```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import datetime as dt

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

```
   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
```

```
df.drop(columns=['Unnamed: 0','key'],inplace=True)

df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200000 entries, 0 to 199999
Data columns (total 7 columns):
 #   Column             Non-Null Count   Dtype
---  ------             --------------   -----
 0   fare_amount        200000 non-null  float64
 1   pickup_datetime    200000 non-null  object
 2   pickup_longitude   200000 non-null  float64
 3   pickup_latitude    200000 non-null  float64
 4   dropoff_longitude  199999 non-null  float64
 5   dropoff_latitude   199999 non-null  float64
 6   passenger_count    200000 non-null  int64
dtypes: float64(5), int64(1), object(1)
memory usage: 10.7+ MB
```

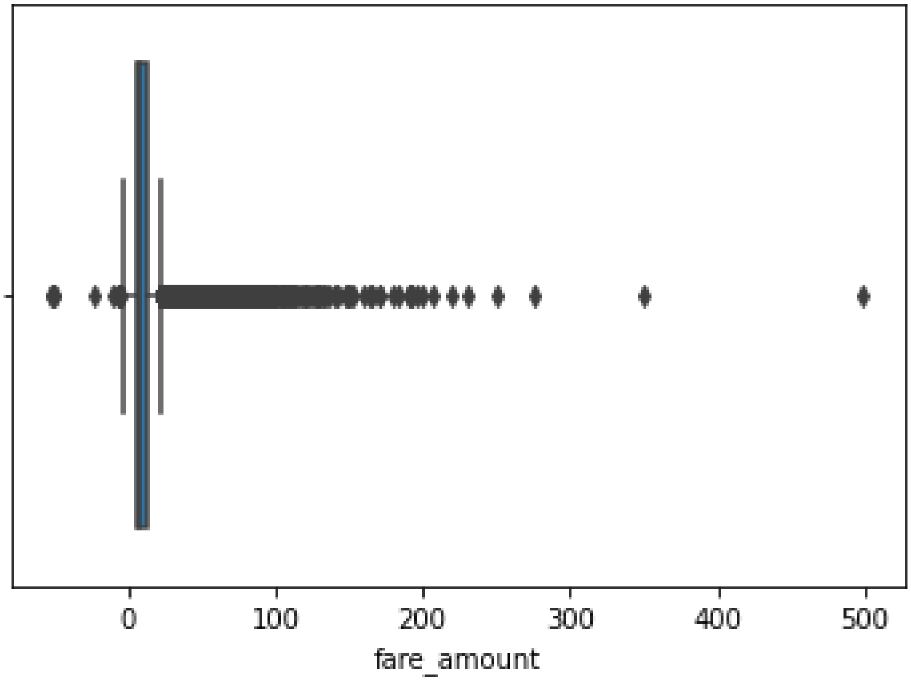
Dropping null rows

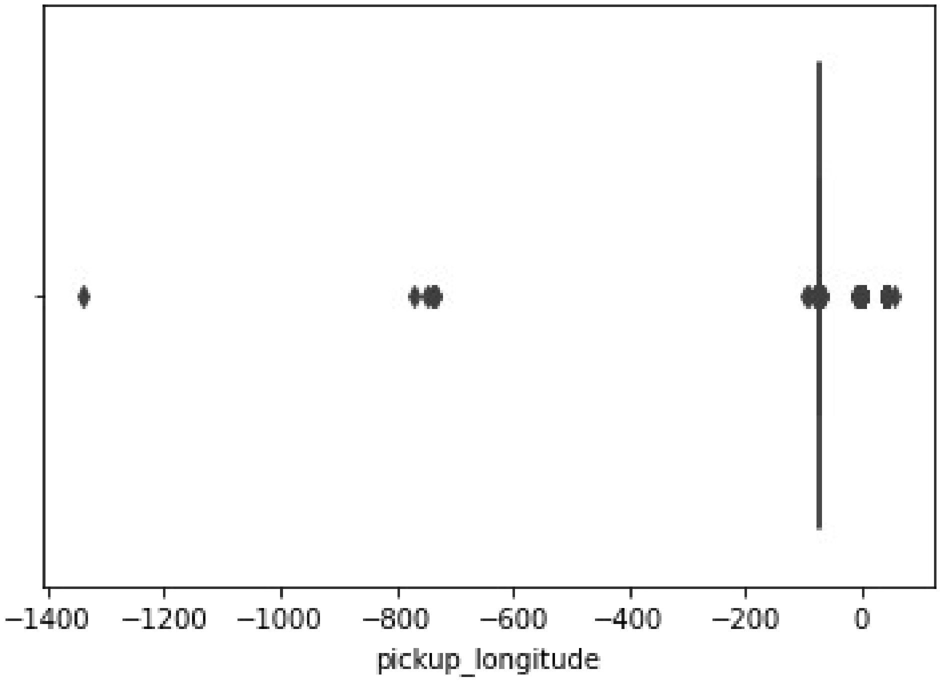
```
df.dropna(how='any',inplace=True)
df.isnull().sum()
```

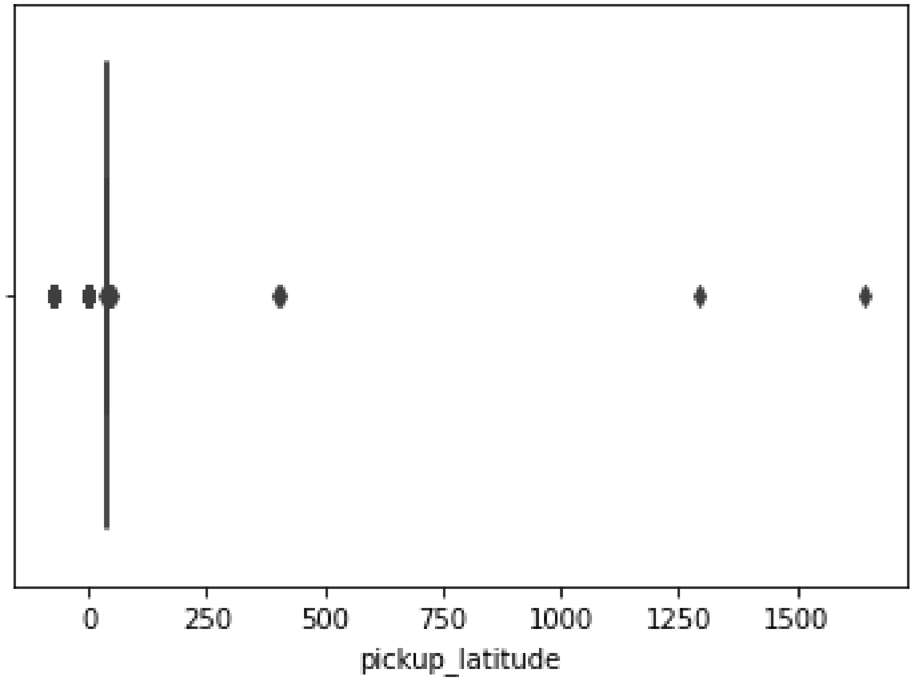
```
fare_amount          0
pickup_datetime      0
pickup_longitude     0
pickup_latitude      0
dropoff_longitude    0
