Uber Price Prediction

In [1]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from datetime import datetime
import warnings
warnings.filterwarnings("ignore")
```

In [14]:

```
data = pd.read_csv("uber.csv")
```

In [15]:

```
#Create a data copy
df = data.copy()
```

In [16]:

```
df.head
```

Out[16]:

```
<bound method NDFrame.head of         Unnamed: 0                            ke
y  fare_amount  \
0         24238194    2015-05-07 19:52:06.0000003          7.5
1         27835199    2009-07-17 20:04:56.0000002          7.7
2         44984355   2009-08-24 21:45:00.00000061         12.9
3         25894730    2009-06-26 08:22:21.0000001          5.3
4         17610152  2014-08-28 17:47:00.000000188         16.0
...            ...                            ...          ...
199995    42598914   2012-10-28 10:49:00.00000053          3.0
199996    16382965    2014-03-14 01:09:00.0000008          7.5
199997    27804658   2009-06-29 00:42:00.00000078         30.9
199998    20259894    2015-05-20 14:56:25.0000004         14.5
199999    11951496   2010-05-15 04:08:00.00000076         14.1

                pickup_datetime  pickup_longitude  pickup_latitude  \
0       2015-05-07 19:52:06 UTC        -73.999817        40.738354
1       2009-07-17 20:04:56 UTC        -73.994355        40.728225
2       2009-08-24 21:45:00 UTC        -74.005043        40.740770
3       2009-06-26 08:22:21 UTC        -73.976124        40.790844
4       2014-08-28 17:47:00 UTC        -73.925023        40.744085
...                         ...               ...              ...
199995  2012-10-28 10:49:00 UTC        -73.987042        40.739367
199996  2014-03-14 01:09:00 UTC        -73.984722        40.736837
199997  2009-06-29 00:42:00 UTC        -73.986017        40.756487
199998  2015-05-20 14:56:25 UTC        -73.997124        40.725452
199999  2010-05-15 04:08:00 UTC        -73.984395        40.720077

        dropoff_longitude  dropoff_latitude  passenger_count
0              -73.999512         40.723217                1
1              -73.994710         40.750325                1
2              -73.962565         40.772647                1
3              -73.965316         40.803349                3
4              -73.973082         40.761247                5
...                   ...               ...              ...
199995         -73.986525         40.740297                1
199996         -74.006672         40.739620                1
199997         -73.858957         40.692588                2
199998         -73.983215         40.695415                1
199999         -73.985508         40.768793                1

[200000 rows x 9 columns]>
```

Data Preprocessing

In [17]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200000 entries, 0 to 199999
Data columns (total 9 columns):
 #   Column             Non-Null Count   Dtype  
---  ------             --------------   -----  
 0   Unnamed: 0         200000 non-null  int64  
 1   key                200000 non-null  object 
 2   fare_amount        200000 non-null  float64
 3   pickup_datetime    200000 non-null  object 
 4   pickup_longitude   200000 non-null  float64
 5   pickup_latitude    200000 non-null  float64
 6   dropoff_longitude  199999 non-null  float64
 7   dropoff_latitude   199999 non-null  float64
 8   passenger_count    200000 non-null  int64  
dtypes: float64(5), int64(2), object(2)
memory usage: 13.7+ MB
```

In [18]:

```
#pickup_datetime is not in required data format
df["pickup_datetime"] = pd.to_datetime(df["pickup_datetime"])
```

In [19]:

```
#Statistics of data
df.describe()
```

Out[19]:

	Unnamed: 0	fare_amount	pickup_longitude	pickup_latitude	dropoff_longitude	dropoff_latitude
count	2.000000e+05	200000.000000	200000.000000	200000.000000	199999.000000	199999.000000
mean	2.771250e+07	11.359955	-72.527638	39.935885	-72.525292	39.923890
std	1.601382e+07	9.901776	11.437787	7.720539	13.117408	6.794829
min	1.000000e+00	-52.000000	-1340.648410	-74.015515	-3356.666300	-881.985513
25%	1.382535e+07	6.000000	-73.992065	40.734796	-73.991407	40.733823
50%	2.774550e+07	8.500000	-73.981823	40.752592	-73.980093	40.753042
75%	4.155530e+07	12.500000	-73.967154	40.767158	-73.963658	40.768001
max	5.542357e+07	499.000000	57.418457	1644.421482	1153.572603	872.697628

In [20]:

```
df.isnull().sum()
```

Out[20]:

```
Unnamed: 0           0
key                  0
fare_amount          0
pickup_datetime      0
pickup_longitude     0
pickup_latitude      0
dropoff_longitude    1
dropoff_latitude     1
passenger_count      0
dtype: int64
```

In [21]:

```
#Drop the rows with missing values
df.dropna(inplace=True)
```

In [22]:

```
# (3)Correlation
df.corr()
```

Out[22]:

