How to Reduce the Risk of Bike Theft and Actions to Take When Your Bike is Stolen
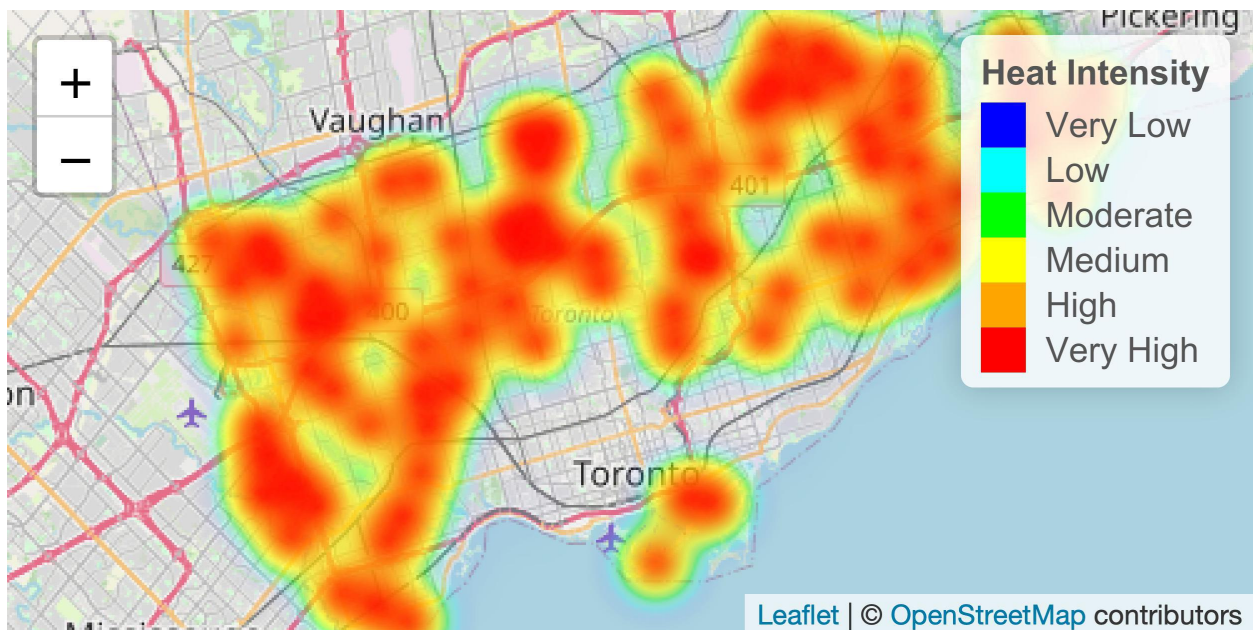
STA313 - Winter 2024