dropoff_latitude     0
passenger_count      0
dtype: int64
```

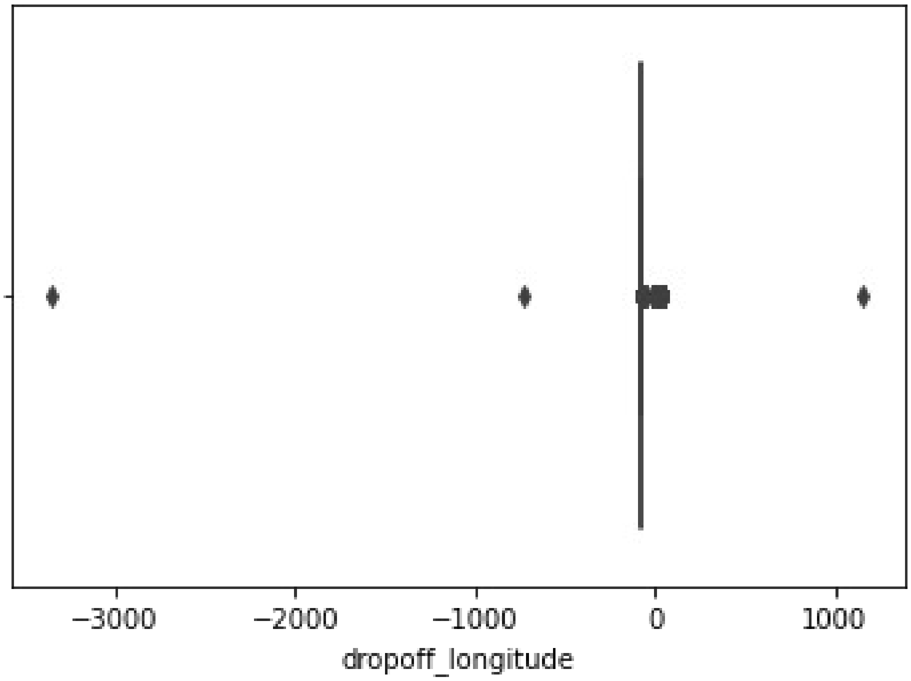
Boxplots

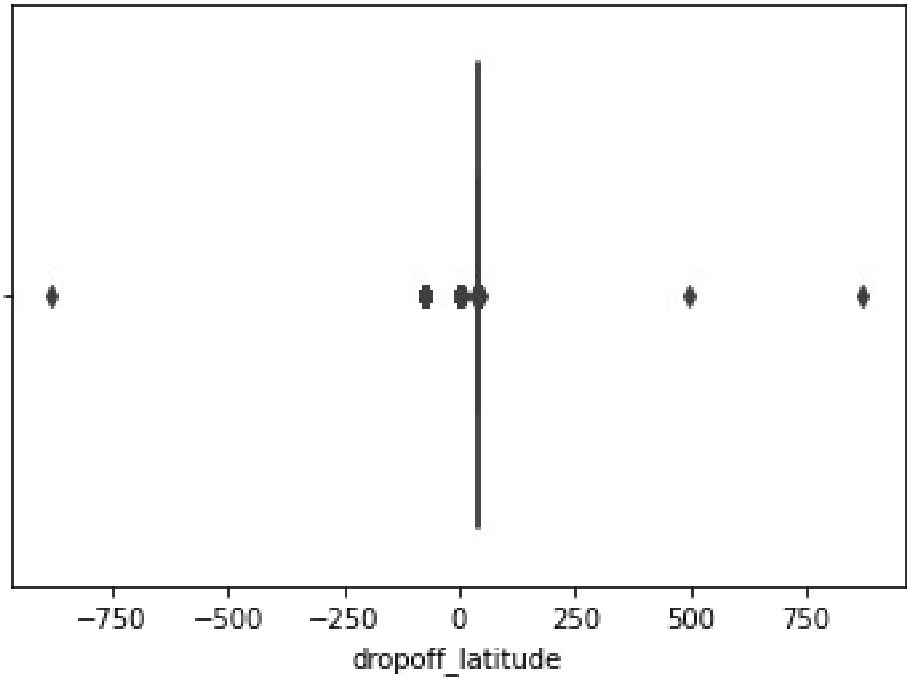
```
for col in df.select_dtypes(exclude=['object']):
    plt.figure()
    sns.boxplot(data=df,x=col)
```

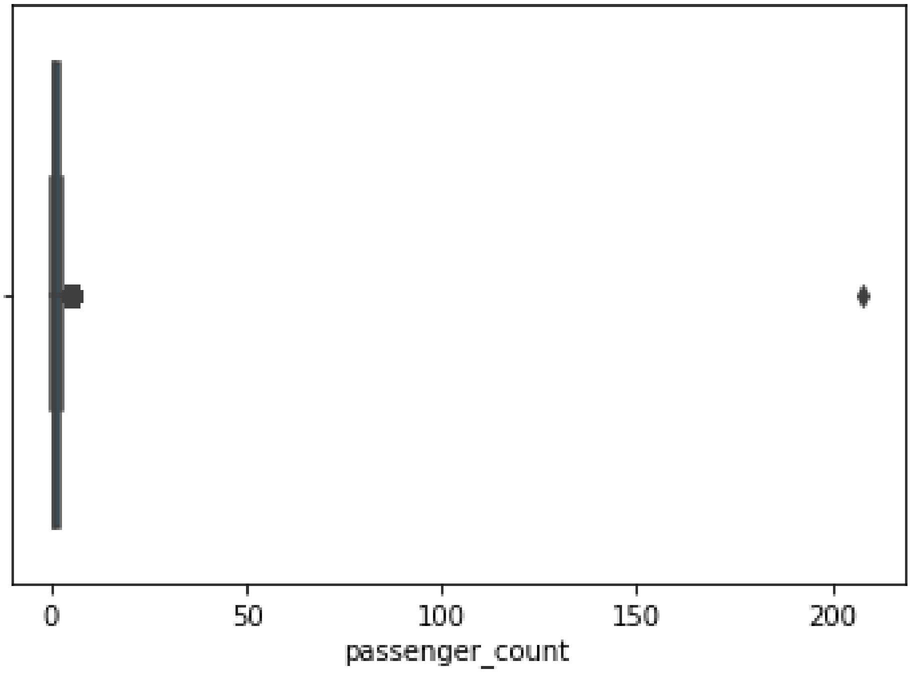



−1400
−1200
−1000
−800
−600
−400
−200
0
pickup_longitude


0
250
500
750
1000
1250
1500
pickup_latitude


−3000
−2000
−1000
0
1000
dropoff_longitude


−750
−500
−250
0
250
500
750
dropoff_latitude



Dropping outliers

-90 < latitude < 90-180 < longitude < 180 fare > 00 < passenger_count < 50

