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CPLN5030: Modeling Geographical Objects

Mini Project Two – 30-Day Map Challenge

12/05/2024

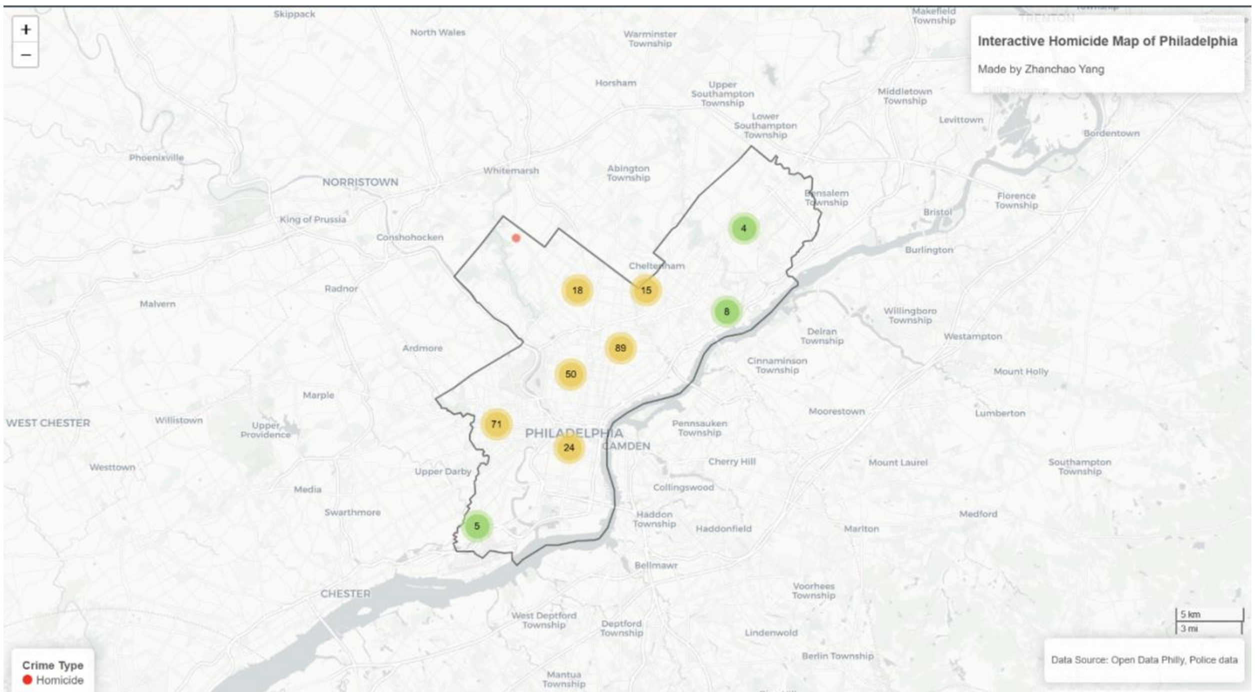
Section 1: Point, Line, and Polygon Map

Day 1 Point Map

Map: The map is a web interactive map. The following graph is just a screenshot.

Link: https://zyang91.github.io/Homicide_map/ (Hosted on GitHub)

Screenshot:



Write up:

The interactive map visualizes homicide incidents in Philadelphia in 2023, highlighting their spatial distribution across neighborhoods using a dynamic, color-coded clustering system. It allows users to zoom into specific neighborhoods and click on individual incidents to view detailed pop-up information. As users zoom in, the clustered data dynamically separates into individual points, each representing a specific homicide incident, providing a more granular view of the spatial distribution. The data sources for the map were from OpenDataPhilly, Crime Incidents mastersheet from 2023. The data contains all types of crimes reported by the Philadelphia police department. The data was filtered using R and tidyverse packages to include only homicide-related crimes. Then, the filtered data was visualized through the **leaflet (R)** package. The completed map was exported as an HTML file and hosted on a GitHub page for public access. The map was inspired by my undergraduate advisor, geographer Dr. Chengbin Deng. During the 2020 COVID-19 outbreak, he created an interactive web map of food pantries across upstate New York to help individuals in need locate nearby accessible food sources. It was my first exposure to web mapping and GIS. I realized the importance of these tools in supporting local communities. This experience ultimately inspired me to pursue an undergraduate degree in geography and GIS.

