DEVELOPMENT PHASE PART 2

PUBLIC TRANSPORT EFFICIENCY ANALYSIS

DATE	**31-10-2023**
TEAM ID	**9277**
PROJECT NAME	**8301-PUBLIC TRANSPORTATION EFFICIENCY ANALYSIS**
TEAM NAME	**PROJ_207140_TEAM_1**

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1.Introduction:

In the phase of this project, we continue our exploration of data analysis, diving deeper into the realm of public transport efficiency. Similar to our previous work on water potability, we embark on a journey to unveil insights hidden within the complex web of data related to public transportation systems. In this phase, we shift our focus to public transport efficiency analysis, employing visualization techniques and predictive modeling to extract meaningful information and make data-driven decisions.

2.Data Preprocessing:

Just as in the previous phase, data preprocessing remains a critical and essential step in our journey towards understanding and optimizing public transport efficiency. Data preprocessing can be described as "the collection and manipulation of data components to produce meaningful information." In this phase, we are dedicated to refining and enhancing the quality of our data, paving the way for more accurate predictions and insights

3.Data cleaning and preprocessing

```
import pandas as pd
```

```
# Load your dataset
data = pd.read_csv('dataset.csv')

# Data cleaning and preprocessing steps (e.g., handling missing values, data
type conversions, etc.)

# Example: Convert 'WeekBeginning' column to datetime data['WeekBeginning']
= pd.to_datetime(data['WeekBeginning'], format='%d-%m%Y %H:%M')

# More data cleaning and preprocessing steps can be added here data.head(25)
```

```
    TripID RouteID  StopID                      StopName WeekBeginning  \
0    23631     100   14156                  181 Cross Rd    2013-06-30
1    23631     100   14144                  177 Cross Rd    2013-06-30
2    23632     100   14132                  175 Cross Rd    2013-06-30
3    23633     100   12266  Zone A Arndale Interchange    2013-06-30
4    23633     100   14147                  178 Cross Rd    2013-06-30
5    23634     100   13907                 9A  Marion Rd    2013-06-30
6    23634     100   14132                  175 Cross Rd    2013-06-30
7    23634     100   13335              9A  Holbrooks Rd    2013-06-30
8    23634     100   13875                  9  Marion Rd    2013-06-30
9    23634     100   13045              206 Holbrooks Rd    2013-06-30
10   23635     100   13335              9A  Holbrooks Rd    2013-06-30
11   23635     100   13383                 8A  Marion Rd    2013-06-30
12   23635     100   13586                 8D  Marion Rd    2013-06-30
13   23635     100   12726                 23  Findon Rd    2013-06-30
14   23635     100   13813                 8K  Marion Rd    2013-06-30
15   23635     100   14062                  20  Cross Rd    2013-06-30
16   23636     100   12780             22A  Crittenden Rd    2013-06-30
17   23636     100   13383                 8A  Marion Rd    2013-06-30
18   23636     100   14154                  180 Cross Rd    2013-06-30
19   23636     100   13524                 8C  Marion Rd    2013-06-30
20   23636     100   14122                  173 Cross Rd    2013-06-30
21   23636     100   13813                 8K  Marion Rd    2013-06-30
22   23637     100   14156                  181 Cross Rd    2013-06-30
23   23637     100   14154                  180 Cross Rd    2013-06-30   24
     23637     100   13335              9A  Holbrooks Rd    2013-06-30

    NumberOfBoardings   0                    Error! Bookmark not defined.
1                                                                     2
2                                                                     3
3                                                                     3

4                  1
5                  1
6                  1
7                  1
```