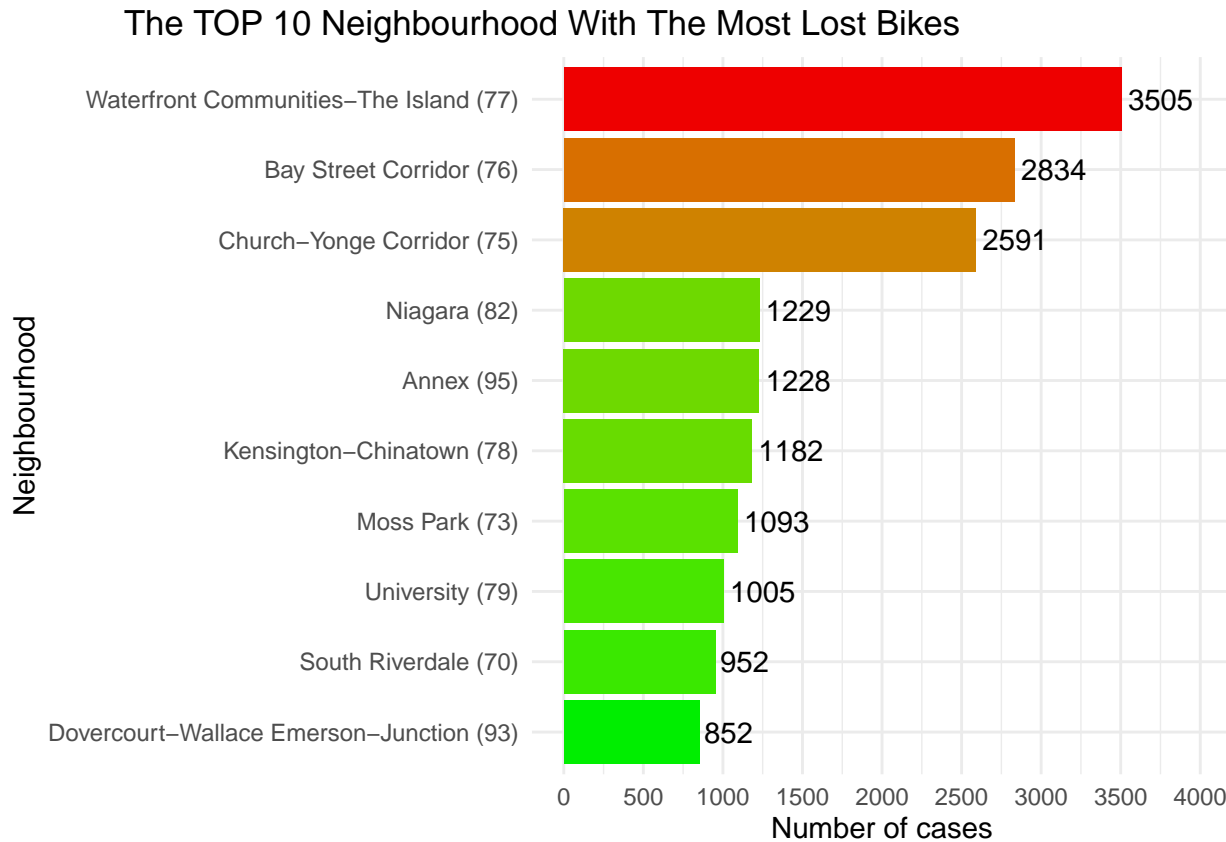Wei Ting Chen and Meixi Xiong

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Introduction

Bike-stolen has become a serious issue in Toronto. Every year, many people report to the Toronto Police Service that their bikes have been stolen. Bike thefts are causing threat to Toronto transportation system and will decrease people's interest for cycling. Also, increasing in people's worry for bike stolen will increase usage of private cars, which will causing more traffic and affect air quality consequently. Cycle Toronto Association would like to publish a data-driven article to provide the community with information regarding bicycle thefts in the city. In this way, people can make wiser personal decisions and have less risk of bike-stolen.
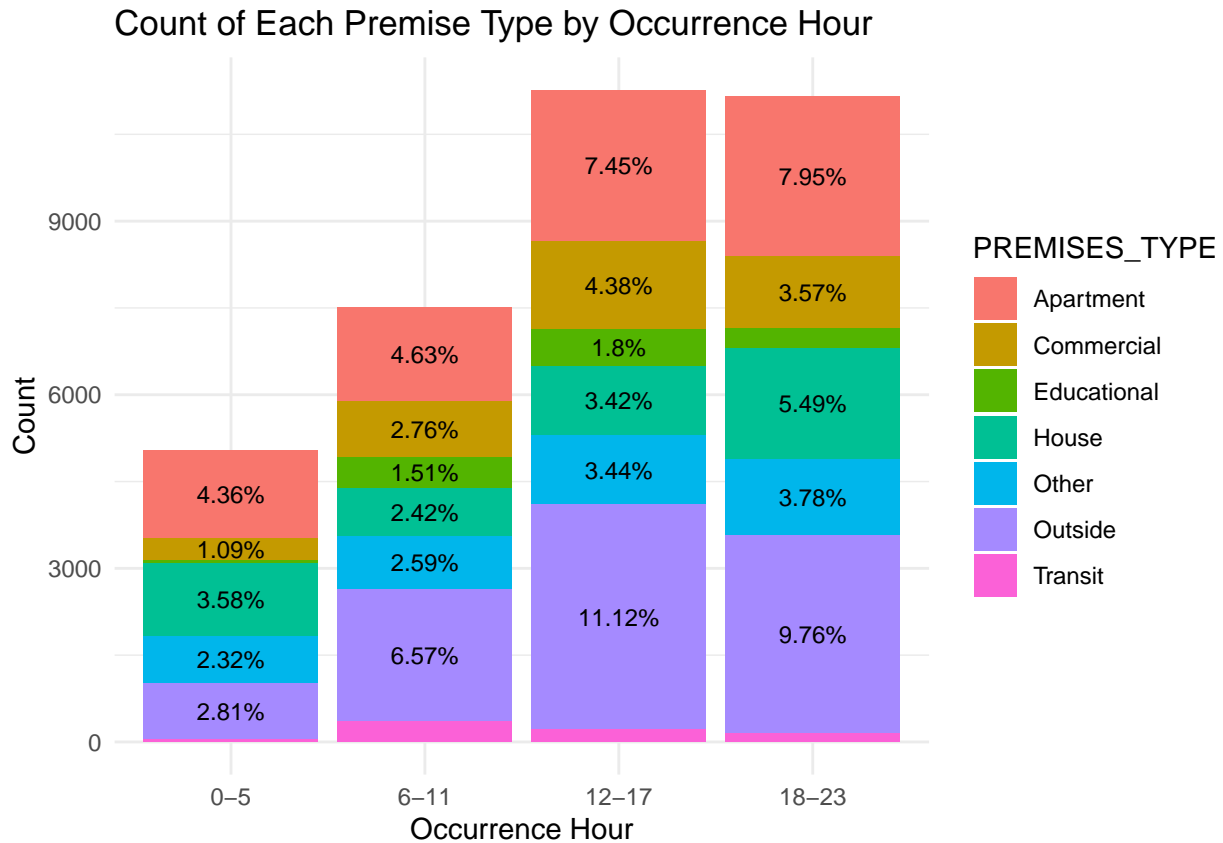
