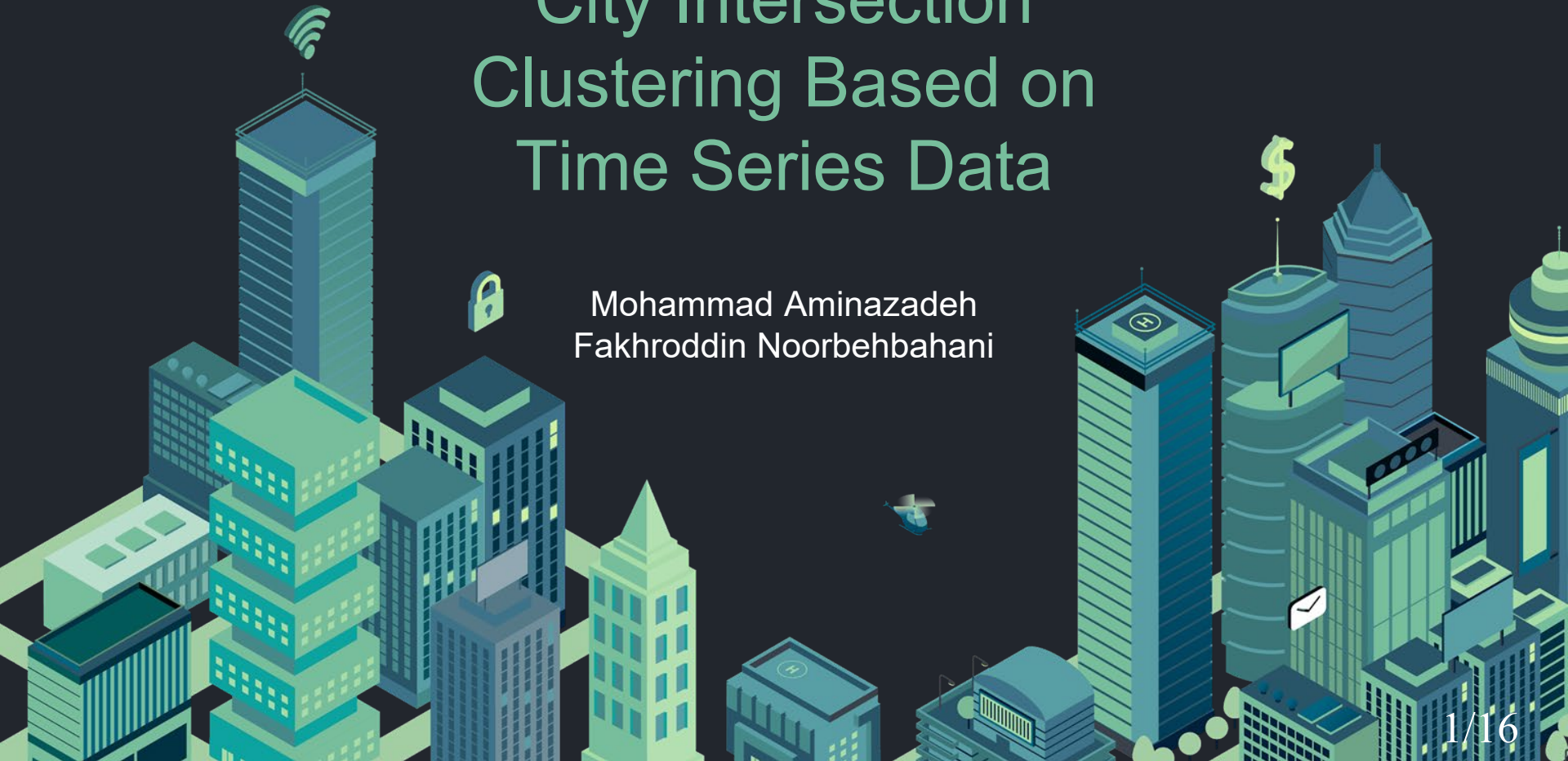
City Intersection Clustering Based on Time Series Data

