Course: Laboratory Practice III

Course Code: 410246

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Class: BE

Roll No. :12

Div: A

Title: 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 random forest regression models.
5. Evaluate the models and compare their respective scores like R2, RMSE, etc. Dataset link: https://www.kaggle.com/datasets/yasserh/uber-fares- dataset

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

```
df=pd.read_csv("/content/uber.csv")
```

```
df.head()
```

	Unnamed: 0	key	fare_amount	pickup_datetime	pickup_longitude	picku
0	24238194	2015-05-07 19:52:06.0000003	7.5	2015-05-07 19:52:06 UTC	-73.999817	
1	27835199	2009-07-17 20:04:56.0000002	7.7	2009-07-17 20:04:56 UTC	-73.994355	
2	44984355	2009-08-24 21:45:00.00000061	12.9	2009-08-24 21:45:00 UTC	-74.005043	
3	25894730	2009-06-26 08:22:21.0000001	5.3	2009-06-26 08:22:21 UTC	-73.976124	
4	17610152	2014-08-28 17:47:00.000000188	16.0	2014-08-28 17:47:00 UTC	-73.925023	

```
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
```

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

```
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
```

```
df.dtypes
```

```
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
```

```
#df['pickup_datetime']=pd.to_datetime(df['pickup_datetime'])
```

```
df.dtypes
```

```
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
```

```
df['dropoff_longitude'].fillna(value=df['dropoff_longitude'].mean(),inplace=True)
```

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

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

```
df['dropoff_latitude'].fillna(value=df['dropoff_latitude'].mean(),inplace=True)
```

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

```
    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
```

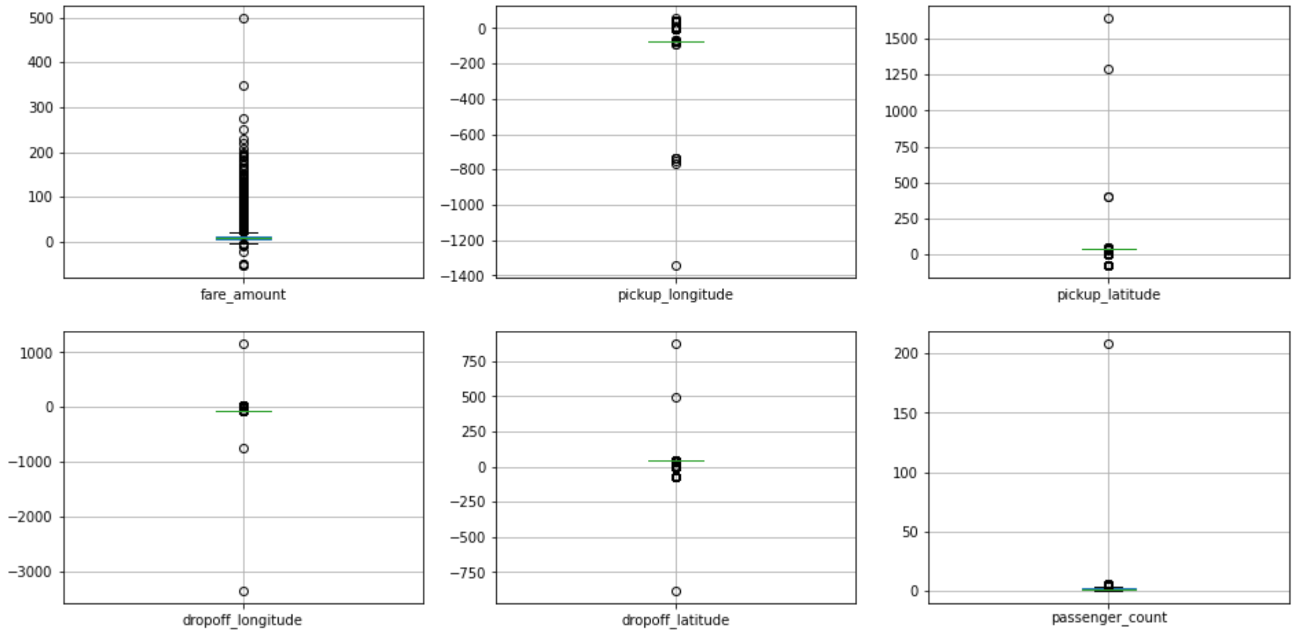
```
df.drop("Unnamed: 0",axis='columns',inplace=True)
```

```
df.head()
```

