In [1]:
```python
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     CHENRES12DEL01                   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]:
```python
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]:
```python
data.isnull().sum()
```

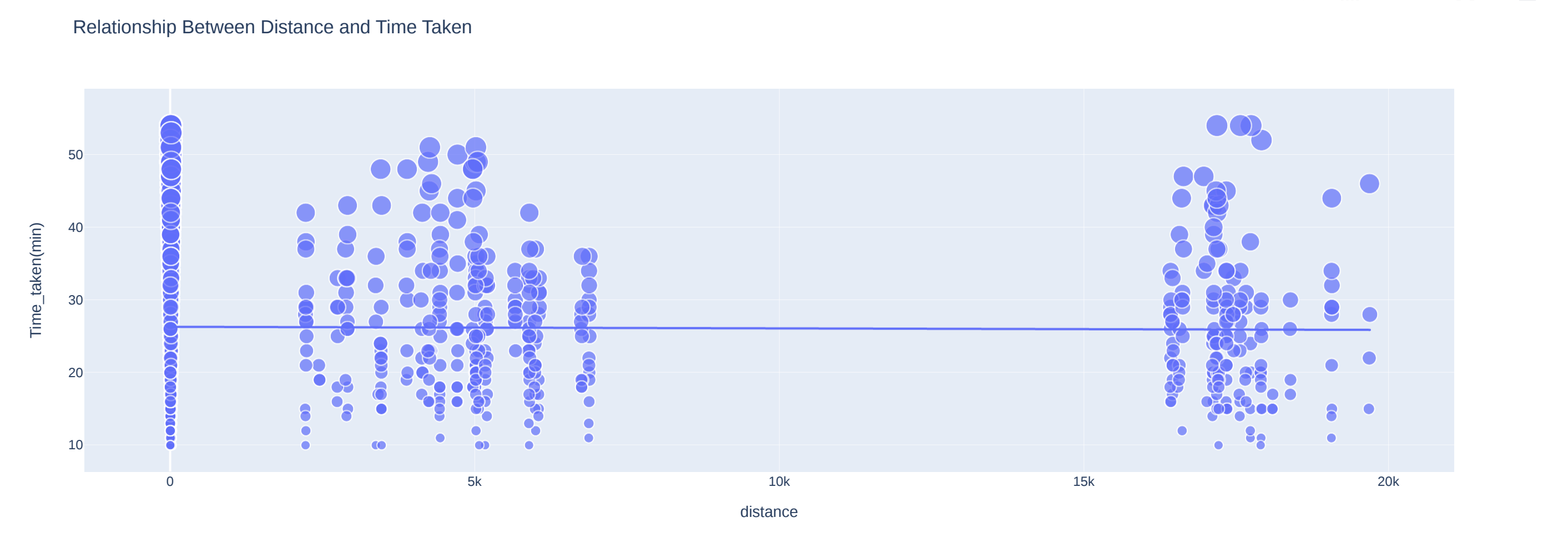
Out[3]:
```
ID                             0
Delivery_person_ID             0
Delivery_person_Age            0
Delivery_person_Ratings        0
Restaurant_latitude            0
Restaurant_longitude           0
Delivery_location_latitude     0
Delivery_location_longitude    0
