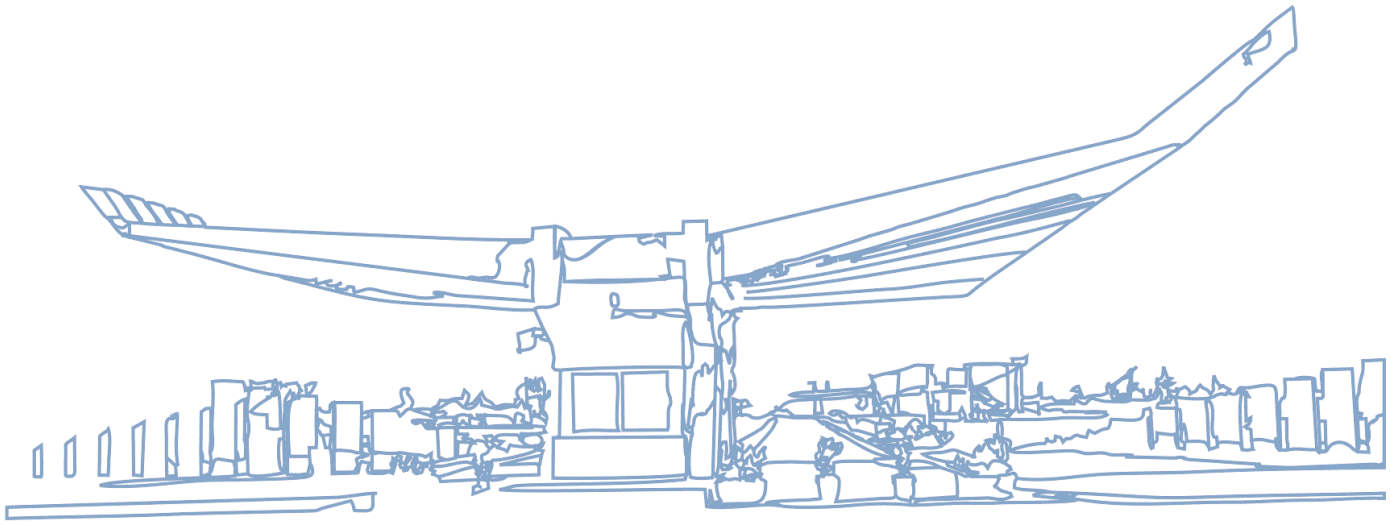
EPOKA UNIVERSITY | Computer Engineering Department

CEN 571 – Data Mining

Assignment 6: DataFrames



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Tasks to completeUse d311.csv (source: https://data.cityofnewyork.us/Social-Services/311-csv/i4zx-95p9) file as a data source and perform the following steps:

1. Create a subdirectory SPRK/Ex2 in the HDFS and upload the d311.csv file in the Ex2 subdirectory

2. Start the Spark Shell and read the d311.csv file. View the schema, and note that the column names match the record field names in the 'csv'. Provide a screenshot of the schema.

3. Display the data in the DataFrame using the show function. How many records are displayed? Display the first five records of the DataFrame. Provide a screenshot of the result.

