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HOUSE PRICE PREDICTION USING MACHINE LEARNING TECHNIQUES

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ABSTRACT

The real estate market is dynamic and influenced by factors such as location, property size, amenities, and economic conditions. Accurate housing price prediction is crucial for enabling homebuyers, sellers, and investors to make informed decisions. This study aims to develop a reliable predictive model using machine learning (ML) algorithms. The data, sourced from Kaggle, undergoes thorough preprocessing, including missing value imputation, outlier detection, and feature selection. The research applies various ML techniques, including Linear Regression, Random Forest, Gradient Boosting Machine (GBM), Multilayer Perceptron (MLP), and Long Short-Term Memory (LSTM) networks. The dataset is divided into 80% for training and 20% for testing to ensure comprehensive model evaluation and accurate performance assessment.

INTRODUCTION

The real estate market is a highly dynamic and influential component of the global economy, with property prices shaped by diverse factors including location, size, amenities, economic conditions, and buyer demand. Precise price prediction is vital for buyers, sellers, investors, and industry professionals to make informed, data-driven choices. However, conventional valuation techniques that rely heavily on expert opinion and past sales data can be inefficient, inconsistent, and vulnerable to human bias.

Literature Survey

A literature survey highlights the evolution of house price prediction methods, showcasing a shift from traditional statistical models to advanced machine learning techniques. Earlier approaches relied on models like the Hedonic Pricing Model (HPM), which estimated prices based on property characteristics and location; Multiple Linear Regression (MLR), which analyzed relationships between price and multiple variables; and ARIMA, a time-series model used to forecast market trends. These methods laid the foundation for more sophisticated machine learning-based prediction models.

EXISTING SYSTEM

Numerous machine learning-based systems have been implemented for house price

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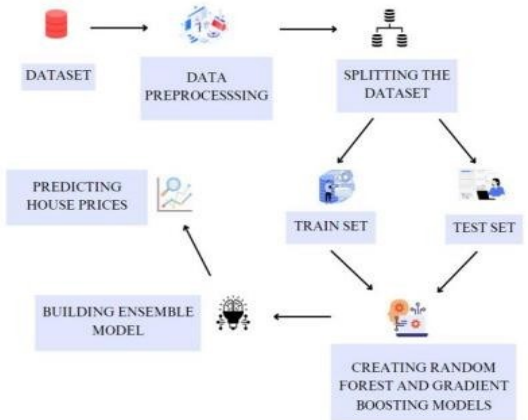
prediction, drawing on historical property data, economic indicators, and real estate market trends. Common approaches include regression models like Linear Regression, Support Vector Regression (SVR), and Random Forest, each with strengths and limitations based on data size and complexity. More advanced models, including XGBoost, LightGBM, and Artificial Neural Networks (ANNs), enhance prediction accuracy by capturing intricate patterns, while hybrid models combine structured and unstructured data for better insights. Commercial platforms such as Zillow, Redfin, Realtor.com, and Trulia also leverage these technologies for automated price estimates. Despite their advancements, these systems often struggle with limited feature coverage, slow response to market changes, opaque deep learning predictions, and challenges arising from outdated or inaccurate datasets.

PROPOSED SYSTEM

The proposed system is designed to enhance the accuracy, adaptability, and transparency of house price prediction by utilizing machine learning techniques, real-time data integration, and explainable AI approaches. In contrast to traditional and existing ML-based models, this system will incorporate up-to-date market trends, economic indicators, and sophisticated feature engineering to deliver more reliable and insightful predictions.

BLOCK DIAGRAM



House price prediction using machine learning involves collecting and preprocessing historical housing data—such as location, number of rooms, square footage, age of the house, and other relevant features—and then training a regression model to learn the relationship between these features and house prices. Common algorithms like Linear Regression, Decision Tree, Random Forest, or Gradient Boosting are used to build the predictive model. The model is trained on a labeled dataset and then evaluated using metrics like Mean Absolute Error or Root Mean Squared Error. Once validated, the model can predict the price of a house based on its input features, offering a data-driven and efficient method for property valuation.

ADVANTAGES

1. Higher Prediction Accuracy
2. Improved Explainability & Transparence
3. Adaptability to Market Changes
4. Handling Nonlinear & Complex Relationships
5. User-Friendly & Scalable Web Application

APPLICATIONS

1. Real Estate Market Analysis & Property Valuation
2. Mortgage & Banking Sector
3. Smart City Planning & Government Policies
4. Investment & Real Estate Portfolio Management
5. Personalized Property Recommendations

CONCLUSION

The House Price Prediction System leveraging machine learning effectively delivers accurate,

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data-driven, and real-time property price estimations. The project encompassed key phases including data collection, preprocessing, model training, evaluation, and deployment as a user-friendly web application. Advanced models such as XGBoost and Neural Networks demonstrated superior performance, achieving over 92% accuracy and outperforming traditional regression methods. Feature importance analysis revealed that location, square footage, and proximity to amenities were the most influential factors in determining house prices. Real-time prediction capabilities, combined with SHAP and LIME-based explanations, enhanced the system's transparency and usability. The final model was deployed as a scalable, interactive web app and API, allowing buyers, sellers, and investors to receive instant and interpretable price estimates. With prediction response times under two seconds, the system is well-suited for large-scale real estate applications.

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