```
import pandas as pd

df=pd.read_csv("uber.csv")

df.shape

(200000, 9)

df.describe()

         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

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.sample(4)
```

```
        Unnamed: 0                            key  fare_amount  \
156400    46558773  2012-11-01 08:57:00.000000100          8.0
193638    52152739    2013-07-28 19:35:08.0000004          6.0
63719     13448563    2012-03-21 17:29:56.0000007          7.3
103597    32567095    2014-01-24 18:54:58.0000002         15.5

                pickup_datetime  pickup_longitude  pickup_latitude  \
156400  2012-11-01 08:57:00 UTC        -74.009467        40.738187
193638  2013-07-28 19:35:08 UTC        -73.975083        40.741632
63719   2012-03-21 17:29:56 UTC        -73.983476        40.738234
103597  2014-01-24 18:54:58 UTC        -74.002686        40.721979

        dropoff_longitude  dropoff_latitude  passenger_count
156400         -73.987793         40.748120                1
193638         -73.969763         40.757180                3
63719          -73.978580         40.755364                2
103597         -73.996915         40.684911                1
```

1. Preporcess data set

```
## drop unnecessary coulumns
df=df.drop(['Unnamed: 0','key','pickup_datetime'],axis=1)
```

```
df.sample(2)
```

```
        fare_amount  pickup_longitude  pickup_latitude
dropoff_longitude  \
162794         20.5        -73.980924        40.767642         -
74.013847
149001         10.0          0.000000         0.000000
0.000000

        dropoff_latitude  passenger_count
162794         40.714813                1
149001          0.000000                5
```

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

```
fare_amount          0
pickup_longitude     0
pickup_latitude      0
dropoff_longitude    1
dropoff_latitude     1
```

```
passenger_count       0
dtype: int64
```

```
df.dropna(inplace=True)
```

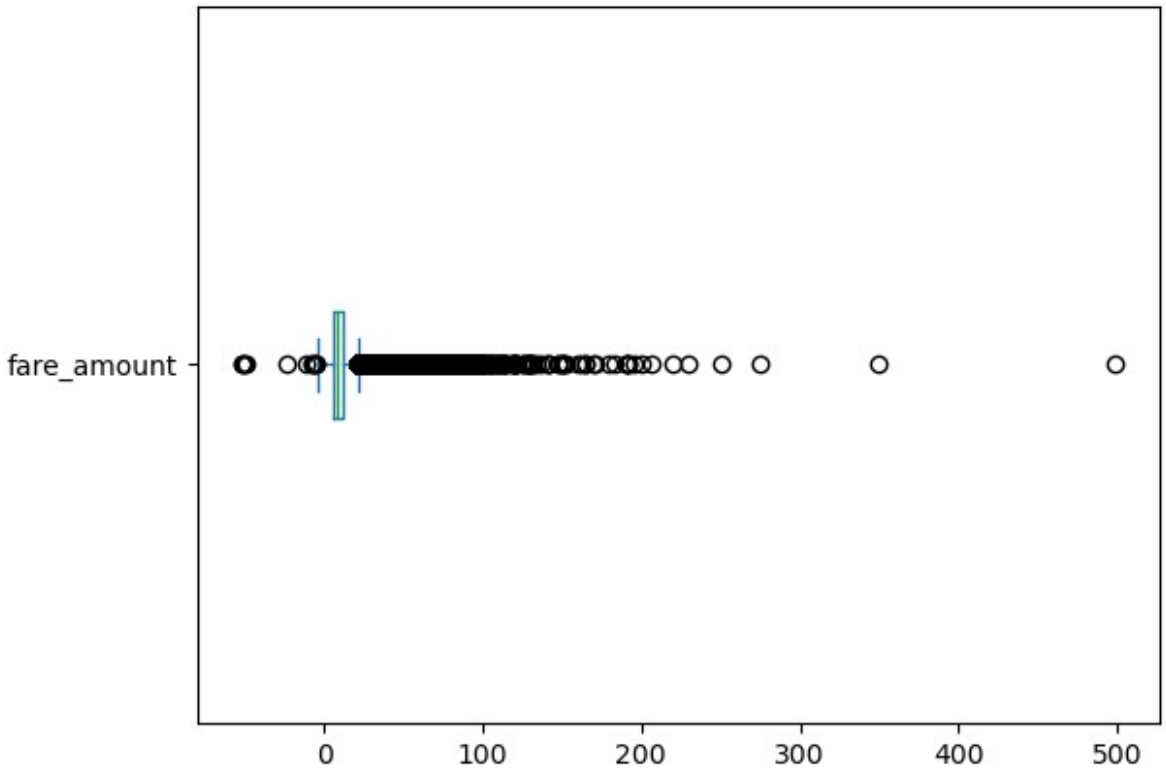
```
df.isnull().sum()
```

```
fare_amount           0
pickup_longitude      0
pickup_latitude       0
dropoff_longitude     0
dropoff_latitude      0
passenger_count       0
dtype: int64
```

