

Spatiotemporal Data Mining of Micromobility Data in Minneapolis, MN

GEOG 5543: Advanced Geocomputing

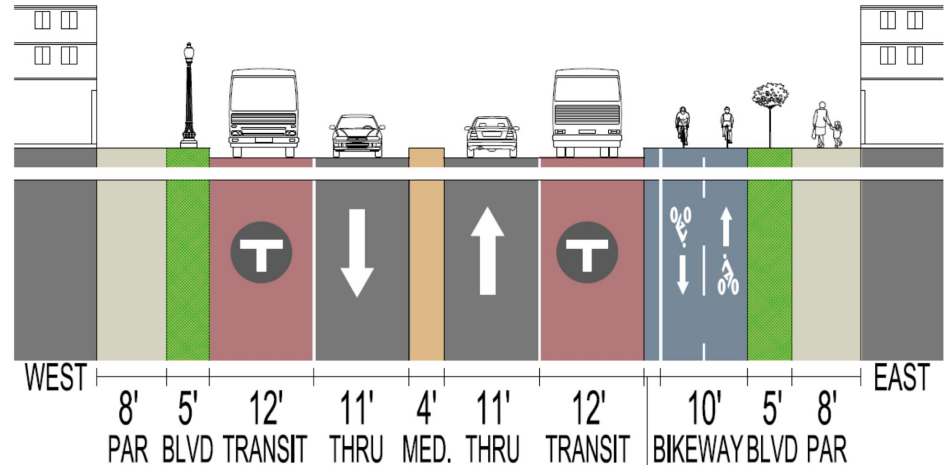
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Problem

- Recent increase in “greener” methods of transportation as a way to combat climate change
- Micromobility (eg., scooters, bikes, etc.) have been common solution
- What are the implications of this on transportation and traffic planning?

Recommended Design: Base Section



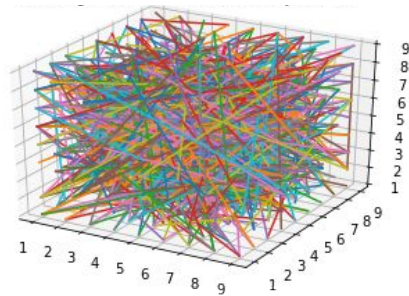
"Hennepin South Summary of Recommended Design" (City of Minneapolis, 2022)

Solution

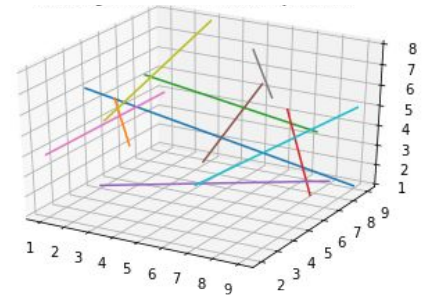
- Use STDM and visualization techniques to understand users' travel patterns and behaviors, to best plan for future of the program and mitigate against potential safety hazards
- Focus on making the data useable through ETL processes, before focusing on data mining (DBSCAN), and then how to best communicate the results

StartTime	EndTime	StartCenterlineID	StartCenterlineType	EndCenterlineID
6/1/2019, 4:30 AM	6/1/2019, 5:00 AM	21934.00	street	17420.00
6/1/2019, 4:30 AM	6/1/2019, 5:00 AM	11403.00	street	16720.00
6/1/2019, 4:30 AM	6/1/2019, 4:30 AM	16913.00	street	16909.00
6/1/2019, 4:30 AM	6/1/2019, 5:00 AM	18754.00	street	17112.00
6/1/2019, 5:00 AM	6/1/2019, 5:00 AM	15149.00	street	25281.00

ETL

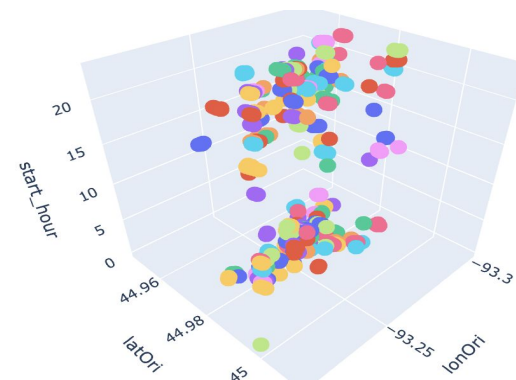
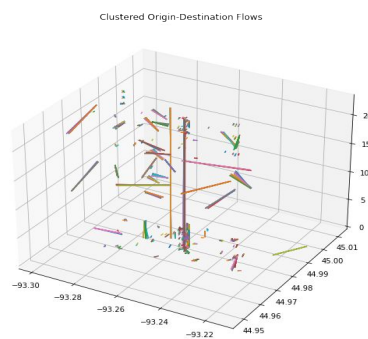
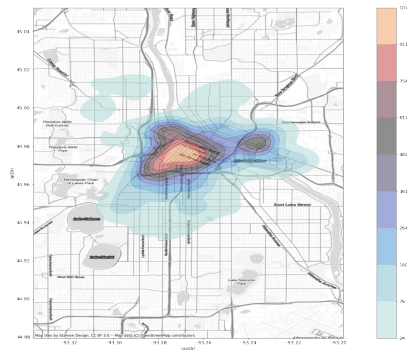
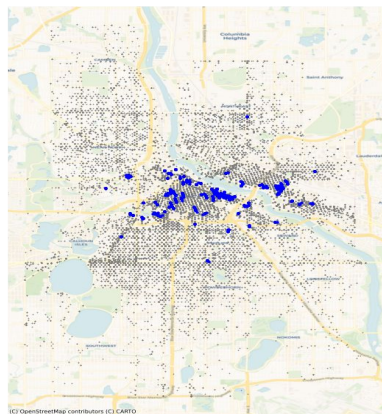


STDM



Results

- Temporal factors are crucial in examining traffic patterns, but the additional dimension makes it difficult to visualize



Images (L to R): Static map of clusters with no temporal filter, KDE of origins at 12:00pm, 3D Plot of clustered O-D flows over time, interactive 3D plot of origin clusters over time

Conclusion & Future Work

- Overall, results are still useful but plenty of room for improvement in both analytical methods and visualization techniques
- Future Visualization Techniques
 - Extending Plotly to use both geospatial & 3D data simultaneously
 - Integration with Uber's H3
 - Animated flow maps or vector fields
 - More in-depth work with Seaborn/Matplotlib to fix existing issues
- Future Analytical Methods
 - scikit-mobility, MovingPandas, & TransBigData
 - deck.gl & kepler.gl
 - VASA & DynamoVis