Tutorial - Week 6*

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1 Task

Using R Markdown, please create a graph using ggplot2 (Wickham 2016) and a map using ggmap (David Kahle 2019) and add explanatory text to accompany both. Be sure to include cross-references and captions, etc. This should take one to two pages for each of them.

Then, for the graph, please reflect on (Vanderplas, Cook, and Hofmann 2020) and add a few paragraphs about the different options that you considered that the graph more effective. (If you've not now got at least two pages about your graph you've likely written too little.)

And finally, for the map, please reflect on the following quote from Heather Krause: 'maps only show people who aren't invisible to the makers' as well as Chapter 3 from ("On Rational, Scientific, Objective Viewpoints from Mythical, Imaginary, Impossible Standpoints" 2020) and add a few paragraphs related to this. (Again, if you've not now got at least two pages about your map you've likely written too little.)

2 Data

To look at Toronto's Fire Services emergency incident's, I utilized the Fire Services Emergency Incident Basic Detail dataset (*Fire Services Emergency Incident Basic Detail* 2021) from the Toronto Open Data portal (Gelfand 2020) using R statistical computing software (R Core Team 2020). For this tutorial, I am only using the columns `Initial.CAD.Event.Call.Type`, `LONGITUDE` , and `LATITUDE` from the raw data. Using these columns, I constructed (Figure 1) & (Figure 2) using `ggplot` (Wickham 2016) & `ggmap` (David Kahle 2019).

2.1 Graph

The graph (Figure 1) was created using ggplot2 library. The graph (Figure 1) shows the Toronto Fire Services emergency incident calls arranged in a decending order. We can see that most call type of call is `Medical`, followed by `Emergency Fire`. Meanwhile, `Non Emergency` & `CBRN & Hazardous Materials` are less common. This makes sense as a residents of Toronto, we rarely ever hear about Hazardous Materials causing issues, and Non-Emergency calls are a waste of resources.

2.2 Reflection on the Graph

After reading Vanderplas, Cook, and Hofmann (2020), I think the aesthetics can significantly affect how different graphs are read for same data. The graph in (Figure 1) has no colour and is a bar graph. With the help of some colour, I could have included additional information such as source of the call to give more insights on this graph. Furthermore, different types of plots could have given different visual information to the readers.

I will be looking at these cognitive principles when making graphs in future:

- Proximity

*Code and data are available at: https://github.com/isfandyar/STA304-Tutorial-week-6

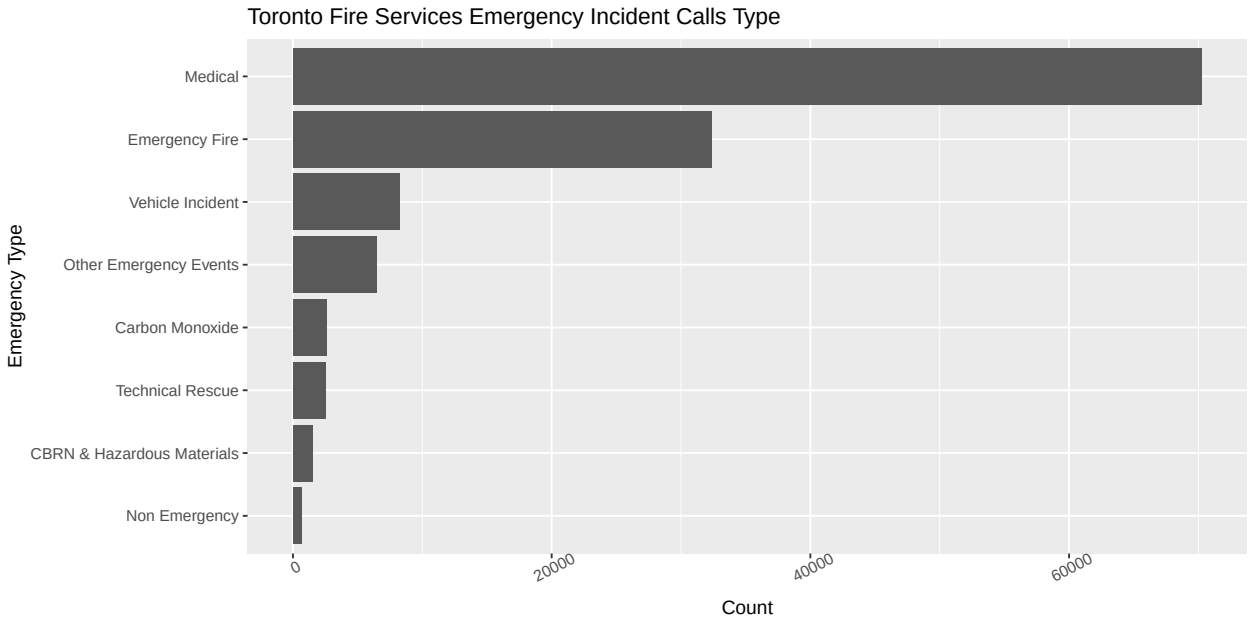

Figure 1: Toronto Fire Services Emergency Incident Calls Type Count)

- Similarity
- Common Region
- Common fate
- Working Memory
- Change blindness
- Ease of Comparisons

Cognitive principles are useful because good graphics take advantage of the human visual system's ability to process large amounts of visual information with relatively little effort

Further, I will be using colours and will be faceting plots to make better graphs with more information for the readers.

