Food_Delivery_Time_Prediction_using_Python

In [1]:
```
import pandas as pd
import numpy as np
import plotly.express as px

data = pd.read_csv("deliverytime.txt")
print(data.head())
```

```
      ID Delivery_person_ID  Delivery_person_Age  Delivery_person_Ratings  \
0   4607     INDORES13DEL02                   37                      4.9
1   B379      BANGRES18DEL02                   34                      4.5
2   5D6D      BANGRES19DEL01                   23                      4.4
3   7A6A    COIMBRES13DEL02                   38                      4.7
4   70A2    CHENRES13DEL03                   32                      4.6

  Restaurant_latitude  Restaurant_longitude  Delivery_location_latitude  \
0           22.745049             75.892471                   22.765049
1           12.913041             77.683237                   13.043041
2           12.914264             77.678400                   12.924264
3           11.003669             76.976494                   11.053669
4           12.972793             80.249982                   13.012793

  Delivery_location_longitude Type_of_order Type_of_vehicle  Time_taken(min)
0                   75.912471         Snack      motorcycle               24
1                   77.813237         Snack         scooter               33
2                   77.688400        Drinks      motorcycle               26
3                   77.026494        Buffet      motorcycle               21
4                   80.289982         Snack         scooter               30
```

In [2]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 45593 entries, 0 to 45592
Data columns (total 11 columns):
 #   Column                       Non-Null Count  Dtype  
---  ------                       --------------  -----  
 0   ID                           45593 non-null  object 
 1   Delivery_person_ID           45593 non-null  object 
 2   Delivery_person_Age          45593 non-null  int64  
 3   Delivery_person_Ratings      45593 non-null  float64
 4   Restaurant_latitude          45593 non-null  float64
 5   Restaurant_longitude         45593 non-null  float64
 6   Delivery_location_latitude   45593 non-null  float64
 7   Delivery_location_longitude  45593 non-null  float64
 8   Type_of_order                45593 non-null  object 
 9   Type_of_vehicle              45593 non-null  object 
 10  Time_taken(min)              45593 non-null  int64  
dtypes: float64(5), int64(2), object(4)
memory usage: 3.8+ MB
```

In [3]:
```
data.isnull().sum()
```

Out[3]:
```
ID                             0
Delivery_person_ID             0
Delivery_person_Age            0
Delivery_person_Ratings        0
Restaurant_latitude            0
Restaurant_longitude           0
Delivery_location_latitude     0
Delivery_location_longitude    0
Type_of_order                  0
Type_of_vehicle                0
Time_taken(min)                0
dtype: int64
```

Calculating Distance Between Two Latitudes and Longitudes

In [4]:
```
# Set the earth's radius (in kilometers)
R = 6371

# Convert degrees to radians
def deg_to_rad(degrees):
    return degrees * (np.pi/180)

# Function to calculate the distance between two points using the haversine formula
def distancelatlong(lat1, lon1, lat2, lon2):
    d_lat = deg_to_rad(lat2-lat1)
    d_lon = deg_to_rad(lon2-lon1)
    a = np.sin(d_lat/2)**2 + np.cos(deg_to_rad(lat1)) * np.cos(deg_to_rad(lat2)) * np.sin(d_lon/2)**2
    c = 2 * np.arctan2(np.sqrt(a), np.sqrt(1-a))
    return R * c

# Calculate the distance between each pair of points
data['distance'] = np.nan

for i in range(len(data)):
    data.loc[i, 'distance'] = distancelatlong(data.loc[i, 'Restaurant_latitude'],
                                              data.loc[i, 'Restaurant_longitude'],
                                              data.loc[i, 'Delivery_location_latitude'],
                                              data.loc[i, 'Delivery_location_longitude'])
```

In [5]:
```
print(data.head())
```

```
      ID Delivery_person_ID  Delivery_person_Age  Delivery_person_Ratings  \
0   4607     INDORES13DEL02                   37                      4.9
1   B379      BANGRES18DEL02                   34                      4.5
2   5D6D      BANGRES19DEL01                   23                      4.4
3   7A6A    COIMBRES13DEL02                   38                      4.7
4   70A2    CHENRES13DEL03                   32                      4.6

  Restaurant_latitude  Restaurant_longitude  Delivery_location_latitude  \
0           22.745049             75.892471                   22.765049
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3           11.003669             76.976494                   11.053669
4           12.972793             80.249982                   13.012793

  Delivery_location_longitude Type_of_order Type_of_vehicle  Time_taken(min)  \
0                   75.912471         Snack      motorcycle               24
1                   77.813237         Snack         scooter               33
2                   77.688400        Drinks      motorcycle               26
3                   77.026494        Buffet      motorcycle               21
4                   80.289982         Snack         scooter               30