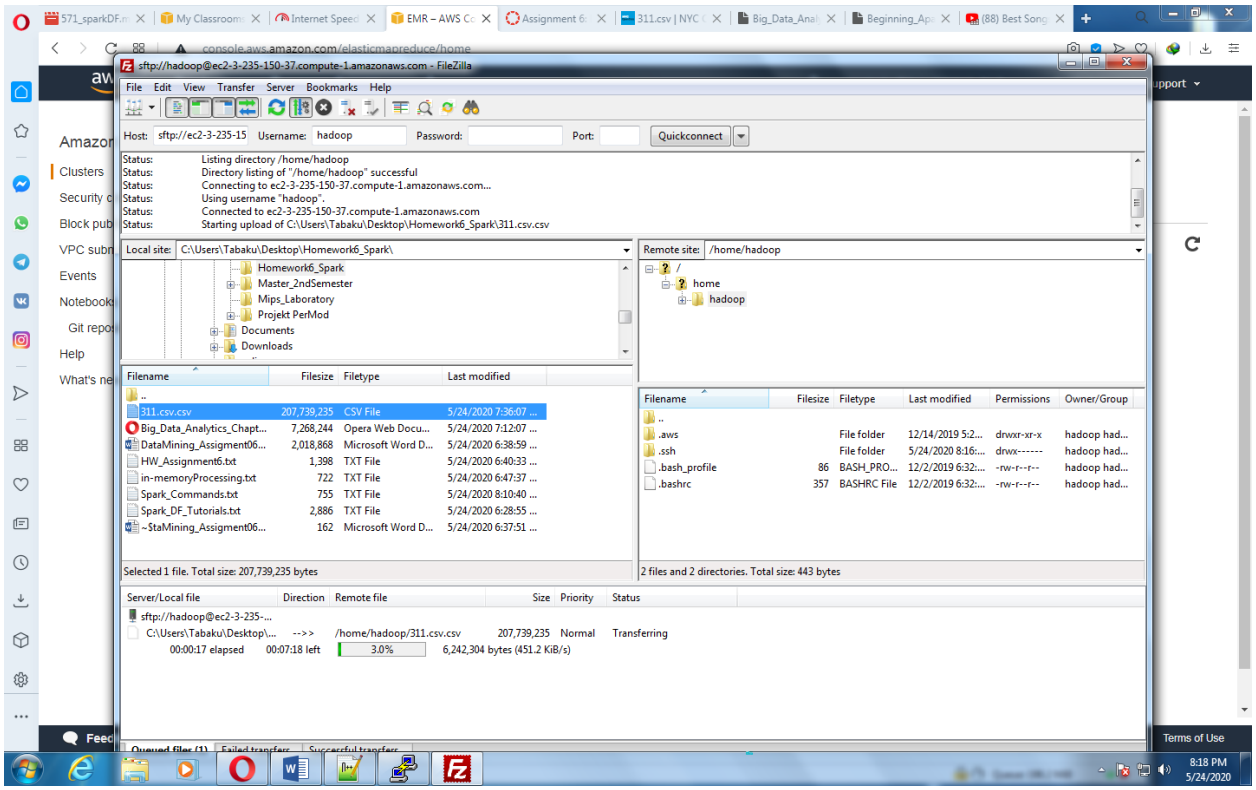
4. Use the count action to return the number of items in the DataFrame. Provide a screenshot of the result.

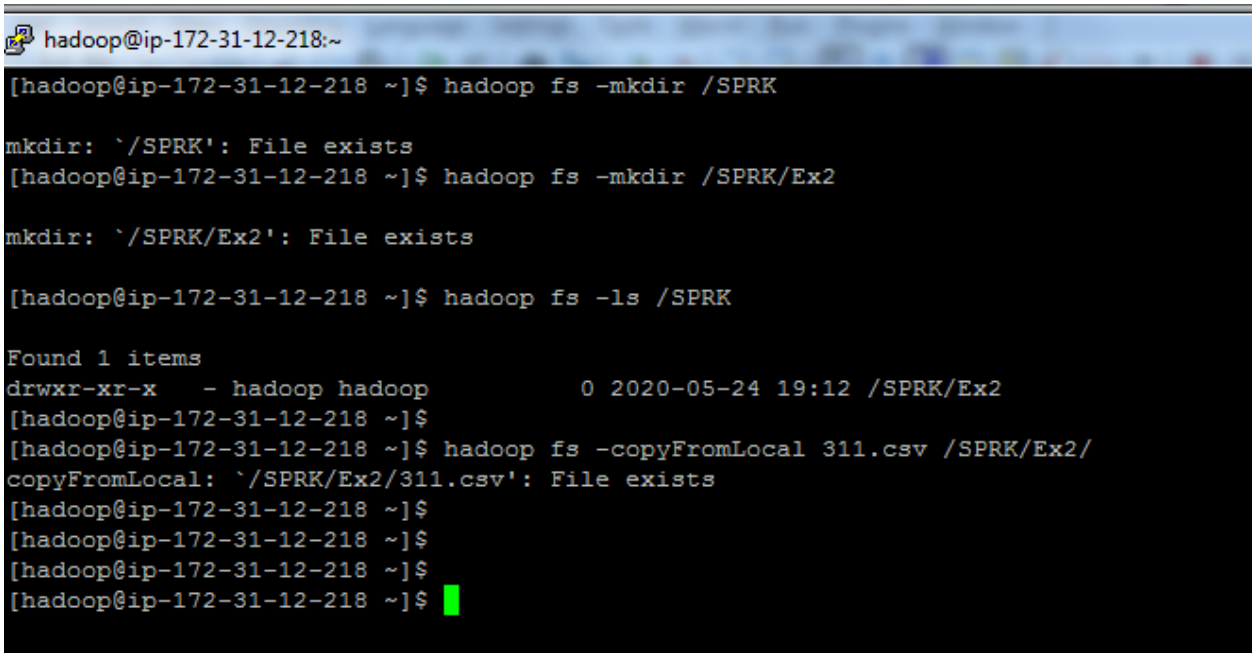
5. Using a select transformation to return a DataFrame with only the ‘Created Date’, ‘Agency’, ‘Complaint Type’ and ‘City’. The select transformation should return all columns with an alias instead of the real name. Display the schema of the new DataFrame. Provide a screenshot of the result.

