
BIG DATA AND GEOSPATIAL DATA MINING
3 DISTRIBUTED DATA PROCESSING
3.2 MapReduce in Phython. MRJob Class

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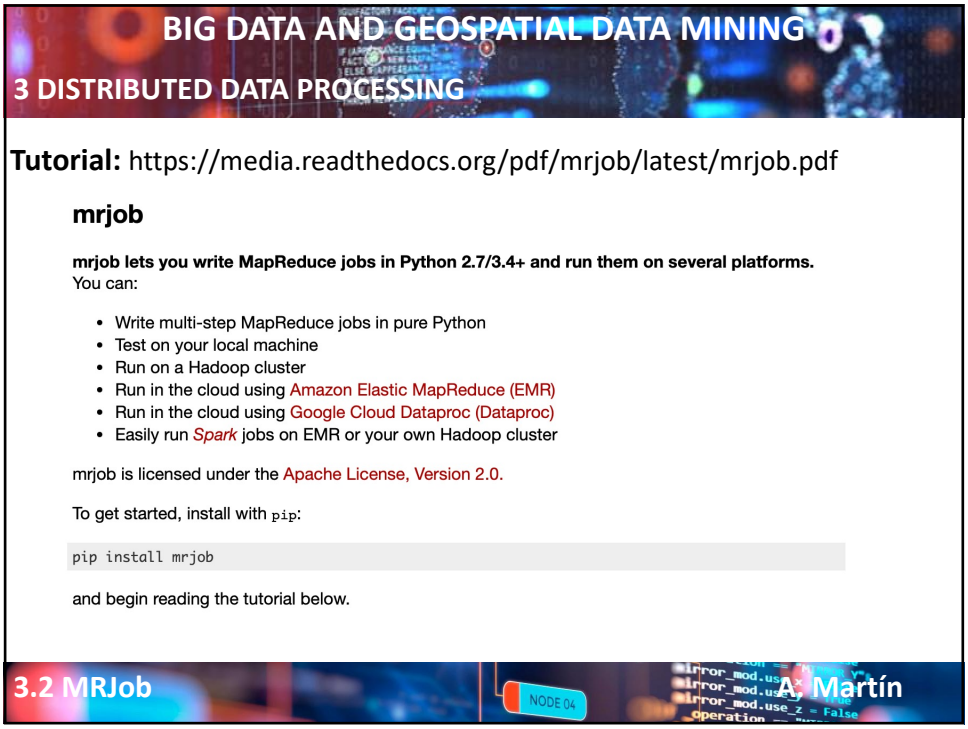
BIG DATA AND GEOSPATIAL DATA MINING
3 DISTRIBUTED DATA PROCESSING
Tutorial: https://media.readthedocs.org/pdf/mrjob/latest/mrjob.pdf
mrjob
mrjob lets you write MapReduce jobs in Python 2.7/3.4+ and run them on several platforms.
You can:
Write multi-step MapReduce jobs in pure Python
Test on your local machine
Run on a Hadoop cluster
Run in the cloud using Amazon Elastic MapReduce (EMR)
Run in the cloud using Google Cloud Dataproc (Dataproc)
Easily run Spark jobs on EMR or your own Hadoop cluster
mrjob is licensed under the Apache License, Version 2.0.
To get started, install with pip:
pip install mrjob
and begin reading the tutorial below.
3.2 MRJob
A. Martín

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Overview

mrjob is the easiest route to writing Python programs that run on Hadoop. If you use mrjob, you'll be able to test your code locally without installing Hadoop or run it on a cluster of your choice.

Additionally, mrjob has extensive integration with Amazon Elastic MapReduce. Once you're set up, it's as easy to run your job in the cloud as it is to run it on your laptop.

Here are a number of features of mrjob that make writing MapReduce jobs easier:

- Keep all MapReduce code for one job in a single class
- Easily upload and install code and data dependencies at runtime
- Switch input and output formats with a single line of code
- Automatically download and parse error logs for Python tracebacks
- Put command line filters before or after your Python code

If you don't want to be a Hadoop expert but need the computing power of MapReduce, mrjob might be just the thing for you.