```
df = df[
    (df.pickup_latitude > -90) & (df.pickup_latitude < 90) &
    (df.dropoff_latitude > -90) & (df.dropoff_latitude < 90) &
    (df.pickup_longitude > -180) & (df.pickup_longitude < 180) &
    (df.dropoff_longitude > -180) & (df.dropoff_longitude < 180) &
    (df.fare_amount > 0) & (df.passenger_count > 0)  &
(df.passenger_count < 50)
]
```

Calculating Distance

```
from math import cos, asin, sqrt, pi
import numpy as np

def distance(lat_1,lon_1,lat_2,lon_2):
#     lat1 = row.pickup_latitude
#     lon1 = row.pickup_longitude
#     lat2 = row.dropoff_latitude
#     lon2 = row.dropoff_longitude
    lon_1, lon_2, lat_1, lat_2 = map(np.radians, [lon_1, lon_2, lat_1,
lat_2])  #Degrees to Radians


    diff_lon = lon_2 - lon_1
    diff_lat = lat_2 - lat_1
    km = 2 * 6371 * np.arcsin(np.sqrt(np.sin(diff_lat/2.0)**2 +
np.cos(lat_1) * np.cos(lat_2) * np.sin(diff_lon/2.0)**2))

    return km

temp =
distance(df['pickup_latitude'],df['pickup_longitude'],df['dropoff_lati
tude'],df['dropoff_longitude'])
temp.head()
```

```
0    1.683323
1    2.457590
2    5.036377
3    1.661683
4    4.475450
dtype: float64
```

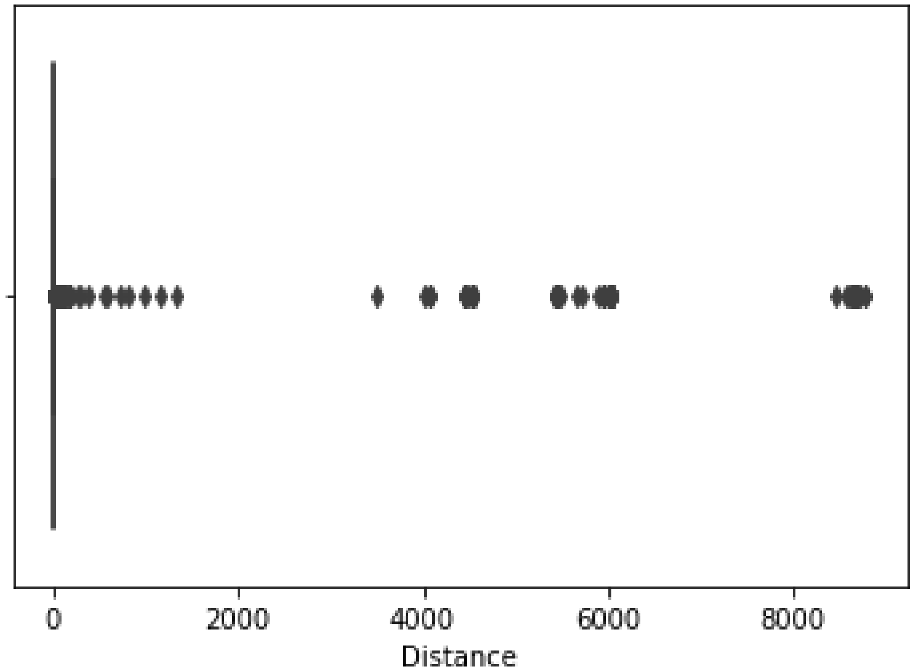
```
df_new = df.copy()
df_new['Distance'] = temp
df = df_new
df.head()
```

