CL1_02

July 15, 2025

```
[ ]: '''
     NAME:Aher Swami Sandip
     ROLL NO.01
     COURSE: AI&DS
     CLASS: BE
     SUB:Computer Laboratory-I (Machine Learning)
     '''
```

```
[ ]: '''
     PRACTICAL NO:02
     A. Predict the price of the Uber ride from a given pickup point to the agreed␣
      ↪drop-off
     location. Perform following tasks:
     1. Pre-process the dataset.
     2. Identify outliers.
     3. Check the correlation.
     4. Implement linear regression and ridge, Lasso regression models.
     5. Evaluate the models and compare their respective scores like R2, RMSE, etc.␣
      ↪'''
```

```
[1]: import numpy as np
     import pandas as pd
     import seaborn as sns
     import math
     import matplotlib.pyplot as plt
     from sklearn.model_selection import train_test_split
     from sklearn.linear_model import LinearRegression, Ridge, Lasso
     from sklearn.metrics import r2_score, mean_squared_error, mean_absolute_error
     from sklearn.preprocessing import StandardScaler
```

```
[2]: data=pd.read_csv('uber.csv')
```

```
[4]: data.head()
```

```
[4]:    Unnamed: 0                            key  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

           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

   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
```

[4]:
```
data.tail()
```

[4]:
```
        Unnamed: 0                            key  fare_amount
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
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
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
```

[5]:
```
data.dtypes
```

[5]:
```
Unnamed: 0             int64
key                   object
fare_amount          float64
pickup_datetime       object
pickup_longitude     float64
```

```
pickup_latitude      float64
dropoff_longitude    float64
dropoff_latitude     float64
passenger_count        int64
dtype: object
```

[6]:

```
data.shape
```

[6]:

```
(200000, 9)
```

[7]:

```
data.describe()
```

[7]:

```
         Unnamed: 0    fare_amount  pickup_longitude  pickup_latitude  \
count  2.000000e+05  200000.000000     200000.000000    200000.000000
mean   2.771250e+07      11.359955        -72.527638        39.935885
std    1.601382e+07       9.901776         11.437787         7.720539
min    1.000000e+00     -52.000000      -1340.648410       -74.015515
25%    1.382535e+07       6.000000        -73.992065        40.734796
50%    2.774550e+07       8.500000        -73.981823        40.752592
75%    4.155530e+07      12.500000        -73.967154        40.767158
max    5.542357e+07     499.000000         57.418457      1644.421482

       dropoff_longitude  dropoff_latitude  passenger_count
count      199999.000000     199999.000000    200000.000000
mean          -72.525292         39.923890         1.684535
std            13.117408          6.794829         1.385997
min         -3356.666300       -881.985513         0.000000
25%           -73.991407         40.733823         1.000000
50%           -73.980093         40.753042         1.000000
75%           -73.963658         40.768001         2.000000
max          1153.572603        872.697628       208.000000
```

[7]:

```
data.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
```

[8]:
```
data=data.drop(['Unnamed: 0','key','pickup_datetime'],axis=1)
```

[9]:
```
data.isnull().sum()
```

[9]:
```
fare_amount          0
pickup_longitude     0
pickup_latitude      0
dropoff_longitude    1
dropoff_latitude     1
passenger_count      0
dtype: int64
```

[10]:
```
data=data.dropna()
```

[11]:
```
data.isnull().sum()
```

[11]:
```
fare_amount          0
pickup_longitude     0
pickup_latitude      0
dropoff_longitude    0
dropoff_latitude     0
passenger_count      0
dtype: int64
```

