Spatial Reconnaissance

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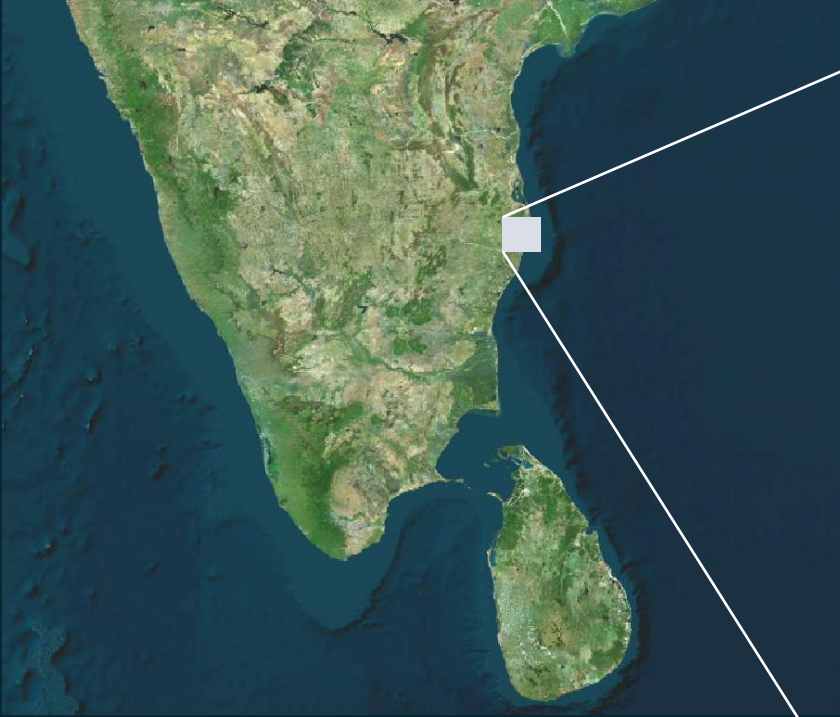
Introduction of Study Area
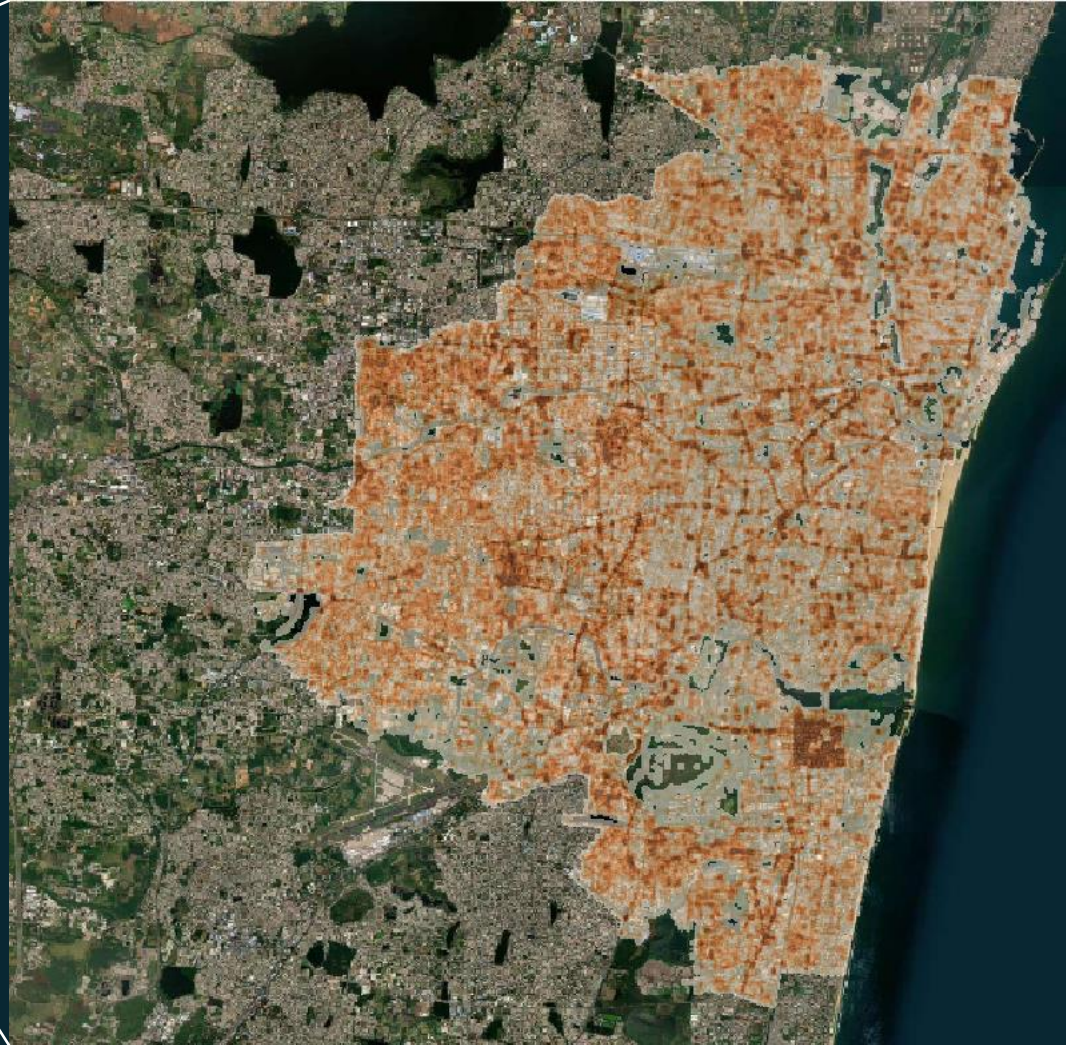