```
   fare_amount          pickup_datetime  pickup_longitude
pickup_latitude  \
0          7.5  2015-05-07 19:52:06 UTC        -73.999817
40.738354
1          7.7  2009-07-17 20:04:56 UTC        -73.994355
40.728225
2         12.9  2009-08-24 21:45:00 UTC        -74.005043
40.740770
3          5.3  2009-06-26 08:22:21 UTC        -73.976124
40.790844
4         16.0  2014-08-28 17:47:00 UTC        -73.925023
40.744085

   dropoff_longitude  dropoff_latitude  passenger_count  Distance
0         -73.999512         40.723217                1  1.683323
1         -73.994710         40.750325                1  2.457590
2         -73.962565         40.772647                1  5.036377
3         -73.965316         40.803349                3  1.661683
4         -73.973082         40.761247                5  4.475450
```

```
sns.boxplot(data=df,x='Distance')
```

```
<AxesSubplot: xlabel='Distance'>
```



```
df = df[(df['Distance'] < 200) & (df['Distance'] > 0)]
```

Date and Time features extract

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

```
<ipython-input-14-834f97bbe4ec>:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  df['pickup_datetime'] = pd.to_datetime(df['pickup_datetime'])
```

```
df['week_day'] = df['pickup_datetime'].dt.day_name()
df['Year'] = df['pickup_datetime'].dt.year
df['Month'] = df['pickup_datetime'].dt.month
df['Hour'] = df['pickup_datetime'].dt.hour
```

```
<ipython-input-15-b91c1da9c026>:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  df['week_day'] = df['pickup_datetime'].dt.day_name()
<ipython-input-15-b91c1da9c026>:2: SettingWithCopyWarning:
```

```
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  df['Year'] = df['pickup_datetime'].dt.year
<ipython-input-15-b91c1da9c026>:3: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  df['Month'] = df['pickup_datetime'].dt.month
<ipython-input-15-b91c1da9c026>:4: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  df['Hour'] = df['pickup_datetime'].dt.hour
```

```python
df.drop(columns=['pickup_datetime','pickup_latitude','pickup_longitude
','dropoff_latitude','dropoff_longitude'],inplace=True)
```

```
<ipython-input-16-a7c1789815f4>:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy

df.drop(columns=['pickup_datetime','pickup_latitude','pickup_longitude
','dropoff_latitude','dropoff_longitude'],inplace=True)
```

```python
df.head()
```

```
   fare_amount  passenger_count  Distance  week_day  Year  Month  Hour
0          7.5                1  1.683323  Thursday  2015      5    19
1          7.7                1  2.457590    Friday  2009      7    20
2         12.9                1  5.036377    Monday  2009      8    21
3          5.3                3  1.661683    Friday  2009      6     8
4         16.0                5  4.475450  Thursday  2014      8    17
```

```python
temp = df.copy()

def convert_week_day(day):
    if day in ['Monday','Tuesday','Wednesday','Thursday']:
        return 0 # Weekday
    return 1 # Weekend

def convert_hour(hour):
    if 5 <= hour <= 12:
        return 1
    elif 12 < hour <= 17:
        return 2
    elif 17 < hour < 24:
        return 3
    return 0

df['week_day'] = temp['week_day'].apply(convert_week_day)
df['Hour'] = temp['Hour'].apply(convert_hour)
df.head()
```

```
<ipython-input-18-655f90749f34>:17: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  df['week_day'] = temp['week_day'].apply(convert_week_day)
<ipython-input-18-655f90749f34>:18: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  df['Hour'] = temp['Hour'].apply(convert_hour)

   fare_amount  passenger_count  Distance  week_day  Year  Month  Hour
0          7.5                1  1.683323         0  2015      5     3
1          7.7                1  2.457590         1  2009      7     3
2         12.9                1  5.036377         0  2009      8     3
3          5.3                3  1.661683         1  2009      6     1
4         16.0                5  4.475450         0  2014      8     2
```

Correlation Matrix