Reference:

Crime incidents. OpenDataPhilly. (2023). https://opendataphilly.org/datasets/crime-incidents/

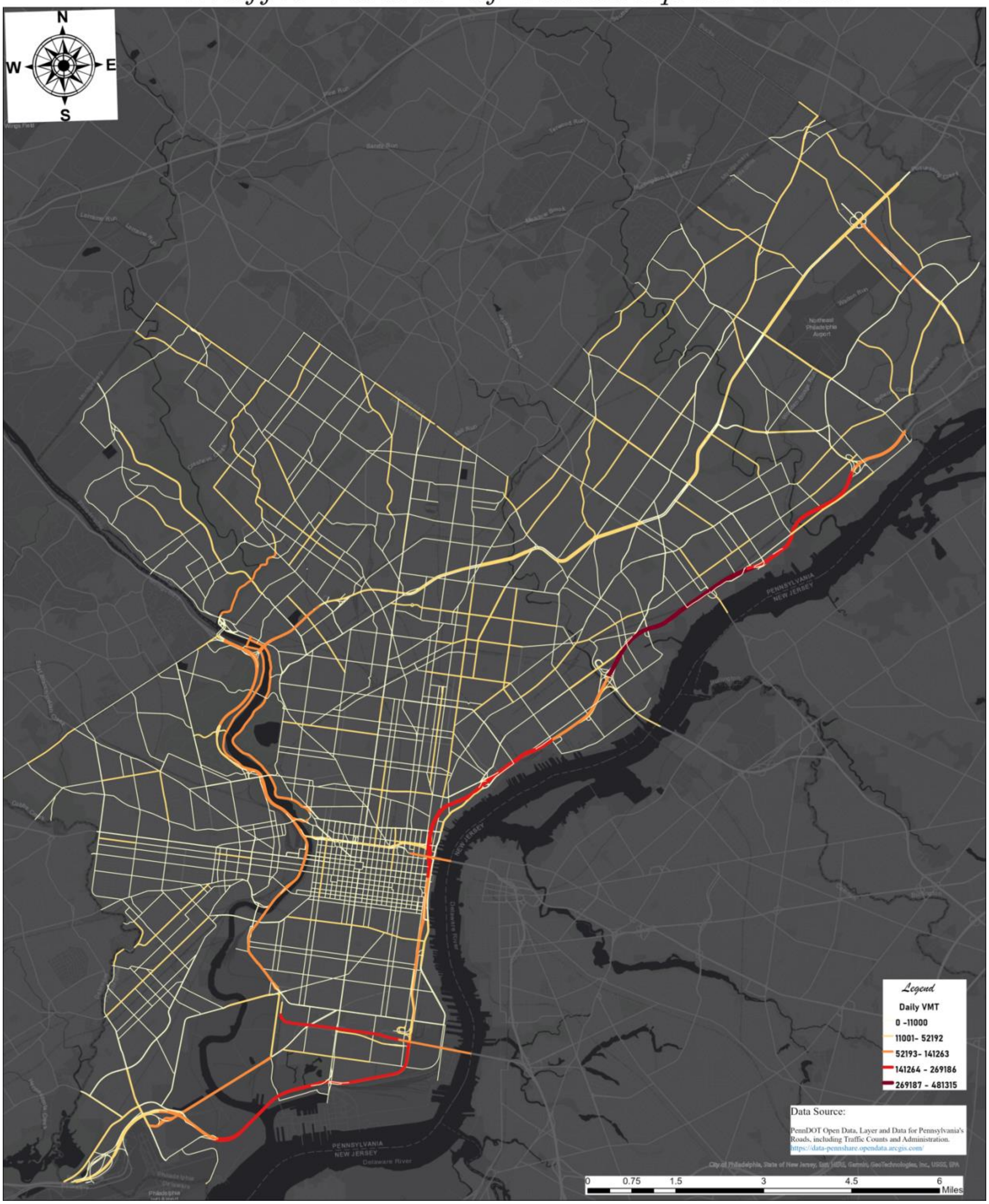
City Limits. OpenDataPhilly. https://opendataphilly.org/datasets/city-limits/