Type_of_order           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

In [4]:
```python
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 distcalculate(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'] = distcalculate(data.loc[i, 'Restaurant_latitude'],
                                        data.loc[i, 'Restaurant_longitude'],
                                        data.loc[i, 'Delivery_location_latitude'],
                                        data.loc[i, 'Delivery_location_longitude'])
```

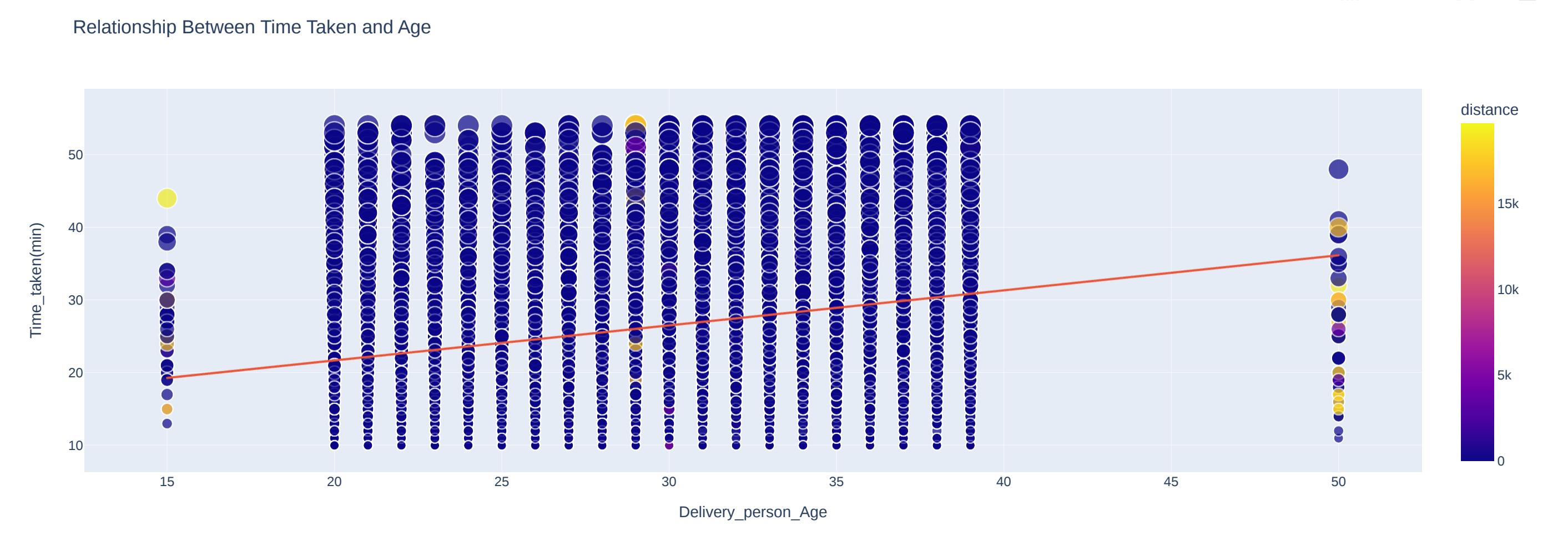
In [5]:
```python