6. Write a query (a series of one or more transformations followed by action) that displays the first 20 lines of ‘Agency’, ‘City’ ‘Complaint Type’ where ‘City’ is not null. Provide a screenshot of the result.

7. Perform the same query as in #6 above, but this time execute a single command to show the same results. Provide a screenshot of the result.

1. After successfully uploading the data into the Hadoop cluster we proceed on further analyze.





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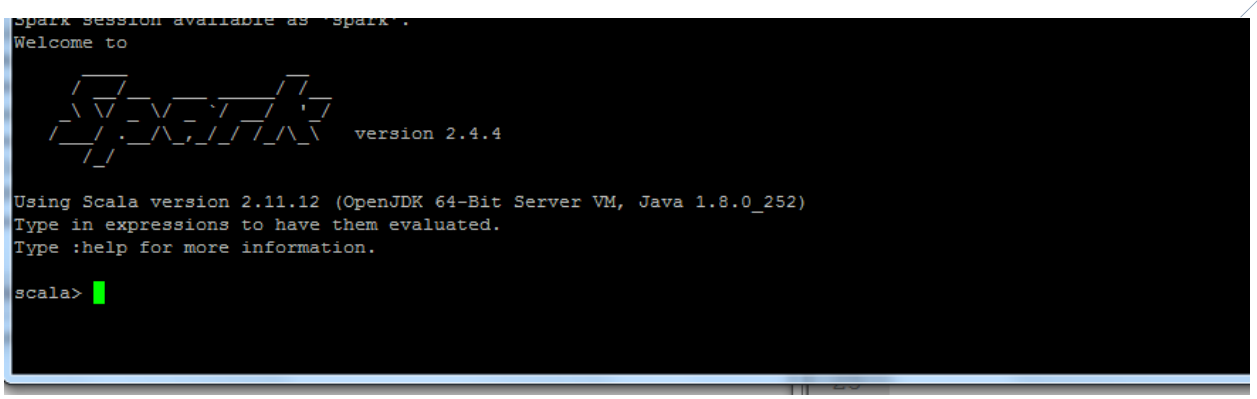
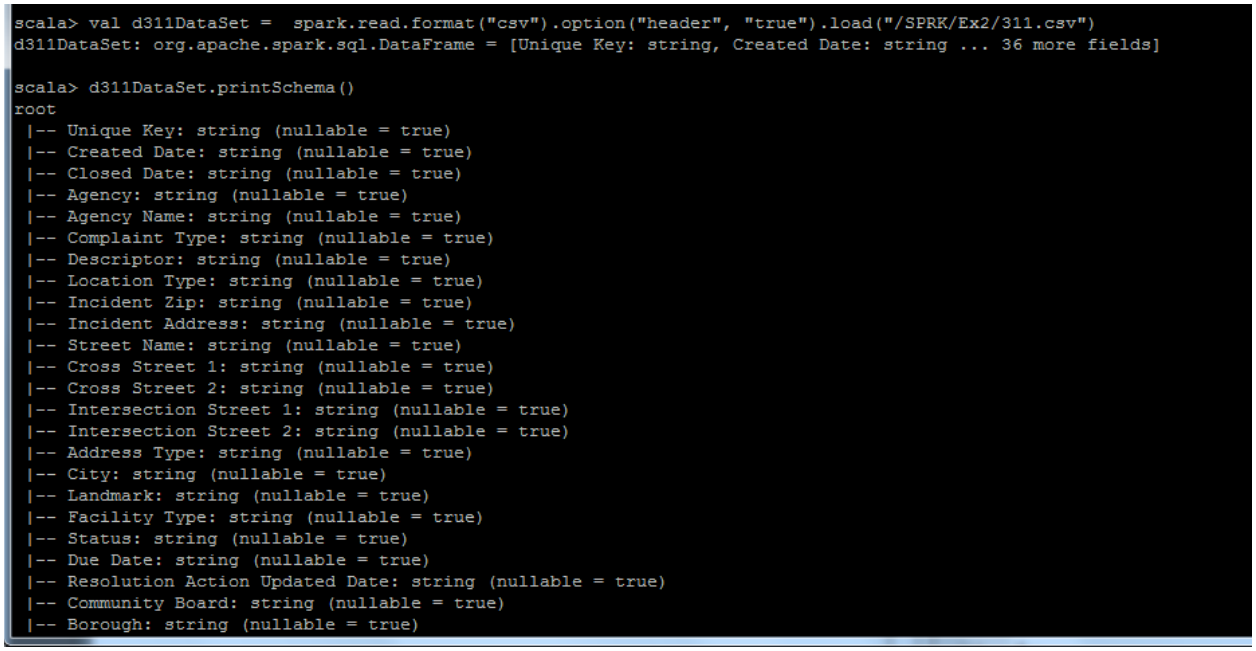
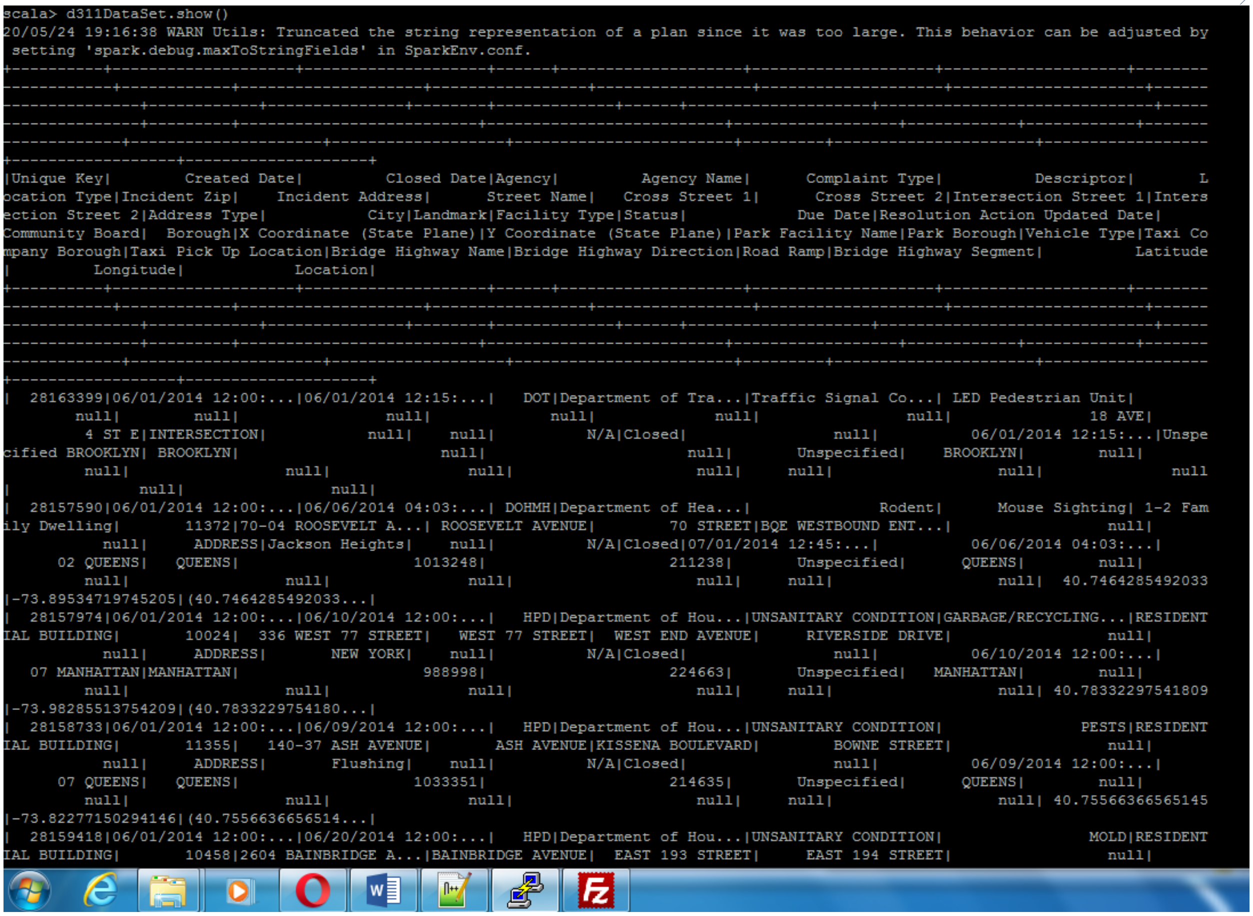
2. Staring the spark shell and proceeding further as shown below