Day 2 Line Map

Map: (See zip file for better view)

Busy Roads

Traffic Volume of Philadelphia Roads



Write up:

The Busy Road—Traffic Volume of Philadelphia Map visualizes the traffic volume across major roads in Philadelphia, measured by the Daily Vehicle Miles Traveled (VMT). Understanding traffic patterns and road usage is critical for urban planning. Transportation optimization and future infrastructure development. The map was created using traffic count data from the PennDOT Open Data Portal. The software used to generate this map was ArcGIS Pro. The workflow involves first clipped transportation data only within the Philadelphia City Boundary. The data was then categorized and visualized based on Daily VMT. The roads were symbolized with a color-coded gradient and widened outline to indicate varying traffic volume levels. The use of dark base maps and contrasting road colors ensures the visualization effectively communicates complex information while remaining accessible to a broad audience.

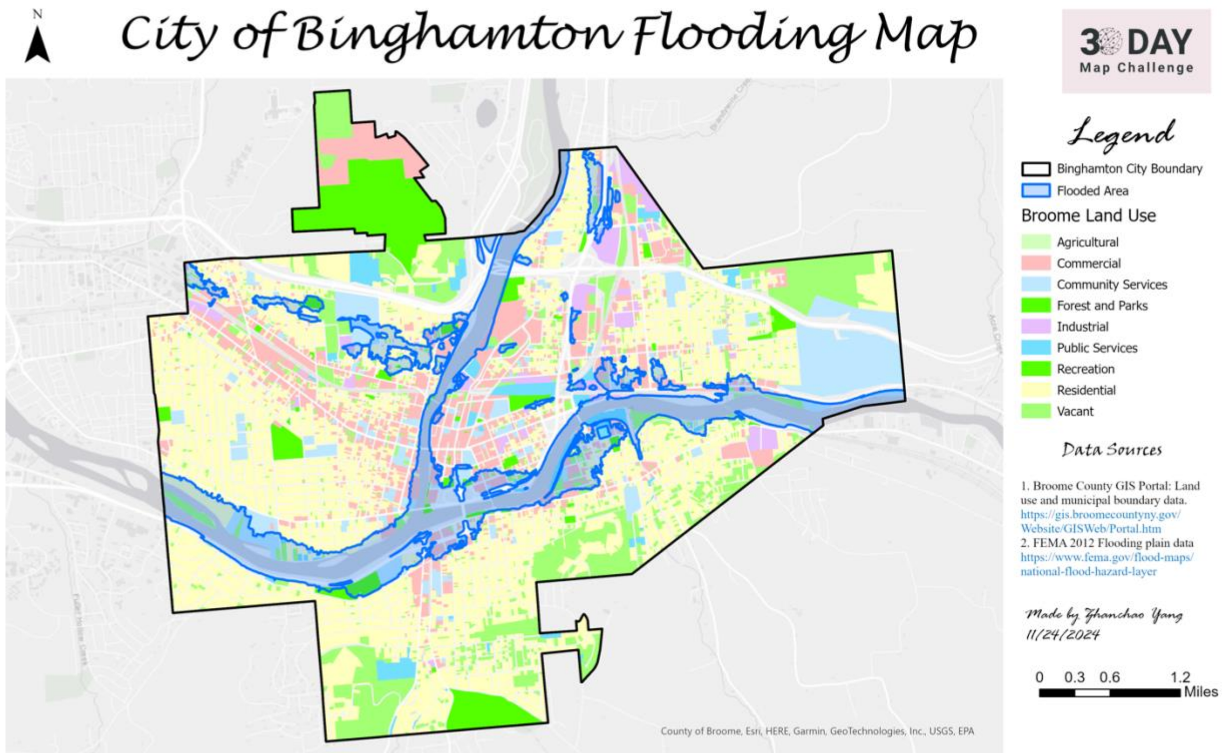
Reference:

PennDOT open data. PennShare. (2024). https://data-pennshare.opendata.arcgis.com/

City Limits. OpenDataPhilly. https://opendataphilly.org/datasets/city-limits/

Day 3 Polygon Map

Map: (Formal submission available in zip file), Just showcase purpose



Write up:

The **City of Binghamton Flooding Map** illustrates flood-prone areas within the city by overlaying FEMA-designated floodplain data with reclassified land use categories. The map highlights areas particularly vulnerable to 100-year flooding events. Floods in Binghamton were always caused by heavy rainfall that overwhelmed the Susquehanna River and its tributaries, resulting in widespread property damage and the displacement of many residents. The blue polygons on the map emphasize areas directly impacted by flooding, based on data derived from FEMA's 2012 post-flooding survey. Identifying vulnerable floodplain land use for targeted floodplain management and strategic planning is essential.

The data sources for this map are from the Broome County GIS Portal for land use and municipal boundaries, as well as FEMA's 2012 post-flooding survey data processed by Binghamton University's GIS and Remote Sensing Core Facility, where I interned. The dataset was clipped to include only the Binghamton city boundary, and land use codes were reclassified from complex code to an easy-to-understand catalog. The floodplain layer was then overlaid onto the land use data to identify affected areas. This map is inspired by my first cartography professor, Lucis Willis. It is designed with a traditional cartographic layout to honor the techniques and principles I learned during my undergraduate studies.

Reference:

Broome County GIS Portal. (2024). https://gis.broomecountyny.gov/Website/GISWeb/Portal.htm

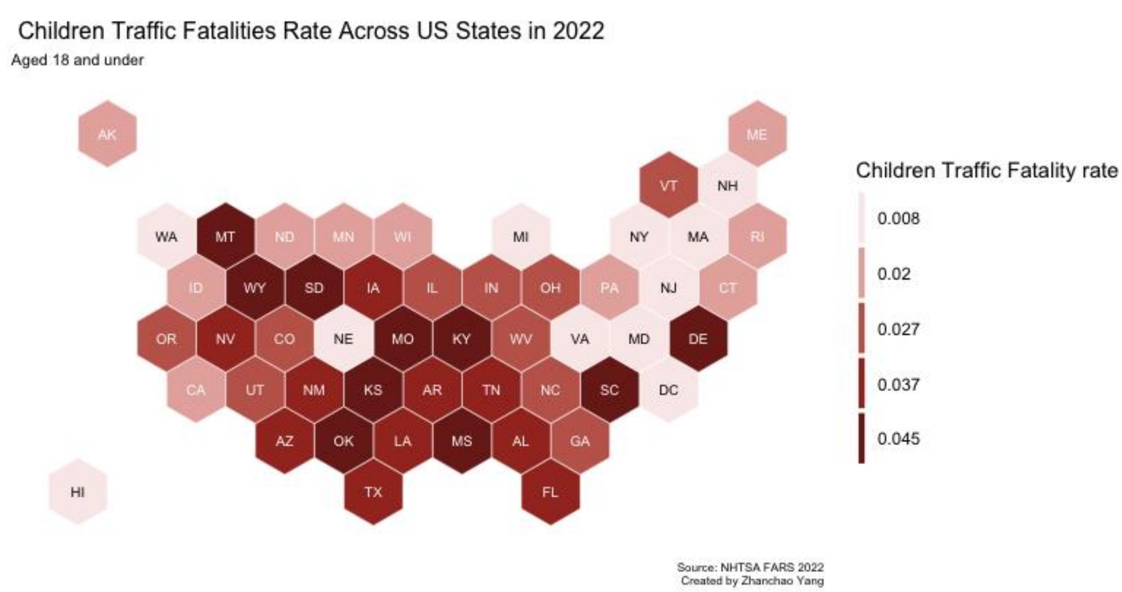
Binghamton University GIS and Remote Sensing Core Facility. https://www.binghamton.edu/geography/gis/index.html