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Classes in Python: Models that define and group the characteristics and properties that will have the objects that instantiate them. In python, a class is defined with the *class* statement followed by a generic name for the object.

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```
#!/usr/bin/env python2
# -*- coding: utf-8 -*-
"""
Created on Wed Jul 18 19:08:33 2018

@author: angelmartinfurones
"""
#CLASE QUE SIMULA UNA CALCULADORA
class Calculadora(object):
    #EL CONSTRUCTOR INICIA "VALOR" A 0
    def __init__(self): #SELF HACE REFERENCIA A SI MISMO
        self.valor=0
    #SUMA UN NUMERO 'N' AL VALOR
    def suma(self,n):
        self.valor +=n
    def getValor(self):
        return self.valor

calc = Calculadora() #INSTANCIA UN OBJETO EN LA VARIABLE CALC

calc.suma(2) #SUMA 2 AL VALOR DE LA CALCULADORA

print(calc.getValor()) #MOSTRARIA UN DOS EN LA SHELL

calc.suma(2) #SE SUMA 2 A LA VARIABLE VALOR

print(calc.getValor())
```


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```python
from mrjob.job import MRJob

class Purchases(MRJob):

    def mapper(self, key, line):
        if len(line.strip().split(","))==6:
            (date,time,store,item,cost,payment) = line.strip().split(",")
            try:
                yield str(store),float(cost)
            except:
                pass

    def reducer(self, store, cost):
        yield str(store), sum(cost)

if __name__ == '__main__':
    Purchases.run()
```

$ Python3 SolMRJob.py purchases.txt | sort > salidaMRJob.txt

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```python
from mrjob.job import MRJob

class Purchases(MRJob):

    def mapper(self, key, line):
        if len(line.strip().split(","))==6:
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if __name__ == '__main__':
    Purchases.run()
```

MRJob class consisting of a Mapper function and Reducer function

Start, python is told to run the program

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```
1  from mrjob.job import MRJob
2
3  class Purchases(MRJob):
4
5      def mapper(self, key, line):
6          if len(line.strip().split(","))==6:
7              (date,time,store,item,cost,payment) = line.strip().split(",")
8              try:
9                  yield str(store),float(cost)
10             except:
11                 pass
12
13     def reducer(self, store, cost):
14         yield str(store), sum(cost)
15
16 if __name__ == '__main__':
17     Purchases.run()
18
```

Ln: 14 Col: 35

- *Line Refers to each line of raw input data*
- *Key refers to the key of each of the input lines, in this case it is not necessary to assign any key so that key can be replaced by "_", so the key is ignored*

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```
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2
3  class Purchases(MRJob):
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5      def mapper(self, key, line):
6          if len(line.strip().split(","))==6:
7              (date,time,store,item,cost,payment) = line.strip().split(",")
8              try:
9                  yield str(store),float(cost)
10             except:
11                 pass
12
13     def reducer(self, store, cost):
14         yield str(store), sum(cost)
15
16 if __name__ == '__main__':
17     Purchases.run()
18
```

Ln: 14 Col: 35

The output will be saved in the *yield* function as a key, value pair

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```
1  from mrjob.job import MRJob
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3  class Purchases(MRJob):
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5      def mapper(self, key, line):
6          if len(line.strip().split(","))==6:
7              (date,time,store,item,cost,payment) = line.strip().split(",")
8              try:
9                  yield str(store),float(cost)
10             except:
11                 pass
12
13     def reducer(self, store, cost):
14         yield str(store), sum(cost)
15
16 if __name__ == '__main__':
17     Purchases.run()
18
```