    distance
0   1.025149
1  20.183530
2   1.552758
3   7.790401
4   6.210138
```
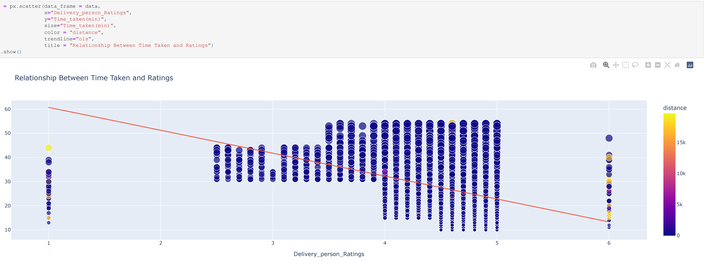
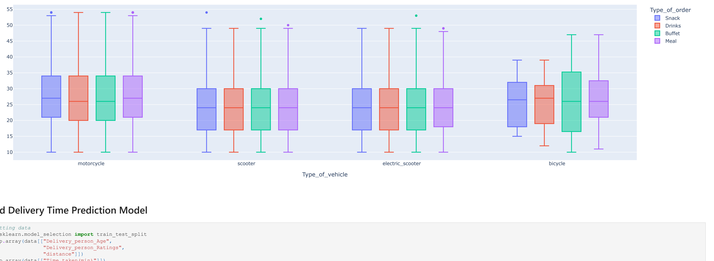

Data Exploration

In [6]:
```
figure = px.scatter(data_frame = data,
                    x = "distance",
                    y = "Time_taken(min)",
                    size = "Time_taken(min)",
                    trendline = "ols",
                    title = "Relationship Between Distance and Time Taken")
figure.show()
```

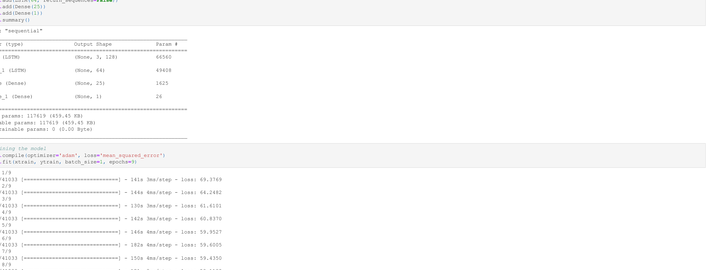
In [7]:
```
figure = px.scatter(data_frame = data,
                    x="Delivery_person_Age",
                    y="Time_taken(min)",
                    size="Time_taken(min)",
                    color = "distance",
                    trendline="ols",
                    title = "Relationship Between Time Taken and Age")
figure.show()
```



In [8]:
```
figure = px.scatter(data_frame = data,
                    x="Delivery_person_Ratings",
                    y="Time_taken(min)",
                    size="Time_taken(min)",
                    color = "distance",
                    trendline="ols",
                    title = "Relationship Between Time Taken and Ratings")
figure.show()
```



In [9]:
```
fig = px.box(data,
             x="Type_of_vehicle",
             y="Time_taken(min)",
             color="Type_of_order")
fig.show()
```



Food Delivery Time Prediction Model

In [10]:
```
#splitting data
from sklearn.model_selection import train_test_split
x = np.array(data[["Delivery_person_Age",
                   "Delivery_person_Ratings",
                   "distance"]])
y = np.array(data[["Time_taken(min)"]])
xtrain, xtest, ytrain, ytest = train_test_split(x, y,
                                                test_size=0.10,
                                                random_state=42)

# creating the LSTM natural network model
from keras.models import Sequential
from keras.layers import Dense, LSTM
model = Sequential()
model.add(LSTM(128, return_sequences=True, input_shape= (xtrain.shape[1], 1)))
model.add(LSTM(64, return_sequences=False))
model.add(Dense(25))
model.add(Dense(1))
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #   
=================================================================
 lstm (LSTM)                 (None, 3, 128)            66560     

 lstm_1 (LSTM)               (None, 64)                49408     

 dense (Dense)               (None, 25)                1625      

 dense_1 (Dense)             (None, 1)                 26        

=================================================================
Total params: 117619 (459.45 KB)
Trainable params: 117619 (459.45 KB)
Non-trainable params: 0 (0.00 Byte)
_________________________________________________________________
```

In [11]:
```
# training the model
model.compile(optimizer='adam', loss='mean_squared_error')
model.fit(xtrain, ytrain, batch_size=1, epochs=9)
```

```
Epoch 1/9
41033/41033 [==============================] - 141s 3ms/step - loss: 69.3769
Epoch 2/9
41033/41033 [==============================] - 144s 4ms/step - loss: 64.2482
Epoch 3/9
41033/41033 [==============================] - 130s 3ms/step - loss: 61.6101
Epoch 4/9
41033/41033 [==============================] - 142s 3ms/step - loss: 60.8370
Epoch 5/9
41033/41033 [==============================] - 146s 4ms/step - loss: 59.9527
Epoch 6/9
41033/41033 [==============================] - 182s 4ms/step - loss: 59.6005
Epoch 7/9
41033/41033 [==============================] - 150s 4ms/step - loss: 59.4350
Epoch 8/9
41033/41033 [==============================] - 121s 3ms/step - loss: 59.1180
Epoch 9/9
41033/41033 [==============================] - 158s 4ms/step - loss: 58.8828
<keras.src.callbacks.History at 0x230235b0f80>
```

Out[11]:

In [12]:
```
print("Food Delivery Time Prediction")
a = int(input("Age of Delivery Partner: "))
b = float(input("Ratings of Previous Deliveries: "))
c = int(input("Total Distance: "))

features = np.array([[a, b, c]])
print("Predicted Delivery Time in Minutes = ", model.predict(features))
```

```
Food Delivery Time Prediction
Age of Delivery Partner: 28
Ratings of Previous Deliveries: 4
Total Distance: 10
1/1 [==============================] - 1s 877ms/step
Predicted Delivery Time in Minutes =  [[36.934468]]
```

So this is how you can use Machine Learning for the task of food delivery time prediction using the Python programming language.

THANK YOU!

GitHub Link: https://github.com/anujtiwari21