2.Identify Outliers

```
df['fare_amount'].plot.box(vert=False)
```

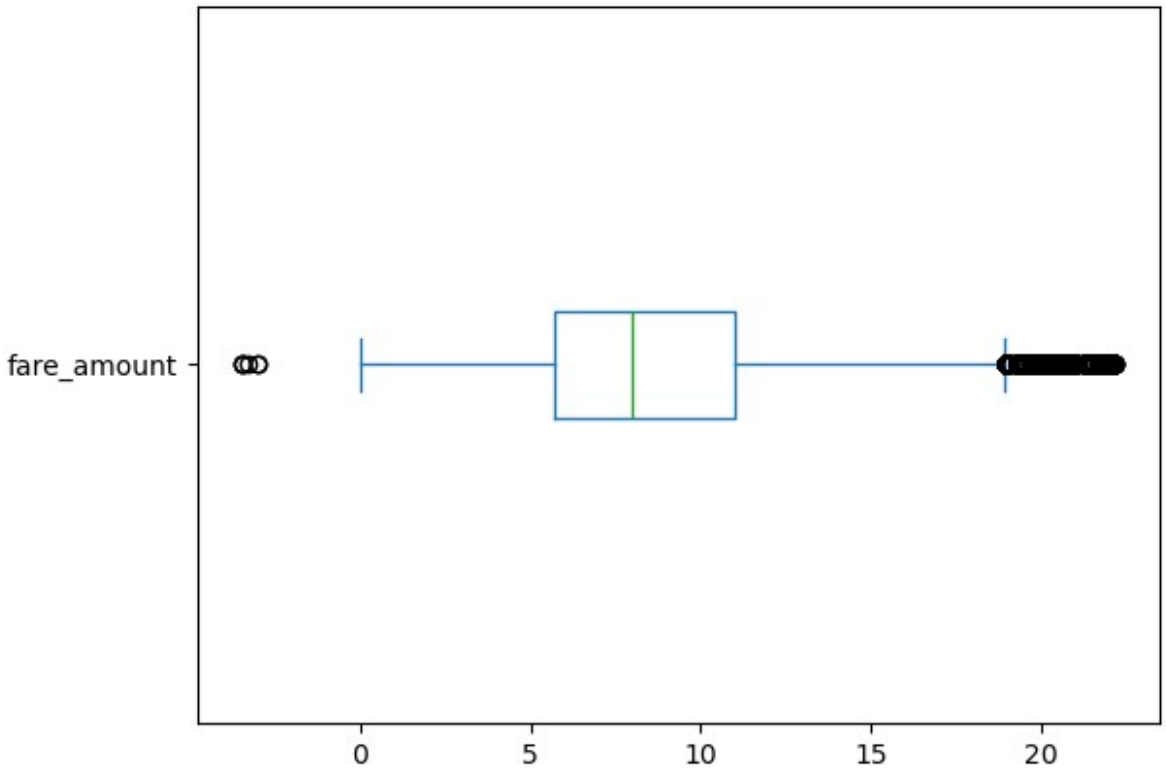
```
<Axes: >
```




```
# calculate inter quartile range
q1=df['fare_amount'].quantile(0.25)
q3=df['fare_amount'].quantile(0.75)
IQR=q3-q1
```

