



TASK-4:

Write MapReduce codes to perform the tasks using the files you've downloaded on your EMR Instance

Dataset used is: https://nyc-tlc-upgrad.s3.amazonaws.com/yellow_tripdata_2017-05.csv

1) Get the dataset to with the following command:

```
wget https://nyc-tlc-upgrad.s3.amazonaws.com/yellow_tripdata_2017-05.csv
```

2) Create python scripts by using the following command:

```
vim mrtask_a.py
vim mrtask_b.py
vim mrtask_c.py
vim mrtask_d.py
vim mrtask_e.py
vim mrtask_e.py
vim mrtask_f.py
```

(a) mrtask_a.py

```
# Which vendors have the most trips, and what is the total revenue generated by
that vendor?
from mrjob.job import MRJob
from mrjob.step import MRStep
class MostTripsTotalRevenue(MRJob):
    def steps(self):
        return [
           MRStep(mapper=self.mapper, reducer=self.reducer),
            MRStep(reducer=self.final_reducer)
    def mapper(self, _, line):
        if not line.startswith('VendorID'):
            data = line.split(',')
            vendor_id = data[0]
            revenue = float(data[16])
           yield vendor_id, revenue
    def reducer(self, key, values):
       yield None, (sum(values), key)
    def final_reducer(self,
                             , values):
        max_revenue, vendor_id = max(values)
       yield vendor_id, max_revenue
    name == ' main ':
   MostTripsTotalRevenue.run()
```





(b) mrtask_b.py

```
# Which pickup location generates the most revenue?
from mrjob.job import MRJob
from mrjob.step import MRStep
class MostRevenuePickupLocation(MRJob):
   def steps(self):
        return [
            MRStep(mapper=self.mapper, reducer=self.reducer),
            MRStep(reducer=self.final_reducer)
    def mapper(self, _, line):
        # Skip the header line
        if not line.startswith('VendorID'):
            fields = line.split(',')
            pickup_location = fields[7]
            revenue = float(fields[16])
            yield pickup_location, revenue
    def reducer(self, pickup_location, revenues):
        yield None, (sum(revenues), pickup_location)
    def final_reducer(self, _, max_revenues):
        max_revenue, pickup_location = max(max_revenues)
        yield pickup_location, max_revenue
if __name__ == '__main__':
    MostRevenuePickupLocation.run()
```

(c) mrtask_c.py

```
# What are the different payment types used by customers and their count? The
final results should be in a sorted format.
from mrjob.job import MRJob
from mrjob.step import MRStep
class PaymentTypesCount(MRJob):
   def mapper(self, _, line):
        # Skip the header line
        if not line.startswith('VendorID'):
            fields = line.split(',')
            payment_type = fields[9]
            yield payment_type, 1
   def combiner(self, payment_type, counts):
       yield payment_type, sum(counts)
   def reducer(self, payment_type, counts):
       yield payment_type, sum(counts)
   def reducer_sort_results(self, payment_type, counts):
       yield None, (sum(counts), payment_type)
   def reducer_output_result(self, _, sorted_results):
        for count, payment_type in sorted(sorted_results, reverse=True):
           yield payment_type, count
   def steps(self):
       return [
           MRStep(mapper=self.mapper, combiner=self.combiner,
reducer=self.reducer),
           MRStep(reducer=self.reducer_sort_results);
            MRStep(reducer=self.reducer_output_result)
        ]
    _name__ == '__main__':
   PaymentTypesCount.run()
```