Ln: 14 Col: 35

Sort and Group, MRJob does it for us, you don't have to program anything

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```
1  from mrjob.job import MRJob
2
3  class Purchases(MRJob):
4
5      def mapper(self, key, line):
6          if len(line.strip().split(","))==6:
7              (date,time,store,item,cost,payment) = line.strip().split(",")
8              try:
9                  yield str(store),float(cost)
10             except:
11                 pass
12
13     def reducer(self, store, cost):
14         yield str(store), sum(cost)
15
16 if __name__ == '__main__':
17     Purchases.run()
18
```

Ln: 14 Col: 35

The input is, in this case, the stores and the cost, but already ordered (we can assign another name to *cost*, for example occurences)

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```python
from mrjob.job import MRJob

class Purchases(MRJob):

    def mapper(self, key, line):
        if len(line.strip().split(","))==6:
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            try:
                yield str(store),float(cost)
            except:
                pass

    def reducer(self, store, cost):
        yield str(store), sum(cost)

if __name__ == '__main__':
    Purchases.run()
```

Ln: 14 Col: 35

The output will be a key/value pair with the store and the sum of the costs

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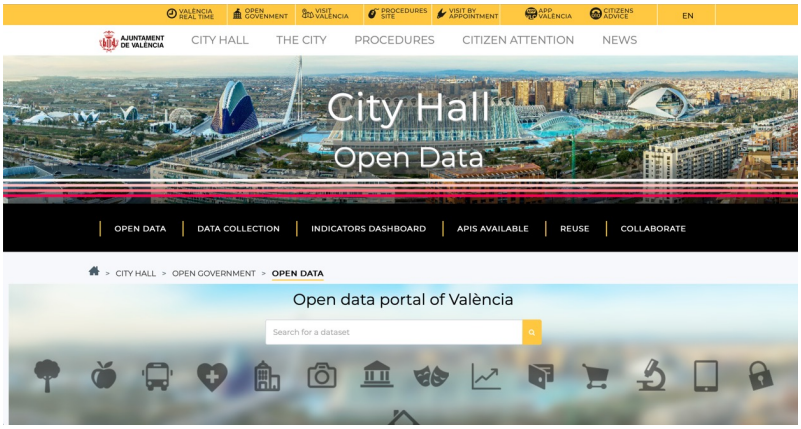

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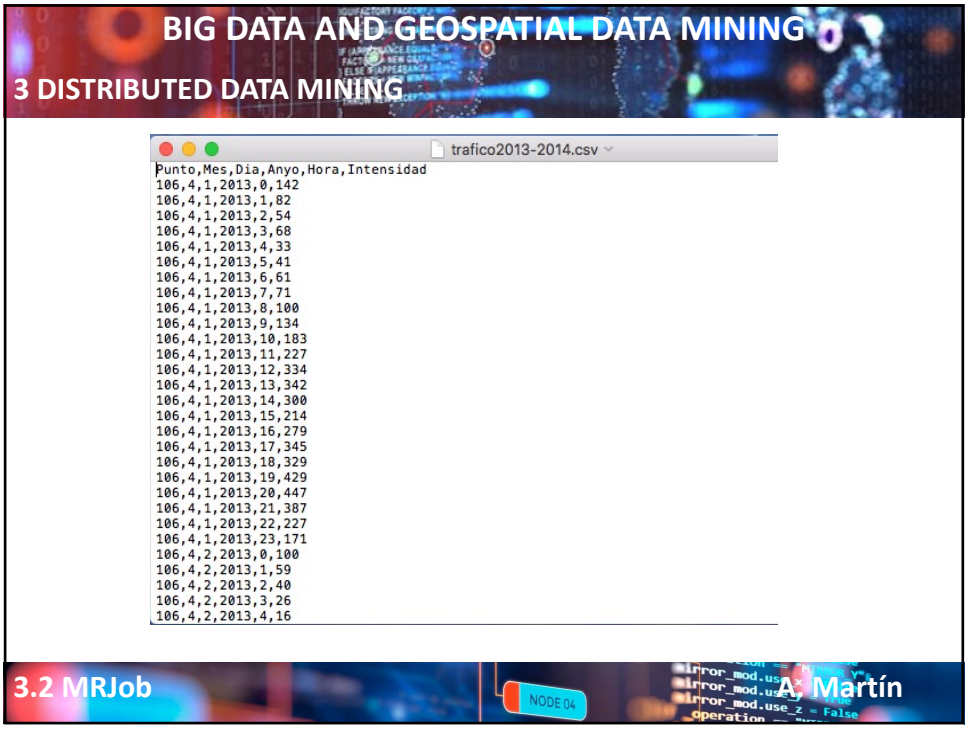
BIG DATA AND GEOSPATIAL DATA MINING
3 DISTRIBUTED DATA MINING
trafico2013-2014.csv
Punto,Mes,Dia,Anyo,Hora,Intensidad
106,4,1,2013,0,142
106,4,1,2013,1,82
106,4,1,2013,2,54
106,4,1,2013,3,68
106,4,1,2013,4,33
106,4,1,2013,5,41
106,4,1,2013,6,61
106,4,1,2013,7,71
106,4,1,2013,8,100
106,4,1,2013,9,134
106,4,1,2013,10,183
106,4,1,2013,11,227
106,4,1,2013,12,334
106,4,1,2013,13,342
106,4,1,2013,14,300
106,4,1,2013,15,214
106,4,1,2013,16,279
106,4,1,2013,17,345
106,4,1,2013,18,329
106,4,1,2013,19,429
106,4,1,2013,20,447
106,4,1,2013,21,387
106,4,1,2013,22,227
106,4,1,2013,23,171
106,4,2,2013,0,100
106,4,2,2013,1,59
106,4,2,2013,2,40
106,4,2,2013,3,26
106,4,2,2013,4,16
3.2 MRJob
NODE 04
A. Martín

