LAB-02

In [2]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error, mean_absolute_error
```

In [3]:

```
df= pd.read_csv("C:/Users/91969/Downloads/train.csv")
df.head()
```

Out[3]:

	trip_duration	distance_traveled	num_of_passengers	fare	tip	miscellaneous_fees	tota
0	748.0	2.75	1.0	75.00	24	6.300	10
1	1187.0	3.43	1.0	105.00	24	13.200	14
2	730.0	3.12	1.0	71.25	0	26.625	9
3	671.0	5.63	3.0	90.00	0	9.750	9
4	329.0	2.09	1.0	45.00	12	13.200	7

In [3]:

```
df.shape
```

Out[3]:

```
(209673, 8)
```

In [4]:

```
df.describe()
```

Out[4]:

	trip_duration	distance_traveled	num_of_passengers	fare	tip
count	209673.000000	209673.000000	209673.000000	209673.000000	209673.000000
mean	1173.181478	5.054431	1.292808	99.623431	13.030824
std	4775.653621	125.217419	0.930754	85.602702	20.367764
min	0.000000	0.020000	0.000000	0.000000	0.000000
25%	446.000000	1.950000	1.000000	52.500000	0.000000
50%	707.000000	3.200000	1.000000	75.000000	9.000000
75%	1098.000000	5.730000	1.000000	116.250000	20.000000
max	86387.000000	57283.910000	9.000000	4466.250000	2500.000000

In [5]:
```
df.info()
```

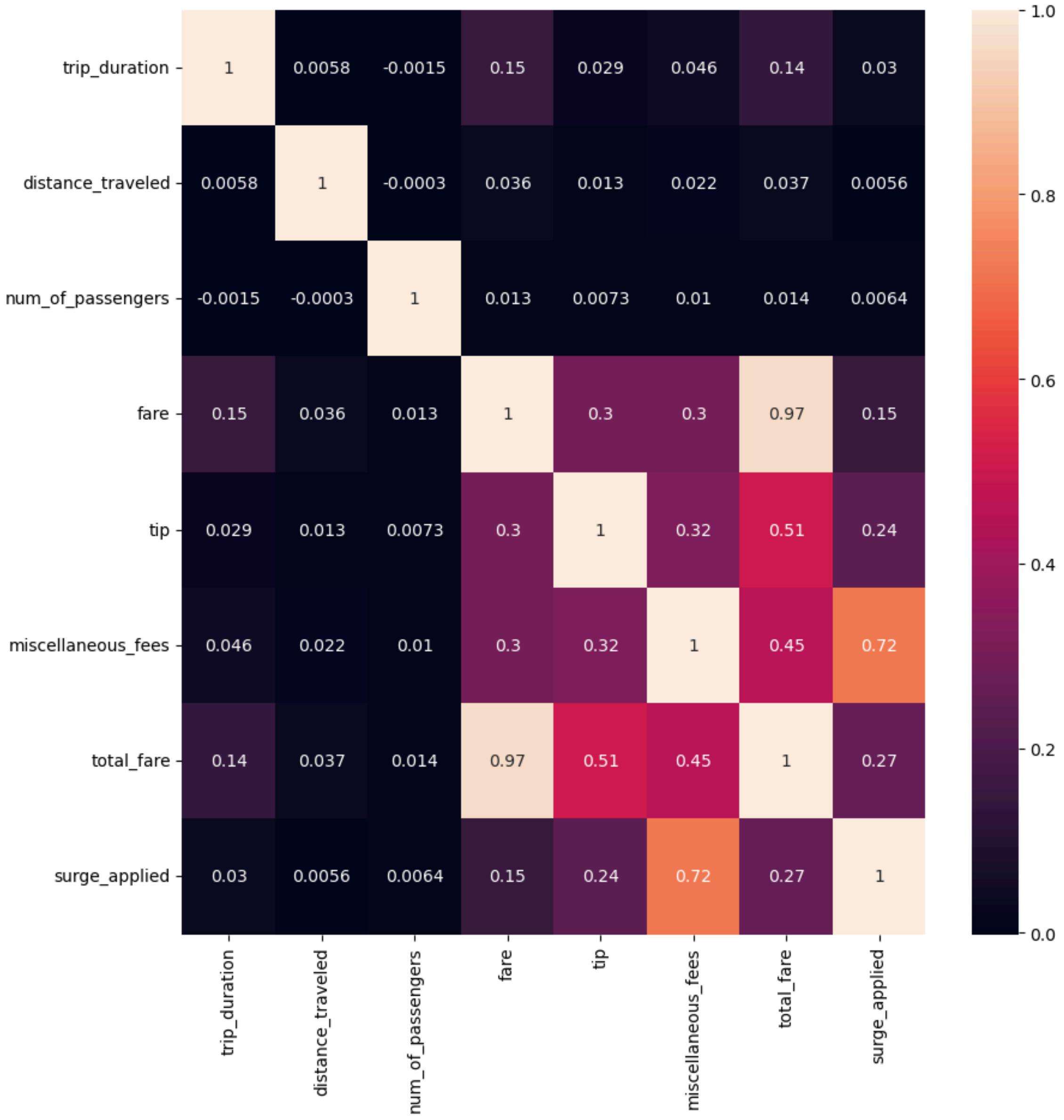
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 209673 entries, 0 to 209672
Data columns (total 8 columns):
 #   Column              Non-Null Count   Dtype  
---  ------              --------------   -----  
 0   trip_duration       209673 non-null  float64
 1   distance_traveled   209673 non-null  float64
 2   num_of_passengers   209673 non-null  float64
 3   fare                209673 non-null  float64
 4   tip                 209673 non-null  int64  
 5   miscellaneous_fees  209673 non-null  float64
 6   total_fare          209673 non-null  float64
 7   surge_applied       209673 non-null  int64  
dtypes: float64(6), int64(2)
memory usage: 12.8 MB
```