(d) mrtask_d.py

```
# What is the average trip time for different pickup locations?
from mrjob.job import MRJob
from datetime import datetime
class AverageTripTime(MRJob):
    def parse_datetime(self, datetime_str):
        formats = ['%d-%m-%Y %H:%M:%S', '%d-%m-%Y %H:%M', '%Y-%m-%d %H:%M', '%Y-
%m-%d %H:%M:%S'l
        for fmt in formats:
                return datetime.strptime(datetime_str, fmt)
            except ValueError:
                pass
        raise ValueError('no valid date format found')
    def mapper(self, _, line):
        # Skip the header line
        if not line.startswith('VendorID'):
            fields = line.split(',')
            pickup location = fields[7]
            pickup_datetime = self.parse_datetime(fields[1])
            dropoff_datetime = self.parse_datetime(fields[2])
            trip_time = (dropoff_datetime - pickup_datetime).total_seconds() /
60.0
            yield pickup_location, (trip_time, 1)
    def combiner(self, pickup_location, trip_times):
        total_trip_time = 0
        total_count = 0
        for trip_time, count in trip_times:
            total_trip_time += trip_time
            total_count += count
        yield pickup_location, (total_trip_time, total_count)
    def reducer(self, pickup_location, trip_times):
        total_trip_time = 0
        total_count = 0
        for trip_time, count in trip_times:
            total_trip_time += trip_time
            total_count += count
        average_trip_time = total_trip_time / total_count
        yield pickup_location, average_trip_time
    __name___ == '___main___':
   AverageTripTime.run()
```

(e) mrtask_e.py

```
# Calculate the average tips to revenue ratio of the drivers for different pickup
locations in sorted format.

from mrjob.job import MRJob

class AverageTipsToRevenueRatio(MRJob):

    def mapper(self, _, line):
        # Skip the header line
        if not line.startswith('VendorID'):
            fields = line.split(',')
            pickup_location = fields[7]
            total_revenue = float(fields[16])
            tips = float(fields[13])
            yield pickup_location, (tips, total_revenue)

def combiner(self, pickup_location, tips_revenues):
        total_tips = 0
        total_revenue = 0
```





(f) mrtask_f.py

```
# How does revenue vary over time? Calculate the average trip revenue per month
analysing it by hour of the day (day vs night) and the day of the week (weekday
vs weekend).
from mrjob.job import MRJob
from datetime import datetime
class AverageRevenueOverTime(MRJob):
    def parse_datetime(self, datetime_str):
    formats = ['%d-%m-%Y %H:%M:%S', '%d-%m-%Y %H:%M', '%Y-%m-%d %H:%M', '%Y-
%m-%d %H:%M:%S']
        for fmt in formats:
            try:
                return datetime.strptime(datetime_str, fmt)
            except ValueError:
                pass
        raise ValueError('no valid date format found')
    def mapper(self, _, line):
        # Skip the header line
        if not line.startswith('VendorID'):
            fields = line.split(',')
            revenue = float(fields[16])
            pickup_datetime = self.parse_datetime(fields[1])
            month = pickup_datetime.month
            hour = pickup_datetime.hour
            weekday = pickup_datetime.weekday()
            yield (month, hour, weekday), revenue
    def reducer(self, key, values):
        total revenue = 0
        num_trips = 0
        for revenue in values:
            total revenue += revenue
            num_trips += 1
        average_revenue = total_revenue / num_trips
        yield key, average_revenue
if _ name _ == '_ main ':
    AverageRevenueOverTime.run()
```





3) Before running these scripts we need to install mrjob by using the following commands:

Questions:

(a) Which vendors have the most trips, and what is the total revenue generated by that vendor?

```
python mrtask_a.py yellow_tripdata_2017-05.csv > mrtask_a.txt

[hadoop@ip-172-31-63-235 ~]$ ls

mrtask_a.py mrtask_a.txt mrtask_b.py mrtask_c.py mrtask_d.py mrtask_e.py mrtask_f.py yellow_tripdata_2017-05.csv
[hadoop@ip-172-31-63-235 ~]$ python mrtask_a.py yellow_tripdata_2017-05.csv > mrtask_a.txt
No configs found; falling back on auto-configuration
No configs specified for inline runner

Creating temp directory /tmp/mrtask_a.hadoop.20240603.233826.200874
Running step 1 of 2...
Running step 2 of 2...
Running step 2 of 2...
job output is in /tmp/mrtask_a.hadoop.20240603.233826.200874/output
Streaming final output from /tmp/mrtask_a.hadoop.20240603.233826.200874/output...
Removing temp directory /tmp/mrtask_a.hadoop.20240603.233826.200874...
[hadoop@ip-172-31-63-235 ~]$

[hadoop@ip-172-31-63-235 ~]$
```