	key	fare_amount	pickup_datetime	pickup_longitude	pickup_latitud
0	2015-05-07 19:52:06.0000003	7.5	2015-05-07 19:52:06 UTC	-73.999817	40.73835
1	2009-07-17 20:04:56.0000002	7.7	2009-07-17 20:04:56 UTC	-73.994355	40.72822
2	2009-08-24 21:45:00.00000061	12.9	2009-08-24 21:45:00 UTC	-74.005043	40.74077

```
fig, axes = plt.subplots(2, 3, figsize=(16, 8))
df.boxplot(column="fare_amount",ax=axes[0,0])
df.boxplot(column="pickup_longitude",ax=axes[0,1])
df.boxplot(column="pickup_latitude",ax=axes[0,2])
df.boxplot(column="dropoff_longitude",ax=axes[1,0])
df.boxplot(column="dropoff_latitude",ax=axes[1,1])
df.boxplot(column="passenger_count",ax=axes[1,2])
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f96edb2c190>
```



```
q1=df['fare_amount'].quantile(0.25)
q3=df['fare_amount'].quantile(0.75)
IQR=q3-q1
LL=q1-1.5*(IQR)
UL=q3+1.5*(IQR)
print(UL,LL)
```

```
22.25 -3.75
```

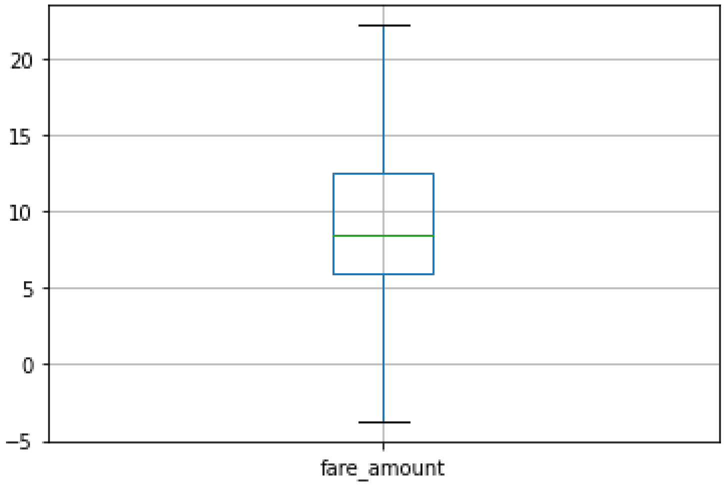
```
outlier =[]
for x in df['fare_amount']:
    if ((x> UL) or (x<LL)):
        outlier.append(x)
print(' outlier in the dataset is', outlier)
```

```
 outlier in the dataset is [24.5, 25.7, 39.5, 29.0, 56.8, 26.1, 49.57, 30.9, 26.9, 4
```

```
df['fare_amount']=np.where(df['fare_amount'] <=LL, LL,df['fare_amount'])
df['fare_amount']=np.where(df['fare_amount'] >=UL, UL,df['fare_amount'])
```

```
df.boxplot(column='fare_amount')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f96ecce3e50>
```

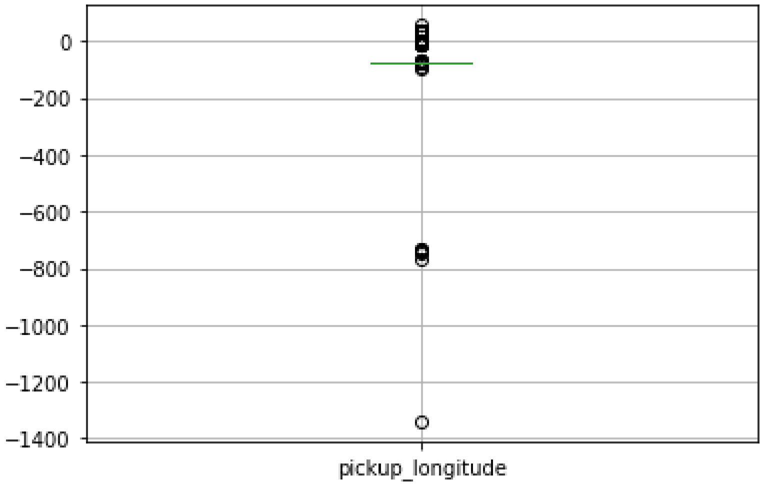


```
q1=df['pickup_longitude'].quantile(0.25)
q3=df['pickup_longitude'].quantile(0.75)
IQR=q3-q1
LL=q1-1.5*(IQR)
UL=q3+1.5*(IQR)
print(UL,LL)
```

```
-73.92978625000003 -74.02943224999999
```

```
df.boxplot(column='pickup_longitude')
```

