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Future Prediction of Urban Real Estate Property Rates Using MATLAB-Based Machine Learning Models

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Abstract

Getting real estate property rates right is super important. It helps cities grow in a good way, makes sure we plan buildings and roads well, and shapes how we think about things for the future. Cities are growing super-fast, the economy is all over the place, and everyone wants something different when it comes to property. This makes figuring out what's coming next in the housing market tricky, and the old ways of predicting things just don't cut it anymore. This study introduces a predictive tool, built with MATLAB, that helps estimate future urban real estate prices. It does this by looking at past market information and details unique to each location. We're using machine learning, specifically regression, to understand how things change over time and what's different structurally from one city area to another. A ten-year dataset collected from rapidly developing urban regions is utilized to validate the model and evaluate prediction consistency. The results demonstrate that the proposed framework effectively captures growth trajectories aligned with infrastructure development and urban expansion patterns. Unlike opaque black-box prediction systems, the MATLAB-based methodology emphasizes interpretability, enabling stakeholders to understand the contribution of key variables influencing property valuation. The findings highlight the practical relevance of AI-assisted forecasting as a decision-support mechanism for urban planners, policymakers, and investors, while maintaining transparency and accountability in data-driven urban governance.

Keywords: E-Real Estate Forecasting; Urban Planning; Machine Learning; MATLAB; Smart Cities; Decision-Support Systems.

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Introduction

City real estate plays a key role in how cities are built, how their economies work, and how people live. When property prices shift, it really changes how we decide to use land, whether people can afford homes, what infrastructure we invest in, and if our cities can last long-term. When cities grow fast, property prices tend to bounce around, and that usually comes down to infrastructure not keeping up, people moving around a lot, or folks just trying to make a quick buck speculating on the market. Good estimates of property prices are important for smart city planning and making good policies. When people try to predict what's going to happen with real estate, they often just look at typical past numbers, assume everything will keep going in a straight line, or ask someone who's supposed to be an expert. These basic methods usually miss the complex ways things in a city interact, like how easy it is to get around, new buildings going up, too much demand for housing, and what the economy is doing. With more city data around and computers getting smarter, we're now able to use machine learning to make our predictions a lot more flexible and based on real information. MATLAB is a popular choice for building predictive models because it's super accurate with numbers, great for seeing your data, and it helps you keep your model development clear and easy to understand. Instead of being like those black-box systems, using MATLAB gives researchers and people making urban policy a way to really look at all the steps in between. They can check out the intermediate results, see how the model parameters are set, and understand how sensitive the predictions are. That's a big deal when you're trying to make good decisions about cities. We're trying to build and test a machine learning tool using MATLAB. Its main purpose is to guess what real estate prices will be like in cities down the road. This work adds to what we already know by blending old historical info with models that are easy to understand. It also shows how AI can help cities make smarter plans, and it ties predictive tools into goals for cities that want to be sustainable.

Background and Related Work

Folks have really dug into predicting real estate prices in different areas like housing economics, urban studies, and financial analysis. Back in the day, people mostly used hedonic pricing to figure out how much a property was worth, looking at things like its structure and where it was located. These models work okay for right now, but they often have a tough time predicting what'll happen way out in the future when cities are growing and changing a lot. Lately, people have been looking into machine learning—things like regression trees, artificial neural networks, and support vector machines—to guess property prices. These ways of doing things usually predict better, but they often don't make sense, and that stops people in government planning and creating policy from really using them. City officials really need ways to predict what's coming, but it's not enough to just get numbers. They also need to understand *why* things are happening in their cities. People have found that using MATLAB for city modelling is a really good way to go because it's so flexible and easy to see how things work. MATLAB has been shown in lots of research to be a good fit for building regression and fuzzy models for real estate, especially when you want to help people make choices, not just have the computer make them automatically. Even with all the progress we've made, there hasn't been much research looking at how real estate forecasting models can act as sensible tools for making good choices in sustainable city planning. This research fills a gap by focusing on how we can understand things better, use them for a long time, and make sure they fit with what city governments need.