Vendor "2" ie: VeriFone Inc. has the most trips and revenue generated is 92896777.545

(b) Which pickup location generates the most revenue?

```
python mrtask_b.py yellow_tripdata_2017-05.csv > mrtask_b.txt

[hadoop@ip-172-31-58-196 ~]$ python mrtask_b.py yellow_tripdata_2017-05.csv > mrtask_b.txt
No configs found; falling back on auto-configuration
No configs specified for inline runner

Creating temp directory /tmp/mrtask_b.hadoop.20240604.000704.853039
Running step 1 of 2...
Running step 2 of 2...
job output is in /tmp/mrtask_b.hadoop.20240604.000704.853039/output

Streaming final output from /tmp/mrtask_b.hadoop.20240604.000704.853039/output...
Removing temp directory /tmp/mrtask_b.hadoop.20240604.000704.853039...
[hadoop@ip-172-31-58-196 ~]$ cat mrtask_b.txt

"132" 14040591.220016211
[hadoop@ip-172-31-58-196 ~]$
```

Pickup location '132' generates the most revenue of 14040591.220016211





(c) What are the different payment types used by customers and their count? The final results should be in a sorted format.

```
python mrtask_c.py yellow_tripdata_2017-05.csv > mrtask_c.txt
[hadoop@ip-172-31-58-196 ~]$ python mrtask_c.py yellow_tripdata_2017-05.csv > mrtask_c.txt No configs found; falling back on auto-configuration
No configs specified for inline runner
 Creating temp directory /tmp/mrtask_c.hadoop.20240604.001225.060982
Running step 1 of 3...
 Running step 2 of 3...
 Running step 3 of 3...
job output is in /tmp/mrtask_c.hadoop.20240604.001225.060982/output
Streaming final output from /tmp/mrtask_c.hadoop.20240604.001225.060982/output...
 Removing temp directory /tmp/mrtask_c.hadoop.20240604.001225.060982...
 [hadoop@ip-172-31-58-196 ~]$ cat mrtask_c.txt
          6780947
 "2"
          3250362
 "3"
          55027
 "4"
          15791
 [hadoop@ip-172-31-58-196 ~]$ |
```

Different payment types used by customers with their count:

```
"1" = Credit Card 6780947
"2" = Cash 3250362
"3" = No Charge 55027
"4" = Dispute 15791
```

(d) What is the average trip time for different pickup locations?

```
python mrtask_d.py yellow_tripdata_2017-05.csv > mrtask_d.txt
```



