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HOUSE PRICE PREDICTION USING ML: A Review

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Abstract: ***In today's society, everyone wants a home that fits their lifestyle and budget while still providing the facilities they require. House values fluctuate a great deal, indicating that they are typically overstated. Many criteria must be considered when projecting house prices, including the location, number of rooms, carpet area, age of the property, and other fundamental local features. This study seeks to forecast house prices based on all of the main factors that go into deciding the price.***

Keywords: Machine learning, Supervised learning, linear regression, model, Ridge regression

I.INTRODUCTION

The real estate industry is a significant contributor to the global economy. Accurately predicting house prices is essential for buyers, sellers, and investors in this industry. Traditionally, real estate agents and property appraisers rely on their experience and knowledge to determine the value of a house. However, with the rapid growth of data and machine learning algorithms, predicting house prices has become more precise and efficient. Machine learning algorithms can analyze vast amounts of data and identify patterns to predict future prices accurately. In this project, we aim to develop a model that can predict house prices based on various factors such as location, size, number of bedrooms and bathrooms, age of the property, and other features. This project's objective is to explore different machine learning algorithms and identify the most effective approach for predicting house prices accurately. The results of this study can help real estate agents, property appraisers, and investors make informed decisions about buying, selling, and investing in properties.

II. LITERATURE SURVEY

In this section, various authors have presented variousblock storage mechanisms and techniques in the cloud.

In [1] Cheng, Zhang, and Li investigated the use of advanced ML techniques like XGBoost and LightGBM for house price prediction and found that XGBoost outperforms traditional regression models, achieving higher

accuracy. They also highlighted the importance of hyperparameter tuning in achieving optimal performance and suggested further exploration of real-time applications in dynamic markets.

In [2] Li, Sun, and Wang analyzed the effect of energy-efficient features on housing prices using random forests and neural networks, concluding that energy-efficient properties see a consistent price premium. The study emphasized the growing consumer preference for sustainable housing and the need for integrating energy metrics in future predictive models.

In [3] Xie, Liu, and Zhao integrated geospatial factors into ML models for improved price prediction, showing that GIS data significantly improves accuracy when combined with machine learning. They suggested that urban planning and zoning policies could be better understood through such geospatial insights.

In [4] Rai, Singh, and Patel explored ensemble models like Gradient Boosting and Random Forests for house price prediction, finding ensemble methods to outperform traditional linear regression by capturing non-linear patterns. The study also discussed the limitations of high computational costs associated with ensemble techniques.

In [5] Zhang, Liu, and Wang used deep learning techniques, including CNN and LSTM, to predict housing prices based on various features and demonstrated that deep learning models achieve higher precision by learning from complex data patterns. They proposed future research on incorporating more unstructured data like images and text descriptions.

In [6] Tian, Huang, and Li focused on urban property valuation using machine learning, particularly decision trees and neural networks, and found that decision trees are effective for capturing price fluctuations in urban environments. Their work suggested incorporating macroeconomic indicators for better long-term predictions.

In [7] Yang, Zhao, and Chen applied Long Short-Term Memory (LSTM) networks to predict time-dependent real estate trends, noting that LSTM networks outperformed traditional models like ARIMA in forecasting future price trends. The research highlighted the potential of recurrent models in capturing cyclical market behavior.

in [8] Zhou, Zhang, and Tang investigated the influence of big data, such as social media and online reviews, on property pricing using ML and found that incorporating unstructured data from social media enhances prediction accuracy.They recommended expanding data sources to include transaction history and public sentiment analysis.

In [9] Gao, Sun, and Qian compared Random Forests, SVM, and XGBoost for predicting housing prices and concluded that XGBoost provided the best trade-off between accuracy and computational efficiency. They also explored feature importance rankings to identify key determinants of housing prices.

In [10] Ravi, Kumar, and Nair applied multi-modal data (e.g., image and text data) combined with machine learning techniques for property price prediction, finding that multi-modal data improved model accuracy, especially for new properties.

In [11] Wang, Huang, and Zhao combined deep neural networks and support vector machines for more accurate

housing price prediction, noting that hybrid models outperformed individual ML models by leveraging the strengths of each

In [12] Jin, Xu, and Zhang used ML in combination with spatial data for more robust predictions of real estate prices and found that spatial data integration significantly improved location-based predictions.

In [13] Liu, Gao, and Zhang applied deep learning models like CNNs to predict housing prices based on property images, demonstrating that CNNs extracted visual features of properties that helped predict prices accurately. Their research highlighted the untapped potential of visual data in property valuation.

In [14] Zhu, Han, and Wei combined feature engineering techniques with ensemble methods for house price prediction and showed that feature engineering enhances model performance.

In [15] Nguyen, Tran, and Le compared Random Forest, Gradient Boosting, and Neural Networks for housing price prediction, finding Random Forest and Gradient Boosting models to be the most effective.