In [6]:
```
df.isnull().sum()
```

Out[6]:
```
trip_duration         0
distance_traveled     0
num_of_passengers     0
fare                  0
tip                   0
miscellaneous_fees    0
total_fare            0
surge_applied         0
dtype: int64
```

Data Visualization

In [7]:
```
plt.figure(figsize=(10,10))
sns.heatmap(df.corr(),annot=True)
plt.show()
```



Train and Test Split

In [8]:
```
X = df.drop(columns='total_fare')
X
```

Out[8]:

	trip_duration	distance_traveled	num_of_passengers	fare	tip	miscellaneous_fees
0	748.0	2.75	1.0	75.00	24	6.300
1	1187.0	3.43	1.0	105.00	24	13.200
2	730.0	3.12	1.0	71.25	0	26.625
3	671.0	5.63	3.0	90.00	0	9.750
4	329.0	2.09	1.0	45.00	12	13.200
...	...	...	...	...	...	...
209668	1617.0	8.42	1.0	150.00	47	5.800
209669	438.0	1.29	1.0	48.75	12	34.575
209670	571.0	2.82	1.0	63.75	0	6.000
209671	491.0	2.16	1.0	56.25	0	13.500
209672	3614.0	33.72	1.0	337.50	0	2.250

209673 rows × 7 columns

In [9]:
```
y = df['total_fare']
y
```

Out[9]:
```
0         105.300
1         142.200
2          97.875
3          99.750
4          70.200
           ...   
209668    202.800
209669     95.325
209670     69.750
209671     69.750
209672    339.750
Name: total_fare, Length: 209673, dtype: float64
```

In [10]:
```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, ra
```

Feature Scaling

In [11]:
```
STD = StandardScaler()
X_train_SD = STD.fit_transform(X_train)
X_test_SD = STD.transform(X_test)
```

Model Training

```
In [12]: LR = LinearRegression()
         LR.fit(X_train_SD, y_train)

Out[12]: LinearRegression()
```

```
In [13]: y_hat = LR.predict(X_test_SD)
```

Model Evaluation

```
In [14]: print("mse: ", mean_squared_error(y_hat, y_test))

         mse:  3.473722029833163e-27
```