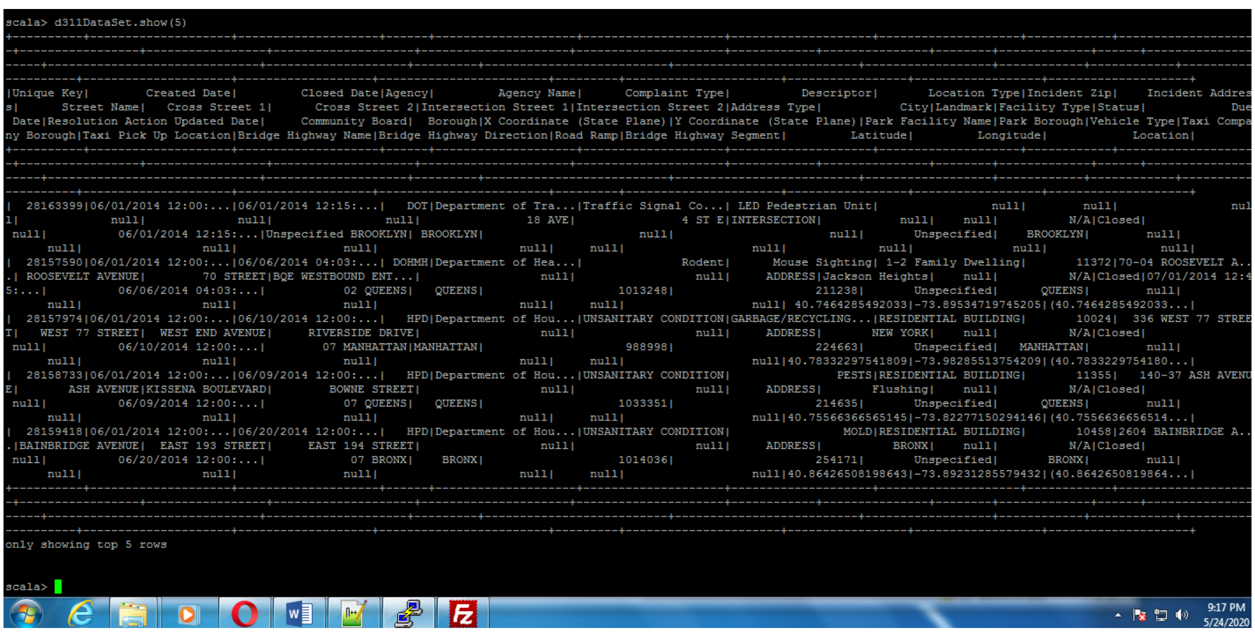


3. Showing the data,



```
scala> d311DataSet.show()
20/05/24 19:16:38 WARN Utils: Truncated the string representation of a plan since it was too large. This behavior can be adjusted by
 setting 'spark.debug.maxToStringFields' in SparkEnv.conf.
|Unique Key|        Created Date|         Closed Date|Agency|         Agency Name|      Complaint Type|          Descriptor|       L
ocation Type|Incident Zip|    Incident Address|       Street Name|    Cross Street 1|      Cross Street 2|Intersection Street 1|Inters
ection Street 2|Address Type|              City|Landmark|Facility Type|Status|             Due Date|Resolution Action Updated Date|
Community Board|  Borough|X Coordinate (State Plane)|Y Coordinate (State Plane)|Park Facility Name|Park Borough|Vehicle Type|Taxi Co
mpany Borough|Taxi Pick Up Location|Bridge Highway Name|Bridge Highway Direction|Road Ramp|Bridge Highway Segment|           Latitude
|         Longitude|            Location|
|  28163399|06/01/2014 12:00:...|06/01/2014 12:15:...|   DOT|Department of Tra...|Traffic Signal Co...| LED Pedestrian Unit|
         null|        null|                null|              null|              null|              null|               18 AVE|
         4 ST E|INTERSECTION|              null|    null|         N/A|Closed|                 null|          06/01/2014 12:15:...|Unspe
cified BROOKLYN| BROOKLYN|                      null|                      null|        Unspecified|    BROOKLYN|        null|
         null|                  null|                null|                      null|     null|                 null|                 null
|              null|                null|
|  28157590|06/01/2014 12:00:...|06/06/2014 04:03:...| DOHMH|Department of Hea...|              Rodent|      Mouse Sighting| 1-2 Fam
ily Dwelling|       11372|70-04 ROOSEVELT A...| ROOSEVELT AVENUE|        70 STREET|BQE WESTBOUND ENT...|                 null|
           null|     ADDRESS|Jackson Heights|    null|         N/A|Closed|07/01/2014 12:45:...|          06/06/2014 04:03:...|
      02 QUEENS|   QUEENS|                   1013248|                    211238|        Unspecified|      QUEENS|        null|
         null|                  null|                null|                      null|     null|                 null|  40.7464285492033
|-73.89534719745205|(40.7464285492033...|
|  28157974|06/01/2014 12:00:...|06/10/2014 12:00:...|   HPD|Department of Hou...|UNSANITARY CONDITION|GARBAGE/RECYCLING...|RESIDENT
IAL BUILDING|       10024|  336 WEST 77 STREET|   WEST 77 STREET|  WEST END AVENUE|     RIVERSIDE DRIVE|                 null|
           null|     ADDRESS|          NEW YORK|    null|         N/A|Closed|                 null|          06/10/2014 12:00:...|
   07 MANHATTAN|MANHATTAN|                    988998|                    224663|        Unspecified|   MANHATTAN|        null|
         null|                  null|                null|                      null|     null|                 null| 40.78332297541809
|-73.98285513754209|(40.7833229754180...|
|  28158733|06/01/2014 12:00:...|06/09/2014 12:00:...|   HPD|Department of Hou...|UNSANITARY CONDITION|               PESTS|RESIDENT
IAL BUILDING|       11355|   140-37 ASH AVENUE|       ASH AVENUE|KISSENA BOULEVARD|        BOWNE STREET|                 null|
           null|     ADDRESS|          Flushing|    null|         N/A|Closed|                 null|          06/09/2014 12:00:...|
      07 QUEENS|   QUEENS|                   1033351|                    214635|        Unspecified|      QUEENS|        null|
         null|                  null|                null|                      null|     null|                 null| 40.75566366565145
|-73.82277150294146|(40.7556636656514...|
|  28159418|06/01/2014 12:00:...|06/20/2014 12:00:...|   HPD|Department of Hou...|UNSANITARY CONDITION|                MOLD|RESIDENT
IAL BUILDING|       10458|2604 BAINBRIDGE A...|BAINBRIDGE AVENUE|  EAST 193 STREET|     EAST 194 STREET|                 null|
```