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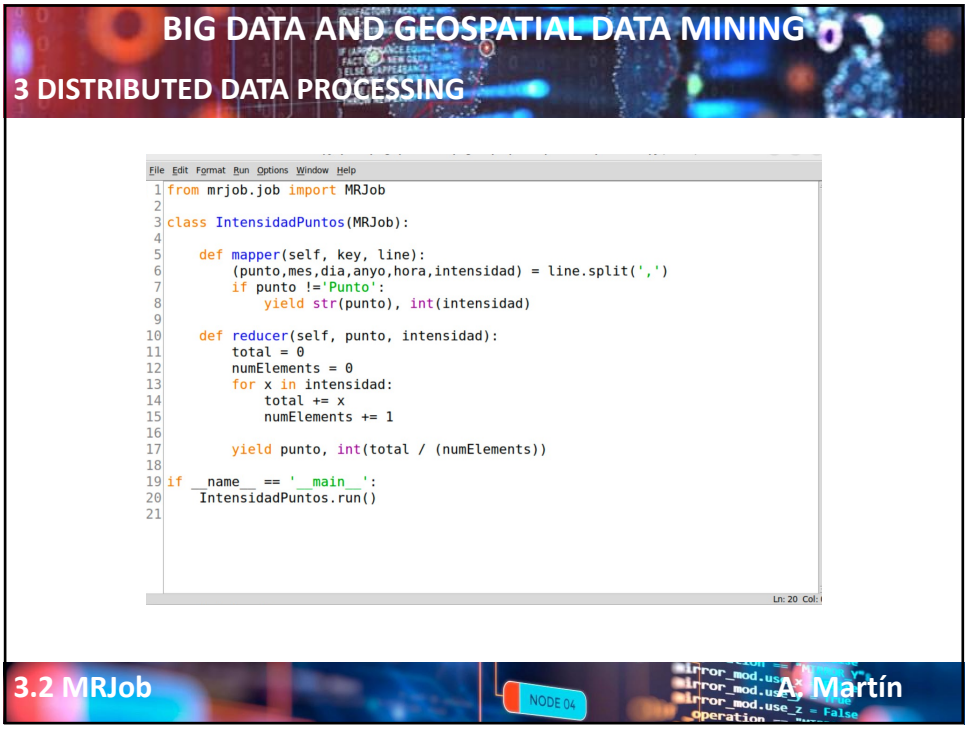
BIG DATA AND GEOSPATIAL DATA MINING
3 DISTRIBUTED DATA PROCESSING
File Edit Format Run Options Window Help
from mrjob.job import MRJob
class IntensidadPuntos(MRJob):
def mapper(self, key, line):
(punto,mes,dia,anyo,hora,intensidad) = line.split(',')
if punto !='Punto':
yield str(punto), int(intensidad)
def reducer(self, punto, intensidad):
total = 0
numElements = 0
for x in intensidad:
total += x
numElements += 1
yield punto, int(total / (numElements))
if __name__ == '__main__':
IntensidadPuntos.run()
Ln: 20 Col:
3.2 MRJob
NODE 04
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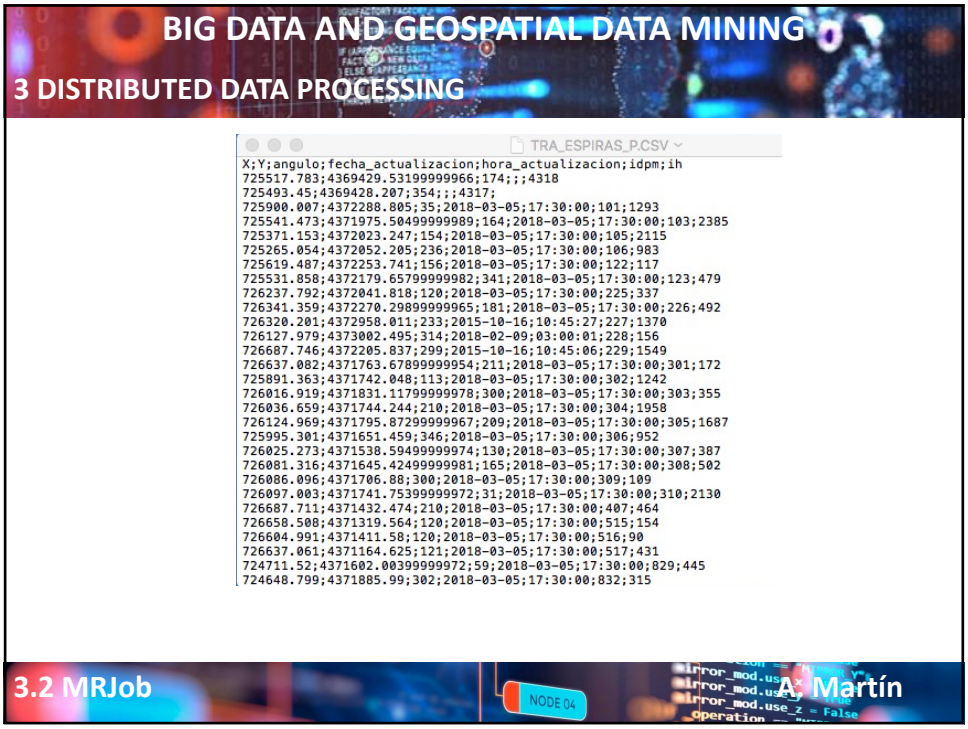
BIG DATA AND GEOSPATIAL DATA MINING
3 DISTRIBUTED DATA PROCESSING
TRA_ESPIRAS_P.CSV
X;Y;angulo;fecha_actualizacion;hora_actualizacion;idpm;ih
725517.783;4369429.53199999966;174;;;4318
725493.45;4369428.207;354;;;4317;
725900.007;4372288.805;35;2018-03-05;17:30:00;101;1293
725541.473;4371975.50499999989;164;2018-03-05;17:30:00;103;2385
725371.153;4372023.247;154;2018-03-05;17:30:00;105;2115
725265.054;4372052.205;236;2018-03-05;17:30:00;106;983
725619.487;4372253.741;156;2018-03-05;17:30:00;122;117
725531.858;4372179.65799999982;341;2018-03-05;17:30:00;123;479