print(data.head())
```

```
     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     CHENRES12DEL01                   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

    distance
0   3.025149
1  20.183530
2   1.552758
3   7.790401
4   6.210138
```

In [6]:
```python
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()
```

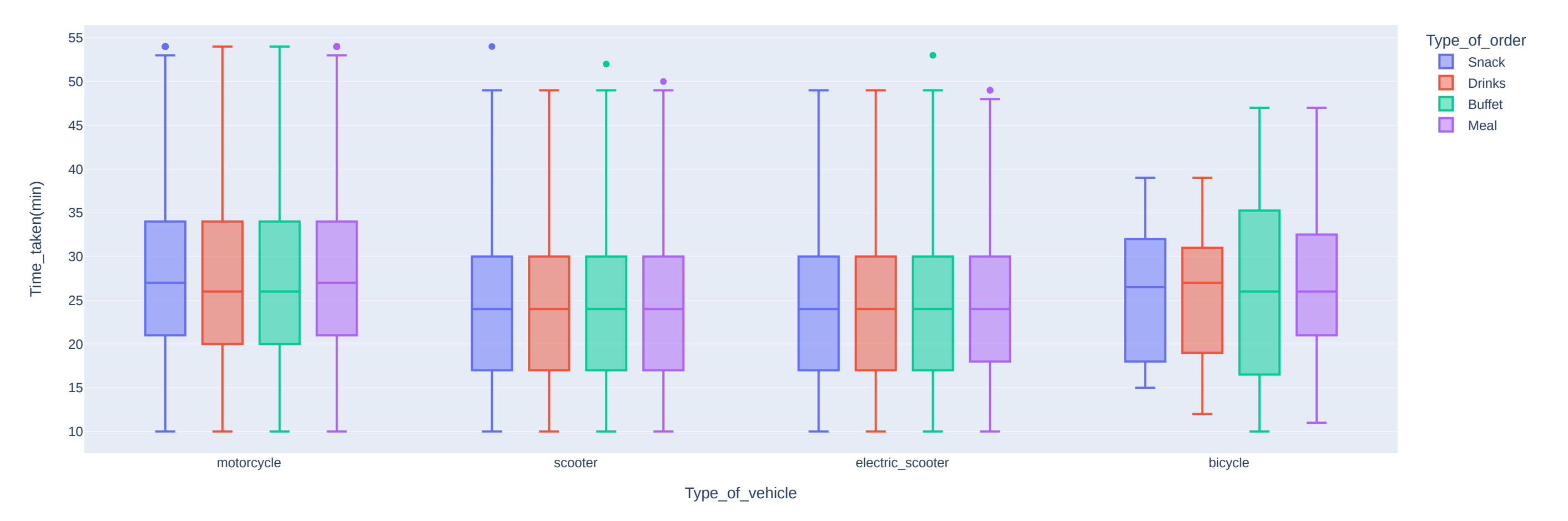


In [7]:
```python
figure = px.scatter(data_frame = data,
                    x="Delivery_person_Age",
                    y="Time_taken(min)",
                    size="Time_taken(min)",