Showing the first five records



```
scala> d311DataSet.show(5)
|Unique Key|        Created Date|         Closed Date|Agency|         Agency Name|      Complaint Type|          Descriptor|       Location Type|Incident Zip|    Incident Addres
s|      Street Name|   Cross Street 1|      Cross Street 2|Intersection Street 1|Intersection Street 2|Address Type|              City|Landmark|Facility Type|Status|             Due
 Date|Resolution Action Updated Date|     Community Board|  Borough|X Coordinate (State Plane)|Y Coordinate (State Plane)|Park Facility Name|Park Borough|Vehicle Type|Taxi Compa
ny Borough|Taxi Pick Up Location|Bridge Highway Name|Bridge Highway Direction|Road Ramp|Bridge Highway Segment|         Latitude|         Longitude|            Location|
|  28163399|06/01/2014 12:00:...|06/01/2014 12:15:...|   DOT|Department of Tra...|Traffic Signal Co...| LED Pedestrian Unit|                null|        null|                nul
l|             null|             null|              null|               18 AVE|               4 ST E|INTERSECTION|              null|    null|         N/A|Closed|
 null|          06/01/2014 12:15:...|Unspecified BROOKLYN| BROOKLYN|                      null|                      null|        Unspecified|    BROOKLYN|        null|
     null|                 null|               null|                    null|     null|                 null|              null|              null|                null|
|  28157590|06/01/2014 12:00:...|06/06/2014 04:03:...| DOHMH|Department of Hea...|              Rodent|      Mouse Sighting| 1-2 Family Dwelling|       11372|70-04 ROOSEVELT A..
.| ROOSEVELT AVENUE|        70 STREET|BQE WESTBOUND ENT...|                 null|                 null|     ADDRESS|Jackson Heights|    null|         N/A|Closed|07/01/2014 12:4
5:...|          06/06/2014 04:03:...|           02 QUEENS|   QUEENS|                   1013248|                    211238|        Unspecified|      QUEENS|        null|
     null|                 null|               null|                    null|     null|                 null| 40.7464285492033|-73.89534719745205|(40.7464285492033...|
|  28157974|06/01/2014 12:00:...|06/10/2014 12:00:...|   HPD|Department of Hou...|UNSANITARY CONDITION|GARBAGE/RECYCLING...|RESIDENTIAL BUILDING|       10024|  336 WEST 77 STREE
T|   WEST 77 STREET|  WEST END AVENUE|     RIVERSIDE DRIVE|                 null|                 null|     ADDRESS|          NEW YORK|    null|         N/A|Closed|
 null|          06/10/2014 12:00:...|        07 MANHATTAN|MANHATTAN|                    988998|                    224663|        Unspecified|   MANHATTAN|        null|
     null|                 null|               null|                    null|     null|                 null|40.78332297541809|-73.98285513754209|(40.7833229754180...|
|  28158733|06/01/2014 12:00:...|06/09/2014 12:00:...|   HPD|Department of Hou...|UNSANITARY CONDITION|               PESTS|RESIDENTIAL BUILDING|       11355|   140-37 ASH AVENU
E|       ASH AVENUE|KISSENA BOULEVARD|        BOWNE STREET|                 null|                 null|     ADDRESS|          Flushing|    null|         N/A|Closed|
 null|          06/09/2014 12:00:...|           07 QUEENS|   QUEENS|                   1033351|                    214635|        Unspecified|      QUEENS|        null|
