**A logo for college computing

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**Assessment Cover Page**

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I further confirm that this work has not previously been submitted for assessment by myself or someone else in CCT College Dublin or any other higher education institution.

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# Title**:**

CA3 - Fremont Bicycle Data Dashboard

# Introduction:

In this report, an exploratory data analysis (EDA) was performed using bicycle data from the “Fremont Bridge Bicycle Counter” dataset. From this, an interactive user-friendly dashboard was built in order to analysis & visualize some of the trends that were uncovered, with the aim being to inform stakeholders of bike usage patterns over a prolonged time period to help urban planners with decisions in relation to sustainable transport infrastructure.

The aim of this assignment is to reveal underlying patters that may influence hourly commuting behaviour, such as seasonality, weekdays vs weekend, and the direction of the flow of traffic over a prolonged time period. All of the insights were gathered from python generated plots post EDA, and a range of modifications were applied to better showcase the data via a dashboard, with the ability to filter for year, weekend/weekday, and direction of traffic flow completed. The dashboard aimed to be functionally robust, visually appealing and interpretable to a wide range of stakeholders to better provide data insights around bicycle infrastructure planning in the Fremont area.

The research identifies implementation issues, describes each visualisation choice, and makes recommendations for future development in order to address this challenge. Feedback from earlier tasks was given particular consideration, with particular emphasis on avoiding bullet points for justifications and making sure that every explanation was important.

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Figure 1: Interactive dashboard layout deployed via Voilà, showing traffic filters and chart arrangement.

# Exploratory Data Analysis (EDA):

The dataset was first loaded int a Jupyter notebook to gather insights into the shape, info & description. It was noted that there were 4 columns, which included the date/ time, journeys east, journeys west, and total journeys. To better make the data interpretable, it was decided to relabel the column names for interpretability, as seen in Figure 1.

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Figure 2: df loading & initial df exploring

The next step taken was to handle missing values. As can be seen in Figure 3, there were 100 rows which contained null values, and the df contained 111695 rows. It was decided that any row that contained a null value would be removed from the df as this accounts for less than .1% of the rows, so it would not skew the data. The df also only began records at the end of 2012, and the middle of 2025, but this data was decided to be kept. The time column was further separated by the day, week, & month, and further algorithms were performed to determine if a day was a weekend or not.

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Figure 3: null values in df

The initial insights revealed some interesting trends that were

* Seasonality – during the summer months (May – September) bicycle counts increased, while during winter months (Oct – Apr) bicycle counts decreased significantly.
* COVID – There was a sharp decline at the onset of the pandemic, and in the years following 2020, pre pandemic peaks as seen in 2019 have not yet materialized.
* 24 Hour Peaks – There was an influx in the total number of bicycles that used the bridge during peak times, which was 8am & 5pm, which indicates this is a primary route used by “9-5” / office workers.
* Directional Bias – There was more commuters using the East bound lane rather than the West bound lane, and this is continuous for every year.
* Weekday vs Weekend – Weekday usage was much higher than weekend usage in terms of total bicycles using the bridge. The weekend generally tended to be flatter, i.e. consistent usage over the day, with no real “peak” usage.

These insights provided the basis for selecting visualisation types and configuring interactivity to suit the end-user’s needs. Beyond just confirming expectations, the EDA also revealed year-over-year fluctuations that were not linear — post-pandemic recovery in 2022–2024 did not follow the same trajectory as the pre-pandemic growth. This can allude to behavioural shifts or the long-term effects of working remotely. Additionally, compared to weekdays, weekend traffic varied more, indicating that non-commute cycling was more susceptible to outside influences like the weather or events. Anomalies in hourly trends — such as unexpected midday peaks on certain weekends — also signalled possible one-off events or inconsistencies in counter operation. These nuances, while subtle, highlight the need for city planners to take a layered, flexible approach to interpreting cycling data.

# Dashboard Design and Visualisation Choices:

Section

A graph showing the growth of a number of vehicles

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A graph showing a number of bicycle traffic

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A graph of a number of blue bars

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A graph of a number of bicycles

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A graph of a graph showing the average number of bicycle traffic

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A graph of a number of people

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A graph of a graph

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A graph of blue bars

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A graph of a number of green bars

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A graph showing a number of rectangles

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# Interactivity and Functionality:

Section

# Interpretation and Justification:

Section

# Future Work:

Section

# Contribution and Reflection:

Section

# Appendix 1

GitHub Project Link