726237.792;4372041.818;120;2018-03-05;17:30:00;225;337
726341.359;4372270.29899999965;181;2018-03-05;17:30:00;226;492
726320.201;4372958.011;233;2015-10-16;10:45:27;227;1370
726127.979;4373002.495;314;2018-02-09;03:00:01;228;156
726687.746;4372205.837;299;2015-10-16;10:45:06;229;1549
726637.082;4371763.67899999954;211;2018-03-05;17:30:00;301;172
725891.363;4371742.048;113;2018-03-05;17:30:00;302;1242
726016.919;4371831.11799999978;300;2018-03-05;17:30:00;303;355
726036.659;4371744.244;210;2018-03-05;17:30:00;304;1958
726124.969;4371795.87299999967;209;2018-03-05;17:30:00;305;1687
725995.301;4371651.459;346;2018-03-05;17:30:00;306;952
726025.273;4371538.59499999974;130;2018-03-05;17:30:00;307;387
726081.316;4371645.42499999981;165;2018-03-05;17:30:00;308;502
726086.096;4371706.88;300;2018-03-05;17:30:00;309;109
726097.003;4371741.75399999972;31;2018-03-05;17:30:00;310;2130
726687.711;4371432.474;210;2018-03-05;17:30:00;407;464
726658.508;4371319.564;120;2018-03-05;17:30:00;515;154
726604.991;4371411.58;120;2018-03-05;17:30:00;516;90
726637.061;4371164.625;121;2018-03-05;17:30:00;517;431
724711.52;4371602.00399999972;59;2018-03-05;17:30:00;829;445
724648.799;4371885.99;302;2018-03-05;17:30:00;832;315
3.2 MRJob
NODE 04
A. Martín