Mohammad Aminazadeh
Fakhroddin Noorbehbahani



Introduction
data source

71 INTERSECTIONS

Introduction
Intersections distribution

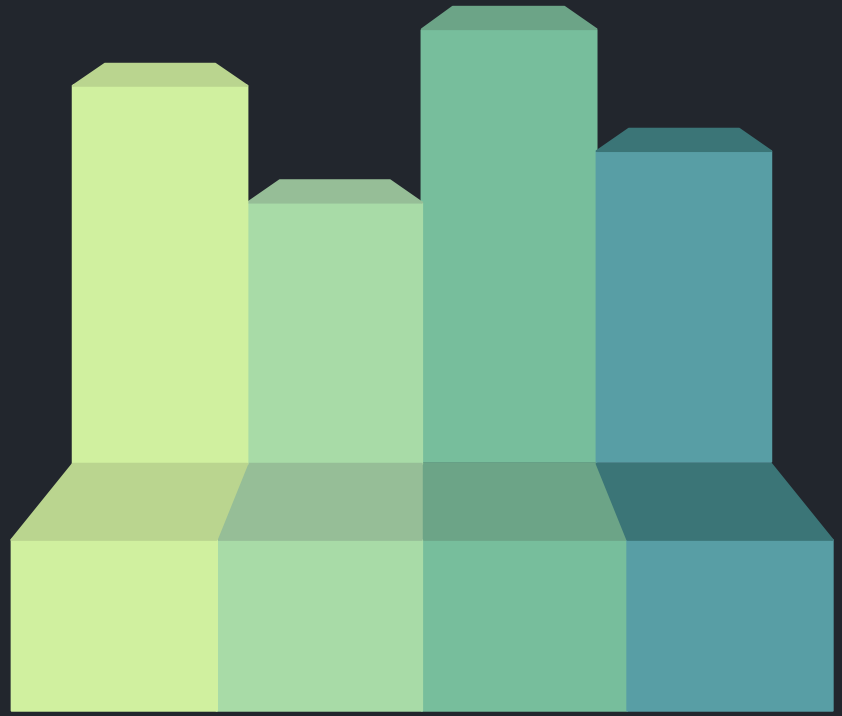
Introduction
data Volume

37 Months of Data in Text Files From October 2018 to November 2021