Section 2: Two self-chosen from the 30-day map challenge

Day 6 Haxagons:

Map:

Map1:



Map 2 :

Write-up:

Map 1, Children's Traffic Fatalities Rates Across the United States in 2022 Hexagon Map, visualizes the rate of traffic fatalities among children in all states. States with higher rates are shown in darker colors, while lighter shades represent lower rates.

Throughout the semester, I worked as a research assistant for Prof. Erick Guerra. My task was to gather data on youth traffic fatalities in the United States over the past ten years. One day, I wondered why I hadn't plotted the data into a hexagon map. The first map is based on the Fatality Analysis Reporting System (FARS) data and the five-year American Community Survey (ACS) results for 2022. Since my tasks for Erick's project consist of 10 years of data, I processed all raw FARS datasets into a DuckDB database. Then, I use the SQL DuckDB query to quickly filter the data I need (fatality individuals and age under 18). Since the FARS datasets don't have FIPS code, I used the tidyverse dplyr packages to create an FIPS code column to join those with population data from ACS quickly. After that, I used the tidy-census package to pull out the 2022 population under 18 by state and joined the data into the FARS table. Lastly, by using dplyr, I got the children's fatality by state. I plotted the data through the ggplot packages to create map 1.

Map 2 compares children's fatalities over the last decades. I apply the fatality count to the map rather than the fatality rate, which I will work on later. I was inspired by the Tableau tutorial, which I used to work on, but not the same way in coding. (code available on GitHub at the beginning)

Reference:

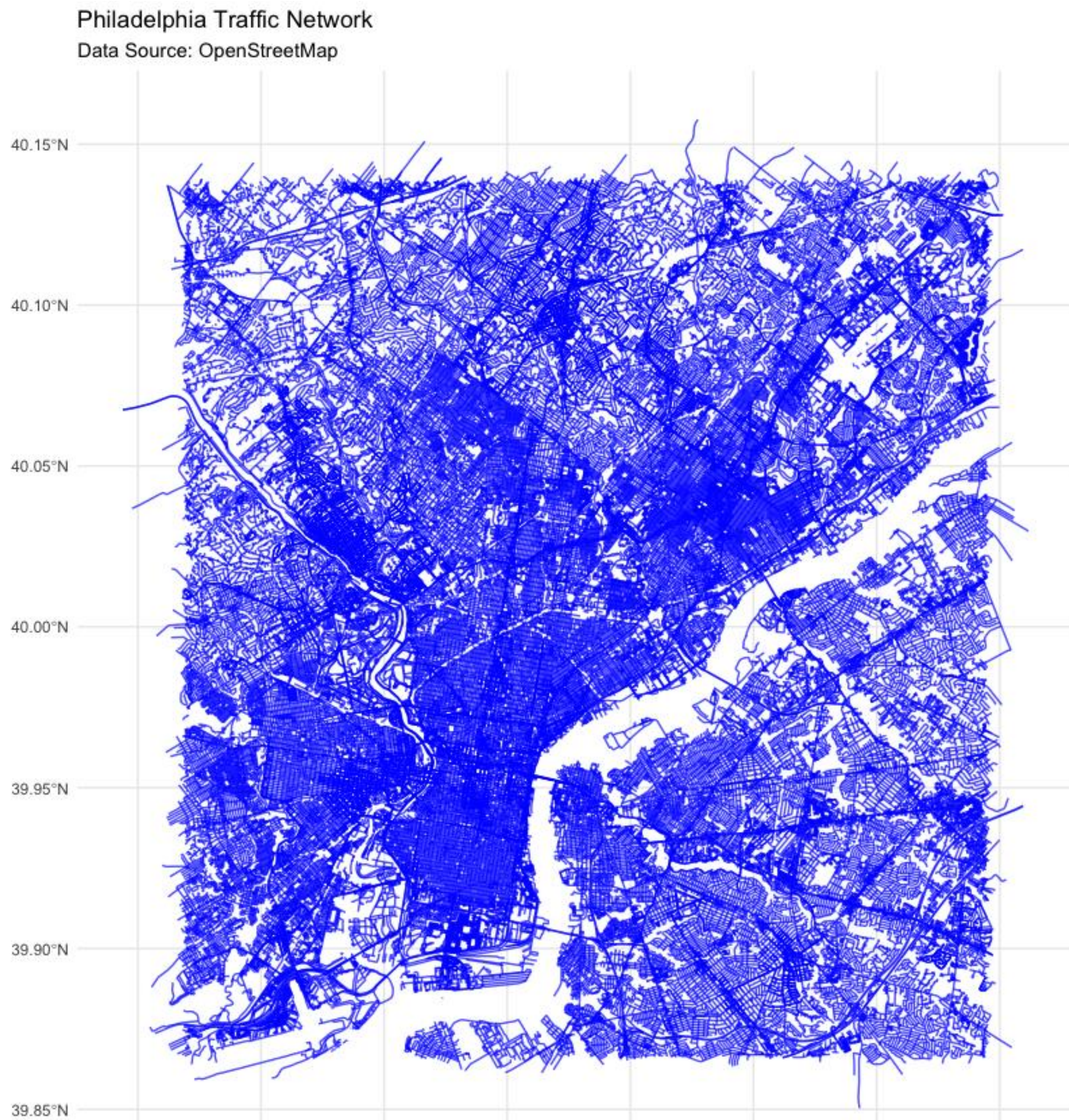
Comprehensive R Archive Network (CRAN). (2024, October 17). *Load US census boundary and attribute data as "tidyverse" and 'sf'-ready data frames [R package tidycensus version 1.6.7]*. The Comprehensive R Archive Network. https://cloud.r-project.org/web/packages/tidycensus/index.html

Fatality Analysis Reporting System (FARS). NHTSA. (2024). https://www.nhtsa.gov/research-data/fatality-analysis-reporting-system-fars

