Geospatial Visualization with R Using Real Estate Market Data

Idelle Sablay

Fresenius University of Applied Sciences

Author Note

Correspondence concerning this article should be addressed to Idelle Sablay, Email: sablay.idelle@stud.hs-fresenius.de

Abstract

Geospatial visualization provides powerful tools for understanding how location influences economic and social phenomena. In the context of real estate markets, spatial analysis reveals patterns in property values, highlights regional disparities, and supports evidence-based decision making for investors, policymakers, and consumers. It demonstrates how R can be leveraged to transform raw real estate data into meaningful geographic insights. Using packages like **ggplot2**, we illustrate methods for preparing spatial datasets, generating maps, and identifying price hotspots across different regions. By integrating geospatial visualization into real estate research, there can be a clearer understanding of market dynamics.

Keywords: Geospatial visualization, R programming, Real estate market, Spatial analysis, Data visualization

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1 Geospatial Information

‘’Geospatial data’ ’ refers to information that specifies the spatial position of something on the Earth’s surface and describes their associated characteristics. It usually combines three parts: the location (such as coordinates on a map), details about the thing or event (its features or characteristics), and time (when it happened or how long it lasted).(IBM (2021)).

‘’Geospatial analytics’ ’ involves examining geographically referenced data to identify underlying patterns, trends, and meaningful insights.(University of Mary Washington (n.d.))

‘’Geographic Information System’ ’ is a computer program that examines and presents data with spatial references. (U.S. Geological Survey (n.d.))

2 GIS in property valuation

Geographic Information Systems (GIS) have become a key tool in modern property valuation, helping to address the biases and shortcomings of old appraisal methods. By combining spatial data with hedonic models, automated valuation models, and artificial intelligence, GIS improves the accuracy, clarity, and speed of real estate market analysis.(Droj et al. (2024))

3 Spatial evaluation methods

3.1 Spatial Econometric techniques

There are three main types of spatial econometric methods. The first is the Spatial Lag Model, which looks at how nearby property prices affect each other. The second is the Spatial Error Model, which helps fix problems caused by similar patterns in errors across different areas. The third is the Spatial Durbin Model, which considers how both the outcome and the factors influencing it are affected by nearby areas.(Muccio and Cannatella (2025))

4 Real Estate Market Visual Analysis

Machine learning can be used to analyze different real estate market data. It helps to easily analyze correlations and relationships within different variables across different market data. It allows for easier understanding of emerging and growing trends.(Lorenz et al. (2022))

4.1 Types of Real Estate Market Data

- Property Listings Data (addresses, prices, property type, size)
- Rental Market Data (monthly rent, vacancy rates, neighborhood attributes)
- Transaction History (sale dates, prices, buyer/seller info)
- Geographic/Demographic Data (census, income levels, population density)
- Construction & Development Data (new projects, zoning, permits)
- Mortgage & Interest Rate Data (loan terms, rate trends)

5 References

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Appendix

Affidavit

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