Lab0 Report

Title: Buffering of high-frequency highways Network

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Project Repository: https://github.com/saliha887/Lab0
Google Drive Link:
Time Spent: 10 hrs.

Abstract

Transit services available in the Metropolitan area of the Twin Cities at high frequency (every fifteen minutes or better) were analyzed using three different techniques to buffer the High-Frequency network. The tools involved in Buffering were ArcGIS-Pro, Jupyter Notebooks in ArcGIS Pro, and Jupyter Notebooks in ArcGIS Online. Transit service data were analyzed from 6:00 AM to 7:00 PM on weekdays, and 9:00 AM to 6:00 PM on Saturdays. Results revealed that all of Route 63, METRO A Line, C Line, D Line, Blue Line, Green Line, and Orange Line, while parts of Route 2, 3, 6, 10, 11, 18, 21, 54, 64 provide High-Frequency service in Metropolitan area of the Twin Cities. Moreover, results show that all tools involved in the data analysis produced similar results.

Problem Statement

How can high-frequency transit services operate every 15 minutes in the Metropolitan area of the Twin Cities be accurately identified and analyzed using different buffering techniques in ArcGIS-Pro, Jupyter Notebooks in ArcGIS Pro, and Jupyter Notebooks in ArcGIS Online?

#		Requirement	Defined As	(Spatial) Data	Attribute Data	Dataset	Preparation
1		Road network	Raw input dataset from MNDOT	Road geometry	No	Mn Geospatial Commons	No

Input Data

The *Minnesota Roads* data from the Minnesota Department of Transportation (MNDOT), serves as a raw input for a variety of analysis in GIS tools. Specifically, this dataset was used to assess transportation networks in three different environments: ArcGIS Pro, Jupyter Notebooks in ArcGIS Pro, and Jupyter Notebooks in ArcGIS Online. The dataset includes comprehensive information about Minnesota's road infrastructure, facilitating detailed analyses of routing and transit patterns. Mn Geospatial Commons enables us to plan and provide an essential foundation for studies on road networks and their accessibility.

Table 2.

#	Title	Purpose in Analysis	Link to Source
1	Minnesota Roads	Raw input dataset for routing analysis from MNDOT by using three different tools such as ArcGIS-Pro, Jupyter Notebooks in ArcGIS Pro, and Jupyter Notebooks in ArcGIS Online.	Mn GeoSpatial Commons

Methods

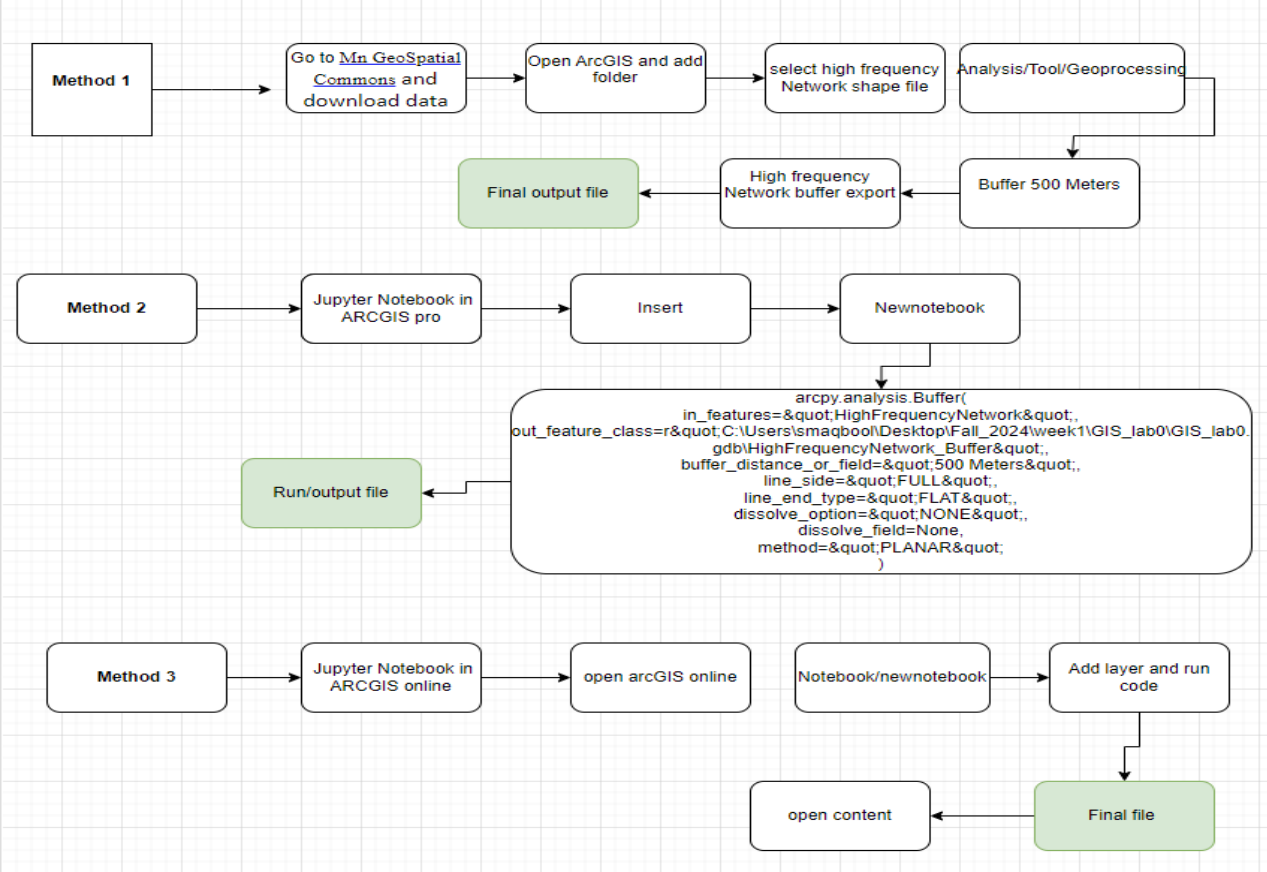

Figure 1. Data flow diagram

First, download the data, select the shapefile in ArcGIS Pro, perform a buffer analysis, and export the result using ArcGIS Pro.
Second, open Jupyter Notebook on ArcGIS Pro write the code, and run.
Third, open Jupyter Notebook in ArcGIS online add layer run code and get the final file.