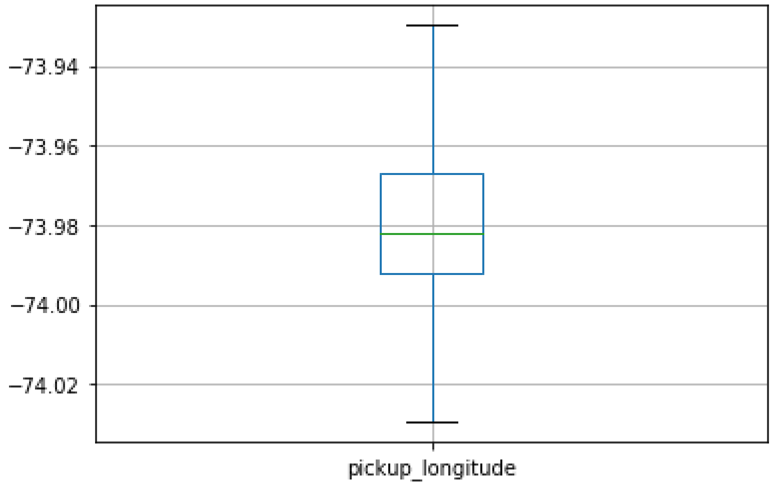
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f96f045a9d0>
```



```
df['pickup_longitude']=np.where(df['pickup_longitude'] <=LL, LL,df['pickup_longitude'])
df['pickup_longitude']=np.where(df['pickup_longitude'] >=UL, UL,df['pickup_longitude'])
```

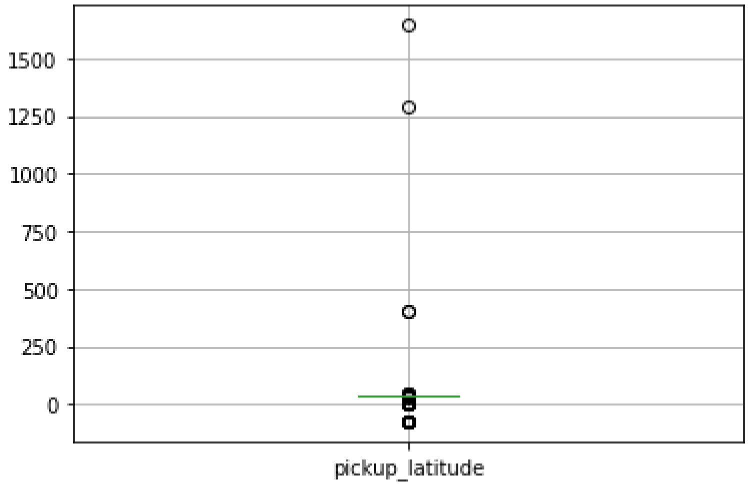
```
df.boxplot(column='pickup_longitude')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f96eb341a50>
```



```
df.boxplot(column='pickup_latitude')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f96eb2ffc50>
```



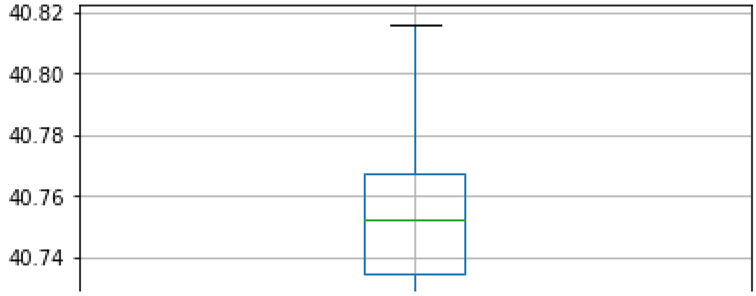
```
q1=df['pickup_latitude'].quantile(0.25)
q3=df['pickup_latitude'].quantile(0.75)
IQR=q3-q1
LL=q1-1.5*(IQR)
UL=q3+1.5*(IQR)
print(UL,LL)
```