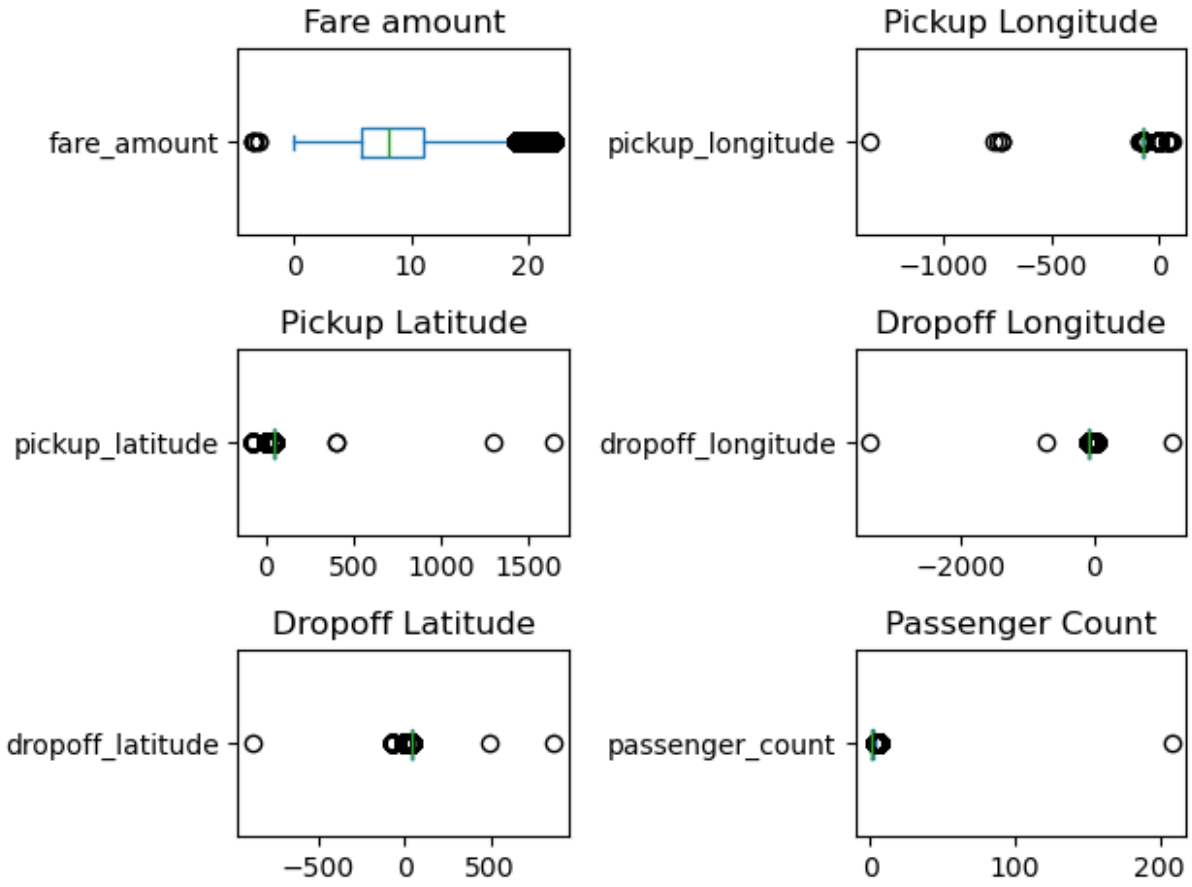
```
lower_bound=q1-1.5*IQR
upper_bound=q3+1.5*IQR

#reomve outliers
df=df[(df['fare_amount']>=lower_bound) &
(df['fare_amount']<=upper_bound)]

df['fare_amount'].plot.box(vert=False)
```

```
<Axes: >
```



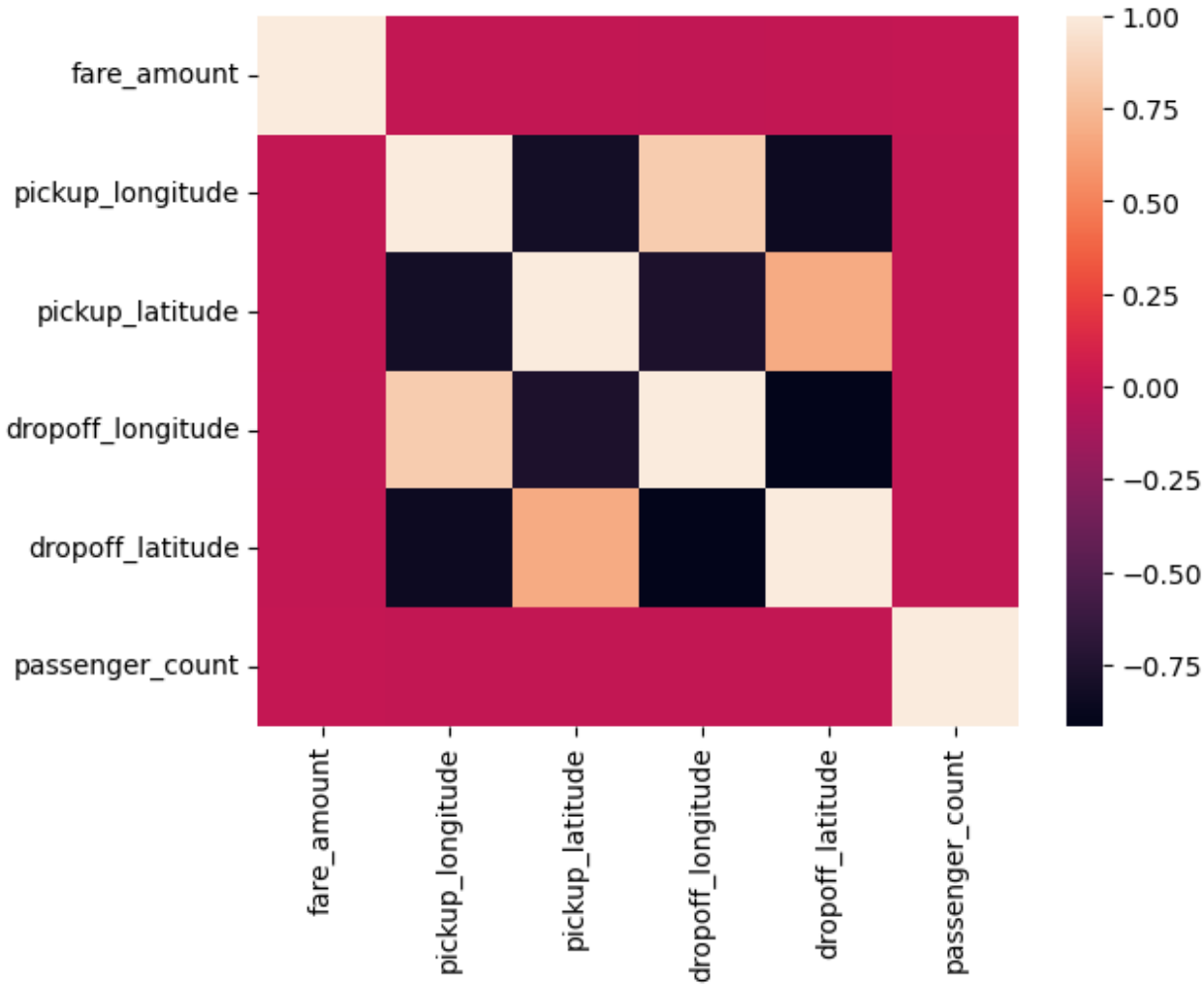

```
import matplotlib.pyplot as plt
import numpy as np

plt.subplot(3,2,1)
plt.title("Fare amount")
df['fare_amount'].plot.box(vert=False)

plt.subplot(3,2,2)
plt.title("Pickup Longitude")
df['pickup_longitude'].plot.box(vert=False)

plt.subplot(3,2,3)
plt.title("Pickup Latitude")
```

```
df['pickup_latitude'].plot.box(vert=False)

plt.subplot(3,2,4)
plt.title("Dropoff Longitude")
df['dropoff_longitude'].plot.box(vert=False)

plt.subplot(3,2,5)
plt.title("Dropoff Latitude")
df['dropoff_latitude'].plot.box(vert=False)

plt.subplot(3,2,6)
plt.title("Passenger Count")
df['passenger_count'].plot.box(vert=False)

plt.tight_layout()
```



