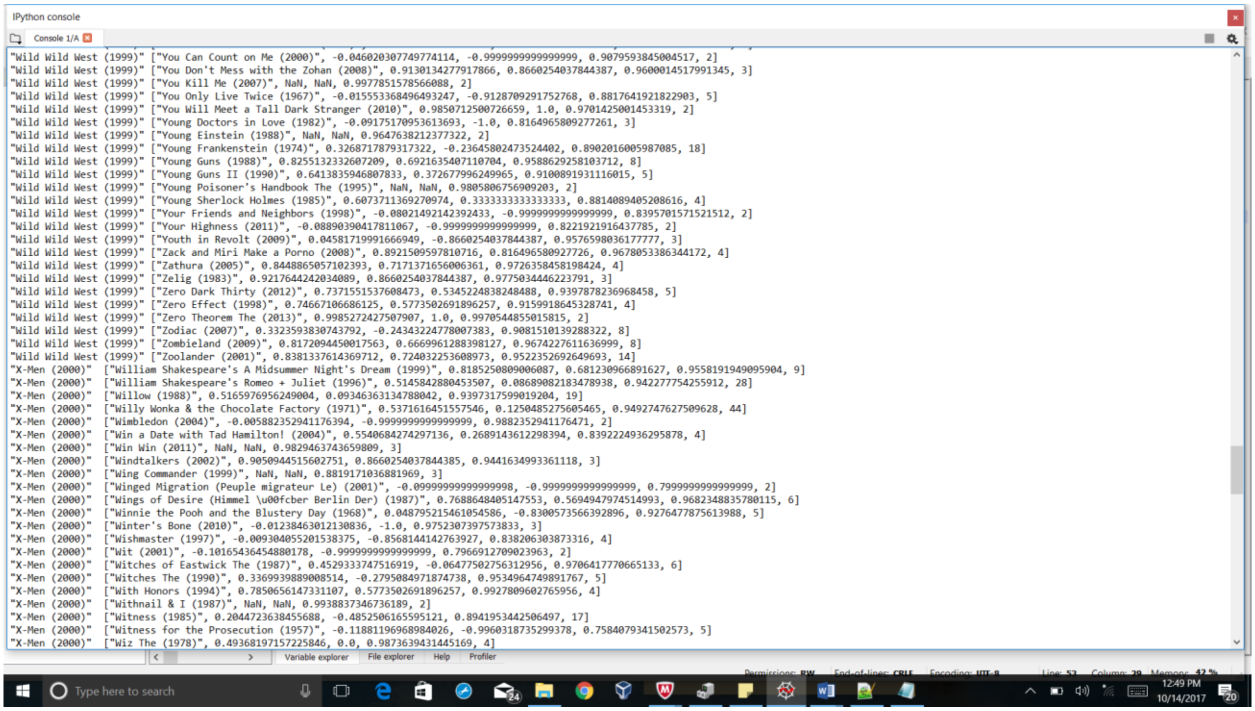
```
    rating =list(ratings)
    for ratings in rating:
      n=len(ratings)
    q1=[]
    q2=[]
    for r1 in ratings:
      q1.append((float(r1[0])))
      q2.append((float(r1[1])))

    if(n>self.options.rating_pairs):
        for movie in self.options.moviename:

          cor = numpy.corrcoef(q1,q2)[0,1]
          cos_cor = 1-spatial.distance.cosine(q1,q2)
          avg_cor = 0.5*(cor+cos_cor)
          while(k>0):
            if titles[0] == movie:
              yield titles[0],(titles[1],avg_cor,cor,cos_cor,n)
            elif titles[1]==movie:
              yield titles[1], (titles[0],avg_cor,cor,cos_cor,n)
            k=k-1
# Main function:
if __name__ == '__main__':
      movies_count.run()
```