```
40.815701375 40.68625237500001
```

```
df['pickup_latitude']=np.where(df['pickup_latitude'] <=LL, LL,df['pickup_latitude'])
df['pickup_latitude']=np.where(df['pickup_latitude'] >=UL, UL,df['pickup_latitude'])
```

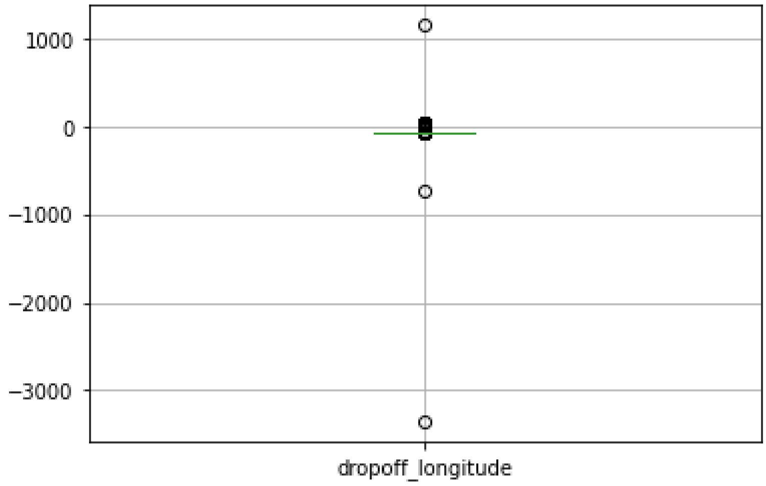
```
df.boxplot(column='pickup_latitude')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f96eb187c10>
```



```
df.boxplot('dropoff_longitude')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f96eb18c090>
```



```
q1=df['dropoff_longitude'].quantile(0.25)
q3=df['dropoff_longitude'].quantile(0.75)
IQR=q3-q1
LL=q1-1.5*(IQR)
UL=q3+1.5*(IQR)
print(UL,LL)
```

```
-73.9220345 -74.0330305
```

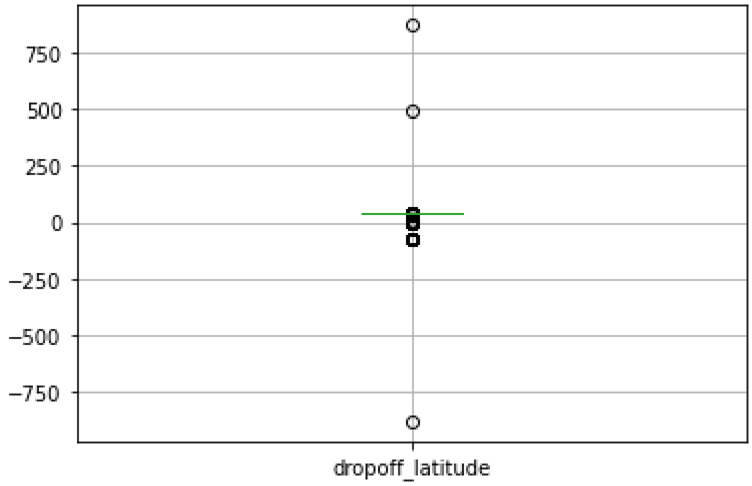
```
df['dropoff_longitude']=np.where(df['dropoff_longitude'] <=LL, LL,df['dropoff_longitude'])
df['dropoff_longitude']=np.where(df['dropoff_longitude'] >=UL, UL,df['dropoff_longitude'])
```

```
df.boxplot('dropoff_longitude')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f96eb158fd0>
```

```
df.boxplot('dropoff_latitude')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f96eaf8be90>
```



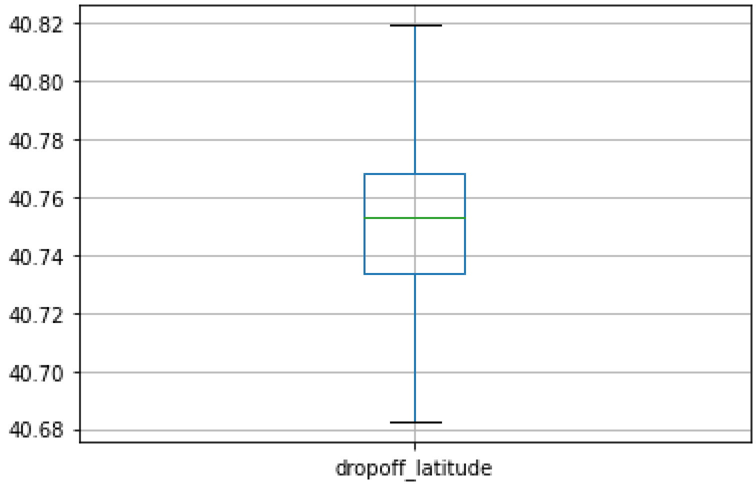
```
q1=df['dropoff_latitude'].quantile(0.25)
q3=df['dropoff_latitude'].quantile(0.75)
IQR=q3-q1
LL=q1-1.5*(IQR)
UL=q3+1.5*(IQR)
print(UL,LL)
```