"144"	17.422410667367306
"145" "146"	13.919851029794044 15.779948824343021
"147"	13.003051643192489
"148" "149"	16.994242069527864
"149" "15"	13.134482758620688 14.868589743589745
"150"	22.067647058823532
"151" "152"	13.72286961525267
"152" "153"	15.034273318872025 12.776791277258567
"154"	22.930303030303033
"155" "156"	23.84722222222218 17.77777777777778
"155"	24.96510297482838
"158"	17.056993321982915
"159" "16"	12.977884615384616 11.23930817610063
"160"	17.381399631675876
"161"	16.501390496486135
"162" "163"	15.5755374379993 17.007285407402943
"164"	16.135913909640667
"165"	23.146643518518516
"166" "167"	16.128181641420127 11.731709401709402
"168"	11.912370135587249
"169" "17"	12.008282828282828
"170"	14.360986719350239 15.23280819184737
"170" "171"	11.867179487179486
"172"	29.29583333333333
"173" "174"	12.247398589065257 12.091085271317832
"175"	11.432758620689656
"176"	0.6
"177" "178"	20.955774278215223 8.291562500000001
"178" "179"	15.1499705882353
"18" "180"	12.653225806451612
"180" "181"	27.183506944444446 15.849603785417022
"182"	12.2456 11.92777777777779
"183" "184"	11.927777777777779 7.346666666666666
"185"	15.095833333333333
"186"	17 3607280512866
"187" "188"	1.425 15.907792044310169
"189"	16.631431947577614
"19"	
	10.768354430379746 26.461985335589397
"190" "191"	10.768354430379746 26.461985335589397 13.486574074074074
"190" "191" "192" "193"	10.768354430379746 26.461985335589397 13.486574074074074 13.586842105263157
"190" "191" "192" "193" "194"	10.768354430379746 26.461985335589397 13.4865740740740974 13.586842105263157 12.075183464619935 27.354013503375846
"190" "191" "192" "193" "194" "195"	10.768354430379746 26.461985335589397 13.486574074074074 13.586842105263157 12.075183464619935 27.354013503375846 22.571194503171245
"190" "191" "192" "193" "194" "195" "196"	10.768354430379746 26.461985335589397 13.486574074074074 13.586842105263157 12.075183464619935 27.354013503375846 22.571194503171245 18.181564465408885
"190" "191" "192" "193" "194" "195" "196" "197" "198"	10.768354430379746 26.461985335589397 13.4865740740740747 13.586842105263157 12.075183464619935 27.354913503375846 22.571194503171245 18.18156446544088805 18.036302681992343 13.806195462478186
"190" "191" "192" "193" "194" "195" "196" "197" "198" "2"	10.768354430379746 26.461985335589397 13.486574974974974 13.586842105263157 12.075183464619935 27.354013503375846 22.571194503171245 18.181564465408805 18.036302681992343 13.806195462478186 42.2
"190" "191" "192" "193" "194" "195" "196" "197" "198" "2" "20"	10.768354430379746 26.461985335589397 13.486574074074074 13.586842105263157 12.075183464619935 27.354013503375846 22.571194503171245 18.181564465498886 18.036302681992343 13.806195462478186 42.2 11.141091954022986 11.855392156862747
"190" "191" "192" "194" "195" "196" "197" "198" "20" "200" "201"	10.768354430379746 26.461985335589397 13.486574074074074 13.586842105263157 12.675183464619935 27.354013503375846 22.571194503171245 18.181564465408805 18.936302681992343 13.806195462478186 42.2 17.141691954022986 11.855392156862747 0.4937499999999997
"190" "191" "192" "194" "196" "196" "197" "198" "20" "200" "201"	10.768354430379746 26.461985335589397 13.4865740740740741 13.586842105263157 12.075183464619935 27.354013503375846 22.571194503171245 18.181564465408886 18.036302681992343 13.806195462478186 42.2 17.141691954022986 11.855392156862747 0.49374939999999997
"190" "191" "192" "193" "194" "195" "196" "197" "20" "200" "200" "201" "203" "204"	10.768354430379746 26.461985335589397 13.486574074074074 13.586842105263157 12.075183464619935 27.354013503375846 22.571194503171245 18.181564465408805 18.036302681992343 13.806195462478186 42.2 17.141091954022986 11.855392156862747 0.4937499999999997 15.4358555263157896 19.28479532163743