                    color = "distance",
                    trendline="ols",
                    title = "Relationship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



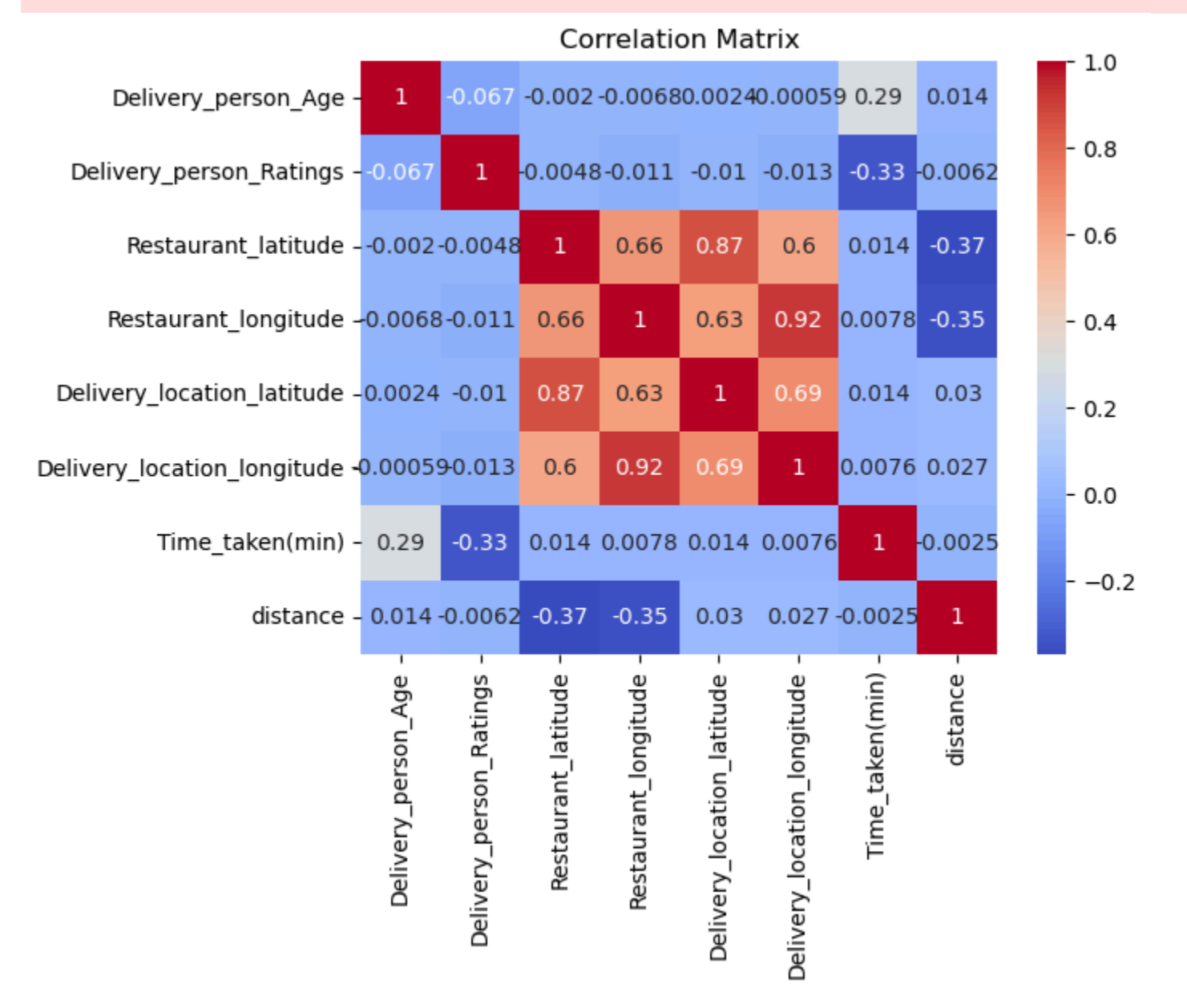
In [8]:
```python
figure = px.scatter(data_frame = data,
                    x="Delivery_person_Ratings",
                    y="Time_taken(min)",
                    size="Time_taken(min)",
                    color = "distance",
                    trendline="ols",
                    title = "Relationship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