Figure 1: Study Area in India

Figure 2: Study Area

Why is it important?

- Without understanding yearly changes, urban planning is reactive, not proactive.

- City infrastructure investments need accurate trend data.

- Helps detect areas of rapid urbanization, congestion risks, or data quality issues.

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Problem Definition

- Urban areas growing rapidly in Chennai,India from 2017 to 2019.

- Road networks are expanding and changing each year.

- Decisions often lack up-to-date data, data driven insights.

- Observations of direction of roads.

- Solving overlapping road networks year by year.

- Prediction of expansion rate based on linear regression model.

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How to solve the problem?

By Using **QGIS and Python.** We analyzed road network data from **2017 to 2019** to detect changes, measure yearly growth, and simulate future expansions.

- Calculated road lengths per year.
- Data from Here Sample Data for Students.
- Detected newly added or missing roads.
- Combined all years into a time-series dataset.
- Built a base for future **road growth prediction.**

Statistical Analysis Overview of Data

Year	Records	Mean fid	Total fid	IQR (Interquartile Range)
2017	82.502	41.251	3.40 Billion	41.251
2018	82.520	41.260	3.40 Billion	41.260
2019	97.878	48.894	4.78 Billion	48.893

Figure 3: Given Data

Statistical Analysis Overview of Data
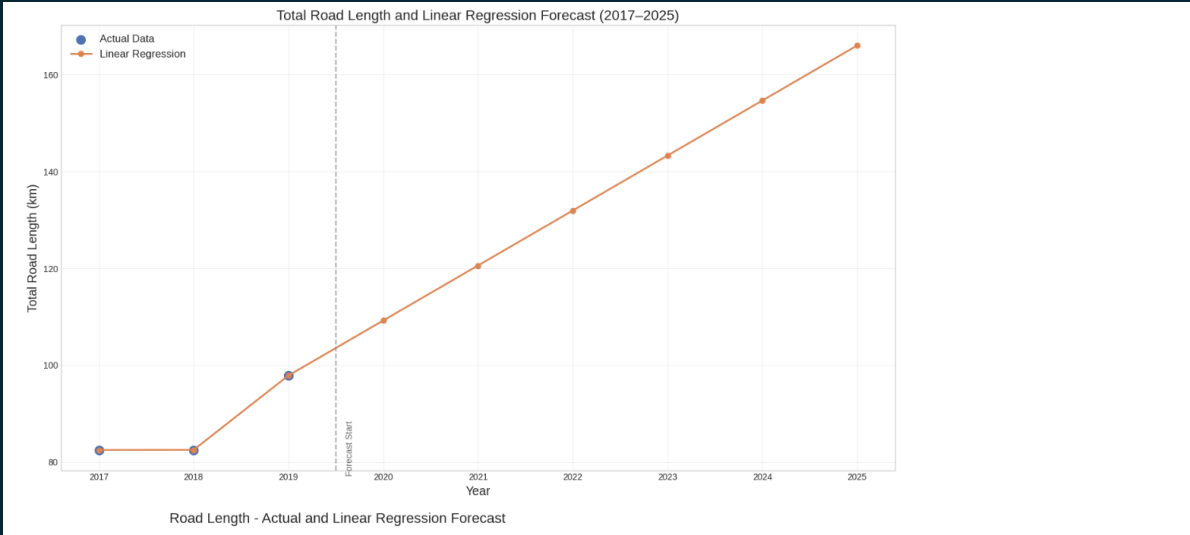
Figure 4: Regression Model

Figure 6: Forecast

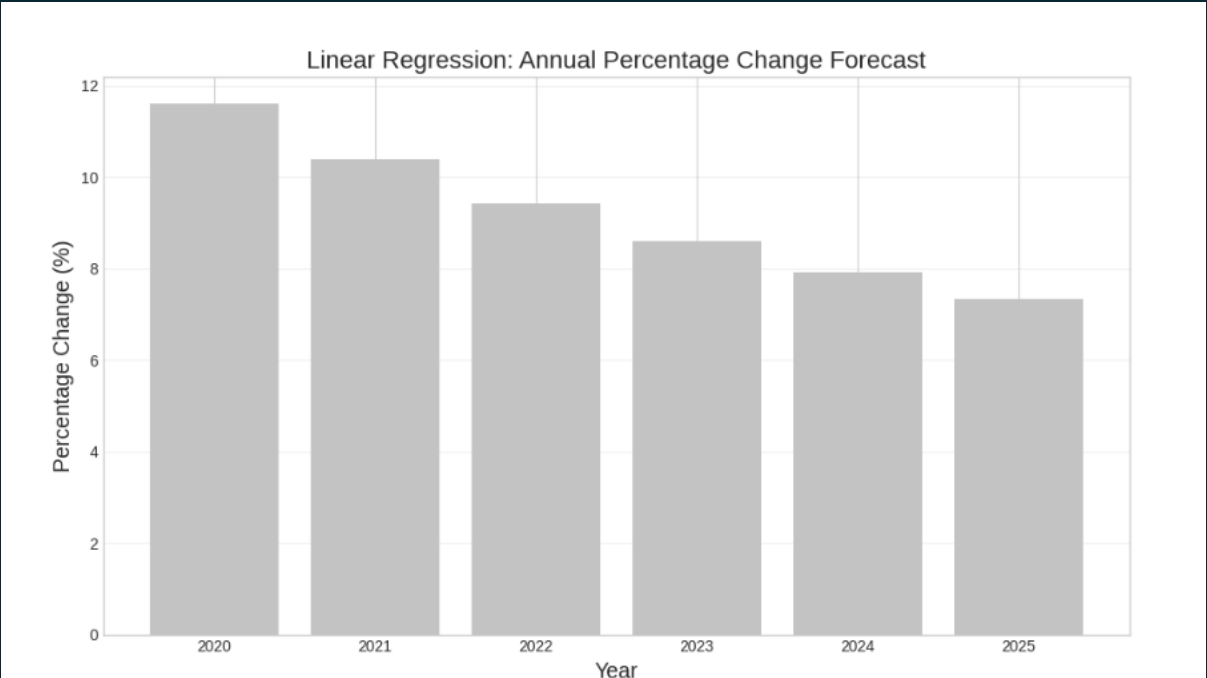| Year	Actual Value	Linear Regression
2017	82.5	82.5
2018	82.52	82.52
2019	97.88	97.88
2020	-	109.24
2021	-	120.59
2022	-	131.95
2023	-	143.31
2024	-	154.66
2025	-	166.02