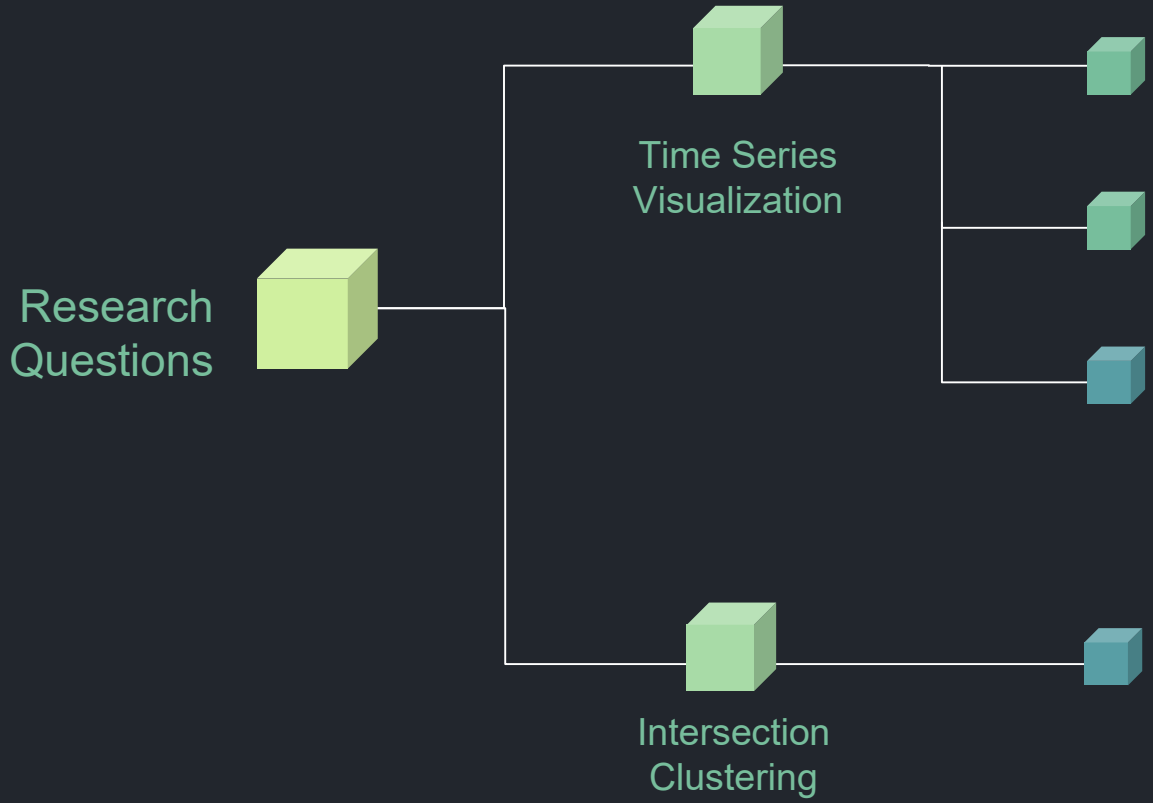
Each File Containing 350K Lines

Total of About 13 Million Lines of Traffic Records

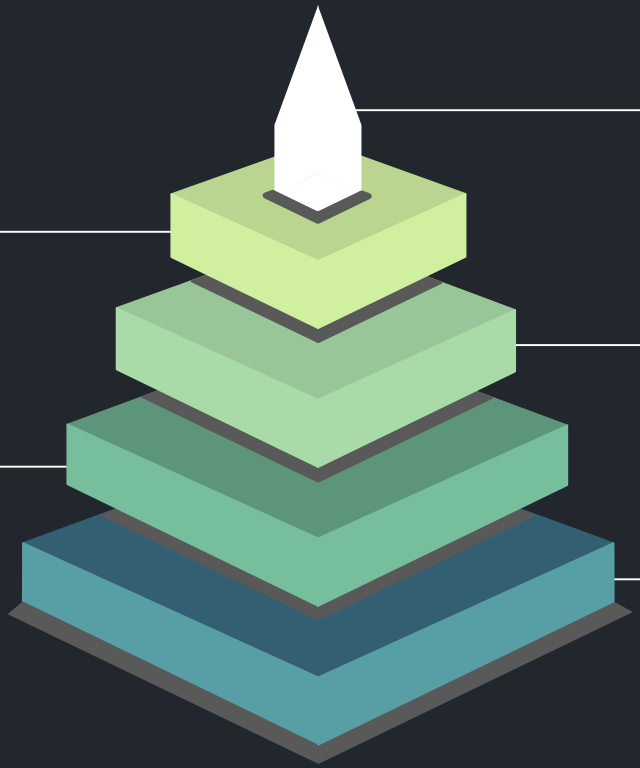
Big Data



What do we aim to find out?