"190" "191" "192" "193" "194" "195" "196" "197" "198" "20" "200" "200" "202" "203" "204" "205"	10.768354430379746 26.461985335589397 13.4865740740740741 13.586842105263157 12.075183464619935 27.354013503375846 22.571194503171245 18.181564465408886 18.936302681992343 13.806195462478186 42.2 17.141091954022986 11.855392156862747 0.49374999999999997 15.435855263157896 19.28479532163743 0.47999999999997 18.713008130081300
"190" "191" "193" "194" "195" "196" "197" "198" "20" "200" "202" "203" "204" "205" "206"	10.768354430379746 26.461985335589397 13.486574074074074 13.586842105263157 12.075183464619935 27.354913503375846 22.571194503171245 18.181564465498889 13.806195462478186 42.2 17.141091954022986 11.855392156862747 0.49374999999999999 15.435855263157896 19.28479532163743 0.47999999999999981 18.713008130081302 11.648809523809524
"190" "191" "193" "194" "195" "196" "197" "198" "200" "201" "202" "202" "204" "205" "206" "206"	10.768354430379746 26.461985335589397 13.4865740740740741 13.586842105263157 12.075183464619935 27.354013503375846 22.571194503171245 18.181564465408886 18.936302681992343 13.806195462478186 42.2 17.141691954022986 11.855392156862747 0.49374999999999997 15.435855263157896 19.28479532163743 0.47999999999997 15.43585563157896 19.28479532163743 0.47999999999997 18.713608136081362 21.648809523809524 8.778993536472758 15.355907172995781
"190" "191" "192" "194" "196" "197" "198" "20" "200" "202" "203" "204" "205" "206" "207" "206" "207" "208"	10.768354430379746 26.461985335589397 13.486574074074074 13.586842105263157 12.075183464619935 27.354913503375846 22.571194503171245 18.1815644654988895 18.036302681992343 13.806195462478186 42.2 17.141091954022986 11.855392156862747 0.493749999999999999999999999999999999999
"190" "191" "193" "194" "195" "196" "197" "198" "200" "201" "202" "202" "204" "205" "206" "206"	10.768354430379746 26.461985335589397 13.4865749740740741 13.586842105263157 12.075183464619935 27.35491350377846 22.571194503171245 18.181564465498886 18.0363925681992343 13.806195462478186 42.2 17.141891954022986 11.855392156862747 0.493749999999999999999999999999999999999
"190" "191" "193" "194" "196" "196" "197" "200" "201" "202" "204" "205" "207" "207" "208" "207" "208" "211"	10.768354430379746 26.461985335589397 13.4865749740740741 13.586842105263157 12.075183464619935 27.35491350377846 22.571194503171245 18.181564465498886 18.0363925681992343 13.806195462478186 42.2 17.141891954022986 11.855392156862747 0.493749999999999999999999999999999999999
"190" "191" "193" "194" "196" "196" "197" "198" "201" "202" "204" "204" "208" "208" "208" "209" "211" "212"	10.768354430379746 26.461985335589397 13.486574074074074 13.586842105263157 12.075183464619935 27.354013503375846 22.571194503171245 18.1815644654988885 18.036302681992343 13.806195462478186 42.2 17.141091954022986 11.855392156862747 0.4937499999999997 15.435855263157896 19.28479532163743 0.479999999999987 18.713008130081302 11.648809523809524 8.778993536472758 15.355907172995781 26.5299986346794 16.197798742138364 18.4766025641025567 17.805909853173578 24.3777777777777777
"190" "191" "193" "194" "196" "196" "197" "200" "201" "202" "204" "205" "207" "207" "208" "207" "208" "211"	10.768354430379746 26.461985335589397 13.4865749740740741 13.586842105263157 12.075183464619935 27.354013503375846 22.571194503171245 18.181564465408886 18.036302681992343 13.806195462478186 42.2 17.141891954022986 11.855392156862747 0.4937493999999997 15.435855263157896 19.28479532163743 0.479999999999987 18.713008130081302 11.648809523809524 8.7789935364772758 15.355907172995781 20.5299986346794 16.197798742138364 18.4766025641802567 17.805908853173578 24.37777777777777
"190" "191" "193" "194" "196" "196" "197" "198" "200" "201" "202" "204" "208" "208" "208" "209" "211" "212" "213" "215"	10.7683544303797446 26.461985335589397 13.486574074074074 13.586842105263157 12.075183464619935 22.571194503171245 18.1815644654088885 18.036302681992343 13.806195462478186 42.2 17.141091954022986 11.855392156862747 0.4937499999999997 15.435855263157896 19.28479532163743 0.47999999999997 18.713068130081302 11.648809523809524 8.778993536472758 15.355907172995781 26.5299986346794 16.197798742138364 18.476602564102567 17.8859908853173578 24.377777777777777