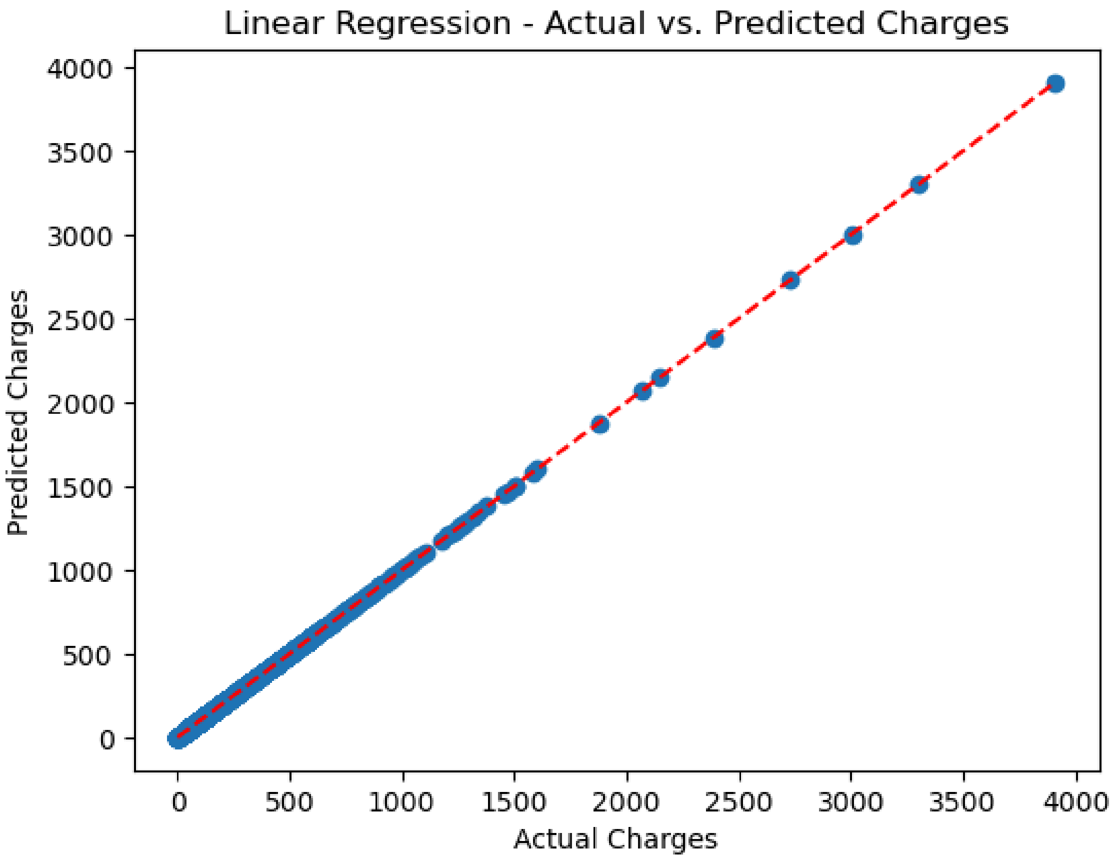
```
In [15]: regressor = LinearRegression()
         regressor.fit(X_train, y_train)
         accuracy = regressor.score(X_test, y_test)
         print("Accuracy:",(int(round(accuracy*100))))

         Accuracy: 100
```

```
In [16]: print("mae: ", mean_absolute_error(y_hat, y_test))

         mae:  3.516311812818896e-14
```

In [17]:
```
plt.scatter(y_test, y_hat)
plt.plot([y_test.min(), y_test.max()], [y_test.min(), y_test.max()], 'r--')
plt.xlabel('Actual Charges')
plt.ylabel('Predicted Charges')
plt.title('Linear Regression - Actual vs. Predicted Charges')
plt.show()
```



In [18]:
```
# To retrieve the intercept:
print(regressor.intercept_)
```

```
-8.526512829121202e-14
```

In [19]:
```
# For retrieving the slope (coefficient of x):
print(regressor.coef_)
```

```
[ 3.68949741e-17 -1.39940559e-17 -1.49684473e-14  1.00000000e+00
  1.00000000e+00  1.00000000e+00  3.84079752e-16]
```

In [20]:
```
y_pred = regressor.predict(X_test)
y_pred
```

Out[20]:
```
array([ 66.    ,  51.    , 163.5   , ...,  63.75 , 236.625,  43.5   ])
```

In [22]:

```
# To compare the actual output values for X_test with the predicted values
df = pd.DataFrame({'Actual': y_test, 'Predicted': y_pred})
df
```

Out[22]:

	Actual	Predicted
110587	66.000	66.000
43371	51.000	51.000
84310	163.500	163.500
160055	212.250	212.250
172966	126.000	126.000
...	...	...
1248	116.625	116.625
48614	306.450	306.450
201198	63.750	63.750
194357	236.625	236.625
183327	43.500	43.500

41935 rows × 2 columns

In [21]:

```
import statistics
SSE=sum((y_pred-y_test)**2)
SST = sum((statistics.mean(y_pred)-y_test)**2)
R2=1-SSE/SST
R2
```

Out[21]:

```
1.0
```