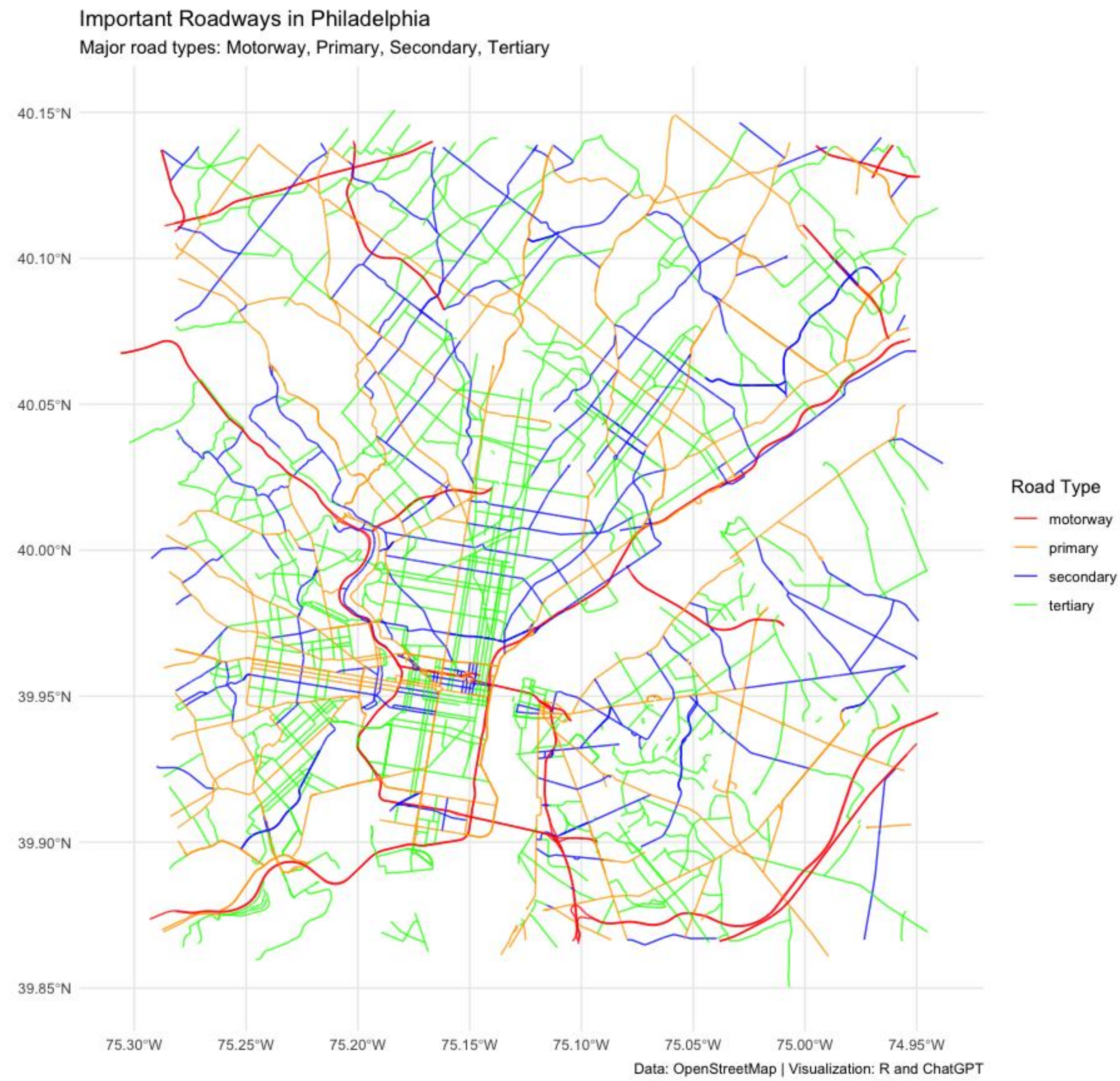
Day 9 AI:

Map: (All those two maps below were generated entirely by AI; pretty bad map)

Phase 1:



Phase 2:



Write up:

AI is prevalent in our daily lives. I am interested in letting AI generate R code and run it. The process began with the prompt: "Please generate a random code in R for mapping about Philadelphia" to ChatGPT. The data source AI utilized was the OpenStreetMap API, which provided comprehensive road data for the area.

The AI-generated script queried the OpenStreetMap API for all road data within the city's boundaries, which the code defined as “bonds.” The data was then plotted on a map (Map 1) using ggplot. While the result showcased a detailed map of Philadelphia’s road networks, the map lacked clarity— the visualization provided limited practical insights.

To refine the analysis, a second prompt focused on “roads categorized by road type, creating a cleaner and more symbolic map” (Map 2). This iteration improved readability but was still messy, with unhelpful gridlines and a bad color scheme that made road identification difficult.

Through this process, I concluded that while AI effectively generates syntactically correct code, it falls short in producing cartographically meaningful outputs. The experiment underscores the indispensable role of GIS professionals and cartographers in analyzing and presenting real-world data. Nevertheless, AI demonstrates potential as a supportive tool for error shooting and code improvement.

Refence:

ChatGPT 4-O,ChatGPT O1-preview, https://chatgpt.com/

Note: All coding map code is available through my 30-day Map Challenge GitHub repo:

https://github.com/zyang91/2024_30day_map_chanllenge