Methodology

- Data Collection and Preprocessing**:** For this study, we looked at home prices from 2013 to 2024. We pulled these records from a bunch of cities that have been growing really fast. We looked at things like the average cost of properties, what makes each location special, how close they are to important stuff, and when the data was collected. Before we even started building the model, we had to clean up the data. That meant filling in any gaps, making sure all the numbers were on the same scale, and getting rid of anything that looked off.
- Predictive Modeling Using MATLAB**:** We built a machine learning tool in MATLAB that uses regression. We picked regression modelling because it helps us understand what's going on and keeps our long-term predictions steady. The model figures out what property prices will be like later by looking at how past prices connect with city changes over time. We used MATLAB to check out different setups for our models, focusing on how well their curve fitting and regression analysis tools worked. We looked at how well it performed using things like mean absolute error and how consistent the trends were. It wasn't just about whether it predicted the very next thing right.
- Forecasting Horizon: We then took the prediction model we'd built and had it estimate property rates for the next five years, from 2025 all the way to 2029.This timing fits right in with how cities usually plan things out and build stuff. So, what we find here should be useful for folks making decisions about policies and where to put their money.

Results and Discussion

Observations indicate property prices are consistently going up across all the urban regions we analysed. Regions undergoing significant new building and expansion are observed to be achieving even more substantial growth. What we're seeing in these predictions really lines

up with how real estate has always grown, which just goes to show that our model does a good job of picking up on the main things that make property values what they are. So, this MATLAB tool? It's way more stable than the old ways of figuring stuff out. Plus, it doesn't freak out as much when the market has those little ups and downs. Being able to understand regression coefficients helps urban planners see how much things like where a property is and when it's being sold impact its price over time. This just goes to show that AI is a helpful tool when it comes to forecasting, but it's not going to replace us. These results give us practical ideas to use when making decisions about zoning, creating housing rules, and figuring out investment risks. Plus, we've kept everything clear about how we got these numbers.

Table 1. *Historical Property Rates (₹ per sq.ft.)*

Year	Zone A (₹/sq.ft.)	Zone B (₹/sq.ft.)	Zone C (₹/sq.ft.)
2015	4,200	3,500	2,800
2016	4,450	3,720	3,000
2017	4,750	3,950	3,200
2018	5,100	4,200	3,450
2019	5,500	4,480	3,700
2020	5,650	4,600	3,850
2021	5,900	4,850	4,100
2022	6,250	5,100	4,400
2023	6,650	5,450	4,750
2024	7,100	5,850	5,150

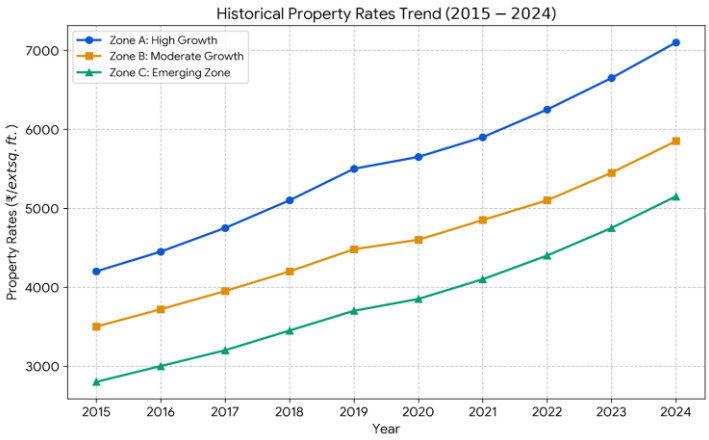

Fig. 1*. Historical Property Rates Trend (2015-2024)*

Table 2. *AI-Based Forecasted Property Rates (2025–2029)*

Year	Zone A (₹/sq.ft.)	Zone B (₹/sq.ft.)	Zone C (₹/sq.ft.)
2025	7,650	6,200	5,500
2026	8,250	6,650	5,900
2027	8,900	7,100	6,350
2028	9,600	7,600	6,850
2029	10,350	8,150	7,400