3. Check the correlation

```
import seaborn as sns
correlation_matrix=df.corr()
sns.heatmap(correlation_matrix)
plt.show()
```



4. Implement Linear Regression and Random Forest

```
#Split the data
X=df[['pickup_longitude', 'pickup_latitude', 'dropoff_longitude',
'dropoff_latitude', 'passenger_count']]
Y=df['fare_amount']

from sklearn.model_selection import train_test_split
X_train,X_test,Y_train,Y_test=train_test_split(X,Y,test_size=0.2,rando
m_state=42)
# here random_state works as a seed , everytime we run the code it
divides the dataset from the same point

from sklearn.linear_model import LinearRegression
from sklearn.ensemble import RandomForestRegressor

lr_m=LinearRegression()
lr_m.fit(X_train,Y_train)

LinearRegression()
```

```
rf_m=RandomForestRegressor(n_estimators=100,random_state=42)
#In the context of the RandomForestRegressor from the sklearn.ensemble module, the n_estimators parameter specifies the number of trees in the forest.
rf_m.fit(X_train,Y_train)
```

```
RandomForestRegressor(random_state=42)
```

```
# predict the values
y_lr_predict=lr_m.predict(X_test)
y_rf_predict=rf_m.predict(X_test)
print(y_lr_predict)
print(y_rf_predict)
```

```
[8.9092654  8.90920366 8.90920456 ... 9.12111117 8.90927677
8.90927104]
[ 5.141 17.307  7.891 ...  7.302  4.207 10.231]
```

5. Evaluate

```
# calculate R2 and RMSE
import numpy as np
from sklearn.metrics import r2_score, mean_squared_error

# for linear regression
r2_lr=r2_score(Y_test,y_lr_predict)
rmse_lr=np.sqrt(mean_squared_error(Y_test,y_lr_predict))

print("For Linear Regression")
print("R-square",r2_lr)
print("RMSE ",rmse_lr)
```

```
For Linear Regression
R-square 8.297133767465326e-05
RMSE  4.136624287486402
```

```
# for Random Forest Regression
r2_rf=r2_score(Y_test,y_rf_predict)
rmse_rf=np.sqrt(mean_squared_error(Y_test,y_rf_predict))

print("For Random Forest Regression")
print("R-square",r2_rf)
print("RMSE ",rmse_rf)
```

```
For Random Forest Regression
R-square 0.7052136223044838
RMSE  2.2460416246528774
```