```
df.corr()
```

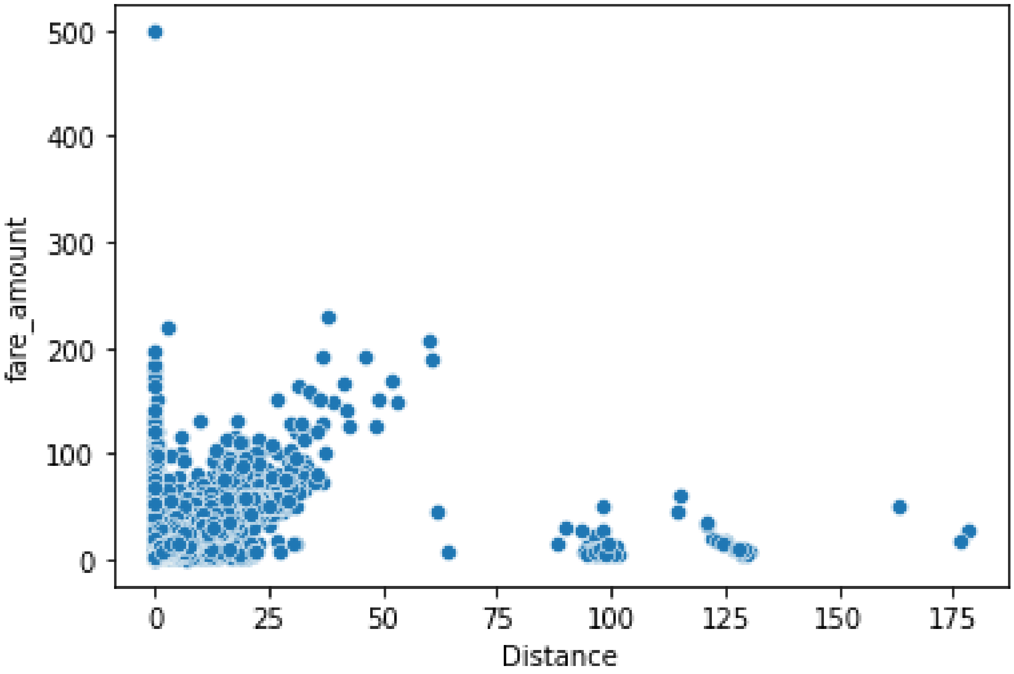
```
                 fare_amount  passenger_count  Distance  week_day
Year  \
fare_amount         1.000000         0.011884  0.778667  0.002305
0.120430
passenger_count     0.011884         1.000000  0.005112  0.035882
0.005339
```

```
Distance             0.778667         0.005112  1.000000  0.014518
0.018617
week_day             0.002305         0.035882  0.014518  1.000000
0.006910
Year                 0.120430         0.005339  0.018617  0.006910
1.000000
Month                0.024120         0.008818  0.007373 -0.007328 -
0.115182
Hour                -0.021078         0.013572 -0.022691 -0.078129
0.001131

                    Month      Hour
fare_amount      0.024120 -0.021078
passenger_count  0.008818  0.013572
Distance         0.007373 -0.022691
week_day        -0.007328 -0.078129
Year            -0.115182  0.001131
Month            1.000000 -0.005410
Hour            -0.005410  1.000000
```

```
sns.scatterplot(y=df['fare_amount'],x=df['Distance'])
```

```
<AxesSubplot: xlabel='Distance', ylabel='fare_amount'>
```



Independent Variable: Distance Dependent Variable: fare_amount

```
from sklearn.preprocessing import StandardScaler
x = df[['Distance']].values
y = df['fare_amount'].values.reshape(-1,1)
```

```
from sklearn.model_selection import train_test_split
x_train, x_test, y_train,y_test =
train_test_split(x,y,random_state=10)

std_x = StandardScaler()
x_train = std_x.fit_transform(x_train)

x_test = std_x.transform(x_test)

std_y = StandardScaler()
y_train = std_y.fit_transform(y_train)

y_test = std_y.transform(y_test)

from sklearn.metrics import mean_squared_error,r2_score,
mean_absolute_error
def fit_predict(model):
    model.fit(x_train,y_train.ravel())
    y_pred = model.predict(x_test)
    r_squared = r2_score(y_test,y_pred)
    RMSE = mean_squared_error(y_test, y_pred,squared=False)
    MAE = mean_absolute_error(y_test,y_pred)
    print('R-squared: ', r_squared)
    print('RMSE: ', RMSE)
    print("MAE:  ",MAE)

from sklearn.linear_model import LinearRegression

fit_predict(LinearRegression())

R-squared:  0.604116792084117
RMSE:  0.6290054895695945
MAE:   0.27552329590959823

from sklearn.ensemble import RandomForestRegressor
fit_predict(RandomForestRegressor())

R-squared:  0.652350257870196
RMSE:  0.589443049630681
MAE:   0.2921068537600526
```