     null|                 null|               null|                    null|     null|                 null|40.75566366565145|-73.82277150294146|(40.7556636656514...|
|  28159418|06/01/2014 12:00:...|06/20/2014 12:00:...|   HPD|Department of Hou...|UNSANITARY CONDITION|                MOLD|RESIDENTIAL BUILDING|       10458|2604 BAINBRIDGE A..
.|BAINBRIDGE AVENUE|  EAST 193 STREET|     EAST 194 STREET|                 null|                 null|     ADDRESS|             BRONX|    null|         N/A|Closed|
 null|          06/20/2014 12:00:...|            07 BRONX|    BRONX|                   1014036|                    254171|        Unspecified|       BRONX|        null|
     null|                 null|               null|                    null|     null|                 null|40.86426508198643|-73.89231285579432|(40.8642650819864...|
only showing top 5 rows

scala>
```

Note: it shows a mess because the screen is small.

4. Counting data

```
scala> val numCount = d311DataSet.count()
numCount: Long = 518909
```

5. Using a select transformation to return a DataFrame with only the ‘Created Date’, ‘Agency’, ‘Complaint Type’ and ‘City’. The select transformation should return all columns with an alias instead of the real name.

```
scala> val costumQuerySelect = d311DataSet.select($"Created Date".alias("A1"), $"Agency".alias("A2"), $"Complaint Type".alias("A3"), $"City".alias("A4"))
costumQuerySelect: org.apache.spark.sql.DataFrame = [A1: string, A2: string ... 2 more fields]

scala> costumQuerySelect.printSchema();
root
 |-- A1: string (nullable = true)
 |-- A2: string (nullable = true)
 |-- A3: string (nullable = true)
 |-- A4: string (nullable = true)


scala> costumQuerySelect.show()
+--------------------+-----+--------------------+---------------+
|                  A1|   A2|                  A3|             A4|
+--------------------+-----+--------------------+---------------+
|06/01/2014 12:00:...|  DOT|Traffic Signal Co...|           null|
|06/01/2014 12:00:...|DOHMH|              Rodent|Jackson Heights|
|06/01/2014 12:00:...|  HPD|UNSANITARY CONDITION|       NEW YORK|
|06/01/2014 12:00:...|  HPD|UNSANITARY CONDITION|       Flushing|
|06/01/2014 12:00:...|  HPD|UNSANITARY CONDITION|          BRONX|
|06/01/2014 12:00:...|  HPD|UNSANITARY CONDITION|       NEW YORK|
|06/01/2014 12:00:...|  HPD|          WATER LEAK|       Flushing|
|06/01/2014 12:00:...|  HPD|          WATER LEAK|       Flushing|
|06/01/2014 12:00:...|  HPD|UNSANITARY CONDITION|          BRONX|
|06/01/2014 12:00:...|  HPD|          WATER LEAK|       Flushing|
|06/01/2014 12:00:...|DOHMH|              Rodent|       BROOKLYN|
|06/01/2014 12:00:...|DOHMH|              Rodent|       Flushing|
|06/01/2014 12:00:...|  HPD|      HEAT/HOT WATER|       BROOKLYN|
|06/01/2014 12:00:...|DOHMH|              Rodent|       BROOKLYN|
|06/01/2014 12:00:...|DOHMH|              Rodent|          BRONX|
|06/01/2014 12:00:...|DOHMH|              Rodent|          BRONX|
|06/01/2014 12:00:...|DOHMH|              Rodent|          BRONX|
|06/01/2014 12:00:...|DOHMH|              Rodent|          BRONX|
|06/01/2014 12:00:...|DOHMH|              Rodent|       BROOKLYN|
|06/01/2014 12:00:...|DOHMH|              Rodent|       BROOKLYN|
+--------------------+-----+--------------------+---------------+
only showing top 20 rows


scala>
```

