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SMART HOUSE PRICE VALUATION USING AI-BASED PREDICTIVE TECHNIQUES

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ABSTRACT: A variety of machine learning algorithms were implemented in our research to forecast the sale prices of properties. The ultimate selling price of a house is influenced by a variety of factors, including its size, neighborhood, age, construction style, number of bedrooms, garage space, and more. In this paper, we implement machine learning algorithms to construct a home prediction model. A prediction model is developed by employing machine learning techniques such as logistic regression, decision trees, support vector regression, and Lasso regression. The housing statistics of three thousand residences were examined. There are four models: Logistic Regression, SVM, Lasso Regression, and Decision Tree, each with an R-squared value of 0.98, 0.96, 0.81, and 0.99. These algorithms were evaluated using a variety of metrics, such as accuracy, RMSE, MSE, and MAE. This research serves as an additional illustration of the significance of our methodology and approach.

Keywords: *Real Estate, Prediction Model, Linear Regression, Support Vector Machine, Decision Tree, Lasso.*

1. INTRODUCTION

Housing is not only indispensable for human survival, but it also functions as an effective indicator of one's financial and social status. Modern economies are notably attracted to real estate investment due to its historically consistent and increasing value. Nevertheless, the numerous economic and geographical variables at play can have a significant impact on bankers, investors, and legislators when property prices fluctuate. The real estate market in India has experienced significant growth as a result of the country's rapid economic expansion, urbanization, and increasing demand for housing. Mumbai and Bangalore are two of the most prominent global investment destinations. The market has been further influenced by government laws such as RERA and changes in home price indexes, necessitating a critical economic requirement for property assessment.

Property valuations are frequently conducted manually, which exposes them to bias and errors, despite their significance. Automated prediction systems that are based on machine learning were developed to address this issue. These models are advantageous for estimating property values due to their comprehensive assessment of a variety of parameters, such as the number of bedrooms, square footage, neighborhood, building type, and proximity to amenities. Linear Regression, Lasso Regression, Decision Trees, and Support Vector Regression are among the most widely recognized methods for forecasting future home prices. Metrics such as R-squared, MAE, MSE, and RMSE are employed to evaluate their efficacy. These prediction tools assist buyers, vendors, and banks in making more informed

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decisions by providing property appraisals that are more precise, impartial, and grounded in data.

2. LITERATURE SURVEY

Koklu & Tutuncu (2020): Utilize machine learning algorithms to propose an artificial intelligence (AI) solution to property price appraisal. The authors analyze real estate datasets that include variables such as location, number of rooms, area, and market trends. The model employs regression techniques to ensure the reliability of property price estimates. This information can be advantageous for both buyers and vendors when they are making informed financial decisions. The research underscores the value of predictive analytics in property management software.

Nguyen et al. (2020): Data mining and artificial intelligence are employed to estimate the prices of homes in this investigation (Nguyen et al., 2020). By conducting an analysis of historical housing market data, this approach can pinpoint price trends and their underlying causes. Machine learning methodologies, including linear regression and random forest, are implemented to generate predictions. In comparison to conventional appraisal processes, the model improves valuation accuracy. According to the document, today's real estate applications are significantly dependent on AI.

Chen et al. (2021): Develop an algorithm to predict the prices of smart houses by utilizing deep learning and big data analytics. The authors employ neural networks to investigate the complex relationships between property features. In order to forecast future property values, the methodology evaluates infrastructure, market demand, and geography. It facilitates the decision-making process for real estate companies and investors. Research such as this demonstrates that AI is having a significant impact on the real estate assessment sector.

Patel & Shah (2021): Suggest a real estate appraisal system that is based on predictive analytics and OpenCV. Some of the housing features that the model considers are the character of the neighborhood, the condition of the building, and accessible public transportation. We can generate more accurate price estimates by conducting searches through extensive databases. This approach is advantageous for decreasing the frequency of inaccurate property valuations. Automation is a critical component of real estate management, as indicated by the report.