2.3 Map

This Map (Figure 2) was created using ggmap library. In this map (Figure 2) we can visualize the (Figure 1) graph in a map. However, over half the incidents had no `longitude` & `latitude` values. Hence, they were not included in this figure. Visually it seems like `Emergency Fire` is the dominant emergency call for the Fire Services. However, based on (Figure 1) we know that `Emergency Fire` is the second most common call.

2.4 Reflection on the Map

The quote 'maps only show people who aren't invisible to the makers' from Heather Krause is very accurate to the Figure 2. Since we didn't have the `longitudes` & `latitudes` of over half the emergency event's, they weren't included in this map. This made it so that Emergency fire seems like the most common type of emergency event the Fire Services respond to. However, in reality the most common is Medical, which is not included in this map at all.

Not all objective viewpoints are being considered. Such as this map doesn't showcase how fire services have an impact on priority neighbourhoods. It is also hard to see which neighbourhoods have higher emergency calls for Fire Services.

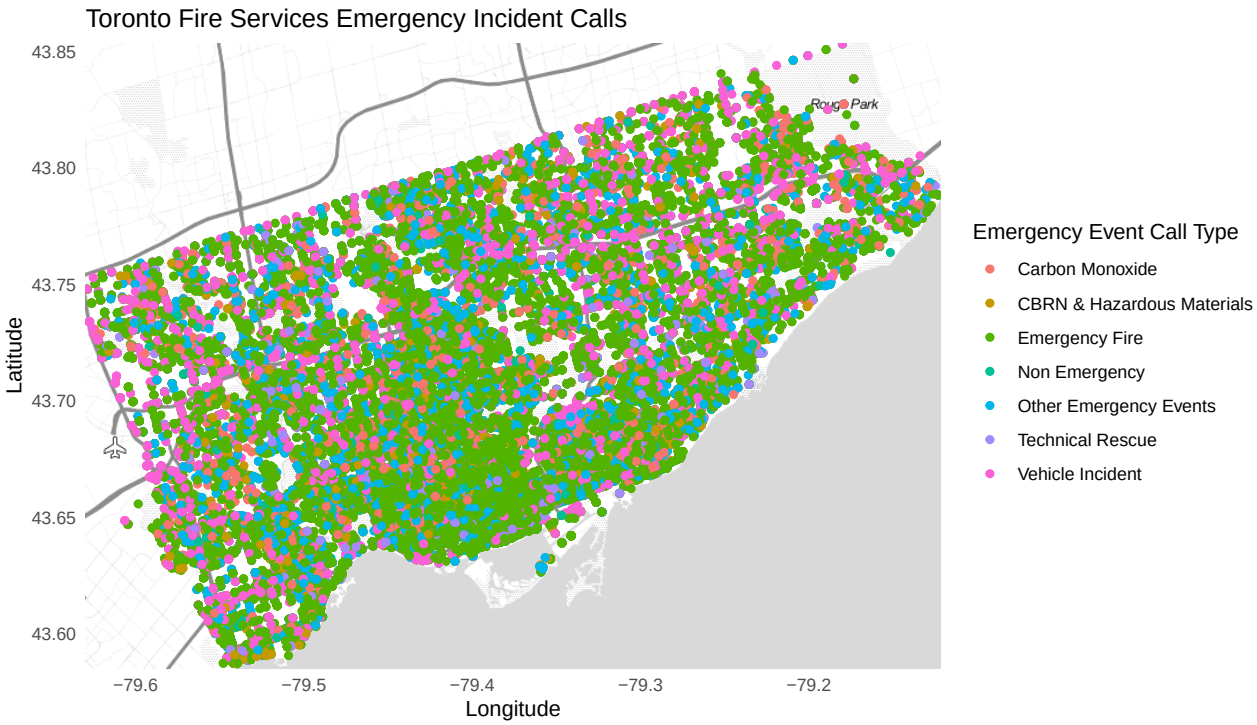

Figure 2: Toronto Fire Services Emergency Incident Calls

References

David Kahle, Scott Jackson, Hadley Wickham. 2019. *Ggmap: Spatial Visualization with Ggplot2*. https://cran.r-project.org/web/packages/ggmap/ggmap.pdf.

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Wickham, Hadley. 2016. *Ggplot2: Elegant Graphics for Data Analysis*. Springer-Verlag New York. https://ggplot2.tidyverse.org.