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

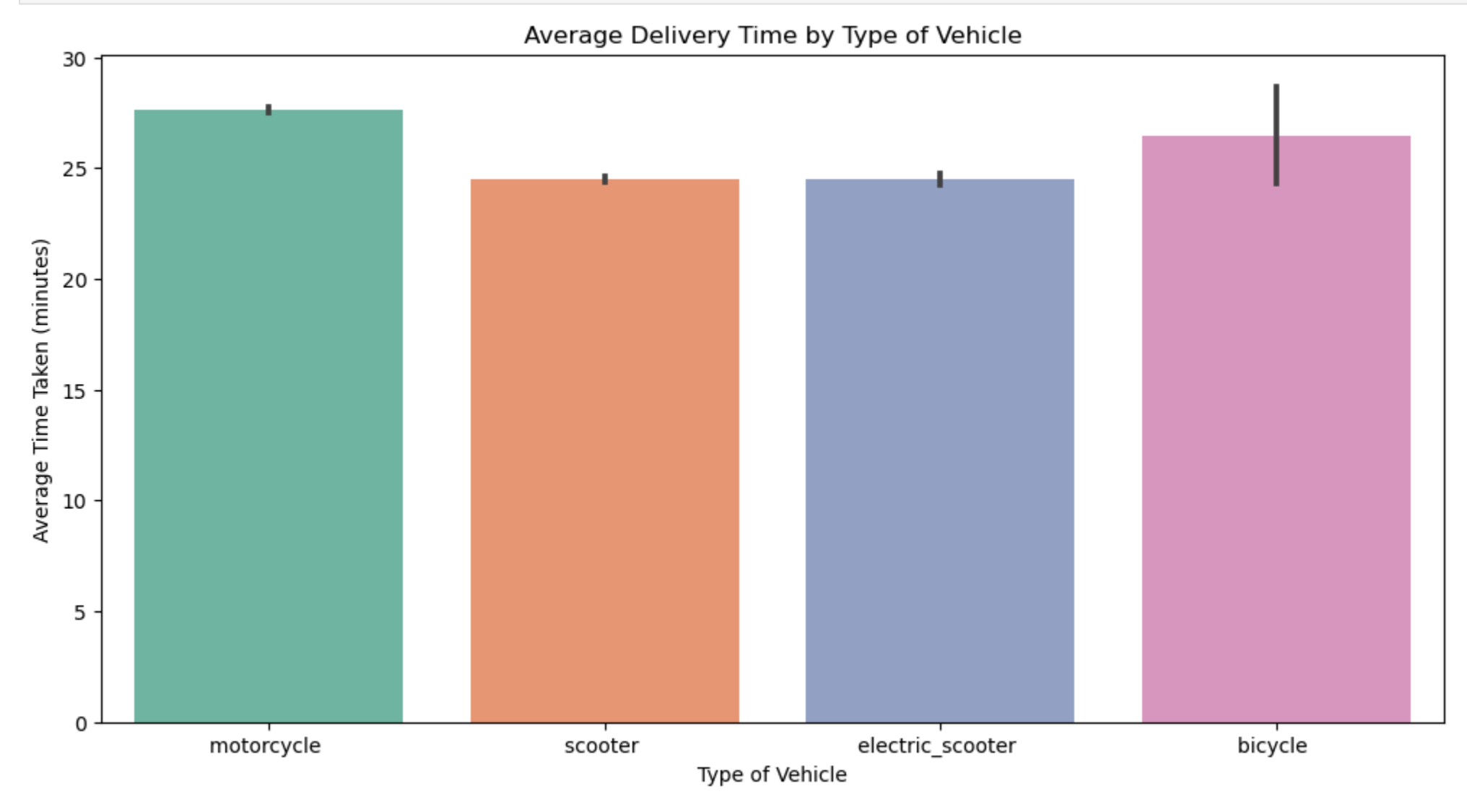


In [11]:
```python
correlation_matrix = data.corr()
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm')
plt.title('Correlation Matrix')
plt.show()
```

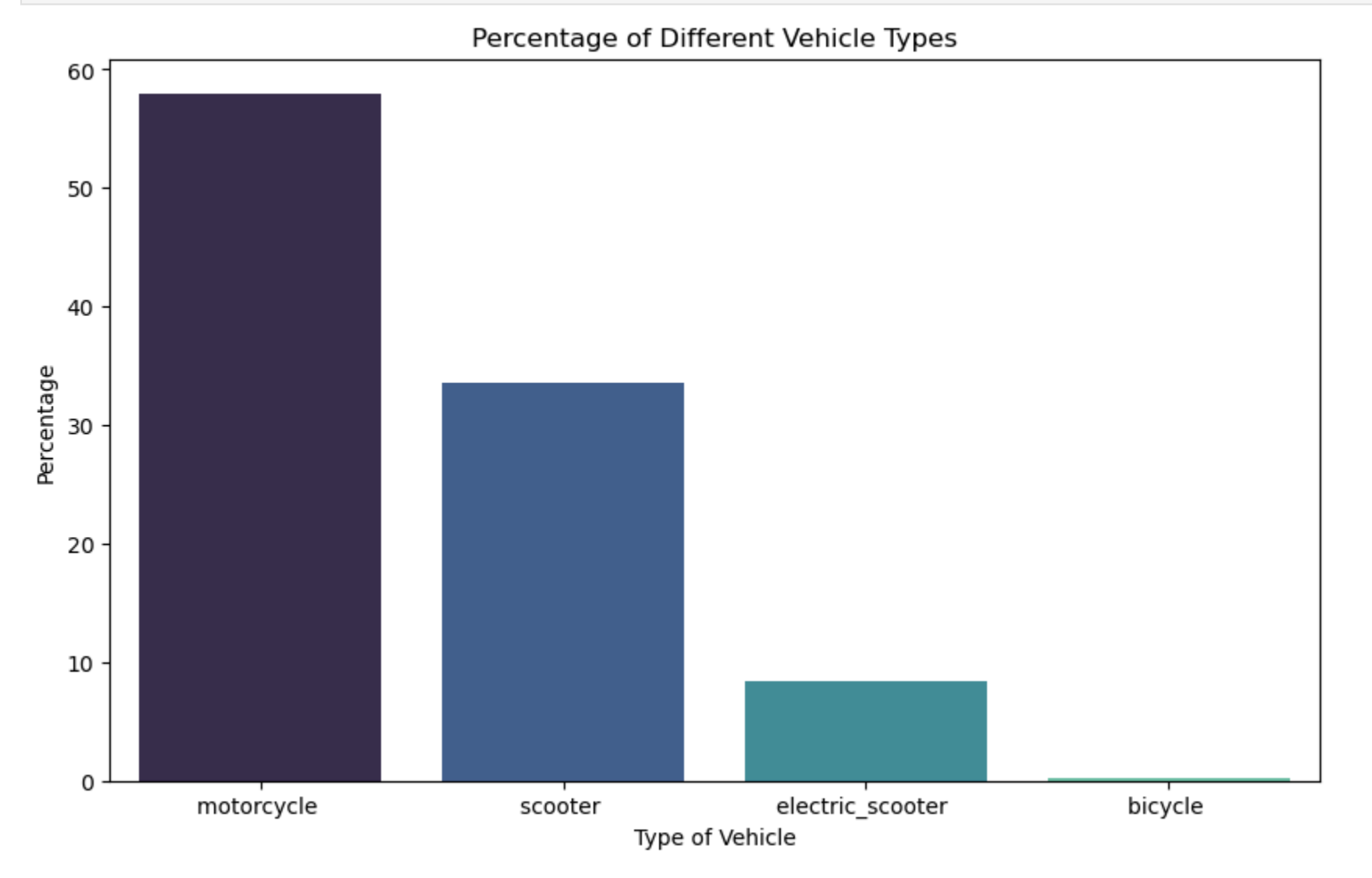
```
C:\Users\NEETI PANDEY\AppData\Local\Temp\ipykernel_20836\3718659487.py:1: FutureWarning:

The default value of numeric_only in DataFrame.corr is deprecated. In a future version, it will default to False. Select only valid columns or specify the value of numeric_only to silence this warning.