Figure 5: Statistical Results

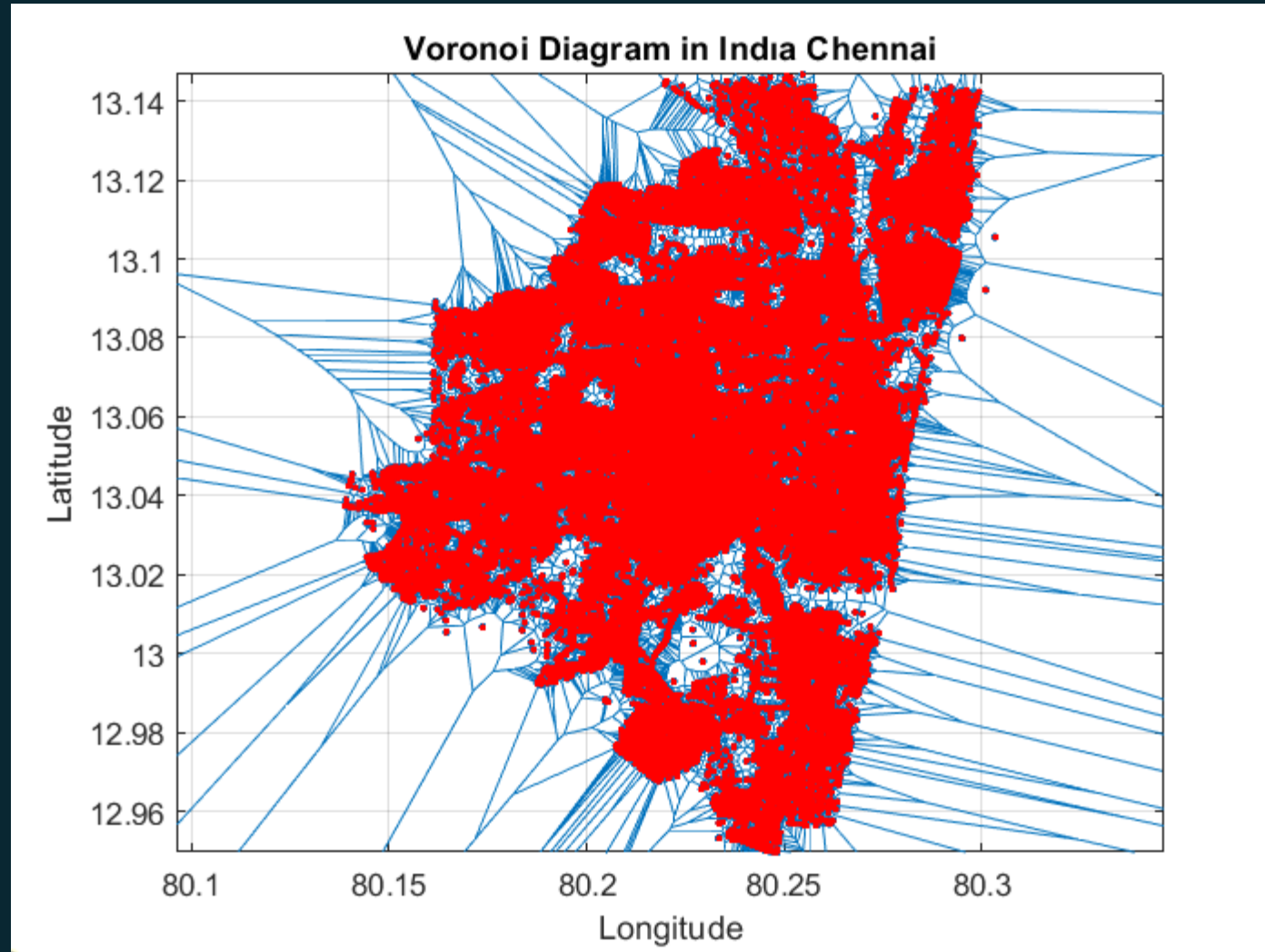# Voronoi Diagram and Heat Map

Figure 7: Voronoi Diagram
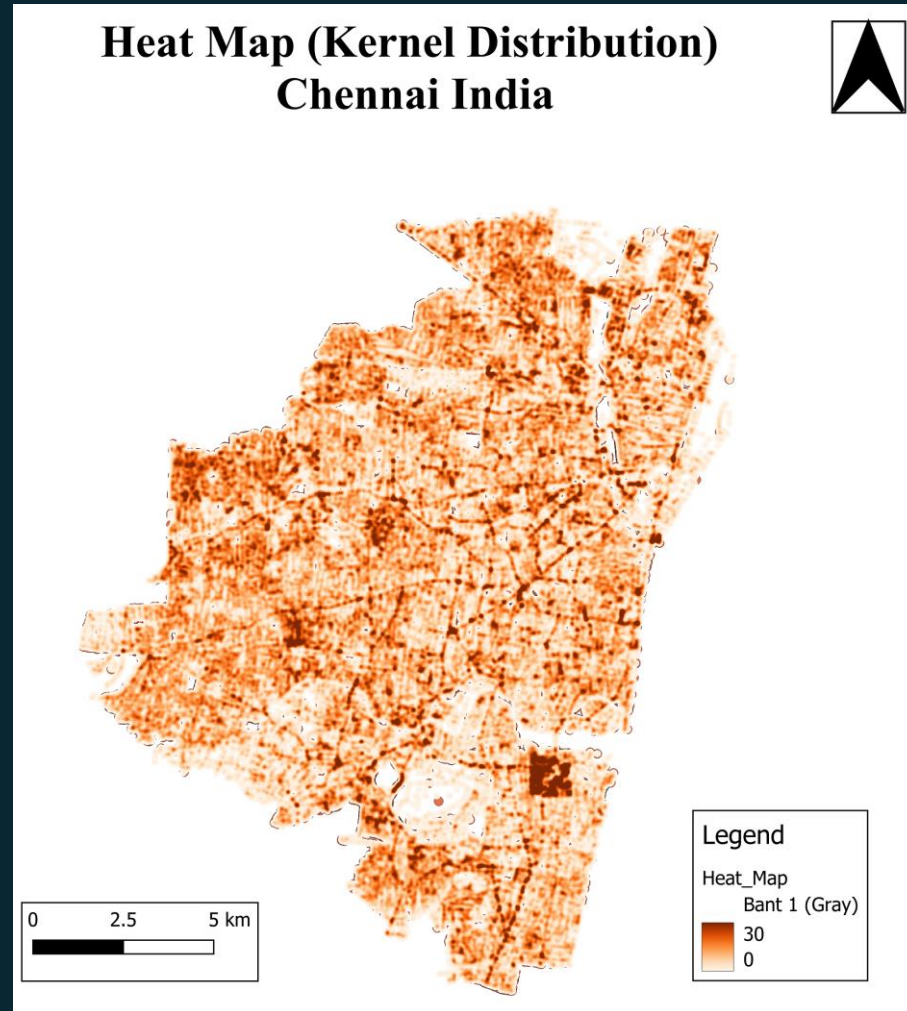
Voronoi Diagram and Heat Map

Figure 8: Heat Map Diagram

Conclusion of the Results

- This study highlights the dynamic expansion of urban and road infrastructures in Chennai, India between 2017 and 2019.

- Through spatial analysis and data-driven approaches, we observed the directional trends and structural evolution of the road network in years.

- By the help of Voronoi diagram and heat map analysis, we could define the directions of expansion in future.

Thank you for your attention!