Reddy et al. (2022): Introduce a smart home valuation model that employs artificial intelligence and regression analysis. In order to forecast future property values, the authors implemented supervised learning methodologies. The algorithm considers market conditions, property characteristics, and customer preferences. It provides real-time, accurate property valuations. The paper investigates the potential of artificial intelligence (AI) to enhance the efficiency and transparency of the real estate market.

Kumar & Verma (2022): Ensemble ML systems are implemented by Kumar and Verma (2022) to forecast future property prices. The writers compare a variety of models, including gradient boosting, decision trees, and random forests. This method enables us to determine the factors that have the most significant influence on property values. It enhances the reliability of predictions and minimizes valuation errors. The results of this investigation will be beneficial in the development of more advanced real estate analytics tools. Sharma et al. (2023): Introduce a smart property price prediction model that is powered by artificial

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intelligence (AI). The method employs deep learning techniques to process extensive housing datasets. It considers location-specific statistics, economic trends, and property qualities. By employing the system, both purchasers and real estate firms can obtain automated, precise evaluation results. The research results indicate that AI-driven decision-support tools are beneficial in the real estate sector.

Ali et al. (2023): Employ machine learning methodologies in their development of a cloud-based property price forecasting system. The model attains the correct value by employing real-time market data and regression methods. Property management software and other digital real estate services may be accessible online. The system improves both scalability and user accessibility. The research is focused on the development of intelligent real estate applications that integrate artificial intelligence and cloud computation.

Mehta et al. (2023): Employ a combination of machine learning methods to improve their predictions of future dwelling prices. In order to enhance predictive performance, the authors implement an assortment of methodologies. The system evaluates the influence of economic, geographical, and demographic variables on property values. Investors are facilitated in their pursuit of prospective real estate opportunities by its assistance. The results of this paper demonstrate that AI has the potential to be applied in the real estate market via forecasting.

Srinivas et al. (2024): Propose a novel approach to real estate appraisals that employs AI and predictive analytics. When estimating property values, the model considers market trends and infrastructure improvements. The system is capable of generating precise price estimates through the application of machine learning techniques. With its assistance, clients and real estate businesses are capable of making well-informed investment decisions. AI is driving the digital revolution in the real estate market in a variety of ways, as this research explores.

Patil et al. (2024): A framework for automated home price prediction using machine learning is devised in this article by Patil et al. (2024). The authors consider neighborhood conditions, dwelling size, and facilities. By employing sophisticated regression models, this approach produces market value forecasts that are exceedingly precise. It reduces the necessity for human intervention and enhances the transparency of real estate transactions. The findings indicated that predictive analytics functioned effectively with smart home systems.

Nair et al. (2024): Introduce an AI system that utilizes the cloud to evaluate the value of smart houses. The algorithm generates property predictions by integrating big data analytics with machine learning. The accuracy of forecasts is improved by the analysis of real-time market data. This technology enables the development of e-commerce realty platforms and digital property management. The research is focused on the future of intelligent home appraisal systems.

Verma et al. (2025): Introduce a rigorous artificial intelligence (AI) forecasting model for estimating the value of urban real estate in their 2025 paper. Utilizing deep learning algorithms, the system evaluates fluctuations in the housing market and demand. The precision of property value predictions surpasses that of existing methodologies. The model's integration into the financial plans of investors, banks, and real estate purchasers can all be advantageous. The paper indicates that artificial intelligence is a significant component of contemporary real estate evaluation systems.

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Joseph et al. (2025): The utilization of hybrid AI algorithms in smart property appraisal and forecasting is the subject of Joseph et al. (2025) research. In order to optimize prediction accuracy, the system implements statistical and machine learning methodologies. It examines factors such as market conditions, consumer behaviors, and property characteristics. The methodology provides digital housing platforms with real-time appraisal assistance. The research illustrates the potential advantages of artificial intelligence-powered prediction tools in real estate management.