```



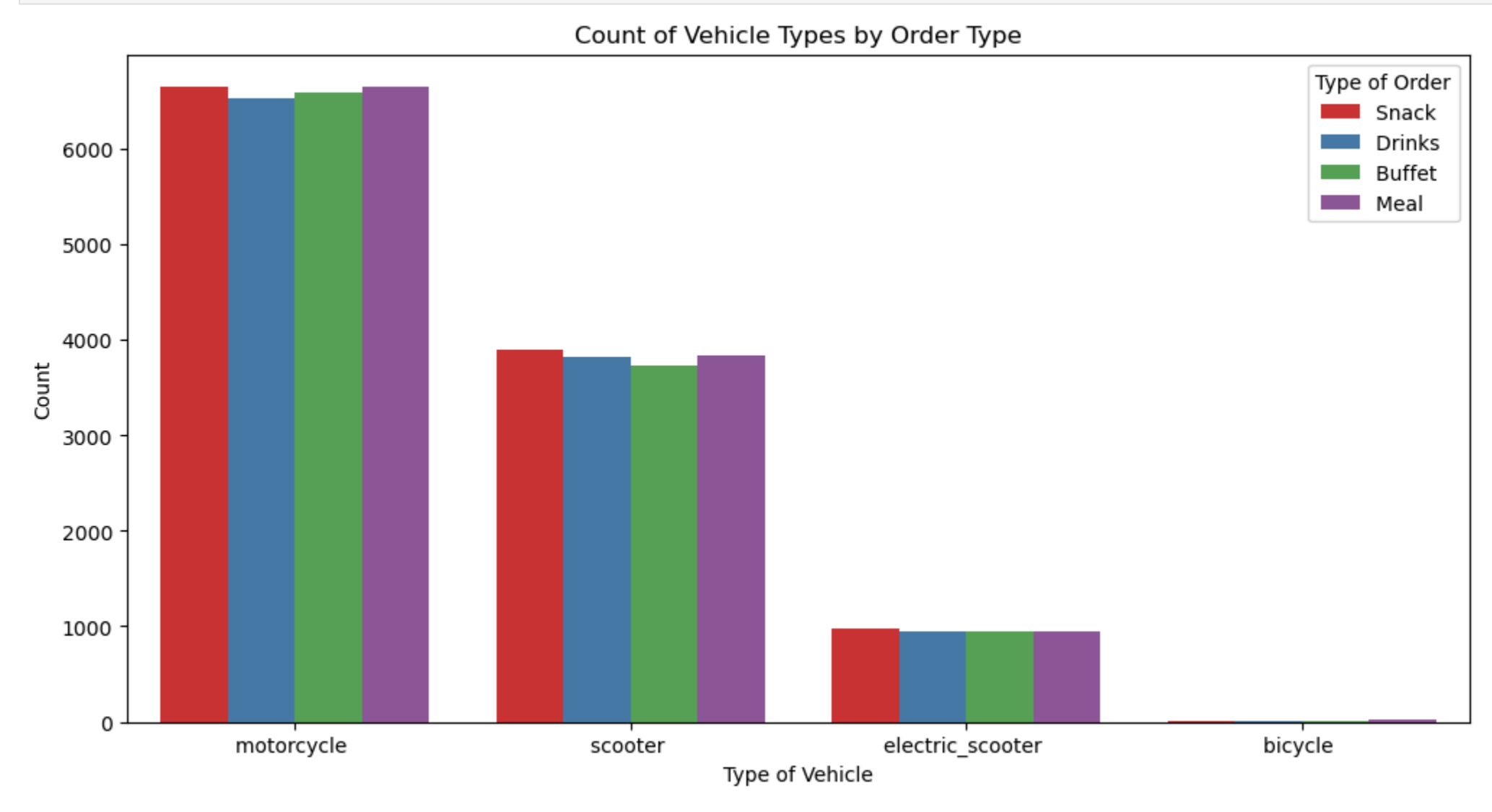
In [12]:
```python
plt.figure(figsize=(12, 6))
sns.barplot(x='Type_of_vehicle', y='Time_taken(min)', data=data, palette="Set2")
plt.title('Average Delivery Time by Type of Vehicle')
plt.xlabel('Type of Vehicle')
plt.ylabel('Average Time Taken (minutes)')
plt.show()
```



In [15]:
```python
plt.figure(figsize=(10, 6))
vehicle_counts = data['Type_of_vehicle'].value_counts(normalize=True) * 100
sns.barplot(x=vehicle_counts.index, y=vehicle_counts.values, palette="mako")
plt.title('Percentage of Different Vehicle Types')
plt.xlabel('Type of Vehicle')
plt.ylabel('Percentage')
plt.show()
```



In [18]:
```python
plt.figure(figsize=(12, 6))
sns.countplot(x='Type_of_vehicle', hue='Type_of_order', data=data, palette="Set1")
plt.title('Count of Vehicle Types by Order Type')
plt.xlabel('Type of Vehicle')
plt.ylabel('Count')
plt.legend(title='Type of Order', loc='upper right')
plt.show()
```



In [19]:
```python
#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)
```

In [20]:
```python
# creating the LSTM neural 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()
```

```
C:\Users\NEETI PANDEY\anaconda3\Lib\site-packages\keras\src\layers\rnn\rnn.py:204: UserWarning:

Do not pass an `input_shape`/`input_dim` argument to a layer. When using Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.