```
40.819268347747794 40.68255579135132
```

```
df['dropoff_latitude']=np.where(df['dropoff_latitude'] <=LL, LL,df['dropoff_latitude'])
df['dropoff_latitude']=np.where(df['dropoff_latitude'] >=UL, UL,df['dropoff_latitude'])
```

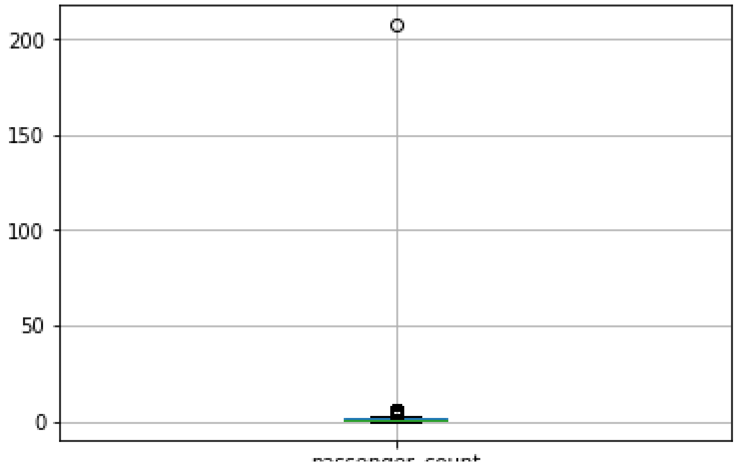
```
df.boxplot('dropoff_latitude')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f96eaf830d0>
```



```
df.boxplot(column='passenger_count')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f96ed1adf10>
```



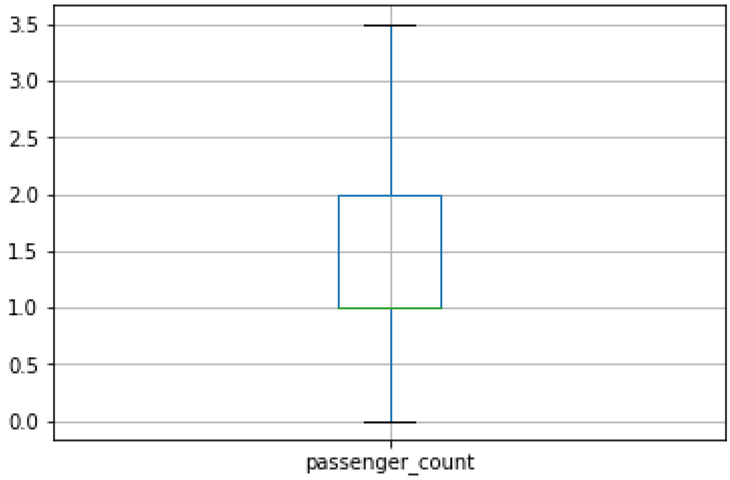
```
q1=df['passenger_count'].quantile(0.25)
q3=df['passenger_count'].quantile(0.75)
IQR=q3-q1
LL=q1-1.5*(IQR)
UL=q3+1.5*(IQR)
print(UL,LL)
```