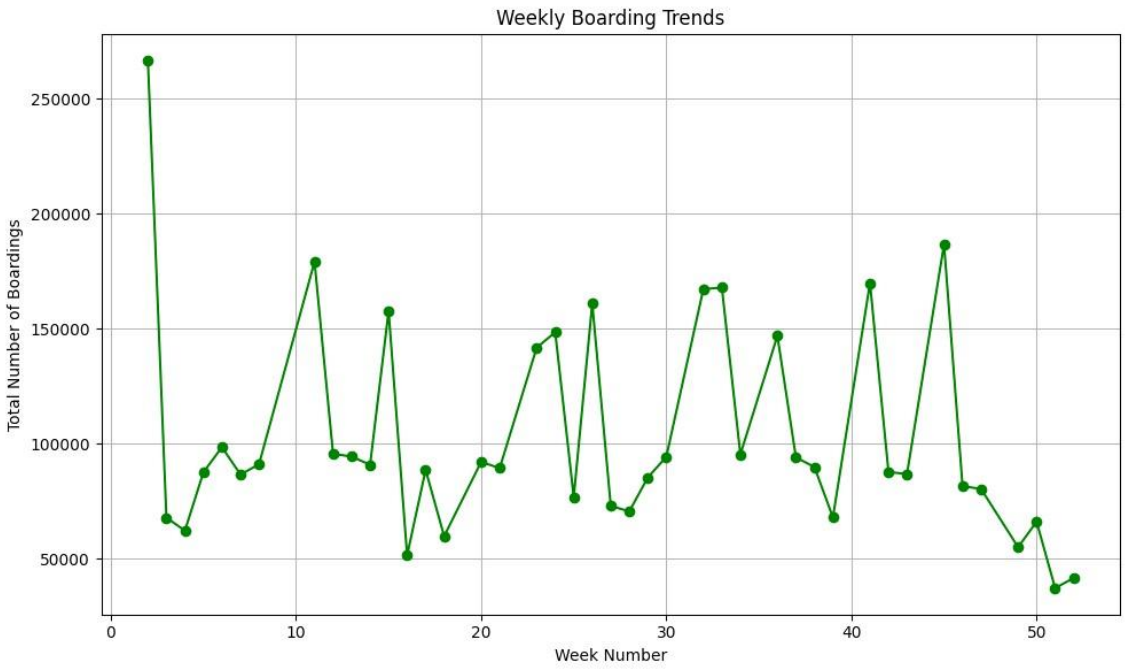
```
8                    1
9                    1
10                   1
11                   1
12                   2
13                   1
14                   1
15                   1
16                   1
17                   1
18                   2
19                   3
20                   1
21                   1
22                   1
23                   1
24                   3
```

3.Visualization

Line Chart - Weekly Boarding Trends

```
# Convert WeekBeginning to datetime and extract week number
data['WeekBeginning'] = pd.to_datetime(data['WeekBeginning'])
data['WeekNumber'] = data['WeekBeginning'].dt.week

# Group data by WeekNumber and sum the NumberOfBoardings weekly_boardings
= data.groupby('WeekNumber')['NumberOfBoardings'].sum()

# Plotting
plt.figure(figsize=(10, 6))
plt.plot(weekly_boardings.index, weekly_boardings.values, marker='o',
color='green')
plt.title('Weekly Boarding Trends')
plt.xlabel('Week Number')
plt.ylabel('Total Number of Boardings')
plt.grid(True) plt.tight_layout()
plt.show()
```

```
<Figure size 1000x600 with 0 Axes>

[<matplotlib.lines.Line2D at 0x7ccb71cf2bf0>]

Text(0.5, 1.0, 'Weekly Boarding Trends')

Text(0.5, 0, 'Week Number')

Text(0, 0.5, 'Total Number of Boardings')
```



Bar Chart - Number of Boardings per StopName

```
import matplotlib.pyplot as plt

# Group data by StopName and sum the NumberOfBoardings
boarding_counts = data.groupby('StopName')['NumberOfBoardings'].sum()

# Plotting
plt.figure(figsize=(12, 6))
boarding_counts.sort_values(ascending=False).head(10).plot(kind='bar',
color='skyblue')
plt.title('Top 10 Stops by Total Number of Boardings')
plt.xlabel('Stop Name') plt.ylabel('Number of
Boardings') plt.xticks(rotation=45, ha='right')
plt.tight_layout() plt.show()
```

```
<Figure size 1200x600 with 0 Axes>
```