```

Model: "sequential"

Layer (type)	Output Shape	Param #
lstm (LSTM)	(None, 3, 128)	66,560
lstm_1 (LSTM)	(None, 64)	49,408
dense (Dense)	(None, 25)	1,625
dense_1 (Dense)	(None, 1)	26

Total params: 117,619 (459.45 KB)
Trainable params: 117,619 (459.45 KB)
Non-trainable params: 0 (0.00 B)

In [21]:
```python
# 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 ━━━━━━━━━━━━━━━━━━━━ 172s 4ms/step - loss: 77.6948
Epoch 2/9
41033/41033 ━━━━━━━━━━━━━━━━━━━━ 144s 4ms/step - loss: 65.2042
Epoch 3/9
41033/41033 ━━━━━━━━━━━━━━━━━━━━ 148s 4ms/step - loss: 62.8585
Epoch 4/9
41033/41033 ━━━━━━━━━━━━━━━━━━━━ 168s 4ms/step - loss: 60.3542
Epoch 5/9
41033/41033 ━━━━━━━━━━━━━━━━━━━━ 152s 4ms/step - loss: 60.3165
Epoch 6/9
41033/41033 ━━━━━━━━━━━━━━━━━━━━ 161s 4ms/step - loss: 59.3921
Epoch 7/9
41033/41033 ━━━━━━━━━━━━━━━━━━━━ 157s 4ms/step - loss: 58.9248
Epoch 8/9
41033/41033 ━━━━━━━━━━━━━━━━━━━━ 151s 4ms/step - loss: 58.1744
Epoch 9/9
41033/41033 ━━━━━━━━━━━━━━━━━━━━ 156s 4ms/step - loss: 60.2050
```

Out[21]:
```
<keras.src.callbacks.history.History at 0x235dd6d2490>
```

In [22]:
```python
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: 23
Ratings of Previous Deliveries: 4.5
Total Distance: 11
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 486ms/step
Predicted Delivery Time in Minutes =  [[22.350037]]
```

In [ ]: