

Enhancing Public Transportation with Data Analysis

Introduction

This project aims to leverage public transportation data to evaluate service efficiency, on-time performance, and passenger feedback, ultimately improving the overall public transportation experience. This document outlines the design thinking process for the project, including analysis objectives, data collection methods, visualization strategies, and code integration.

Data Collection

To achieve the project objectives, we will need to collect data from various sources:

1. **Transportation Schedules:** Obtain schedules and timetables for public transportation services. This data will help in assessing on-time performance.
2. **Real-Time Updates:** Gather real-time data, including GPS tracking, to monitor the actual movements of vehicles and identify delays or deviations from schedules.

Visualization Strategy

To effectively communicate insights, we will use IBM Cognos for data visualization. Here's the strategy for creating informative dashboards and reports:

1. **Key Performance Indicators (KPIs):** Design dashboards displaying on-time performance, passenger satisfaction, and service efficiency KPIs. These KPIs will provide a quick overview of the state of public transportation.
2. **Time-Series Visualizations:** Utilize line charts and time-series plots to visualize trends in on-time performance: highlight days or time slots with the highest delays.

Assessment and Analysis:

- Conduct a comprehensive assessment of the current transportation system, including infrastructure, routes, schedules, and ridership patterns.
- Analyze data related to passenger demand, routes, congestion, and delays. Engage Stakeholders:
 - Collaborate with transportation authorities, government agencies, and local communities.
 - Seek input from commuters, businesses, and advocacy groups to understand their needs and concerns.
- Optimize Routes and Schedules:
 - Use data analysis and modeling to optimize routes and schedules for efficiency and reduced congestion.
 - Consider factors like population density, traffic patterns, and peak hours.

Infrastructure Investment:

- Invest in modernizing and expanding public transportation infrastructure, including buses, trains, subways, and stations.
- Focus on accessibility for people with disabilities.

Integration of Modes:

- Implement integrated fare systems that allow seamless transfers between different modes of public transportation (e.g., bus to train).
- Create transportation hubs to facilitate easy transfers.

Real-Time Data and Technology:

- Integrate real-time data, GPS tracking, and mobile apps to provide passengers with up-to-date information on routes, arrivals, and delays.
- Implement smart ticketing and contactless payment options.

Sustainability and Environmental Considerations:

- Promote the use of electric and hybrid vehicles to reduce emissions.
- Incorporate green infrastructure and practices to mitigate the environmental impact.

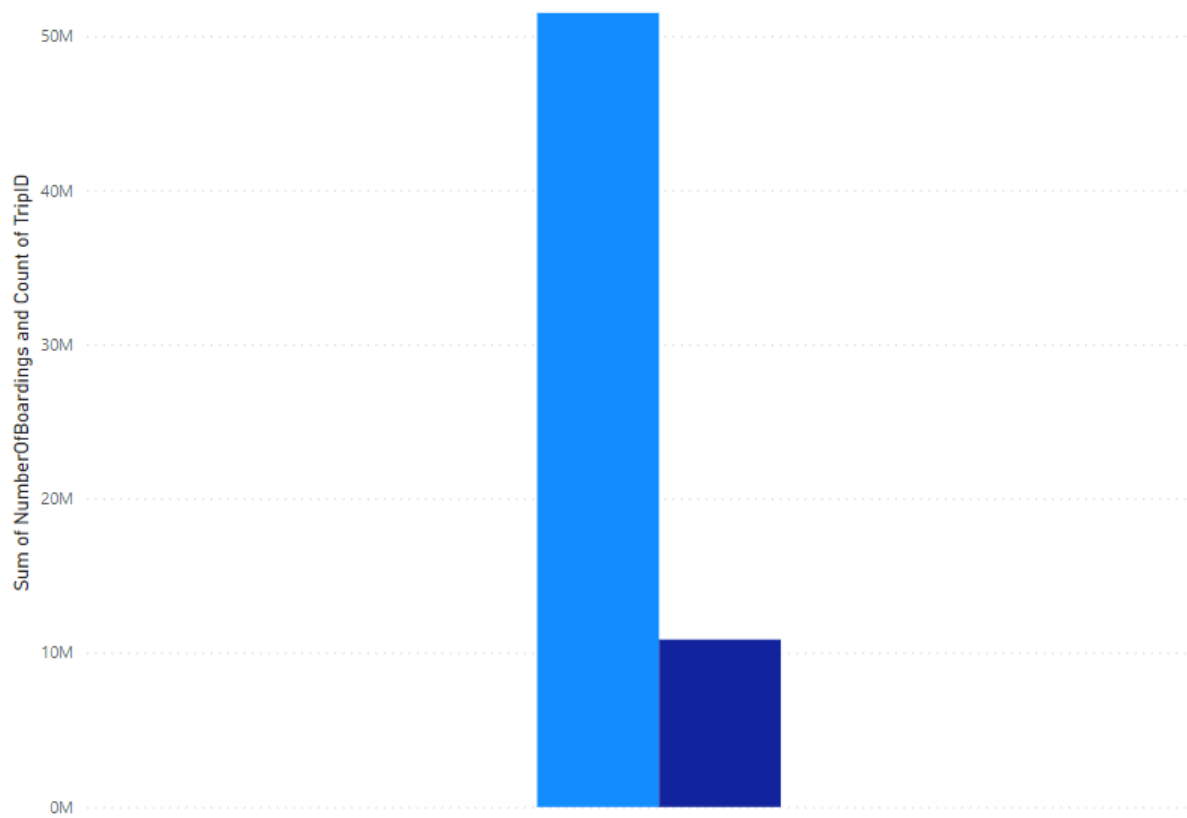
Safety and Security:

- Invest in security measures to ensure the safety of passengers and staff.
- Implement surveillance systems and emergency response protocols.

79	65.5k	100	996	10.0k	18.7k		30Jun13	6Jul14	1
23631		100		14156		181 Cross Rd	2013-06-30 00:00:00		1
23631		100		14144		177 Cross Rd	2013-06-30 00:00:00		1
23632		100		14132		175 Cross Rd	2013-06-30 00:00:00		1
23633		100		12266		Zone A Arndale Interchange	2013-06-30 00:00:00		2
23633		100		14147		178 Cross Rd	2013-06-30 00:00:00		1
23634		100		13907		9A Marion Rd	2013-06-30 00:00:00		1
23634		100		14132		175 Cross Rd	2013-06-30 00:00:00		1
23634		100		13335		9A Holbrooks Rd	2013-06-30 00:00:00		1
23634		100		13875		9 Marion Rd	2013-06-30 00:00:00		1
23634		100		13045		206 Holbrooks Rd	2013-06-30 00:00:00		1
23635		100		13335		9A Holbrooks Rd	2013-06-30 00:00:00		1
23635		100		13383		8A Marion Rd	2013-06-30 00:00:00		1
23635		100		13586		8D Marion Rd	2013-06-30 00:00:00		2
23635		100		12726		23 Findon Rd	2013-06-30 00:00:00		1

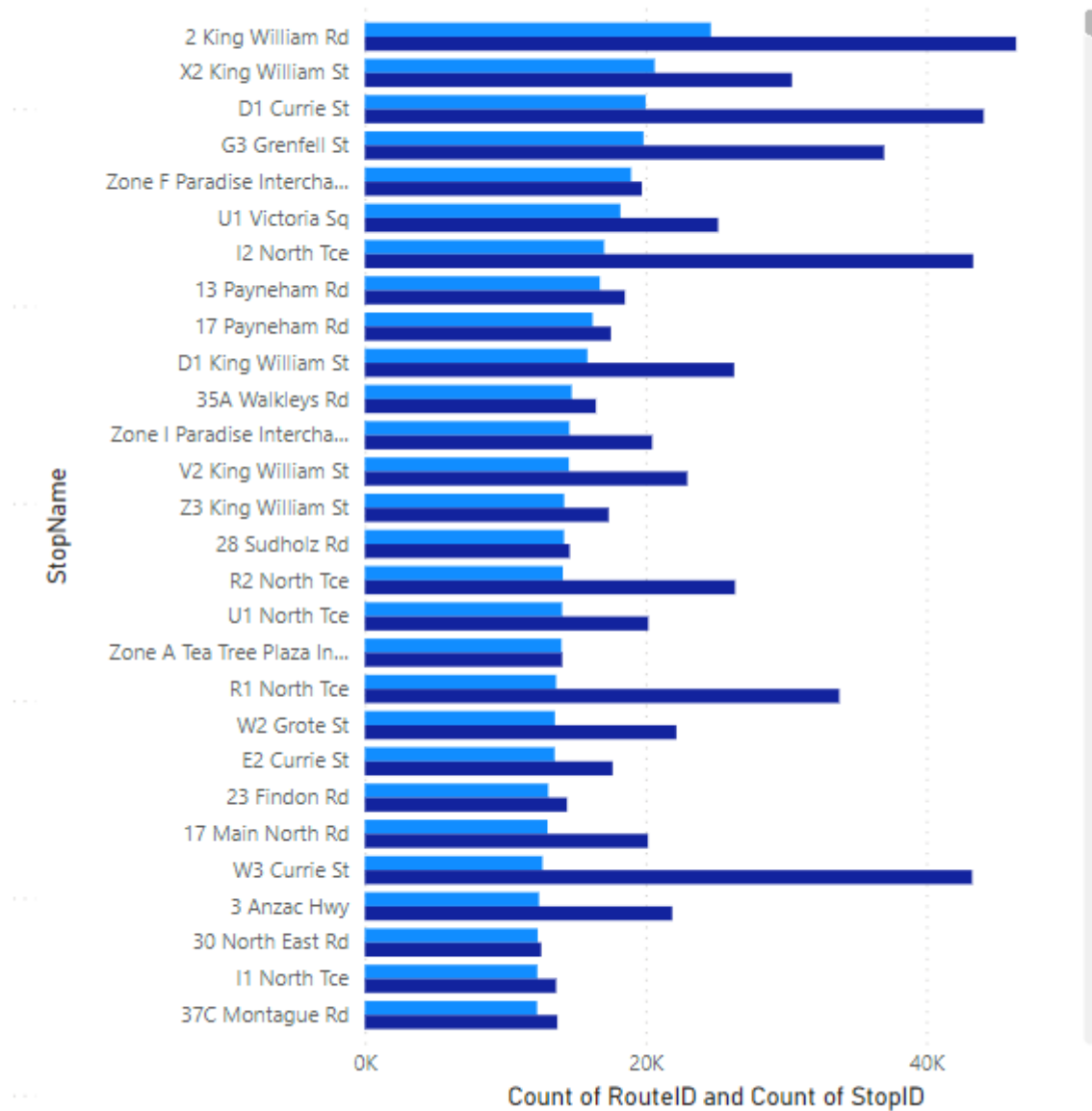
Sum of NumberOfBoardings and Count of TripID

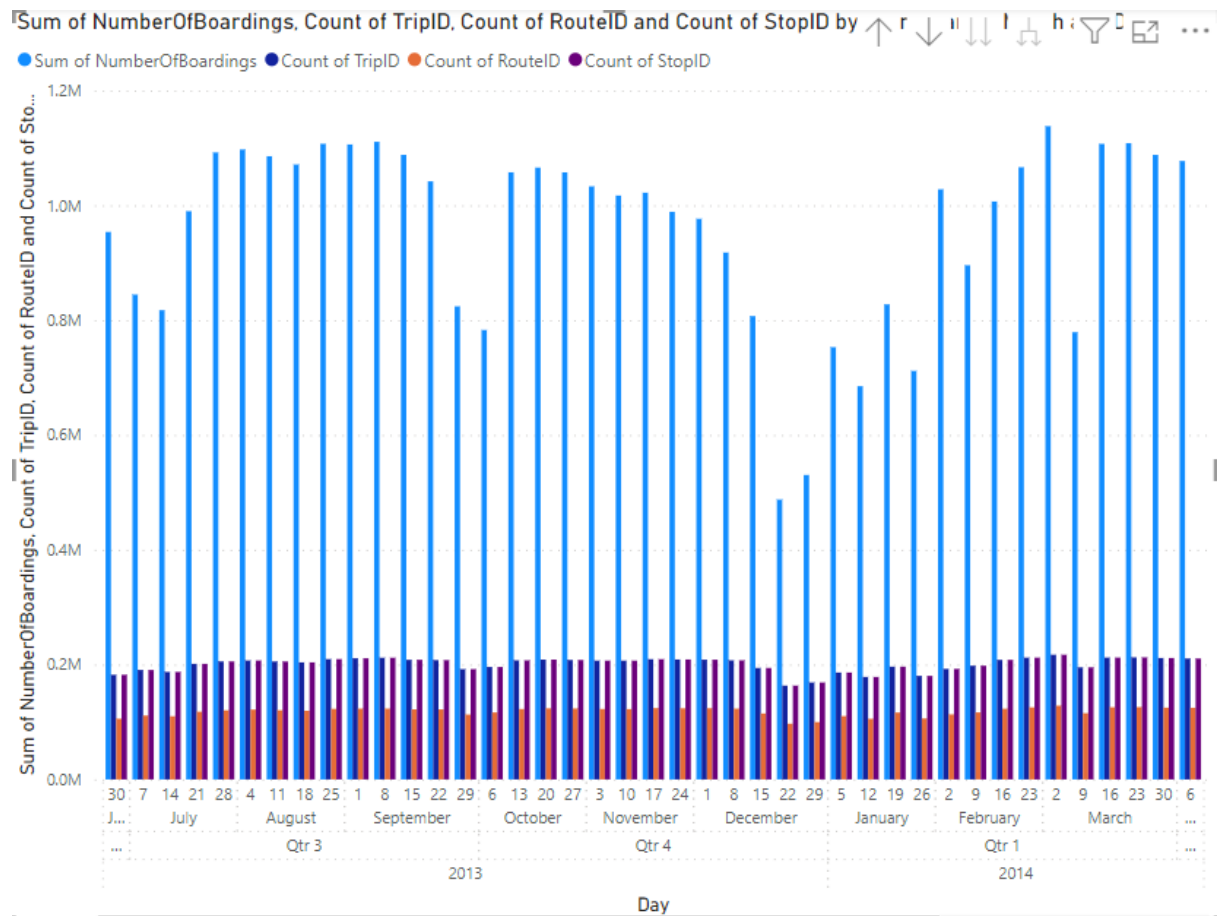
● Sum of NumberOfBoardings ● Count of TripID

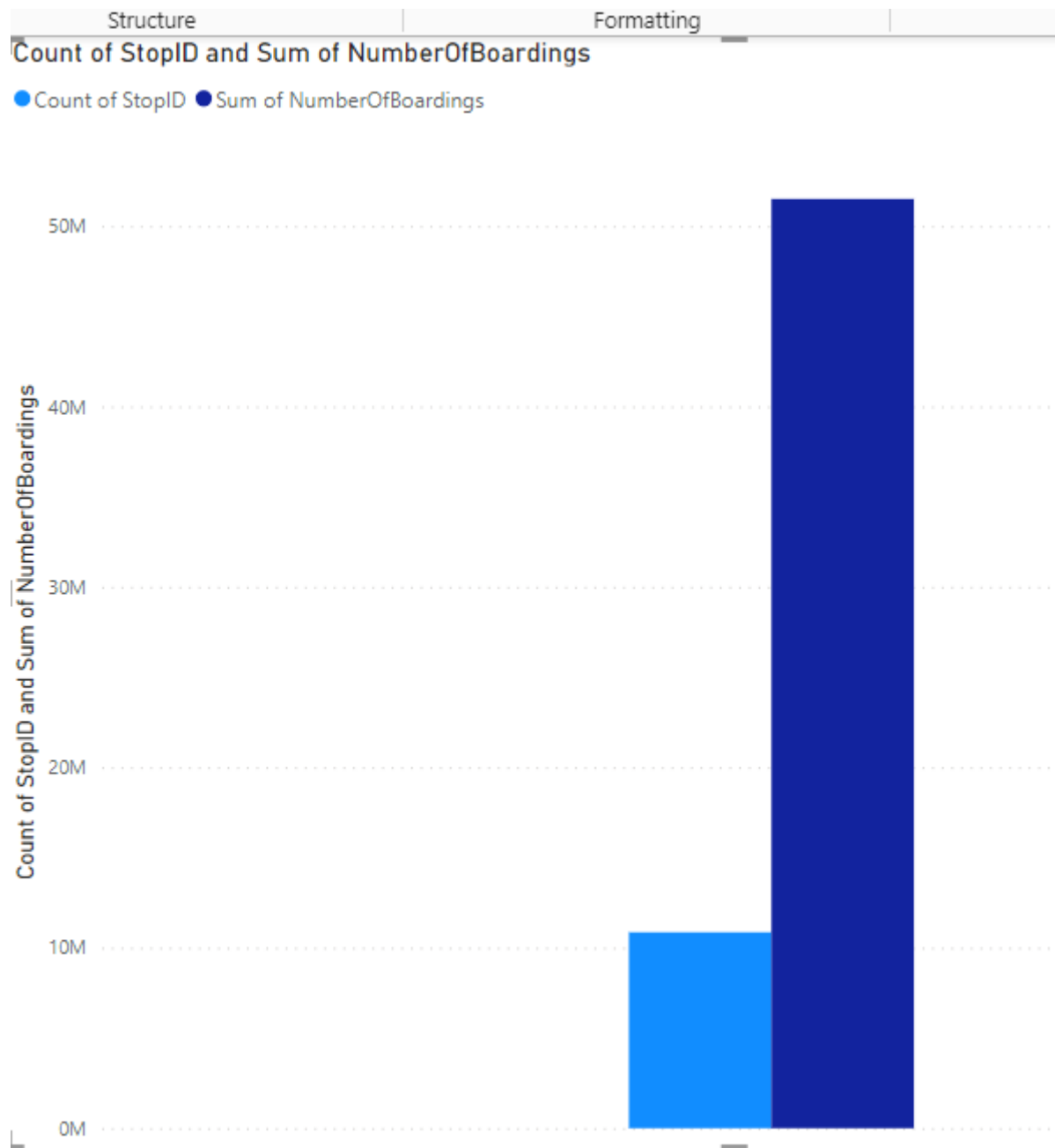


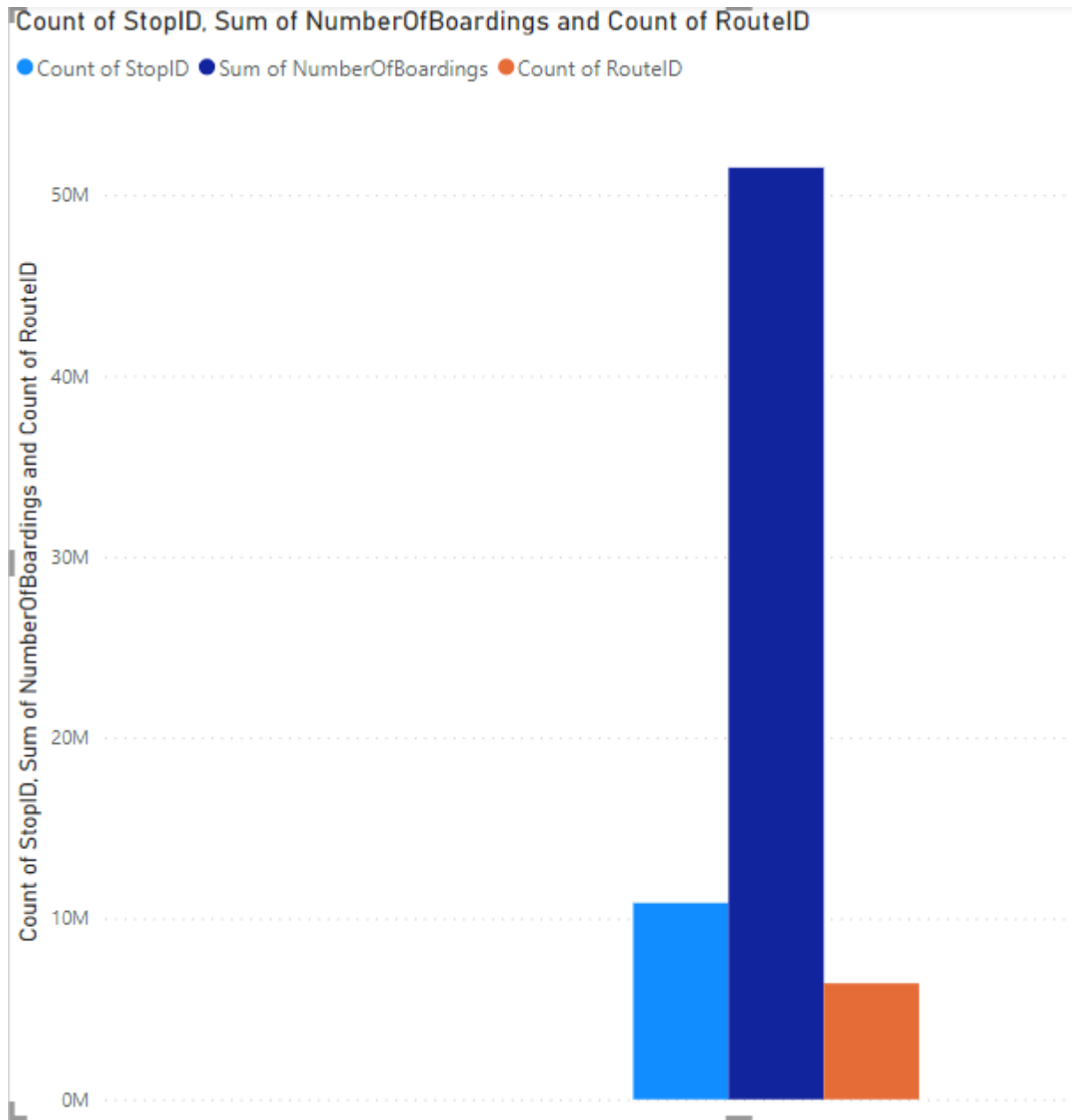
Count of RouteID and Count of StopID by StopName

● Count of RouteID ● Count of StopID









Reports for on-time performance in public transportation

Reports on on-time performance in public transportation are crucial for both transportation authorities and passengers. These reports help identify areas of improvement, enhance efficiency, and provide transparency to the public.

Methodology:

Describe the methods used to collect data, such as GPS tracking, ticketing systems, or passenger surveys.

Explain how on-time performance is defined (e.g., within a certain number of minutes of the scheduled arrival or departure time).

- On-Time Performance (OTP): Present OTP percentages for different modes of transport (buses, trains, trams, etc.) and specific routes or lines.
- Service Reliability: Include data on the consistency of service intervals.

- Dwell Time: Analyze the time buses or trains spend at stops.
- Peak Hour Performance: Highlight performance during peak travel times.
- Customer Satisfaction: Include passenger feedback related to punctuality and reliability.

Service efficiency metrics in public transportation

Service efficiency metrics in public transportation are vital for evaluating the effectiveness and productivity of transit systems. These metrics provide insights into the system's performance, helping authorities optimize operations, enhance passenger experience, and allocate resources effectively.

- On-Time Performance (OTP): The percentage of services arriving or departing within a defined window of the scheduled time. Often calculated as $(\text{Number of On-Time Services} / \text{Total Number of Services}) * 100\%$.
- Service Frequency: The number of services (buses, trains, etc.) operating on a specific route within a given period.
- Headway: The time interval between consecutive services on the same route. Shorter headways indicate higher frequency and potentially better service.
- Travel Time: The duration it takes for a vehicle to travel between two specific points. Variability in travel time can affect passenger convenience.
- Journey Reliability: The consistency in travel time. A reliable service ensures passengers can predict their travel time accurately.

Calculating service punctuality rates

Source code:

```
import pandas as PD

services['delay'] = services['actual_time'] - services['scheduled_time']
delay_threshold = 5

on_time_services = len(services[services['delay'] <=
delay_threshold])

total_services = len(services)

punctuality_rate = (on_time_services / total_services) * 100
print(f"Punctuality Rate: {punctuality_rate:.2f}%")
```

Sentiment analysis on passenger feedback in Python

Source Code:


```
from text blob import TextBlob

feedbacks = [
    "The service was excellent and the staff was very helpful.", "The
    bus was delayed and the staff was rude.",
    "I had a pleasant experience with the Bus.",

]
```

```
def analyze_sentiment(feedback):
    analysis = TextBlob(feedback)
```

```

if analysis.sentiment.polarity > 0:
    return "Positive"

elif analysis.sentiment.polarity <
    0: return "Negative"

else:
    return "Neutral"

```

for feedback in feedbacks:

```

    sentiment = analyze_sentiment(feedback)
    print(f"Feedback: '{feedback}'")
    print(f"Sentiment: {sentiment}")

print("-" * 30)

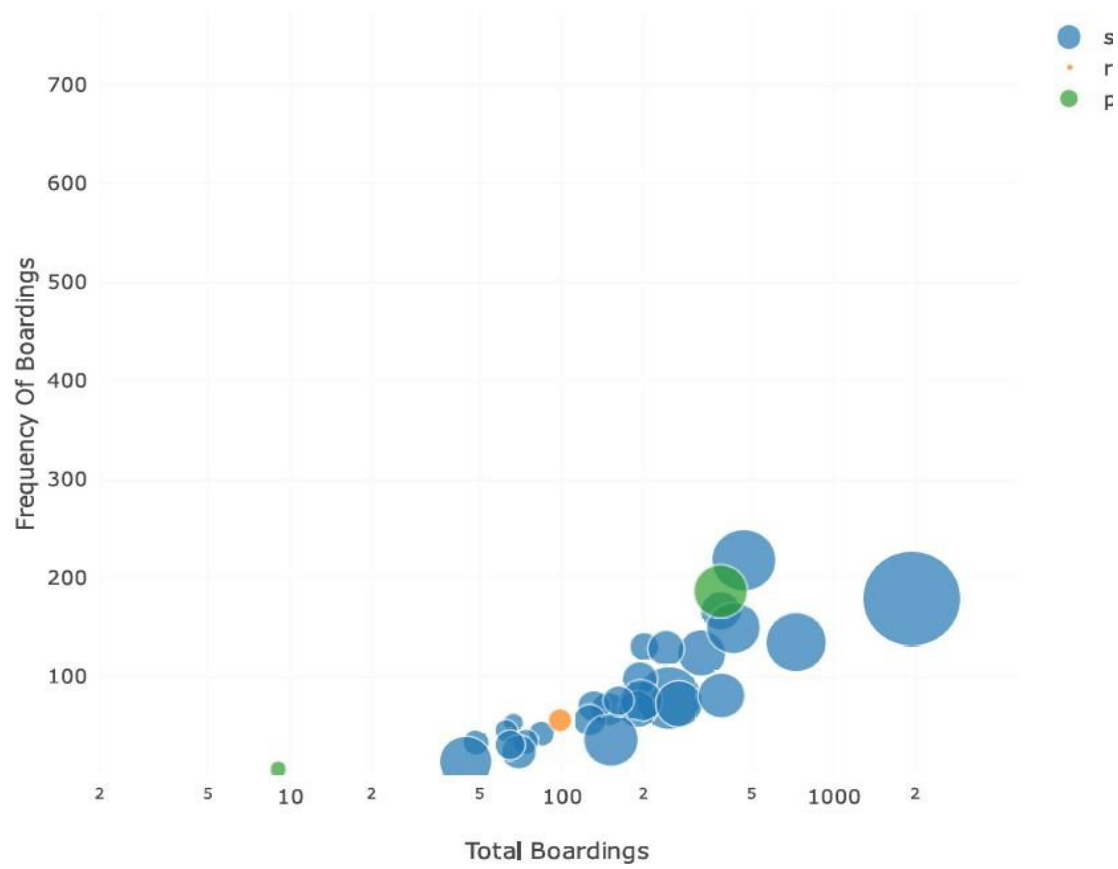
```

	TripID	RouteID	StopID	StopName	WeekBeginning	NumberOfBoardings	formatted_address	latitude	longitude
0	23631	100	14156	181 Cross Rd	2013-06-30	1	181 Cross Rd, Westbourne Park SA 5041, Australia	-34.966656	138.592148
1	23631	100	14144	177 Cross Rd	2013-06-30	1	177 Cross Rd, Westbourne Park SA 5041, Australia	-34.966607	138.592301
2	23632	100	14132	175 Cross Rd	2013-06-30	1	175 Cross Rd, Westbourne Park SA 5041, Australia	-34.966758	138.592715

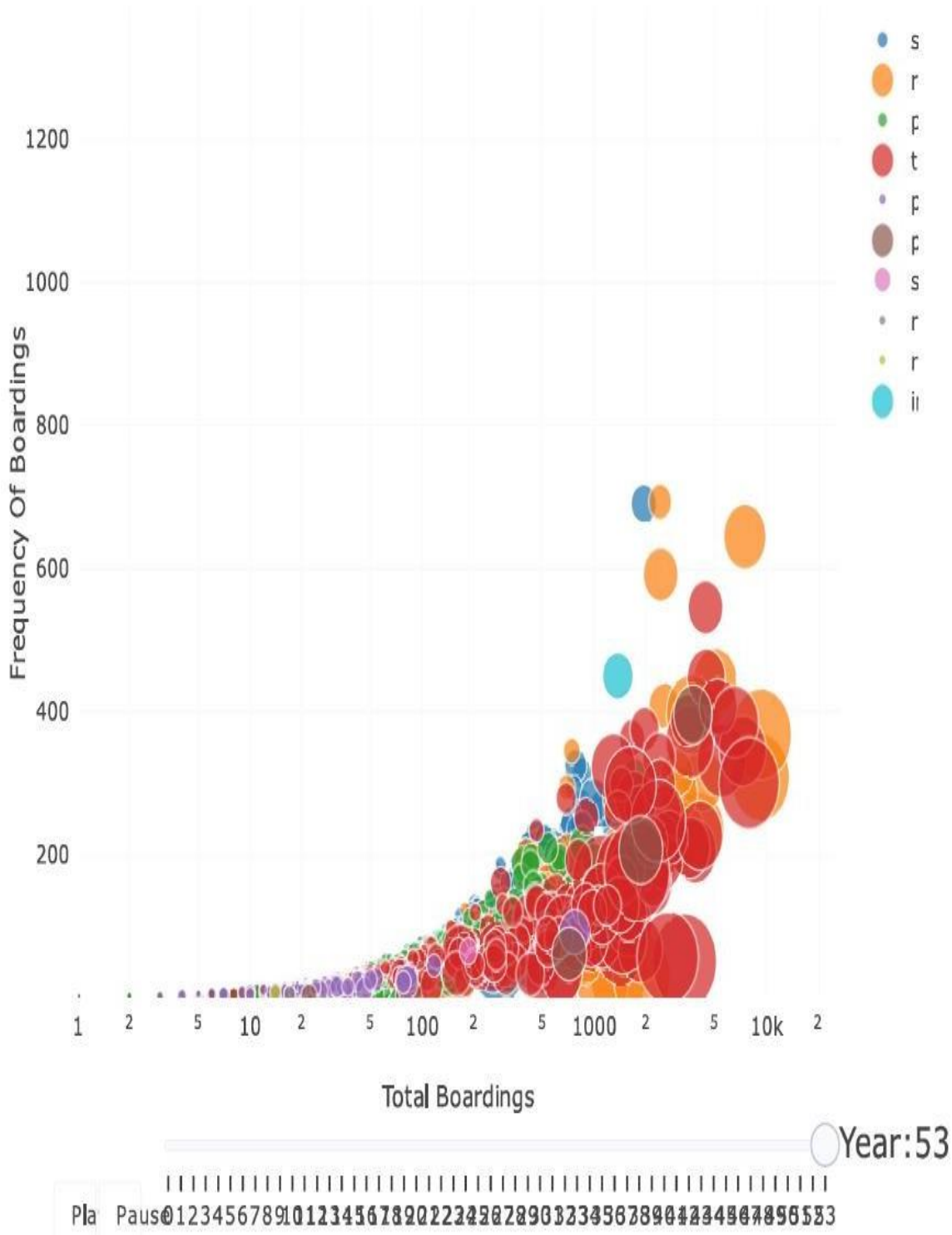
TripID
 RouteID
 StopID
 StopName
 WeekBeginning
 NumberOfBoardings
 formatted_address
 latitude
 longitude
 postcode 4
 type
 route_desc 21
 dist_from_centre
 holiday_label
 dtype: int64