This report aims for using bike theft dataset to visualize bike theft situation in Toronto and generate strategic solutions for reducing the risk of bike stolen for people. From the dataset, we consider the location where bike thefts appear more frequently, including top 10 neighbourhood with the most lost bikes, cost range and bike type of the bike that are more likely stolen, premise type and occurrence hour that bike-stolen happens more often, and top 10 divisions with the most lost bikes where people can seek for help when their bikes are stolen.
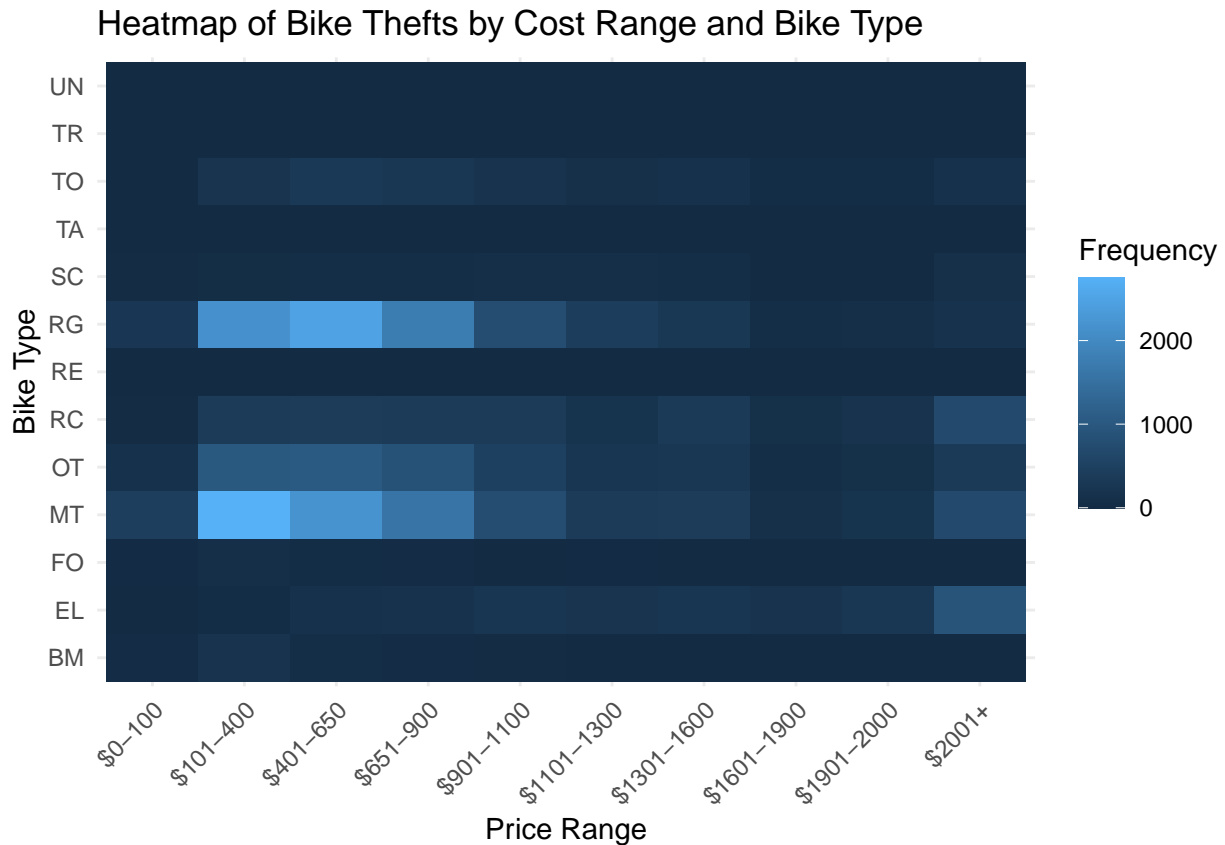
This graph visualizes bike-stolen frequency of different area, with heat intensity ranging from blue to red indicating frequency ranging from "Very Low" to "Very High". We can clearly see the area of "Very High" and "High" and those with "Medium" and "Moderate" frequency. People should pay close attention to their bikes when riding in those "Very High" and "High" area on the map and possibly avoid riding in those areas. We hope to discover the exact neighborhood with the most lost bikes. So, we visualized the graph below.