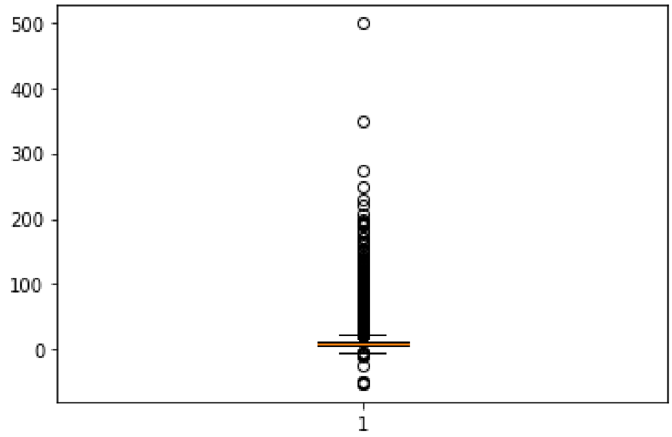
	Unnamed: 0	fare_amount	pickup_longitude	pickup_latitude	dropoff_longitude	dropoff_lati
Unnamed: 0	1.000000	0.000587	0.000230	-0.000341	0.000270	0.00
fare_amount	0.000587	1.000000	0.010458	-0.008482	0.008986	-0.01
pickup_longitude	0.000230	0.010458	1.000000	-0.816461	0.833026	-0.84
pickup_latitude	-0.000341	-0.008482	-0.816461	1.000000	-0.774787	0.70
dropoff_longitude	0.000270	0.008986	0.833026	-0.774787	1.000000	-0.91
dropoff_latitude	0.000271	-0.011014	-0.846324	0.702367	-0.917010	1.00
passenger_count	0.002259	0.010158	-0.000415	-0.001559	0.000033	-0.00

In [23]:

```
plt.boxplot(df['fare_amount'])
```

Out[23]:

```
{'whiskers': [<matplotlib.lines.Line2D at 0x7f33e6383460>,
  <matplotlib.lines.Line2D at 0x7f33e63837f0>],
 'caps': [<matplotlib.lines.Line2D at 0x7f33e6383b80>,
  <matplotlib.lines.Line2D at 0x7f33e6383f10>],
 'boxes': [<matplotlib.lines.Line2D at 0x7f33e63831f0>],
 'medians': [<matplotlib.lines.Line2D at 0x7f33e637a2e0>],
 'fliers': [<matplotlib.lines.Line2D at 0x7f33e637a670>],
 'means': []}
```



In [24]:

```
#Remove Outliers
q_low = df["fare_amount"].quantile(0.01)
q_hi  = df["fare_amount"].quantile(0.99)

df = df[(df["fare_amount"] < q_hi) & (df["fare_amount"] > q_low)]
```

In [25]:

```
#Check the missing values now
df.isnull().sum()
```

Out[25]:

```
Unnamed: 0           0
key                  0
fare_amount          0
pickup_datetime      0
pickup_longitude     0
pickup_latitude      0
dropoff_longitude    0
dropoff_latitude     0
passenger_count      0
dtype: int64
```

In [26]:

```
#Time to apply learning models
from sklearn.model_selection import train_test_split
```

In [27]:

```
#Take x as predictor variable
x = df.drop("fare_amount", axis = 1)
#And y as target variable
y = df['fare_amount']
```

In [28]:

```
#Necessary to apply model
x['pickup_datetime'] = pd.to_numeric(pd.to_datetime(x['pickup_datetime']))
x = x.loc[:, x.columns.str.contains('^Unnamed')]
```

In [29]:

```
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size = 0.2, random_state = 1
```

In [30]:

```
from sklearn.model_selection import train_test_split
from sklearn.model_selection import cross_val_score
from sklearn.linear_model import LinearRegression
from sklearn.ensemble import RandomForestRegressor
from sklearn.metrics import mean_squared_error, r2_score
from math import sqrt
```

In [32]:

```
from sklearn.linear_model import LinearRegression
```

In [33]:

```
lrmodel = LinearRegression()
lrmodel.fit(x_train, y_train)
```

Out[33]:

```
LinearRegression()
```

In [34]:

```
#Prediction
predict = lrmodel.predict(x_test)
```

In [35]:

```
#Check Error
from sklearn.metrics import mean_squared_error
lrmodelrmse = np.sqrt(mean_squared_error(predict, y_test))
print("RMSE error for the model is ", lrmodelrmse)
```

```
RMSE error for the model is  8.063863046328835
```

In [36]:

```
#Let's Apply Random Forest Regressor
from sklearn.ensemble import RandomForestRegressor
rfrmodel = RandomForestRegressor(n_estimators = 100, random_state = 101)
```

In [39]:

```
#Fit the Forest
rfrmodel.fit(x_train, y_train)
rfrmodel_pred = rfrmodel.predict(x_test)
```

In [40]:

```
#Errors for the forest
rfrmodel_rmse = np.sqrt(mean_squared_error(rfrmodel_pred, y_test))
print("RMSE value for Random Forest is:",rfrmodel_rmse)
```

```
RMSE value for Random Forest is: 9.757713738069647
```