	StopName	WeekBeginning	type	NumberOfBoardings_sum	NumberOfBoardings_count	NumberOfBoardings_max
0	1 Anzac Hwy	2013-06-30	street_address	1003	378	51
1	1 Anzac Hwy	2013-07-07	street_address	783	360	28
2	1 Anzac Hwy	2013-07-14	street_address	843	343	45
3	1 Anzac Hwy	2013-07-21	street_address	710	356	28
4	1 Anzac Hwy	2013-07-28	street_address	898	379	41

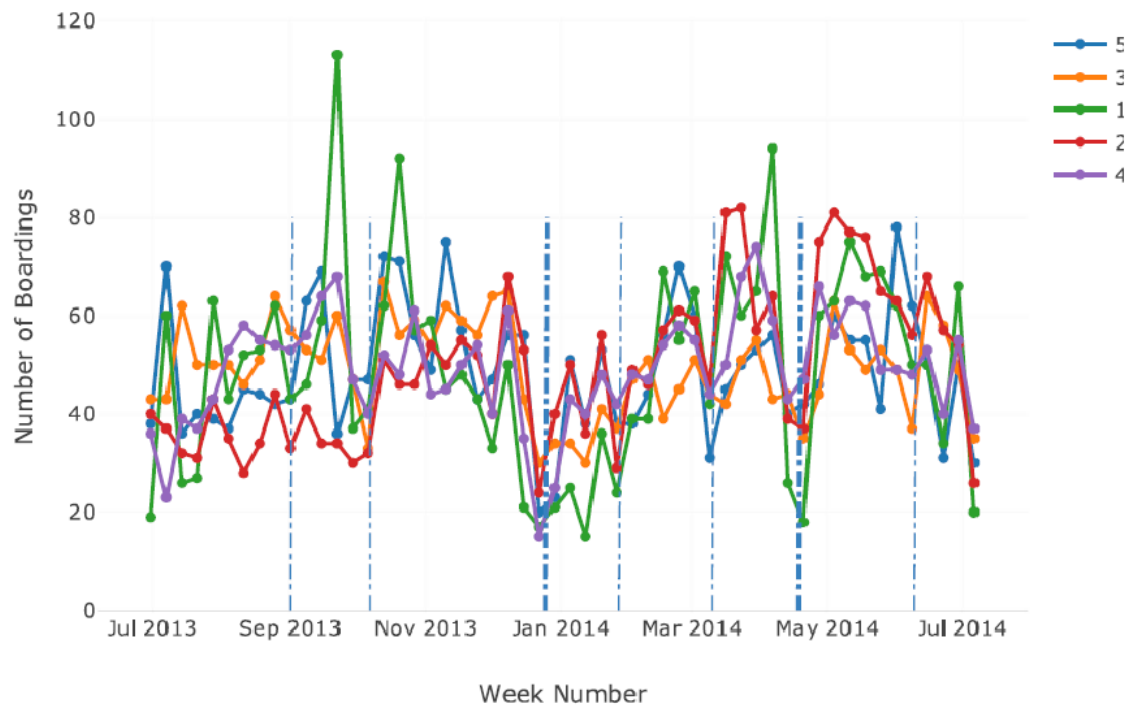
VISUALIZATION



Adelaide Weekly Bus Transport Summary 2D



Weekly Boarding Total



Weekly Boarding Total