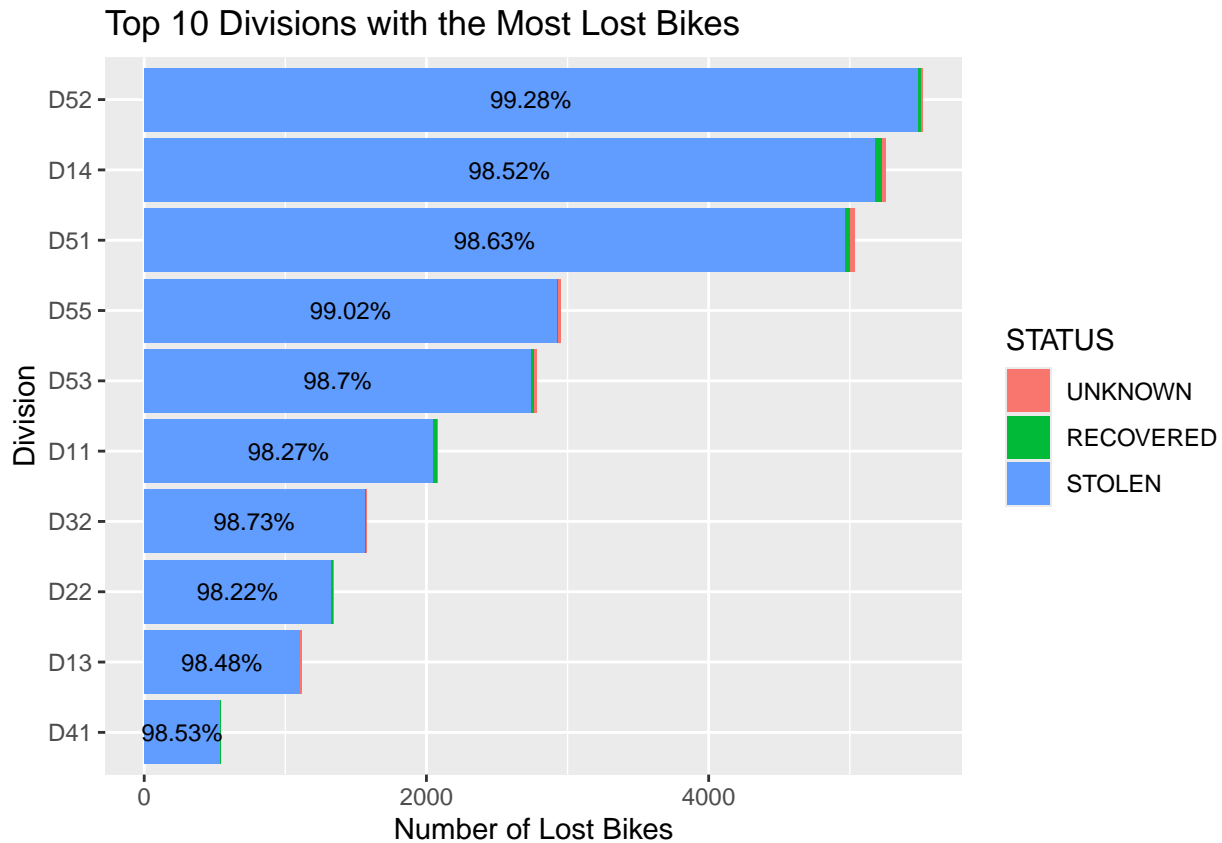## The TOP 10 Neighbourhood With The Most Lost Bikes