Command used -

-m "Wild Wild West (1999)" -k 25 -m "X-Men (2000)"-k 25 movies.csv ratings.csv



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"Wild Wild West (1999)" ["Zelig (1983)", 0.9217644242034089, 0.8660254037844387, 0.9775034446223791, 3]
"Wild Wild West (1999)" ["Zero Dark Thirty (2012)", 0.7371551537608473, 0.5345224838248488, 0.9397878236968458, 5]
"Wild Wild West (1999)" ["Zero Effect (1998)", 0.74667106686125, 0.5773502691896257, 0.9159918645328741, 4]
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"X-Men (2000)"  ["William Shakespeare's A Midsummer Night's Dream (1999)", 0.8185250809006087, 0.681230966891627, 0.9558191949095904, 9]
"X-Men (2000)"  ["William Shakespeare's Romeo + Juliet (1996)", 0.5145842880453507, 0.08689082183478938, 0.942277754255912, 28]
"X-Men (2000)"  ["Willow (1988)", 0.5165976956249004, 0.09346363134788042, 0.9397317599019204, 19]
"X-Men (2000)"  ["Willy Wonka & the Chocolate Factory (1971)", 0.5371616451557546, 0.1250485275605465, 0.9492747627509628, 44]
"X-Men (2000)"  ["Wimbledon (2004)", -0.005882352941176394, -0.9999999999999999, 0.9882352941176471, 2]
"X-Men (2000)"  ["Win a Date with Tad Hamilton! (2004)", 0.5540684274297136, 0.2689143612298394, 0.8392224936295878, 4]
"X-Men (2000)"  ["Win Win (2011)", NaN, NaN, 0.9829463743659809, 3]
"X-Men (2000)"  ["Windtalkers (2002)", 0.9050944515602751, 0.8660254037844385, 0.9441634993361118, 3]
"X-Men (2000)"  ["Wing Commander (1999)", NaN, NaN, 0.8819171036881969, 3]
"X-Men (2000)"  ["Winged Migration (Peuple migrateur Le) (2001)", -0.09999999999999998, -0.9999999999999999, 0.7999999999999999, 2]
"X-Men (2000)"  ["Wings of Desire (Himmel \u00fcber Berlin Der) (1987)", 0.7688648405147553, 0.5694947974514993, 0.9682348835780115, 6]
"X-Men (2000)"  ["Winnie the Pooh and the Blustery Day (1968)", 0.048795215461054586, -0.8300573566392896, 0.9276477875613988, 5]
"X-Men (2000)"  ["Winter's Bone (2010)", -0.01238463012130836, -1.0, 0.9752307397573833, 3]
"X-Men (2000)"  ["Wishmaster (1997)", -0.009304055201538375, -0.8568144142763927, 0.838206303873316, 4]
"X-Men (2000)"  ["Wit (2001)", -0.10165436454880178, -0.9999999999999999, 0.7966912709023963, 2]
"X-Men (2000)"  ["Witches of Eastwick The (1987)", 0.4529333747516919, -0.06477502756312956, 0.9706417770665133, 6]
"X-Men (2000)"  ["Witches The (1990)", 0.3369939889008514, -0.2795084971874738, 0.9534964749891767, 5]
"X-Men (2000)"  ["With Honors (1994)", 0.7850656147331107, 0.5773502691896257, 0.9927809602765956, 4]
"X-Men (2000)"  ["Withnail & I (1987)", NaN, NaN, 0.9938837346736189, 2]
"X-Men (2000)"  ["Witness (1985)", 0.2044723638455688, -0.4852506165595121, 0.8941953442506497, 17]
"X-Men (2000)"  ["Witness for the Prosecution (1957)", -0.11881196968984026, -0.9960318735299378, 0.7584079341502573, 5]
"X-Men (2000)"  ["Wiz The (1978)", 0.49368197157225846, 0.0, 0.9873639431445169, 4]
```

Ran the movie recommendation part 2 in amazon aws as well using EMR-(Elastic Map Reduce).

Set the environment variables aws_access_key_id , aws_secret_access_key in local system

Taken from the aws profile security options.

Procedure followed:

1) Kept the movies and ratings csv files, and python file in S3 bucket.
2) Created cluster using EMR with 1 Master Node and 9 slave nodes
3) Set the SSH key between master node and slave nodes
4) Connected to amazon aws using putty
5) Once connected, copied the files available in s3 bucket to the created instance
6) Executed the command from console

Commands used:

Performed the below step to copy each file one by one from s3 bucket to the instance created

1) aws s3 cp s3://moviesimilarities/movies.csv ./

Executed the program with the below command

1) python untitled.py movies.csv ratings.csv