```
3.5 -0.5
```

```
df['passenger_count']=np.where(df['passenger_count'] <=LL, LL,df['passenger_count'])
df['passenger_count']=np.where(df['passenger_count'] >=UL, UL,df['passenger_count'])
```

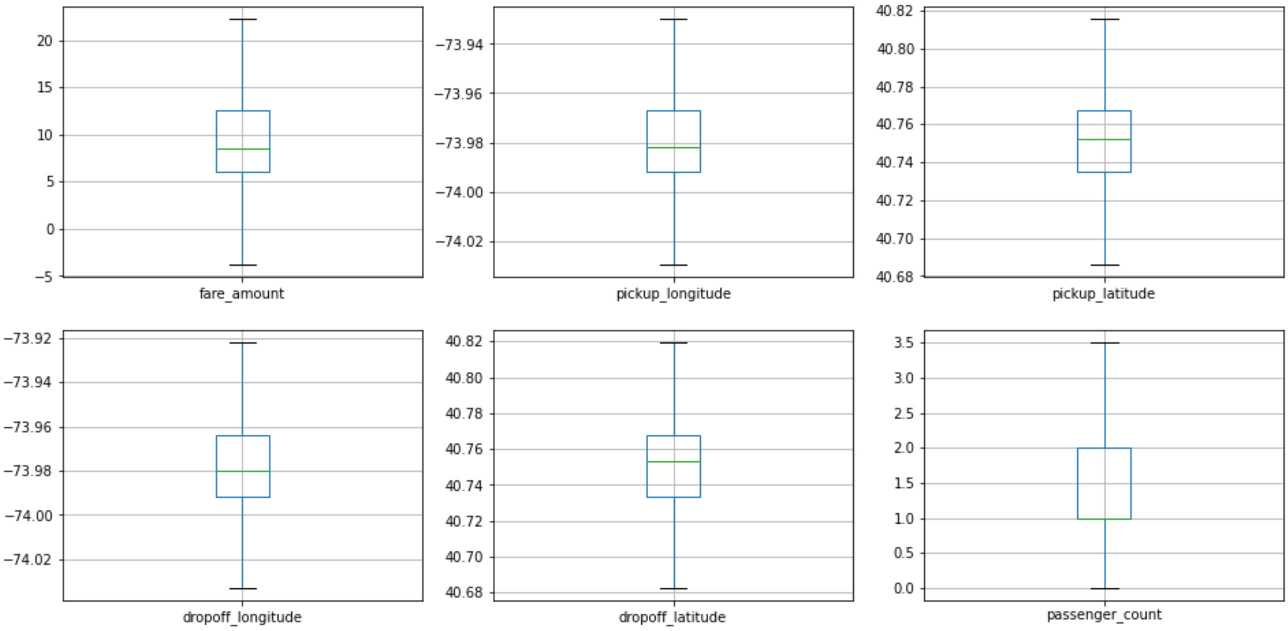
```
df.boxplot(column='passenger_count')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f96eaf83c10>
```

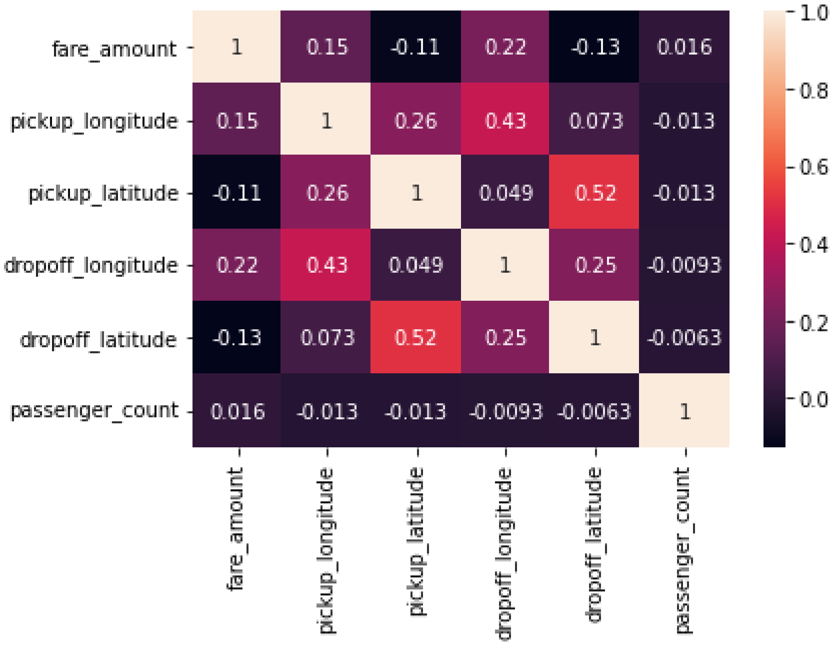


```
fig, axes = plt.subplots(2, 3, figsize=(16, 8))
df.boxplot(column="fare_amount",ax=axes[0,0])
df.boxplot(column="pickup_longitude",ax=axes[0,1])
df.boxplot(column="pickup_latitude",ax=axes[0,2])
df.boxplot(column="dropoff_longitude",ax=axes[1,0])
df.boxplot(column="dropoff_latitude",ax=axes[1,1])
df.boxplot(column="passenger_count",ax=axes[1,2])
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f96eacca1d0>
```



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



```
x= df.iloc [:, : -1]
y= df.iloc [:, -1 :]
```

```
from sklearn.model_selection import train_test_split
```

```
xtrain, xtest, ytrain, ytest = train_test_split(df.drop(labels=['fare_amount','pickup_date
print("xtrain shape : ", xtrain.shape)
print("xtest shape : ", xtest.shape)
print("ytrain shape : ", ytrain.shape)
print("ytest shape : ", ytest.shape)
```

```
xtrain shape :  (150000, 5)
xtest shape :  (50000, 5)
ytrain shape :  (150000,)
ytest shape :  (50000,)
```