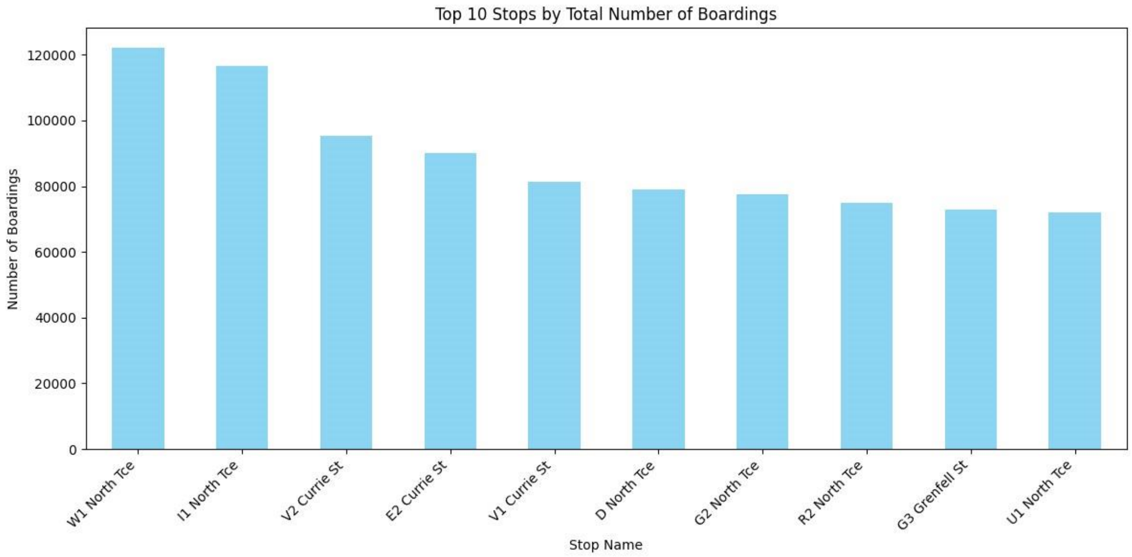
```
<Axes: xlabel='StopName'>
```

```
Text(0.5, 1.0, 'Top 10 Stops by Total Number of Boardings')
```

```
Text(0.5, 0, 'Stop Name')
```

```
Text(0, 0.5, 'Number of Boardings')
```

```
(array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9]),
 [Text(0, 0, 'W1 North Tce'),
  Text(1, 0, 'I1 North Tce'),
  Text(2, 0, 'V2 Currie St'),
  Text(3, 0, 'E2 Currie St'),
  Text(4, 0, 'V1 Currie St'),
  Text(5, 0, 'D North Tce'),
  Text(6, 0, 'G2 North Tce'),
  Text(7, 0, 'R2 North Tce'),
  Text(8, 0, 'G3 Grenfell St'),
  Text(9, 0, 'U1 North Tce')])
```



3.1.Advanced data analysis

Aggregating Boarding Counts by RouteID

```
import pandas as pd
# Group by RouteID and sum the NumberOfBoardings boarding_by_route =
data.groupby('RouteID')['NumberOfBoardings'].sum()

# Display the result print(boarding_by_route)
```

```
RouteID
117     312470
118     319790
140      83064
141      331118
142      79091
147        169540
148        5190
150     318672
168      296199
169      13397
170      143076
171      91911
```

```
100      328740
100B       8250
100C      11828
100K       6364
100N       6419
100P      13277
100S        260
101       39114
115       15460
117       67637
142      287270
144      183253
144G      15814
147      136496
150      105953
150B      55517
150P       8147
155       98191
157      307301
157X      81745
162       92171
167      237238
167C      32195
168       30858
Name: NumberOfBoardings, dtype: int64
```

Calculating Average Boarding Counts per Stop

```
# Group by StopID and calculate the average number of boardings
avg_boardings_per_stop = data.groupby('StopID')['NumberOfBoardings'].mean()

# Display the result print(avg_boardings_per_stop)
```

```
StopID
10817    2.776013
10818    2.333333
10843    2.257143
10877    2.326316
10879    1.400000
...
18408    1.875000
18409    2.714286
18410    1.500000
18411    1.156250
18493    9.122678
Name: NumberOfBoardings, Length: 969, dtype: float64
```

Finding Stops with Highest Weekly Boarding Counts

```
# Convert WeekBeginning to datetime and extract week number
data['WeekBeginning'] = pd.to_datetime(data['WeekBeginning'])
data['WeekNumber'] = data['WeekBeginning'].dt.week

# Group by StopName and WeekNumber, then sum the NumberOfBoardings
weekly_boarding_counts = data.groupby(['StopName',
'WeekNumber'])['NumberOfBoardings'].sum()

# Find stops with the highest weekly boarding counts
stops_with_highest_boardings =
weekly_boarding_counts.groupby('StopName').idxmax()

# Display the result print(stops_with_highest_boardings)
```

```
StopName
1 Anzac Hwy                                                (1 Anzac Hwy, 26)
1 Fullarton Rd                                           (1 Fullarton Rd, 8)
1 George St                                               (1 George St, 27)
1 Glen Osmond Rd                                     (1 Glen Osmond Rd, 33)
1 Henley Beach Rd                                   (1 Henley Beach Rd, 26)
...
Zone B Registry Rd Flinders Un    (Zone B Registry Rd Flinders Un, 11)
Zone B West Lakes Interchange      (Zone B West Lakes Interchange, 26)
Zone C Moseley St                                   (Zone C Moseley St, 26)
Zone D Arndale Interchange            (Zone D Arndale Interchange, 38)
Zone D Port Adelaide Interchan    (Zone D Port Adelaide Interchan, 26)
Name: NumberOfBoardings, Length: 583, dtype: object
```