We discovered that the top 10 neighbourhood with the most lost bikes are Waterfront Communities – The Island, Bay Street Corridor, Church – Yonge Corridor, Niagara, Annex, Kensington – Chinatown, Moss Park, University, South Riverdale, and Dovercourt – Wallace Emerson – Junction. These areas are all quite crowded with lots of students, office workers, residents, and tourists. In particular, Waterfront Communities – The Island, Bay Street Corridor, Church – Yonge Corridor have the highest number of lost bikes, all of which have more than 2,000 cases. Also, these three neighbourhoods are all located in downtown. As a result, we advise people to avoid leaving their bikes unwatched and be careful with their bikes when riding in these crowded neighbourhoods to lower the risk of bike stolen.

Count of Each Premise Type by Occurrence Hour

We further investigate into the premise type and occurrence hour that bike-stolen happens more frequently. For occurrence hour, we conclude that 0-5 o'clock, bike-stolen happens least often, which has about 4,500 cases. It's likely because people are usually sleeping at that time including the bike thefts and there are less bikes accessible to bike thefts. Also, 12-17 o'clock and 18-23 o'clock are when bike-stolen happens most often, which has about 10,000 cases in each time range. It's likely because people are usually at work/school or back from work/school or doing other activities at that time and there are more bikes accessible to thefts. Also, for premise type, we discover that between 12-23 o'clock, that is when bike-stolen happens most often, most bike-stolen happens outside (about 10%) and in apartments (about 8%). House, commercial, and other are the next 3 most likely premise type where bike-stolen happens. This discovery aligns with that people are usually outside for work/school/other activities (for example, shopping) or back to home at that time. And apartments are usually busier and more crowded at that time with more people coming and going, which increases the potential for bike stolen. The visual channel used is identity channel, color hue, which helps distinct the different premise categories.

Heatmap of Bike Thefts by Cost Range and Bike Type

Then, we investigate into the bike type and price range that have most stolen bikes by generating a heatmap. It is visualized that lighter color represents higher frequency while darker color represents lower frequency. We discover from the graph that bike type: RG (REGULAR) and MT (MOUNTAIN) and price range $101-900 have relatively higher frequency of being stolen. In particular, bike type: RG(REGULAR) and price range: $401-650 as well as bike type: MT(MOUTAIN) and price range: $101-400 have highest frequency of being stolen. We suggest people avoid buying these two types of bikes especially bike type: RG(REGULAR) and price range: $401-650 and bike type: MT(MOUNTAIN) and price range: $101-400 to have less risk of losing bikes. The visual encoding used here is saturation, highlighting the magnitude of frequency, which is a quantitative variable.

Top 10 Divisions with the Most Lost Bikes

Finally, we discovered that the top 10 divisions with the most lost bikes are: D52, D14, D51, D55, D53, D11, D32, D22, D13, D41. In particular, D52, D14, D51 have the top3 highest lost bikes, all of which have more than 5,000 cases. People who have lost their bikes are advised to reach out these 10 divisions for help. However, all above divisions have more than 98% of lost bikes stolen and the proportions of lost bikes being recovered are all very small. So, it is highly likely that divisions fail to find a stolen bike. The annotation here aids the visual interpretation and assessment of the values these bars represent; it is a type of popout.

Conclusion

In conclusion, bike-stolen most likely happens in Waterfront Communities – The Island, Bay Street Corridor, Church – Yonge Corridor, Niagara, Annex, Kensington – Chinatown, Moss Park, University, South Riverdale, and Dovercourt – Wallace Emerson – Junction (especially Waterfront Communities – The Island, Bay Street Corridor, Church – Yonge Corridor), between 12-23 o'clock, and at outside or in apartment. People should be more careful when riding in these areas especially between 12 – 23 o'clock. Also, bikes that have bike type: RG(REGULAR) and price range: $401-650 and bike type: MT(MOUTAIN) and price range: $101-400 are most likely to be stolen. People should avoid buying these kinds of bikes. Besides, people who have lost their bikes are suggested to visit D52, D14, D51, D55, D53, D11, D32, D22, D13, D41 (especially D52, D14, D51) for help but it is very likely that a lost bike cannot be recovered.

Some limitations: our data analysis is based on the bike stolen cases that were reported to divisions. There might be a lot of bike stolen cases that weren't reported to divisions and weren't included in the given dataset. For example, people who have lost bikes may find it difficult to get to a nearby division and fail to report their bike loss. Therefore, there might bias in our data analysis.