```
from sklearn.linear_model import LinearRegression
lm=LinearRegression()
lm.fit(xtrain,ytrain)
```

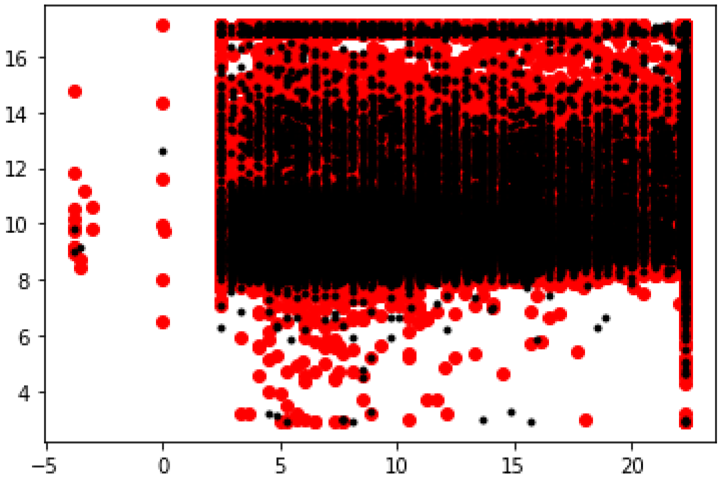
```
LinearRegression()
```

```
ytest_pred=lm.predict(xtest)
ytrain_pred=lm.predict(xtrain)
```

```
import matplotlib.pyplot as plt
```

```
plt.scatter(ytrain,ytrain_pred,c='red',marker='o',label="Training data")
plt.scatter(ytest,ytest_pred,c="black",marker=".",label="Testing data")
```

```
<matplotlib.collections.PathCollection at 0x7f96e6bebbd0>
```



```
from sklearn.metrics import mean_squared_error,r2_score
mse = mean_squared_error(ytest,ytest_pred)
print("mseTest = ", mse)
print("rmseTest = ", np.sqrt(mse))
mse = mean_squared_error(ytrain,ytrain_pred)
print("mseTrain = ", mse)
print("rmseTrain = ", np.sqrt(mse))
```

```
mseTest =  27.04690874482973
rmseTest =  5.200664259960426
mseTrain =  26.936549296136462
rmseTrain =  5.19004328461107
```

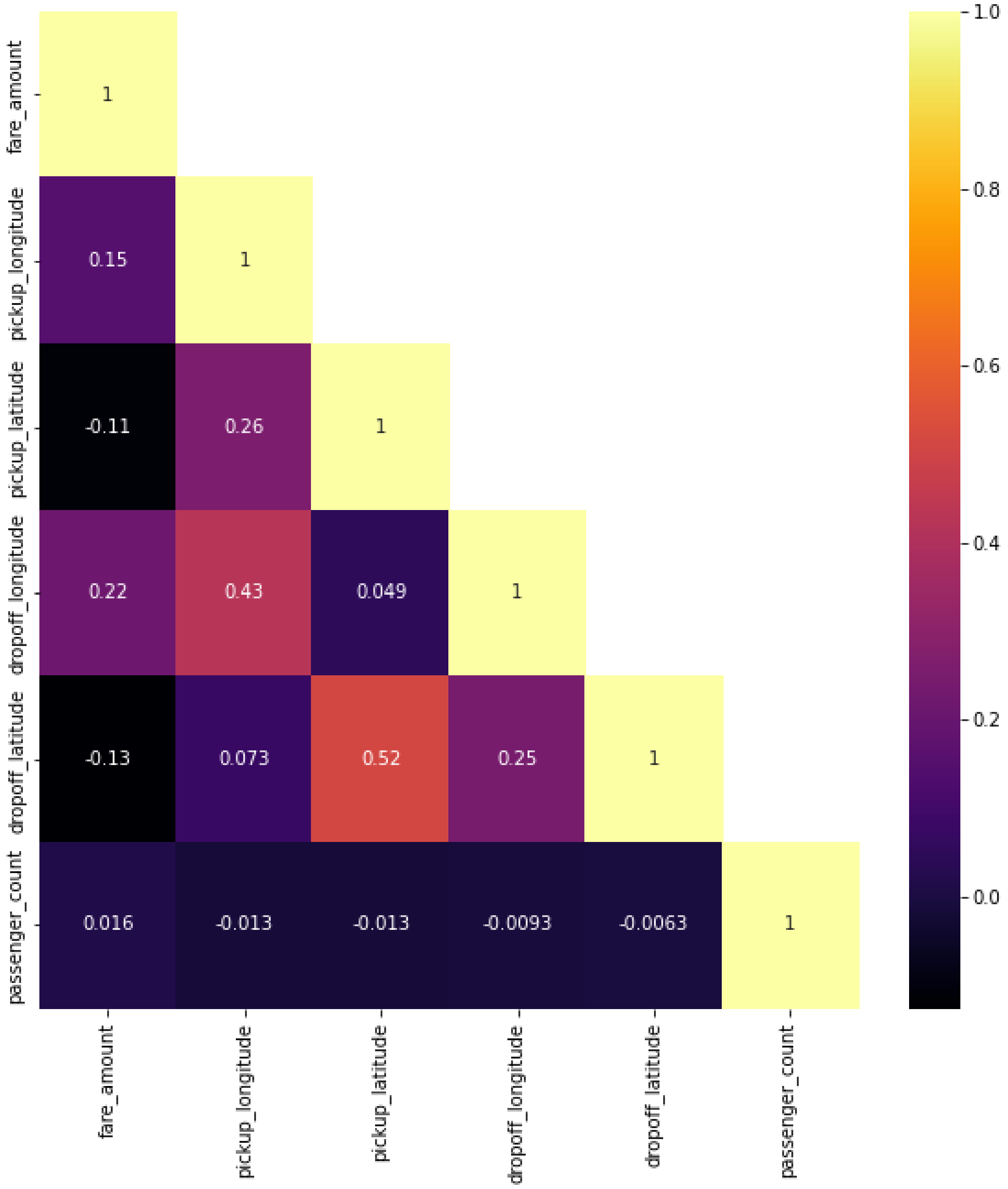
```
corr_matrix = df.corr()
```