[12]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 199999 entries, 0 to 199999
Data columns (total 6 columns):
 #   Column             Non-Null Count   Dtype
---  ------             --------------   -----
 0   fare_amount        199999 non-null  float64
 1   pickup_longitude   199999 non-null  float64
 2   pickup_latitude    199999 non-null  float64
 3   dropoff_longitude  199999 non-null  float64
 4   dropoff_latitude   199999 non-null  float64
 5   passenger_count    199999 non-null  int64
dtypes: float64(5), int64(1)
memory usage: 10.7 MB
```

[14]:
```
data.info()
```

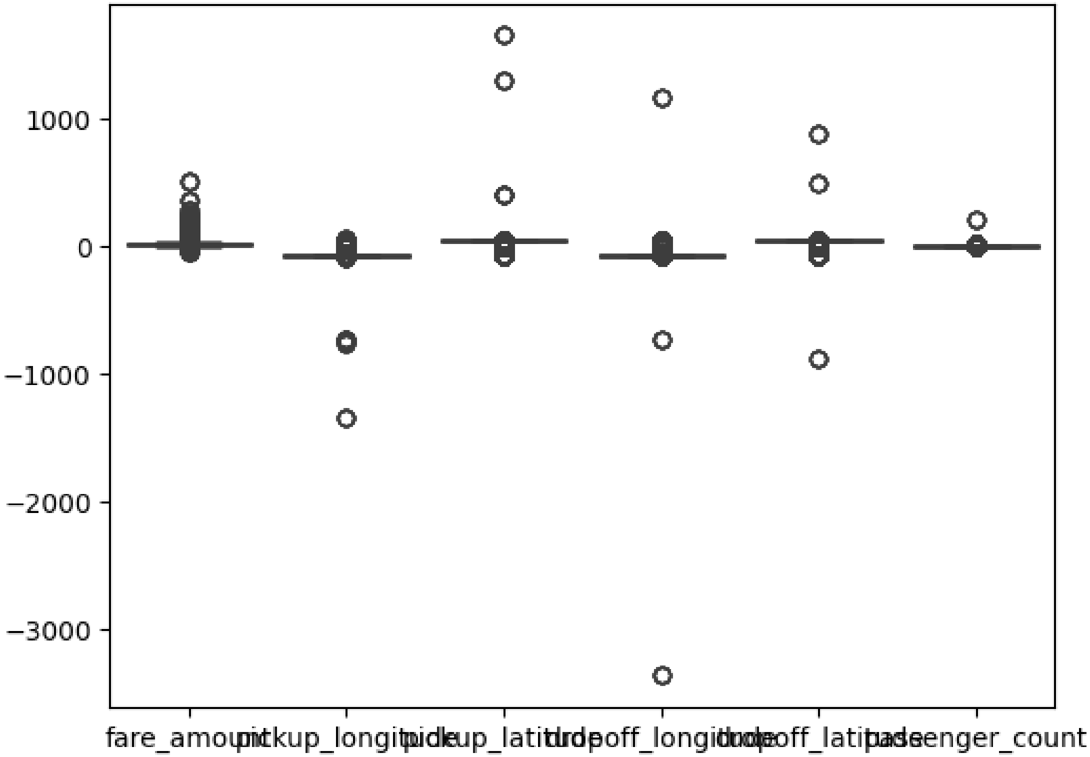
```
<class 'pandas.core.frame.DataFrame'>
Index: 199999 entries, 0 to 199999
Data columns (total 6 columns):
 #   Column             Non-Null Count   Dtype
```

```
---  ------             --------------   -----
 0   fare_amount        199999 non-null  float64
 1   pickup_longitude   199999 non-null  float64
 2   pickup_latitude    199999 non-null  float64
 3   dropoff_longitude  199999 non-null  float64
 4   dropoff_latitude   199999 non-null  float64
 5   passenger_count    199999 non-null  int64
dtypes: float64(5), int64(1)
memory usage: 10.7 MB
```

[13]:

```
numeric_cols = data.select_dtypes(include=['int', 'float']).columns.tolist()
print(numeric_cols)
for col in numeric_cols:
        sns.boxplot(data[numeric_cols])
```

```
['fare_amount', 'pickup_longitude', 'pickup_latitude', 'dropoff_longitude',
'dropoff_latitude', 'passenger_count']
```



[14]:

```
X = data.drop('fare_amount', axis=1)
y = data['fare_amount']
```

[15]:

```
Q1 = X.quantile(0.25)
Q3 = X.quantile(0.75)
```

)