In [16] Chen, Sun, and Guo explored big data analytics and ML in predicting real estate prices across regions, concluding that big data significantly improves prediction accuracy.

In [17] Zhang, Chen, and Wu focused on using ML algorithms like SVM for predicting housing market trends and demonstrated that SVM can effectively forecast short-term housing market trends.

Table 1: Summarization of various papers

Authors	Title	Research Focus	Remarks
Cheng, Y. et al. (2023)	Predicting Housing Prices with Advanced Machine Learning Models	Investigated the use of advanced ML techniques like XGBoost and LightGBM for house price prediction	Found that XGBoost outperforms traditional regression models, achieving higher accuracy.
Li, Y. et al. (2023)	Impact of Energy Efficiency on Housing Prices Using Machine Learning	Analyzed the effect of energy-efficient features on housing prices using random forests and neural networks	Concluded that energy-efficient properties see a consistent price premium
Xie, X. et al. (2022)	Geospatial Machine Learning Models for Housing Price Forecasting	Integrated geospatial and environmental factors into machine learning models for improved price prediction.	Showed that GIS data significantly improves accuracy when combined with machine learning

Rai, N. et al. (2022)	Predicting House Prices using Ensemble Models	Explored ensemble models like Gradient Boosting and Random Forests for house price prediction	Found ensemble methods to outperform traditional linear regression by capturing non-linear patterns
Zhang, X. et al. (2022)	Application of Deep Learning to Housing Market Prediction	Used deep learning techniques, including CNN and LSTM, to predict housing prices based on various features like location, age, and square footage	Demonstrated that deep learning models achieve higher precision by learning from complex data patterns
Tian, J. et al. (2021)	Machine Learning for Predicting Residential Property Prices in Urban Areas	Focused on urban property valuation using machine learning, particularly decision trees and neural networks	Found that decision trees are effective for capturing price fluctuations in urban environments
Yang, M. et al. (2021)	Time Series Analysis for Predicting Real Estate Prices Using LSTM	Applied Long Short-Term Memory (LSTM) networks to predict time-dependent real estate trends	LSTM networks outperformed traditional models like ARIMA in forecasting future price trends
Zhou, Y. et al. (2021)	The Role of Big Data in Predicting Real Estate Prices	Investigated the influence of big data, such as social media and online reviews, on property pricing using machine learning	Found that incorporating unstructured data from social media enhances prediction accuracy
Gao, Y. et al. (2020)	A Comparative Study of ML Algorithms for House Price Prediction	Conducted a comparison between popular machine learning models like Random Forests, SVM, and XGBoost for predicting housing prices.	Concluded that XGBoost provided the best trade-off between accuracy and computational efficiency.

Wang, L. et al. (2020)	A Hybrid Model for Real Estate Price Forecasting	Combined deep neural networks and support vector machines for more accurate housing price prediction.	Hybrid models outperformed individual machine learning models by leveraging the strengths of each

Jin, S. et al. (2020)	Integration of Machine Learning and Spatial Data for Real Estate Valuation,	Used machine learning in combination with spatial data for more robust predictions of real estate prices	Found that spatial data integration significantly improved location-based predictions
Liu, H. et al. (2019)	Deep Learning for Property Valuation"	Applied deep learning models like convolutional neural networks (CNNs) to predict housing prices based on images of the properties	CNNs were able to extract visual features of properties that helped predict prices accurately
Zhu, X. et al. (2019)	Housing Price Prediction with Feature Engineering and Ensemble Methods	Combined feature engineering techniques with ensemble methods (XGBoost, Random Forest) for house price prediction.	Showed that feature engineering enhances model performance, especially in predicting property value
Nguyen, D. et al. (2019)	A Comparative Analysis of Machine Learning Approaches for Real Estate Price Prediction	Compared multiple machine learning models, including Random Forest, Gradient Boosting, and Neural Networks, for house price prediction	Found Random Forest and Gradient Boosting models to be the most effective for housing price prediction.
Chen, Y. et al. (2019)	"Applying Big Data and Machine Learning for Housing Price Prediction	Explored the application of big data analytics and machine learning in predicting real estate prices across different regions	Found that big data significantly improves prediction accuracy, especially with diverse data sources
Zhang, L. et al. (2018)	Using Machine Learning Algorithms to Predict Housing Market Trends	Focused on using machine learning algorithms like Support Vector Machines (SVM) for predicting housing market trends.	Demonstrated that SVM can be effectively used for forecasting short-term trends in the housing market

III. CONCLUSION

In conclusion, we have successfully developed a machine learning web solution to predict house prices based on various features. The solution involves collecting and cleaning data, building and training a linear regression model. Moreover, we have incorporated hyperparameter tuning to optimize the model's performance further. This improves the model's ability to predict house prices accurately, leading to better decision-making for both buyers and sellers in the real estate market.

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