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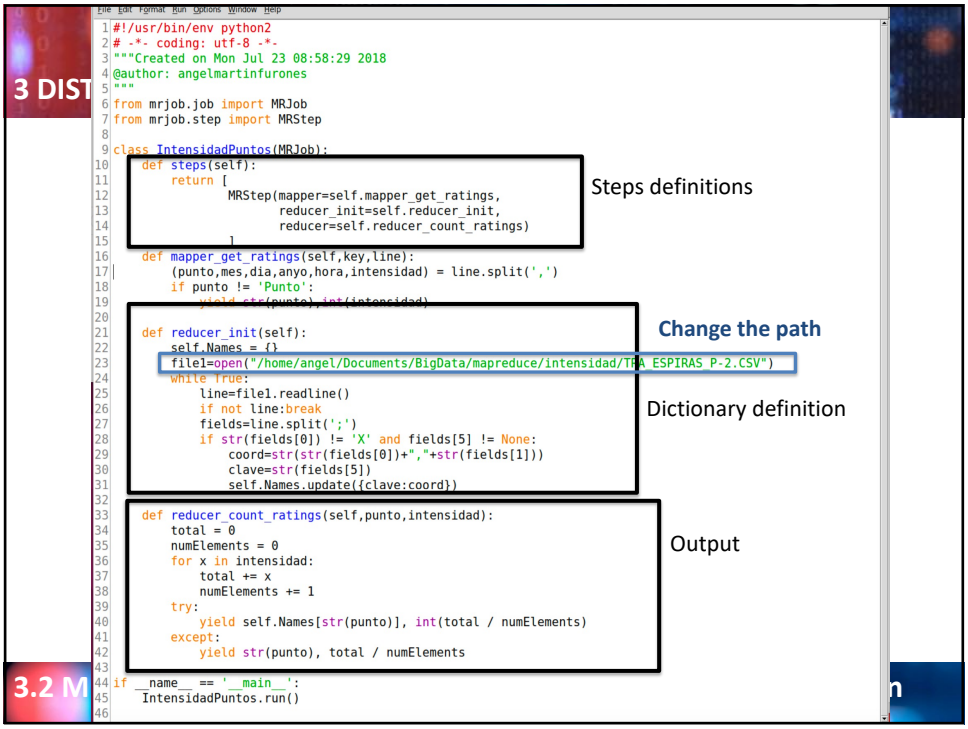
3 DIST
3.2 M
#!/usr/bin/env python2
-*- coding: utf-8 -*-
"""Created on Mon Jul 23 08:58:29 2018
@author: angelmartinfurones
"""
from mrjob.job import MRJob
from mrjob.step import MRStep
class IntensidadPuntos(MRJob):
def steps(self):
return [
MRStep(mapper=self.mapper_get_ratings,
reducer_init=self.reducer_init,
reducer=self.reducer_count_ratings)
]
def mapper_get_ratings(self,key,line):
(punto,mes,dia,anyo,hora,intensidad) = line.split(',')
if punto != 'Punto':
yield str(punto),int(intensidad)
def reducer_init(self):
self.Names = {}
file1=open("/home/angel/Documents/BigData/mapreduce/intensidad/TRA_ESPIRAS_P-2.CSV")
while True:
line=file1.readline()
if not line:break
fields=line.split(';')
if str(fields[0]) != 'X' and fields[5] != None:
coord=str(str(fields[0])+","+str(fields[1]))
clave=str(fields[5])
self.Names.update({clave:coord})
def reducer_count_ratings(self,punto,intensidad):
total = 0
numElements = 0
for x in intensidad:
total += x
numElements += 1
try:
yield self.Names[str(punto)], int(total / numElements)
except:
yield str(punto), total / numElements
if __name__ == '__main__':
IntensidadPuntos.run()
Steps definitions
Change the path
Dictionary definition
Output