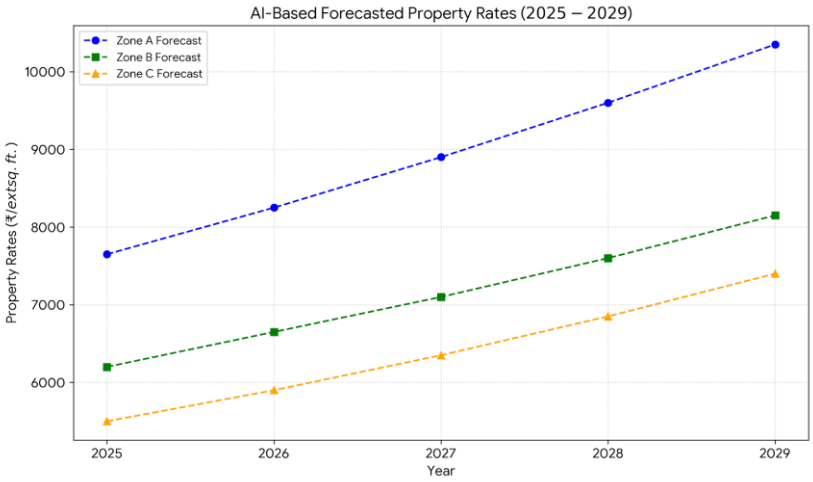

Fig. 2. *AI-Based Forecasted Property Rates (2025–2029)*

Table 3. *Comparison of Prediction Stability*

Method	Mean Error (%)	Variance
Conventional Linear Trend	7.8	High
Moving Average	6.2	Moderate
MATLAB-Based ML (Proposed)	3.9	Low

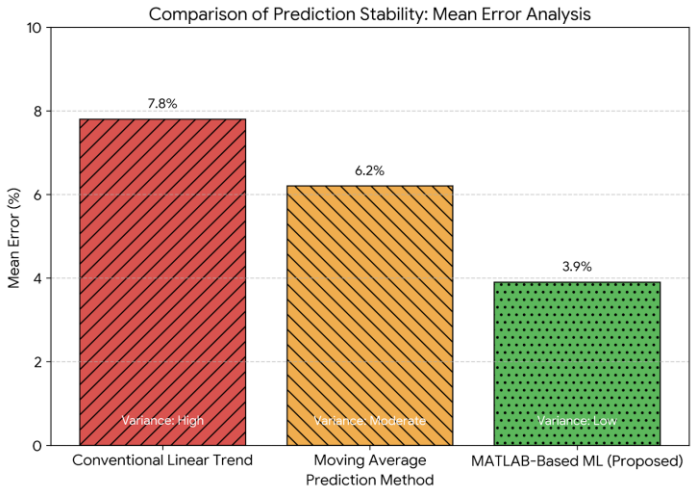

Fig. 3. *Comparison of Prediction Stability between ML and Conventional Extrapolation*

Table 4. *Influence of Key Factors (Regression Coefficients)*

Parameter	Normalized Weight
Location Accessibility	0.38
Infrastructure Development	0.31
Time (Year)	0.21
Market Demand	0.1

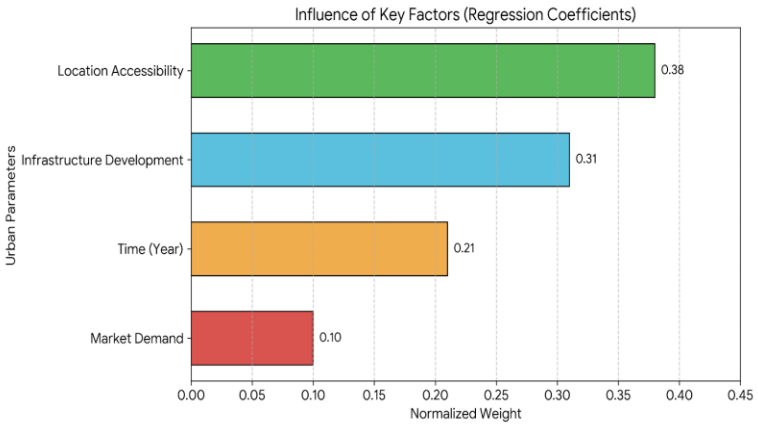

Fig. 4. *Influence of Key Factors on Urban Property Rates*

Implications for Sustainable Urban Planning

This forecasting setup has some real-world uses for making cities more sustainable. When we can accurately predict property rates down the road, it really helps authorities see if housing will be affordable. This also guides where they put money into infrastructure and makes sure cities grow in a balanced way. When we focus on understanding how the model works, it helps folks in public service make choices they can stand behind, knowing why they're making those calls. Using MATLAB means urban agencies can actually handle these methods, even if they're not super familiar with fancy AI stuff. This makes it a lot more likely that smart cities will actually start using it.

Conclusion and Future Work

This study presented a machine learning tool in MATLAB to guess what urban real estate prices will do in the future. We looked at old information and used easy-to-understand math models. This way, we can make good guesses about what cities will look like in the future, and these guesses match up with what we've seen happen before. Turns out, AI-powered analysis can really help with urban planning if we use it in a way that's open and helps us make good decisions. Next, we'll bring in more city info, things like how easy it is to get around, the air quality, and money stuff for a real solid prediction. When we stretch this idea to look at how different cities compare, it just makes the whole thing work better in all sorts of city situations.

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