Analysis Process



PHASE 5
Time Series Clustering

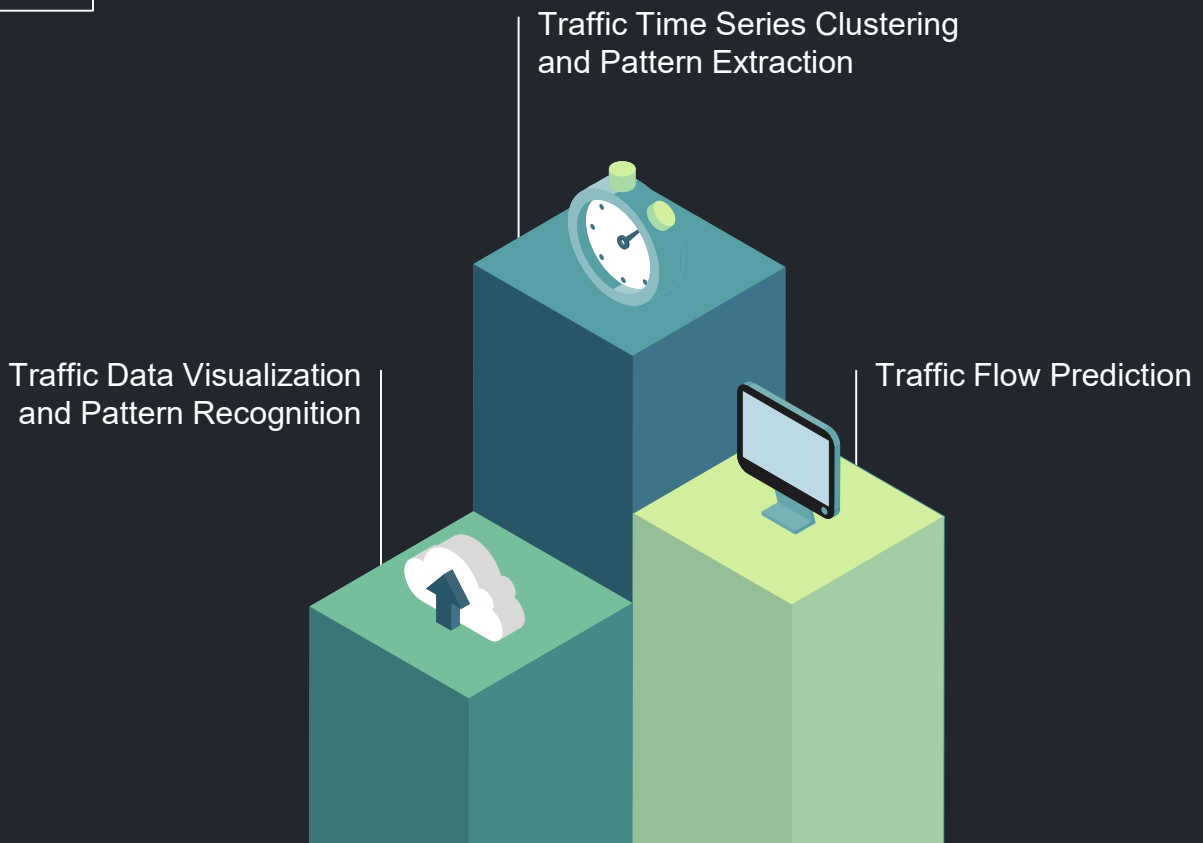
PHASE 4
Time Series Visualization

PHASE 3
Traffic Values and
Time Aggregation

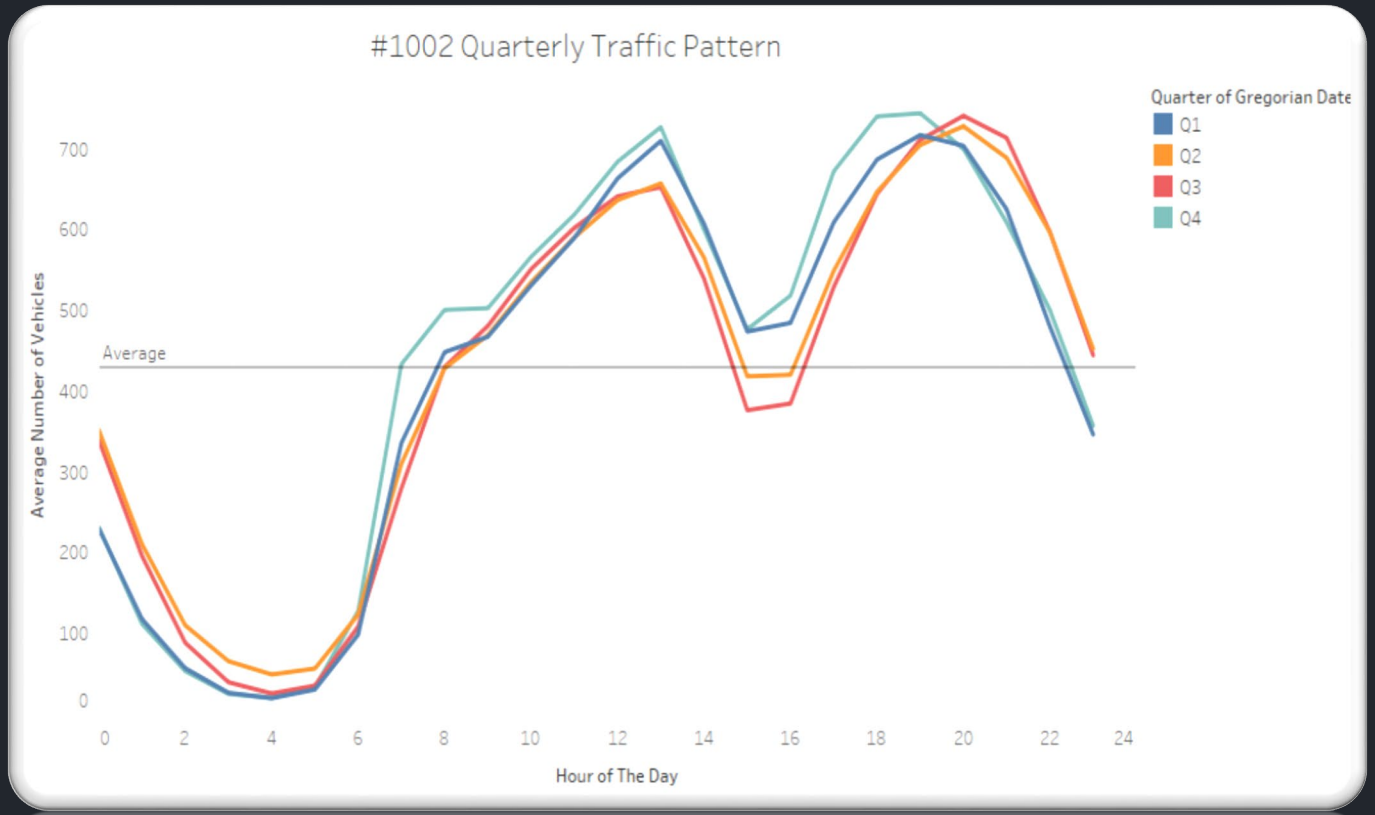
PHASE 2
Handling Missing Values

PHASE 1
Data Cleaning and
Intersection Separation

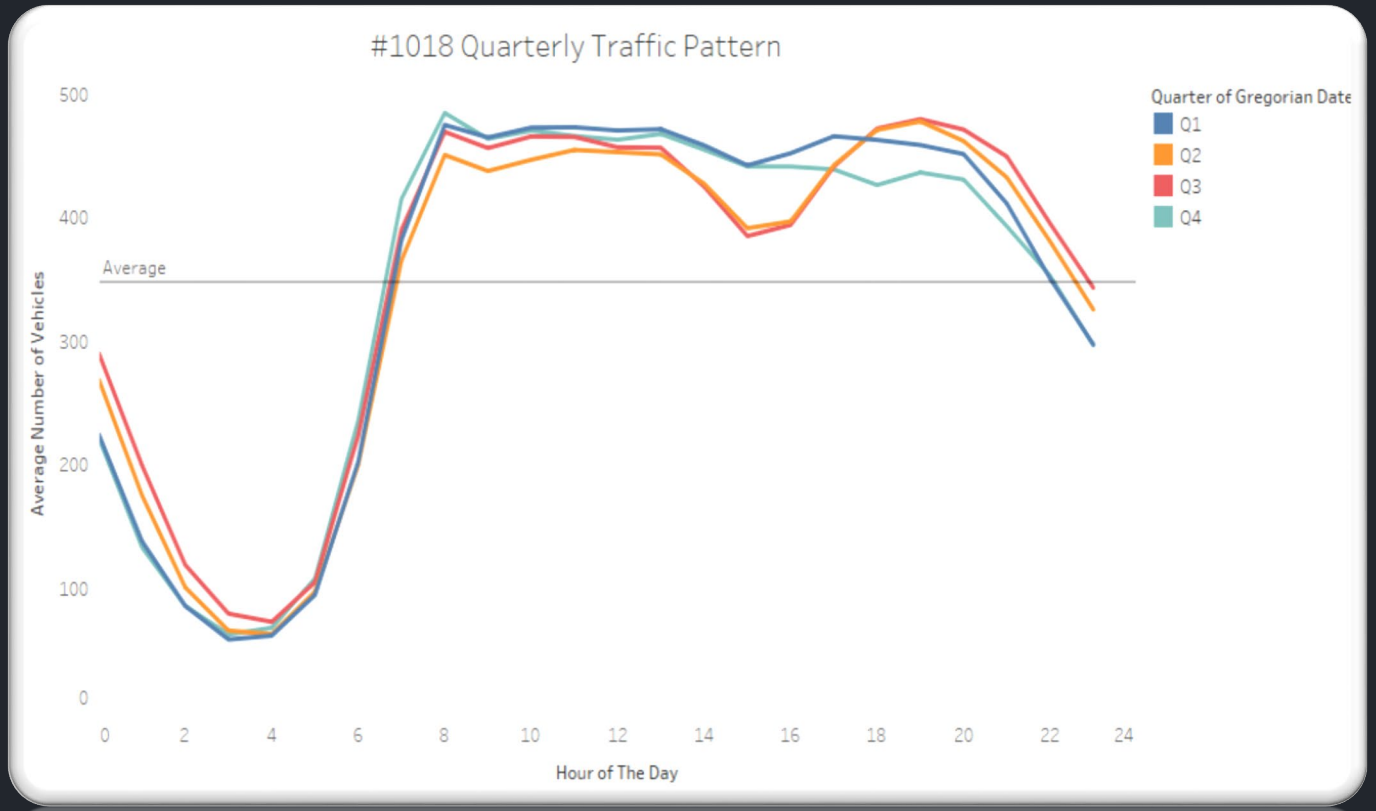
Comparison to Related Works



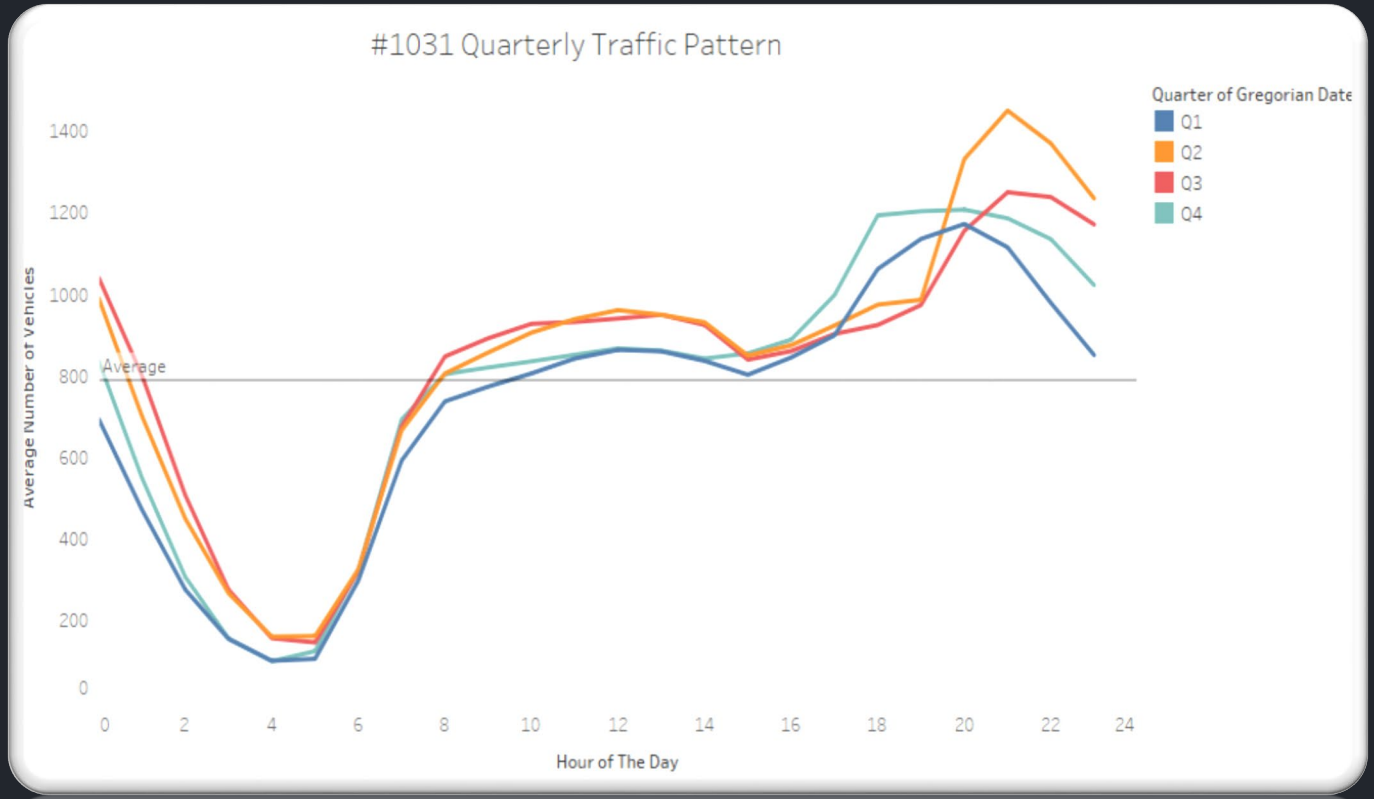
Quarterly Visualization Results



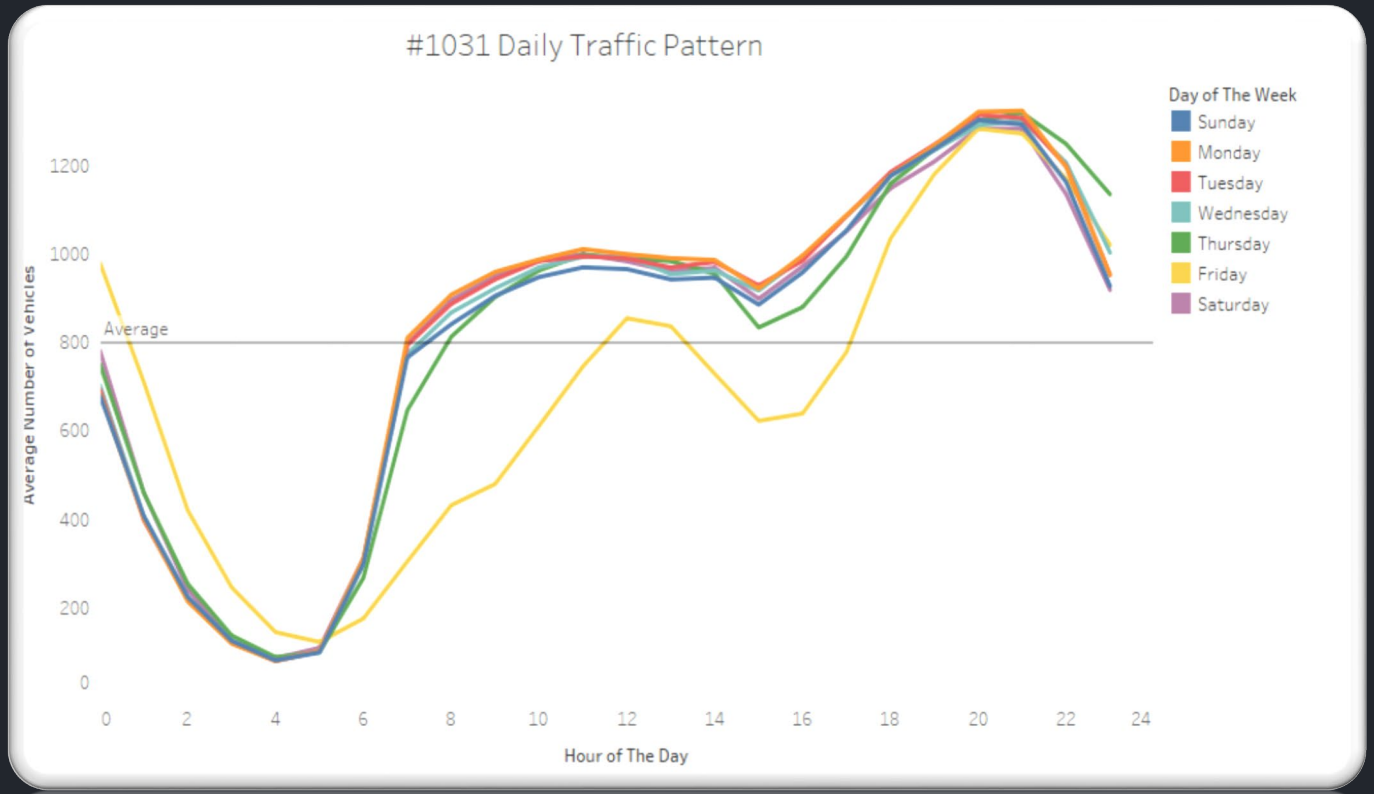
Quarterly Visualization Results



Quarterly Visualization Results



Week Days
Visualization Result



Clustering Process

Algorithm