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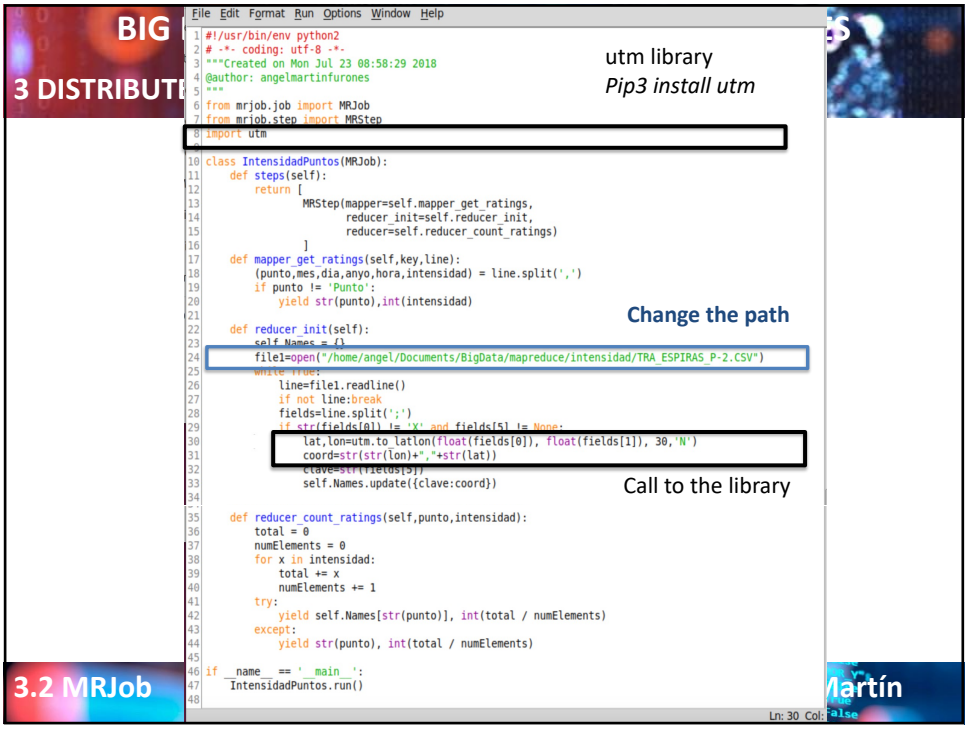
BIG
3 DISTRIBUT
File Edit Format Run Options Window Help
#!/usr/bin/env python2
-*- coding: utf-8 -*-
"""Created on Mon Jul 23 08:58:29 2018
@author: angelmartinfurones
"""
from mrjob.job import MRJob
from mrjob.step import MRStep
import utm
class IntensidadPuntos(MRJob):
def steps(self):
return [
MRStep(mapper=self.mapper_get_ratings,
reducer_init=self.reducer_init,
reducer=self.reducer_count_ratings)
]
def mapper_get_ratings(self,key,line):
(punto,mes,dia,anyo,hora,intensidad) = line.split(',')
if punto != 'Punto':
yield str(punto),int(intensidad)
def reducer_init(self):
self.Names = {}
file1=open("/home/angel/Documents/BigData/mapreduce/intensidad/TRA_ESPIRAS_P-2.CSV")
while True:
line=file1.readline()
if not line:break
fields=line.split(';')
if str(fields[0]) != 'X' and fields[5] != None:
lat,lon=utm.to_latlon(float(fields[0]), float(fields[1]), 30,'N')
coord=str(str(lon)+","+str(lat))
clave=str(fields[5])
self.Names.update({clave:coord})
def reducer_count_ratings(self,punto,intensidad):
total = 0
numElements = 0
for x in intensidad:
total += x
numElements += 1
try:
yield self.Names[str(punto)], int(total / numElements)
except:
yield str(punto), int(total / numElements)
if __name__ == '__main__':
IntensidadPuntos.run()
utm library
Pip3 install utm
Change the path
Call to the library
3.2 MRJob
Martín