```
IQR = Q3 - Q1
outliers = ((X < (Q1 - 1.5 * IQR)) | (X > (Q3 + 1.5 * IQR))).any(axis=1)
X = X[~outliers]
y = y[~outliers]
```

[16]:

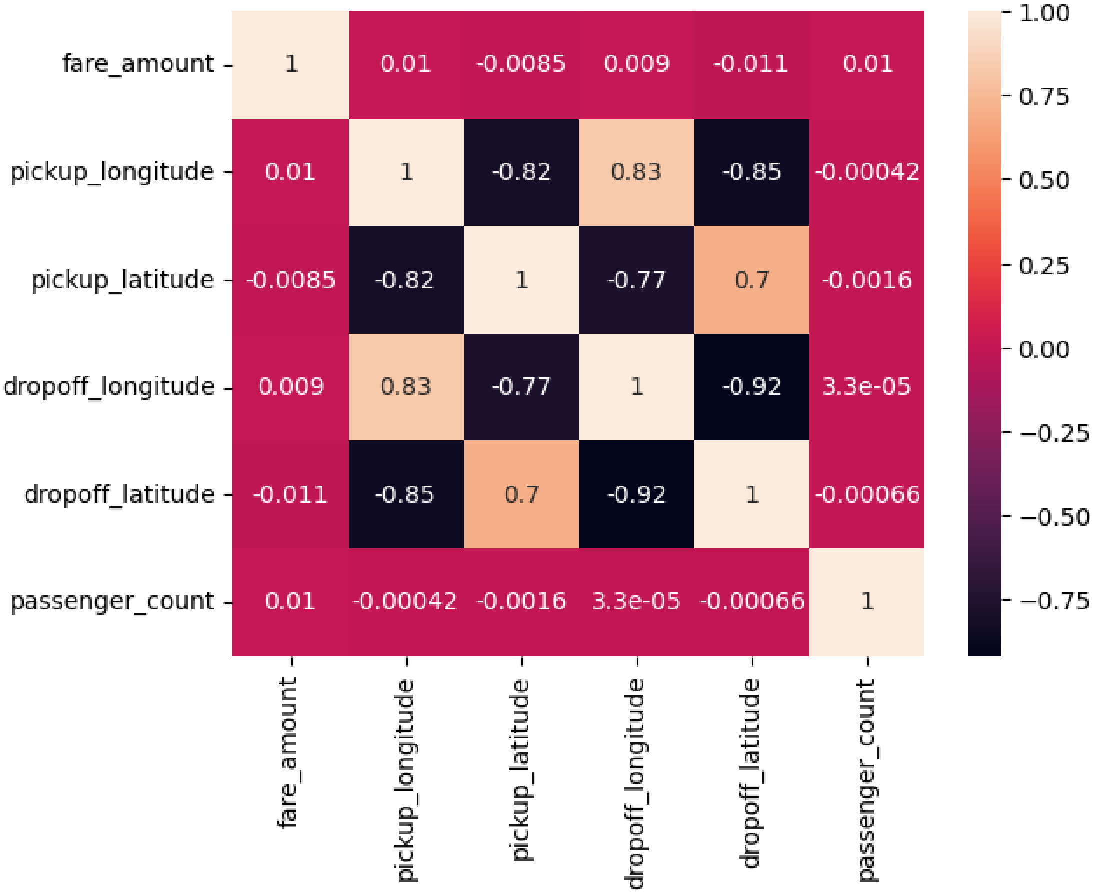
```
correlation_matrix = data.corr()
for col in data.columns:

    print(correlation_matrix[col])
    print()
```

```
fare_amount          1.000000
pickup_longitude     0.010458
pickup_latitude     -0.008482
dropoff_longitude    0.008986
dropoff_latitude    -0.011014
passenger_count      0.010158
Name: fare_amount, dtype: float64

fare_amount          0.010458
pickup_longitude     1.000000
pickup_latitude     -0.816461
dropoff_longitude    0.833026
dropoff_latitude    -0.846324
passenger_count     -0.000415
Name: pickup_longitude, dtype: float64