6. Writing a query (a series of one or more transformations followed by action) that displays the first 20 lines of ‘Agency’, ‘City’ ‘Complaint Type’ where ‘City’ is not null. Provide a screenshot of the result.

```
scala> val costumQuerySelect6 = d311DataSet.select("Agency", "City", "Complaint Type").where("City is not Null")
costumQuerySelect6: org.apache.spark.sql.Dataset[org.apache.spark.sql.Row] = [Agency: string, City: string ... 1 more field]

scala> costumQuerySelect6.show()
+------+--------------+--------------------+
|Agency|          City|      Complaint Type|
+------+--------------+--------------------+
| DOHMH|Jackson Heights|              Rodent|
|   HPD|      NEW YORK|UNSANITARY CONDITION|
|   HPD|      Flushing|UNSANITARY CONDITION|
|   HPD|         BRONX|UNSANITARY CONDITION|
|   HPD|      NEW YORK|UNSANITARY CONDITION|
|   HPD|      Flushing|          WATER LEAK|
|   HPD|      Flushing|          WATER LEAK|
|   HPD|         BRONX|UNSANITARY CONDITION|
|   HPD|      Flushing|          WATER LEAK|
| DOHMH|      BROOKLYN|              Rodent|
| DOHMH|      Flushing|              Rodent|
|   HPD|      BROOKLYN|      HEAT/HOT WATER|
| DOHMH|      BROOKLYN|              Rodent|
| DOHMH|         BRONX|              Rodent|
| DOHMH|         BRONX|              Rodent|
| DOHMH|         BRONX|              Rodent|
| DOHMH|         BRONX|              Rodent|
| DOHMH|      BROOKLYN|              Rodent|
| DOHMH|      BROOKLYN|              Rodent|
| DOHMH|      NEW YORK|              Rodent|
+------+--------------+--------------------+
only showing top 20 rows


scala> costumQuerySelect6.printSchema()
root
 |-- Agency: string (nullable = true)
 |-- City: string (nullable = true)
 |-- Complaint Type: string (nullable = true)


scala>
```

By default it displays 20 values so no need to specify .show (20).

7. Executing the same command as exercise #6 but this time will a single command to show the same results.

```
scala> d311DataSet.select("Agency", "City", "Complaint Type").where("City is not Null").show()
+------+--------------+--------------------+
|Agency|          City|      Complaint Type|
+------+--------------+--------------------+
| DOHMH|Jackson Heights|              Rodent|
|   HPD|      NEW YORK|UNSANITARY CONDITION|
|   HPD|      Flushing|UNSANITARY CONDITION|
|   HPD|         BRONX|UNSANITARY CONDITION|
|   HPD|      NEW YORK|UNSANITARY CONDITION|
|   HPD|      Flushing|          WATER LEAK|
|   HPD|      Flushing|          WATER LEAK|
|   HPD|         BRONX|UNSANITARY CONDITION|
|   HPD|      Flushing|          WATER LEAK|
| DOHMH|      BROOKLYN|              Rodent|
| DOHMH|      Flushing|              Rodent|
|   HPD|      BROOKLYN|      HEAT/HOT WATER|
| DOHMH|      BROOKLYN|              Rodent|
| DOHMH|         BRONX|              Rodent|
| DOHMH|         BRONX|              Rodent|
| DOHMH|         BRONX|              Rodent|
| DOHMH|         BRONX|              Rodent|
| DOHMH|      BROOKLYN|              Rodent|
| DOHMH|      BROOKLYN|              Rodent|
| DOHMH|      NEW YORK|              Rodent|
+------+--------------+--------------------+
only showing top 20 rows


scala>
```