

# RailEstate: An Interactive System for Metro Linked Property Trends

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## Abstract

Access to metro systems plays a critical role in shaping urban housing markets by enhancing neighborhood accessibility and driving property demand. We present RailEstate, a novel web-based system that integrates spatial analytics, natural language interfaces, and interactive forecasting to analyze how proximity to metro stations influences residential property prices in the Washington metropolitan area. Unlike static mapping tools or generic listing platforms, RailEstate combines 25 years of historical housing data with transit infrastructure to support low-latency geospatial queries, time-series visualizations, and predictive modeling. Users can interactively explore ZIP-code-level price patterns, investigate long-term trends, and forecast future housing values around any metro station. A key innovation is our natural language chatbot, which translates plain-English questions (e.g., “What is the highest price in Falls Church in the year 2000?”) into executable SQL over a spatial database. This unified and interactive platform empowers urban planners, investors, and residents to derive actionable insights from metro-linked housing data—without requiring technical expertise. A demonstration video of the system is available at <https://www.youtube.com/watch?v=ZLiz8S1UXsc>.

## CCS Concepts

• **Information systems** → **Spatial-temporal systems**; **Geographic information systems**; • **Computing methodologies** → **Natural language processing**; • **Applied computing** → *Forecasting*.

## Keywords

Geospatial Analytics, Spatial Databases, Urban Computing, Public Transit, Text-to-SQL

## ACM Reference Format:

Chen-Wei Chang, Yu-Chieh Cheng, Yun-En Tsai, Fanglan Chen, and Chang-Tien Lu. 2025. RailEstate: An Interactive System for Metro Linked Property

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SIGSPATIAL '25, Minneapolis, MN, USA  
© 2025 Copyright held by the owner/author(s).  
ACM ISBN 979-8-4007-2086-4/2025/11  
<https://doi.org/10.1145/3748636.3762799>

Trends. In *The 33rd ACM International Conference on Advances in Geographic Information Systems (SIGSPATIAL '25)*, November 3–6, 2025, Minneapolis, MN, USA. ACM, New York, NY, USA, 4 pages. <https://doi.org/10.1145/3748636.3762799>

## 1 Introduction

Public transit accessibility is a well-established driver of urban real estate dynamics. Proximity to metro stations enhances neighborhood appeal by reducing commute times, increasing mobility, and improving connectivity [6]. Studies consistently show a strong correlation between transit access and higher nearby property values [5, 10]. Yet homebuyers, investors, and planners still lack *comprehensive, real-time* tools to reveal these effects in a localized, data-driven manner. Existing platforms offer only static listings without dynamic transit data or historical trends, leaving users to cross-reference maps, schedules, and market reports manually.

Prior work shows that transit proximity significantly affects property values, but tools for fine-grained, real-time spatial analysis remain limited. Statistical models quantify price effects [7, 9], yet results vary across regions and time due to confounding factors [8]. Spatial databases like PostGIS enable scalable queries [4], but are inaccessible to most non-technical users, while GIS dashboards often provide only static visualizations [3] without longitudinal or interactive analysis.

To address this gap, we present RailEstate, an interactive, database-driven web application that delivers accessible, real-time, and interpretable insights into the relationship between metro access and residential housing trends. The system supports interactive geospatial queries around metro stations and visualizes both current housing prices and long-term trends, enabling users to observe fluctuations associated with infrastructure changes or economic cycles. A natural-language chatbot further enhances users’ access to complex queries by translating plain-English questions into optimized SQL queries, which are executed over a cloud PostGIS backend.

RailEstate is a unified system that integrates spatial databases, interactive web mapping, and LLM-powered interfaces to support intuitive analysis of housing markets. Our contributions include:

- **Location-Aware Housing Price Engine.** We deploy a cloud-hosted PostGIS database with spatial indexing to enable low-latency retrieval of housing prices near metro stations. Users can explore price gradients dynamically and