Results

High-frequency Transit services in the Twin Cities Metropolitan area are presented in Fig. 1. These services included about sixteen routes. Some routes were observed partially present in the study area, while others were observed fully in the domain. Routes 2, 3, 6, 10, 11, 18, 21, 54, and 64 were partially present in the study area, and had relatively less frequency, while Route 63,

METRO A Line, C Line, D Line, Blue Line, Green Line, and Orange Line were within the study area and had high frequency. Similar results were observed when data were analyzed using different tools.

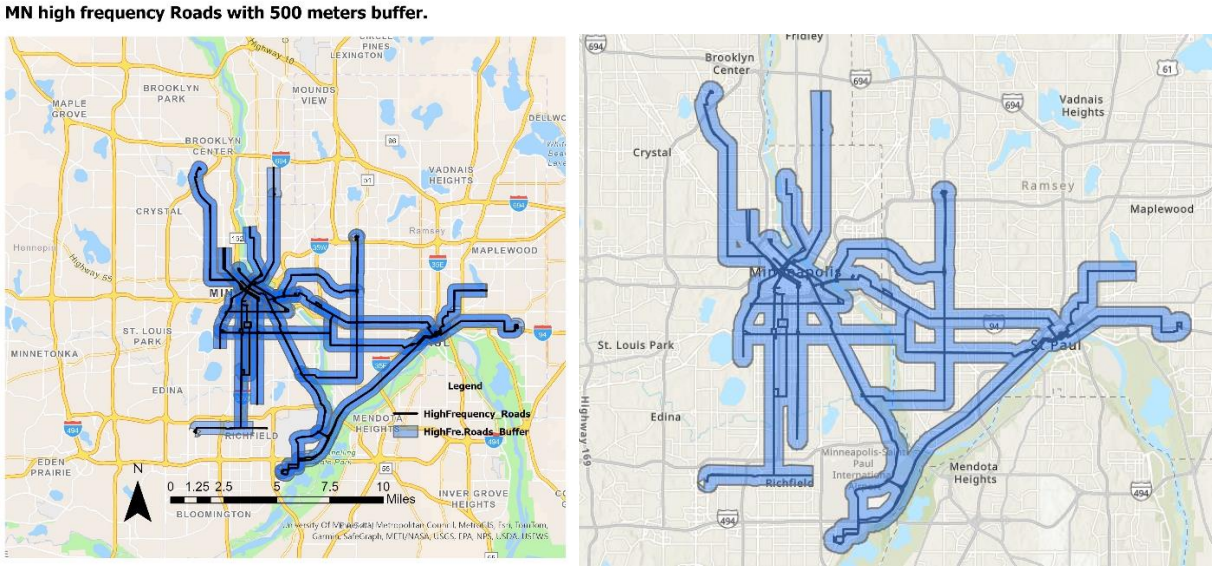

Fig.1. High-frequency network in Metropolitan Area analyzed using ArcGIS-Pro (left) and ArcGIS-online (right)

Results Verification

To check the correctness of high-frequency transit analysis results qualitative methods are applied here. First, the visualizations generated from each tool (ArcGIS Pro, Jupyter Notebooks in ArcGIS Pro, Jupyter Notebooks in ArcGIS Online) look similar. All tools show the same spatial layout, extent, and characteristics of the high-frequency transit network. Secondly, do a manual comparison of the buffered routes by overlaying each map on a base map.

Discussion and Conclusion

Three different tools were applied to analyze the data of High-Frequency Transit services in the Twin Cities Metropolitan area. All three methods produced similar results. It is concluded that either of these three methods can be used for analyzing such data.

GitHub: It's a new tool for me. I heard about it for the first time and got interested in learning more about its function etc. but it's a little bit confusing especially pull requests and code.

References

https://gisdata.mn.gov/dataset?q=road+network

Self-score

Category	Description	Points Possible	Score
Structural Elements	All elements of a lab report are included **(2 points each)**: Title, Notice: Dr. Bryan Runck, Author, Project Repository, Date, Abstract, Problem Statement, Input Data w/ tables, Methods w/ Data,	28	**28**

	Flow Diagrams, Results, Results Verification, Discussion and Conclusion, References in common format, Self-score		
Clarity of Content	Each element above is executed at a professional level so that someone can understand the goal, data, methods, results, and their validity and implications in a 5 minute reading at a cursory-level, and in a 30 minute meeting at a deep level **(12 points)**. There is a clear connection from data to results to discussion and conclusion **(12 points)**.	24	**24**
Reproducibility	Results are completely reproducible by someone with basic GIS training. There is no ambiguity in data flow or rationale for data operations. Every step is documented and justified.	28	**28**
Verification	Results are correct in that they have been verified in comparison to some standard. The standard is clearly stated **(10 points)**, the method of comparison is clearly stated **(5 points)**, and the result of verification is clearly stated **(5 points)**.	20	**20**
		100	**100**