Analyzing Trends Over Time (Weekly/Monthly)

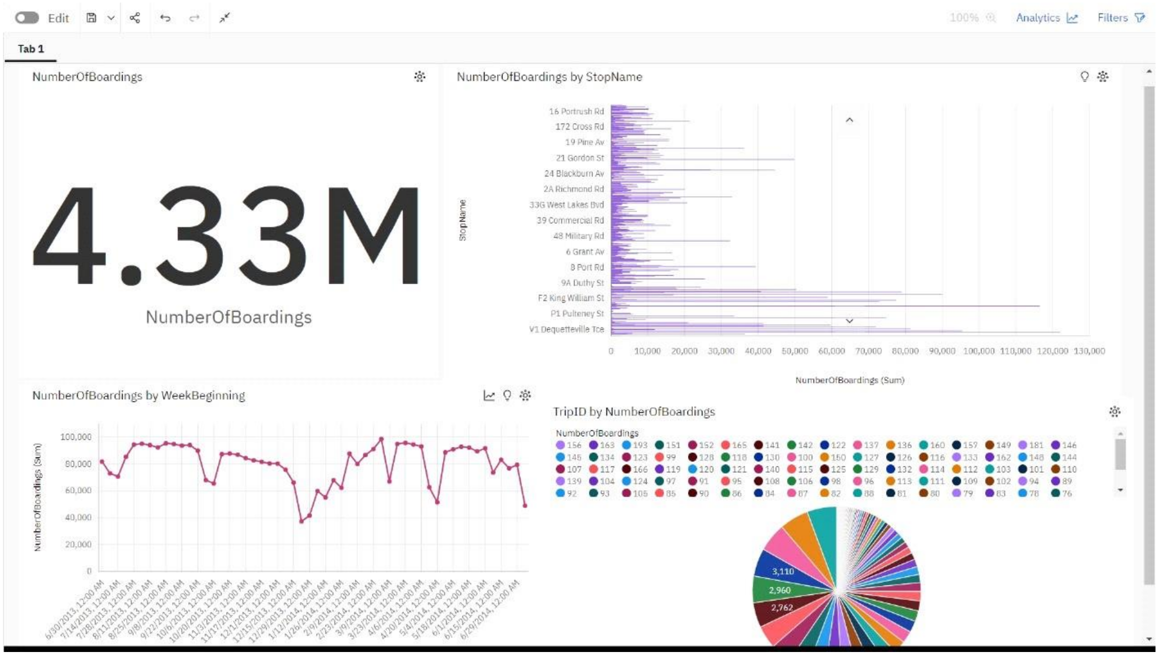
```
# Convert WeekBeginning to datetime and extract week and month
data['WeekBeginning'] = pd.to_datetime(data['WeekBeginning'])
data['WeekNumber'] = data['WeekBeginning'].dt.week data['Month']
= data['WeekBeginning'].dt.month

# Group by WeekNumber and Month, then sum the NumberOfBoardings
weekly_boarding_trends = data.groupby(['WeekNumber',
'Month'])['NumberOfBoardings'].sum()

# Display the result print(weekly_boarding_trends)
```

```
WeekNumber  Month
1           1         59791
2           1         55026
3           1         67844
4           1         62204
5           2         87621
```

6	2	79964
7	2	86610
8	2	91046
9	3	98500
10	3	66953
11	3	94828
12	3	95643
13	3	94406
14	4	92959
15	4	62636
16	4	51434
17	4	88624
18	5	90852
19	5	92782
20	5	92112
21	5	89378
22	6	91608
23	6	73602
24	6	83086
25	6	76725
26	6	161049
27	7	121795
28	7	70588
29	7	85288
30	7	94344
31	8	95061
32	8	93992
33	8	92247
34	8	95341
35	9	94762
36	9	93643
37	9	94053
38	9	89866
39	9	67959
40	10	65428
41	10	87246
42	10	87703
43	10	86839
44	11	84346
45	11	82642
46	11	81556
47	11	80333
48	12	80176
49	12	75652
50	12	66079
51	12	37207

```
52          12        41587
Name: NumberOfBoardings, dtype: int64
```

4.Conclusion:



In this project, we have continued our journey in the pursuit of comprehensive data analysis by creating visualizations and constructing a predictive model. Leveraging the capabilities of visualization libraries such as Matplotlib and Seaborn, we have unveiled insights through histograms, scatter plots, and correlation matrices. Additionally, we have delved into the realm of predictive modeling, where we have applied data-driven techniques to gain a better understanding of public transport efficiency