fare_amount         -0.008482
pickup_longitude    -0.816461
pickup_latitude      1.000000
dropoff_longitude   -0.774787
dropoff_latitude     0.702367
passenger_count     -0.001559
Name: pickup_latitude, dtype: float64

fare_amount          0.008986
pickup_longitude     0.833026
pickup_latitude     -0.774787
dropoff_longitude    1.000000
dropoff_latitude    -0.917010
passenger_count      0.000033
Name: dropoff_longitude, dtype: float64

fare_amount         -0.011014
pickup_longitude    -0.846324
pickup_latitude      0.702367
dropoff_longitude   -0.917010
dropoff_latitude     1.000000
```

```
passenger_count     -0.000659
Name: dropoff_latitude, dtype: float64

fare_amount          0.010158
pickup_longitude    -0.000415
pickup_latitude     -0.001559
dropoff_longitude    0.000033
dropoff_latitude    -0.000659
passenger_count      1.000000
Name: passenger_count, dtype: float64
```

[17]:

```
dataplot=sns.heatmap(data.corr(),annot=True)
plt.show()
```



[18]:

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
```

[19]:

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2,␣
  ↪random_state=42)
```

[20]:

```
scaler = StandardScaler()
X_train = scaler.fit_transform(X_train)
X_test = scaler.transform(X_test)
```

[21]:

```
linear_reg = LinearRegression()
linear_reg.fit(X_train, y_train)
```

[21]:

```
LinearRegression()
```

[22]:

```
ridge_reg = Ridge(alpha=1.0)
ridge_reg.fit(X_train, y_train)
```

[22]:

```
Ridge()
```

[23]:

```
lasso_reg = Lasso(alpha=1.0)
lasso_reg.fit(X_train, y_train)
```

[23]:

```
Lasso()
```

[24]:

```
y_pred_linear = linear_reg.predict(X_test)
y_pred_ridge = ridge_reg.predict(X_test)
y_pred_lasso = lasso_reg.predict(X_test)
```

[25]:

```
r2_linear = r2_score(y_test, y_pred_linear)
rmse_linear = np.sqrt(mean_squared_error(y_test, y_pred_linear))
mae_linear = mean_absolute_error(y_test, y_pred_linear)

r2_ridge = r2_score(y_test, y_pred_ridge)
rmse_ridge = np.sqrt(mean_squared_error(y_test, y_pred_ridge))
mae_ridge = mean_absolute_error(y_test, y_pred_ridge)

r2_lasso = r2_score(y_test, y_pred_lasso)
rmse_lasso = np.sqrt(mean_squared_error(y_test, y_pred_lasso))
mae_lasso = mean_absolute_error(y_test, y_pred_lasso)
```

[26]:

```
print("Linear Regression - R2:", round(r2_linear,2), "RMSE:",␣
  ↪round(rmse_linear), "MAE:", round(mae_linear))
print("Ridge Regression - R2:", round(r2_ridge), "RMSE:", round(rmse_ridge),␣
  ↪"MAE:", round(mae_ridge))
print("Lasso Regression - R2:", round(r2_lasso), "RMSE:", round(rmse_lasso),␣
  ↪"MAE:", round(mae_lasso))
```

```
Linear Regression - R2: 0.02 RMSE: 5 MAE: 3
Ridge Regression - R2: 0 RMSE: 5 MAE: 3
Lasso Regression - R2: 0 RMSE: 5 MAE: 3
```

[27]:

```
#prediction of price
#heatmap
```

[28]:

```
import math
print(abs(linear_reg.predict([[73.987042,40.739367,-73.986525,40.
 ↪740297,1]])[0]))
print(abs(ridge_reg.predict([[73.987042,40.739367,-73.986525,40.740297,1]])[0]))
print(abs(lasso_reg.predict([[73.987042,40.739367,-73.986525,40.740297,1]])[0]))
```

```
85.47108766462476
85.46891283895303
9.088837443709256
```