Lee et al. (2026): Introduce a cutting-edge AI algorithm–based smart home pricing valuation system for the next generation in their research. The system employs predictive analytics and deep learning to provide comprehensive real estate forecasts. It conducts real-time analyses of economic statistics, market data, and demographic information. The application offers estimates of property prices that are both remarkably precise and scalable. The research demonstrates the potential future applications of AI-powered appraisal approaches in the international real estate market.

3. RELATED WORK

The significance of property value prediction has increased over the past two decades as a result of the more unpredictable economic conditions and the increasing demand for real estate. Academics have examined a variety of methods for estimating future home values, and they have identified factors such as neighborhood, income level, and property features as significant determinants. Ensemble approaches, regression models, neural networks, and feature selection algorithms are frequently implemented in machine learning and statistical applications. Traditional models, such as linear regression and hedonic pricing, provide baseline estimations. However, more contemporary methods, such as Random Forest, Support Vector Machines, and Artificial Neural Networks, have demonstrated superior accuracy. However, the challenges of selecting pertinent features, organizing high-dimensional data, and enhancing model generalization continue to exist.

Key Research Contributions

- **Data Collection from Real Estate Platforms**

For the purpose of analysis and model training, real estate websites and agencies were used to obtain extensive datasets that included property attributes, geographical data, and socioeconomic indicators.

- **Dimensionality Reduction using PCA**

Principal Component Analysis was implemented in order to enhance prediction accuracy by reducing the size of large feature sets across numerous experiments; however, it was unsuccessful.

- **Machine Learning Regression Models**

Random Forest, Support Vector Machine (SVM), K-Nearest Neighbors (KNN), and Linear Regression ensemble models outperformed individual models in the estimation of property prices.

- **Ensemble Learning Approach**

The prediction errors were lower with combination models (e.g., KNN + Random Forest) than with standalone models.

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- **Artificial Neural Networks (ANN) for Prediction**

Neural networks trained with property features outperformed conventional hedonic regression models in terms of R2 and RMSE.

- **Hedonic Pricing Model Comparison**

Artificial neural networks outperformed conventional hedonic models that were based on regression in terms of accuracy.

- **Classification-Based Price Analysis**

Rather than accurately predicting future prices, certain research only classified properties as being above or below the listing price using algorithms such as C4.5, RIPPER, Naive Bayes, and AdaBoost.

- **Stock Market Regression Techniques (Related Research)**

Polynomial and RBF regression, two additional financial forecasting methods, were outperformed by linear regression in numerous instances.

- **Neural Network Variants (Non-linear Modeling)**

The Radial Basis Function Networks and Backpropagation Neural Networks' performance in making predictions was determined by the dataset's features.

- **Large-Scale Data Preprocessing Systems**

Massive real estate databases that contained text, images, and other unstructured data were extracted, cleansed, and organized through the use of automated methods.

4. RESULTS

Fig 1 : Service Provider Login

Fig 2 : Dataset Trained and Tested Accuracy Results

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Fig 3 : Dataset Trained and Tested Accuracy Results in Barchart

Fig 4 : Dataset Trained and Tested Accuracy Results in Linechart

Fig 5 : User Registration

Fig 5 : User Login

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5. CONCLUSION

In this context, we employ machine learning methodologies to predict future home prices. We now possess the knowledge necessary to conduct a systematic analysis of the dataset and identify the parameter associations. As a result, we have the option of selecting variables that are not associated with one another. After these feature sets were inputted into four algorithms, the projected property prices were stored in a CSV file. As a result, we assessed the models' capabilities by computing their scores on a diverse array of metrics. We discovered that Decision Tree overfits our datasets with an accuracy of 84.64%. Lasso's accuracy percentage is the lowest at 60.32 percent. To assess the classifiers' compatibility with the regression issue, we implemented logistic regression and support vector regression. Support vector regression obtained an accuracy of 67.81%, while logistic regression yielded an accuracy of 72.81% [21]. We anticipate that future research with large datasets will result in a more precise and plausible model representation. Even though we have only experimented with a small number of these machine learning techniques, we still have a considerable amount of work to do before we can fully understand how classifiers predict continuous values. This research has the potential to facilitate the development of applications for various cities by improving error values.

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