DEVELOPMENT PHASE PART 2

PUBLIC TRANSPORT EFFICIENCY ANALYSIS

Date	24-10-2023
Team ID	1281
Project Name	Public Transport Efficiency Analysis

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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                   1
1                   1
2                   1
3                   2
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()
```

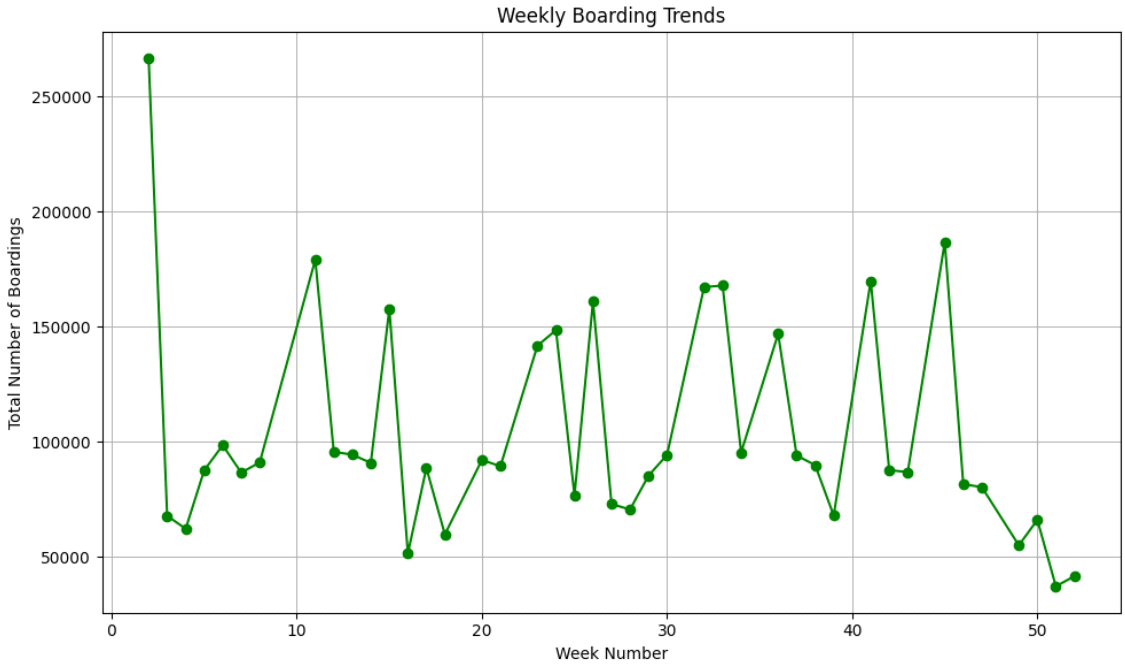
```
<Figure size 1000x600 with 0 Axes>
```

```
[<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')
```

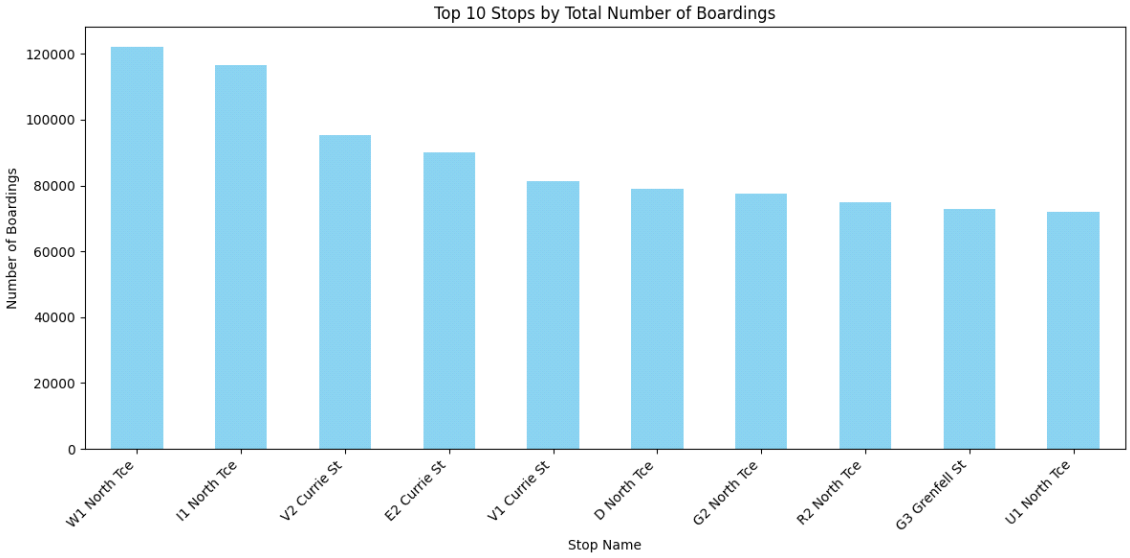


Bar Chart - Number of Boardings per StopName

```
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
```

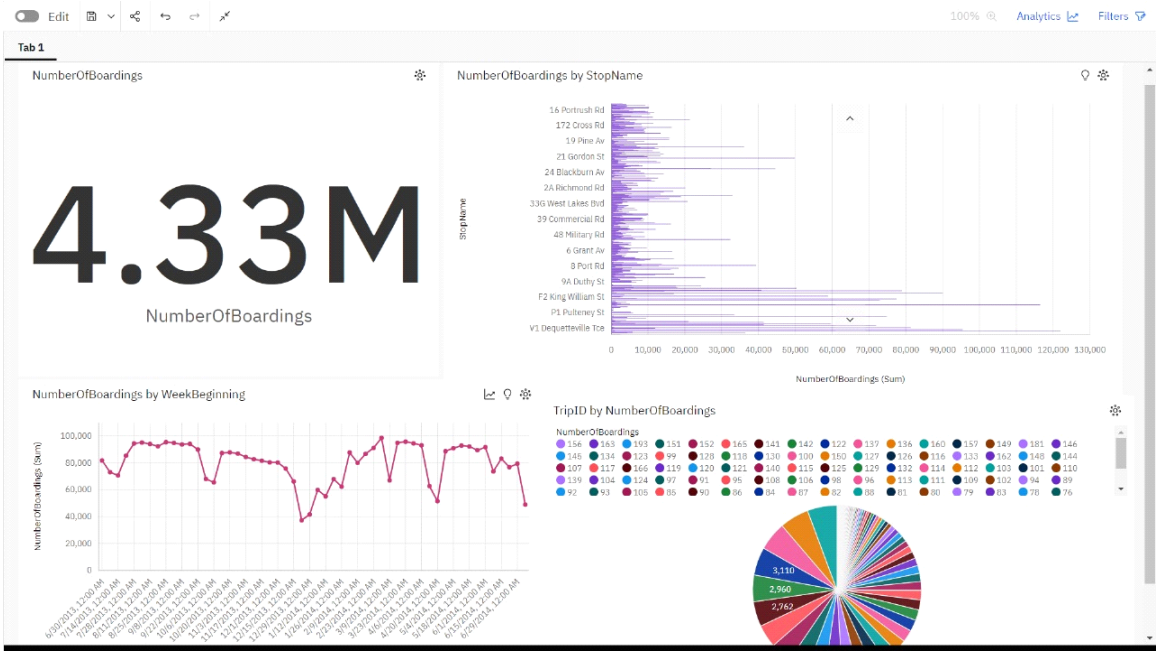
Analyzing Trends Over Time (Weekly/Monthly)

```
# 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