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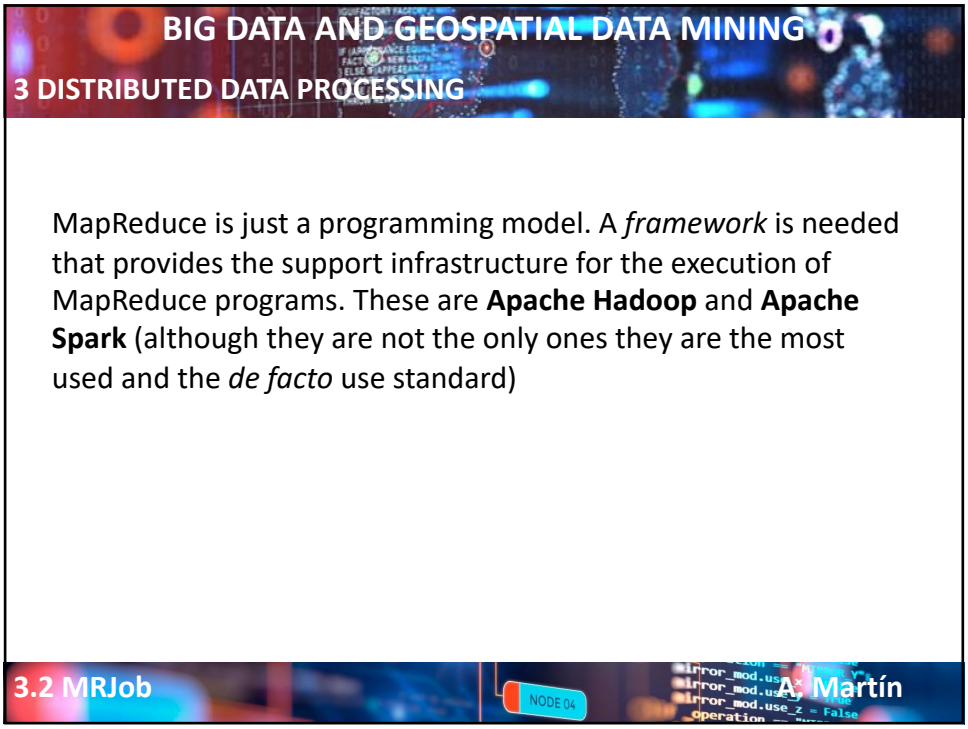
BIG DATA AND GEOSPATIAL DATA MINING
3 DISTRIBUTED DATA PROCESSING
MapReduce is just a programming model. A *framework* is needed that provides the support infrastructure for the execution of MapReduce programs. These are **Apache Hadoop** and **Apache Spark** (although they are not the only ones they are the most used and the *de facto* use standard)
3.2 MRJob
NODE 04
A. Martín

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