Finding the best
algorithm for our problem

The Optimum k

Choosing the optimum
number of clusters

Clusters Visualization

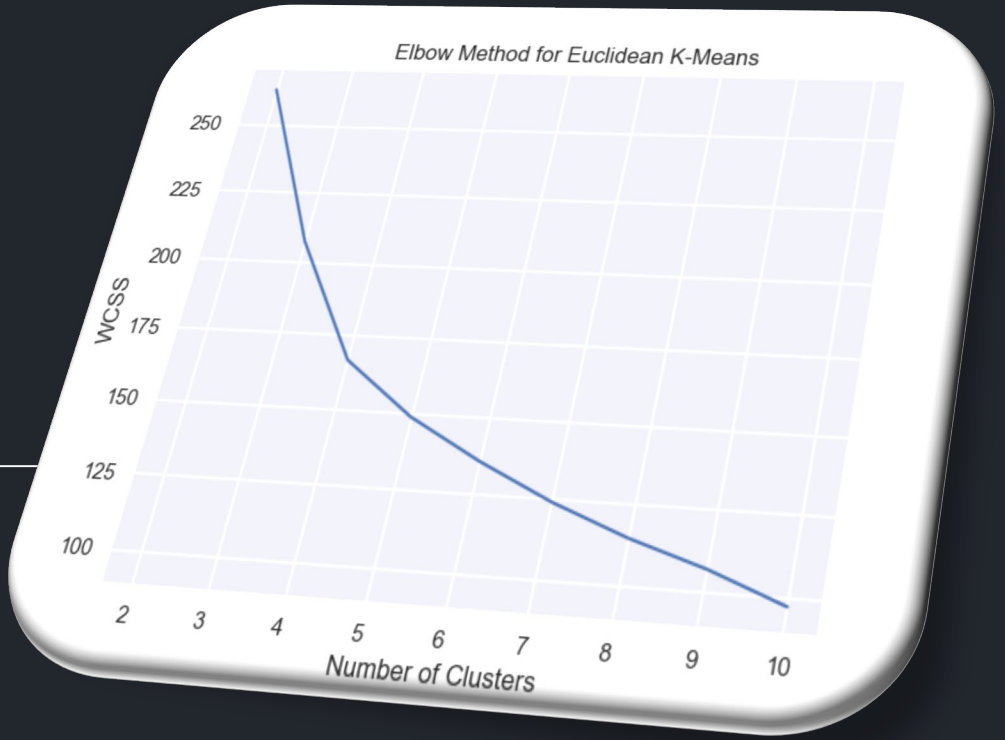
Visualizing each cluster
to obtain patterns

Analysis

How intersections are
separated and why?

The Optimum k

Optimum number of clusters is choosed via “The Elbow Method” that tries to minimize WCSS. This Algorithm resulted in k=5



Clusters Visualization

Cluster	Color on Map	Functionality
1	Green	North-South Connection/Transportation
2	Black	Out-of-City Transportation
3	Blue	Main Business/Entertainment Centers
4	Yellow	Out-of-City Transportation