"190" "191" "193" "194" "196" "197" "208" "200" "201" "203" "204" "205" "206" "207" "211" "211" "212" "214" "216"	10.768354430379746 26.461985335589397 13.4865740740740741 13.586842105263157 12.075183464619935 27.354013503375846 22.571194503171245 18.1815644654488885 18.036392681992343 13.806195462478186 42.2 17.141691954022986 11.855392156862747 0.493749399999999 15.435855263157896 19.28479532163743 0.479999999999999 18.713008130081302 11.648809523809524 8.778993536472758 15.355907172995781 20.5299986346794 16.197798742138364 18.476602564102567 17.805909853173578 24.37777777777773 20.40786163522013 8.2208333333333333 8.20833333333333333333333333333333333333
"190" "191" "193" "194" "196" "196" "197" "198" "201" "202" "204" "208" "208" "208" "209" "211" "212" "212" "213" "215" "215" "215" "215" "215" "215"	10.768354430379746 26.461985335589397 13.486574074074074 13.586842105263157 12.075183464619935 27.354913503375846 22.571194503171245 18.18156446544088895 18.036302681992343 13.3866195462478186 42.2 17.141091954022986 11.355392156862747 0.493749999999999999999999999999999999999
"190" "191" "193" "194" "196" "197" "198" "200" "201" "202" "203" "204" "205" "206" "207" "211" "211" "211" "211" "214" "215"	10.768354430379746 26.461985335589397 13.486574074074074074 13.586842105263157 12.075183464619935 27.354913503375846 22.571194503171245 18.1815644654488885 18.036392681992343 13.806195462478186 42.2 17.141891954022986 11.855392156862747 0.493749999999999999999999999999999999999
"190" "191" "193" "194" "196" "196" "197" "200" "201" "202" "204" "204" "205" "207" "211" "212" "212" "214" "215" "215" "216" "218" "218" "218"	10.768354430379746 26.461985335589397 13.4865740740740741 13.586842105263157 12.075183464619935 27.354913503375846 22.571194503171245 18.1815644654088895 18.036302681992343 13.806195402478186 42.2 17.141091954022986 11.855392156862747 0.4937419999999999999999999999999999999999
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(e) Calculate the average tips to revenue ratio of the drivers for different pickup locations in sorted format.

```
python mrtask_e.py yellow_tripdata_2017-05.csv > mrtask_e.txt
```

```
[hadoop@ip-172-31-58-196 ~]$ ls
mrtask_a.py mrtask_b.txt mrtask_c.txt mrtask_d.txt mrtask_f.py yellow_tripdata_2017-05.csv.1
mrtask_b.py mrtask_c.py mrtask_d.py mrtask_e.py yellow_tripdata_2017-05.csv |
mrtask_b.py mrtask_c.py mrtask_d.py mrtask_e.py yellow_tripdata_2017-05.csv > mrtask_e.txt
No configs found; falling back on auto-configuration
No configs specified for inline runner
Creating temp directory /tmp/mrtask_e.hadoop.20240604.011220.382512
Running step 1 of 1...
job output is in /tmp/mrtask_e.hadoop.20240604.011220.382512/output
Streaming final output from /tmp/mrtask_e.hadoop.20240604.011220.382512...
[hadoop@ip-172-31-58-196 ~]$ cat mrtask_e.txt
```

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[hadoop@ip-172-31-58-196 ~]$ cat mrtask_e.txt
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(f) How does revenue vary over time? Calculate the average trip revenue per month analysing it by hour of the day (day vs night) and the day of the week (weekday vs weekend).

```
python mrtask_f.py yellow_tripdata_2017-05.csv > mrtask_f.txt
```

```
[hadoop@ip-172-31-58-196 ~]$ python mrtask_f.py yellow_tripdata_2017-05.csv > mrtask_f.txt
No configs found; falling back on auto-configuration
No configs specified for inline runner
Creating temp directory /tmp/mrtask_f.hadoop.20240604.013608.691540
Running step 1 of 1...
job output is in /tmp/mrtask_f.hadoop.20240604.013608.691540/output
Streaming final output from /tmp/mrtask_f.hadoop.20240604.013608.691540/output...
Removing temp directory /tmp/mrtask_f.hadoop.20240604.013608.691540...
[hadoop@ip-172-31-58-196 ~]$ cat mrtask_f.txt
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