```
print(corr_matrix["fare_amount"].sort_values(ascending=False))
```

```
fare_amount          1.000000
dropoff_longitude    0.218704
pickup_longitude     0.154069
passenger_count      0.015778
pickup_latitude     -0.110842
dropoff_latitude    -0.125898
Name: fare_amount, dtype: float64
```

```
plt.figure(figsize=(10,10))
sns.heatmap(df.corr(), annot=True, cmap='inferno', mask=np.triu(df.corr(), k=1))
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f96e6ba73d0>
```



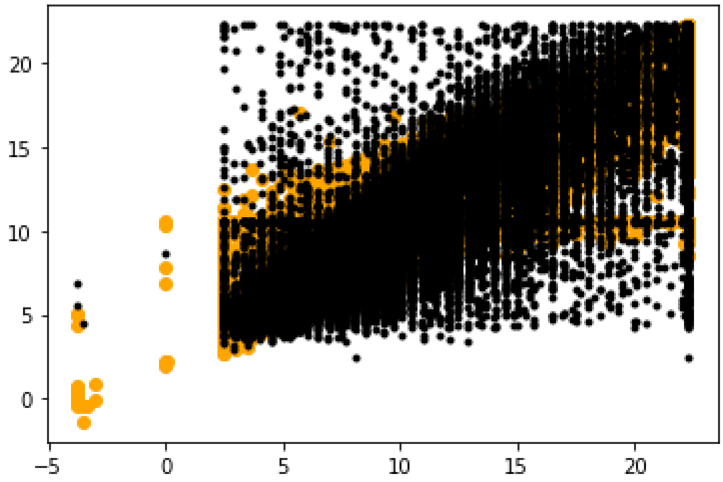
```
from sklearn.ensemble import RandomForestRegressor

rf = RandomForestRegressor()
rf.fit(xtrain,ytrain)
```

```
     RandomForestRegressor()
```

```
ytest_pred2=rf.predict(xtest)
ytrain_pred2=rf.predict(xtrain)
```

```
plt.scatter(ytrain,ytrain_pred2,c='orange',marker='o',label="Training data")
plt.scatter(ytest,ytest_pred2,c="black",marker=".",label="Testing data")
```

```
     <matplotlib.collections.PathCollection at 0x7f96e6a9b090>
```



```
from sklearn.metrics import mean_squared_error,r2_score, mean_absolute_error
mse = mean_squared_error(ytest,ytest_pred2)
print("mseTest = ", mse)
print("rmseTest = ", np.sqrt(mse))

mse = mean_squared_error(ytrain,ytrain_pred2)
print("mseTrain = ", mse)
print("rmseTrain = ", np.sqrt(mse))
```

```
     mseTest =  7.109194055504839
     rmseTest =  2.6663071945116976
     mseTrain =  1.6670899194229358
     rmseTrain =  1.291158363417492
```

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