5	Purple	Riverside Transportation

References

- W. Chen, F. Guo, and F. Y. Wang, “A Survey of Traffic Data Visualization,” *IEEE Trans. Intell. Transp. Syst.*, vol. 16, no. 6, pp. 2970–2984, 2015, doi: 10.1109/TITS.2015.2436897.
- N. Hayashi and Y. Shiraishi, “A method for summarizing and visualizing city traffic data,” *2014 7th Int. Conf. Mob. Comput. Ubiquitous Networking, ICMU 2014*, pp. 165–170, 2014, doi: 10.1109/ICMU.2014.6799089.
- T. Tsuboi, “Traffic congestion visualization by traffic parameters in India,” *Int. Conf. Innov. Comput. Commun.*, pp. 371–380, 2020.
- Z. Zamani, M. Pourmand, and M. H. Saraee, *Application of Data Mining in Traffic Management: Case of City of Isfahan*.
- H. Zhang, Y. Zhang, Z. Li, and D. Hu, “Spatial – Temporal Traffic Data Analysis Based on Global Data Management Using MAS,” *Ieee Trans. Intell. Transp. Syst.*, vol. 5, no. 4, pp. 267–275, 2004.
- C. Tominski, H. Schumann, G. Andrienko, and N. Andrienko, “Stacking-based visualization of trajectory attribute data,” *IEEE Trans. Vis. Comput. Graph.*, vol. 18, no. 12, pp. 2565–2574, 2012, doi: 10.1109/TVCG.2012.265.
- M. Picozzi, N. Verdezoto, M. Pouke, J. Vatjus-Anttila, and A. Quigley, “Traffic visualization: Applying information visualization techniques to enhance traffic planning,” *GRAPP 2013 IVAPP 2013 - Proc. Int. Conf. Comput. Graph. Theory Appl. Int. Conf. Inf. Vis. Theory Appl.*, pp. 554–557, 2013, doi: 10.5220/0004291605540557.
- J. Pu, S. Liu, Y. Ding, H. Qu, and L. Ni, “T-watcher: A new visual analytic system for effective traffic surveillance,” *Proc. - IEEE Int. Conf. Mob. Data Manag.*, vol. 1, pp. 127–136, 2013, doi: 10.1109/MDM.2013.23.
- L. Po, F. Rollo, C. Bachechi, and A. Corni, “From sensors data to urban traffic flow analysis,” *5th IEEE Int. Smart Cities Conf. ISC2 2019*, pp. 478–485, 2019, doi: 10.1109/ISC246665.2019.9071639.

Thank You