IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

## IN COMPUTER & COMMUNICATION ENGINEERING

Volume 12, Issue 4, April 2024

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.379

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 | A Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 4, April 2024 ||

| DOI: 10.15680/IJIRCCE.2024.1204176 |

# Estate Housing Prices Prediction Using ML

**Suyash Narsale, Akshada Bamdale, Shrikant Bale, Srushti Bhandwalkar , Prof. Vishakha Chilpipre, Prof. Trupti Khose**

Student, Department of Information Technology, Dhole Patil College of Engineering Pune, Maharashtra, India[1]

Professor, Department of Information Technology, Dhole Patil College of Engineering Pune, Maharashtra, India[2]

**ABSTRACT**: House price prediction is a critical task in the real estate industry, aiding buyers, sellers, and investors in making informed decisions. Traditional methods of valuation often rely on subjective assessments and historical trends, lacking the ability to capture the intricate relationships between housing attributes and market dynamics. In contrast, machine learning offers a data-driven approach to house price prediction, leveraging advanced algorithms to analyse large volumes of housing data and uncover hidden patterns. This study explores the application of machine learning techniques, focusing on regression analysis, ensemble learning, and deep learning, to predict house prices accurately. By considering factors such as square footage, location, amenities, economic indicators, and market trends, machine learning models can provide valuable insights into the factors driving property prices. Through the analysis of real-world datasets and empirical studies, this research evaluates the performance and efficacy of machine learning models in house price prediction, highlighting their advantages in terms of accuracy, scalability, automation, and adaptability. Furthermore, the study discusses the implications of machine learning for various stakeholders in the real estate industry, including homebuyers, sellers, real estate agents, appraisers, and investors. Ultimately, house price prediction using machine learning represents a transformative approach to real estate valuation, empowering stakeholders with data-driven insights and facilitating informed decision-making in dynamic and competitive housing markets.

## I. INTRODUCTION

House price prediction plays a pivotal role in the real estate industry, influencing decisions made by homebuyers, sellers, investors, and real estate professionals. Accurately assessing the value of a property is crucial for ensuring fair transactions, maximizing returns on investments, and understanding market trends. Traditionally, real estate valuation has relied on subjective assessments, historical data analysis, and expert judgment. However, these methods often overlook the complex interplay of factors that influence property prices, such as location, size, amenities, economic indicators, and market dynamics.

In recent years, machine learning has emerged as a powerful tool for house price prediction, offering a data-driven approach to real estate valuation. By leveraging advanced algorithms and large datasets, machine learning models can analyze housing attributes, identify patterns, and make predictions with higher accuracy and efficiency than traditional methods. Regression analysis, ensemble learning, and deep learning are among the techniques used to model the relationship between housing features and prices, capturing nonlinearities and interactions that may be overlooked by conventional approaches.

The application of machine learning in house price prediction presents several advantages, including scalability to handle large volumes of data, automation of analysis processes, and adaptability to changing market conditions. Moreover, machine learning models can provide valuable insights into the factors driving property prices, helping stakeholders make informed decisions and mitigate risks associated with real estate transactions.

This study aims to explore the application of machine learning techniques in house price prediction, examining the performance and efficacy of different algorithms on real-world datasets. By evaluating the strengths and limitations of machine learning models, this research seeks to shed light on their potential impact on the real estate industry. Furthermore, the study will discuss the implications of machine learning for various stakeholders, including homebuyers, sellers, real estate agents, appraisers, and investors.

In summary, house price prediction using machine learning represents a promising approach to real estate valuation, offering data-driven insights and enhancing decision-making in dynamic and competitive housing markets. This research seeks to contribute to the understanding of machine learning in real estate and its implications for stakeholders in the industry.

International Journal of Innovative Research in Computer and Communication Engineering

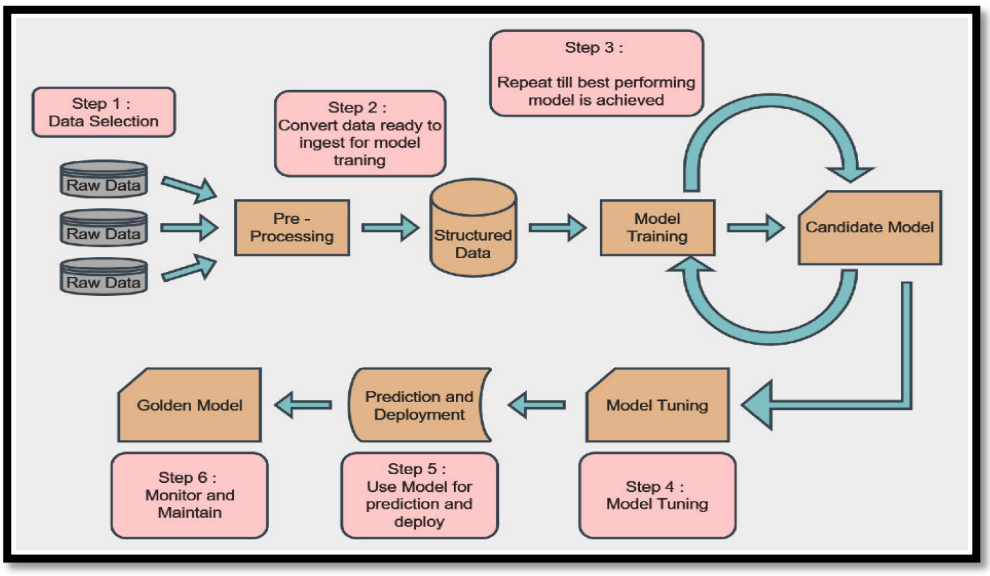
| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 | A Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 4, April 2024 ||

| DOI: 10.15680/IJIRCCE.2024.1204176 |

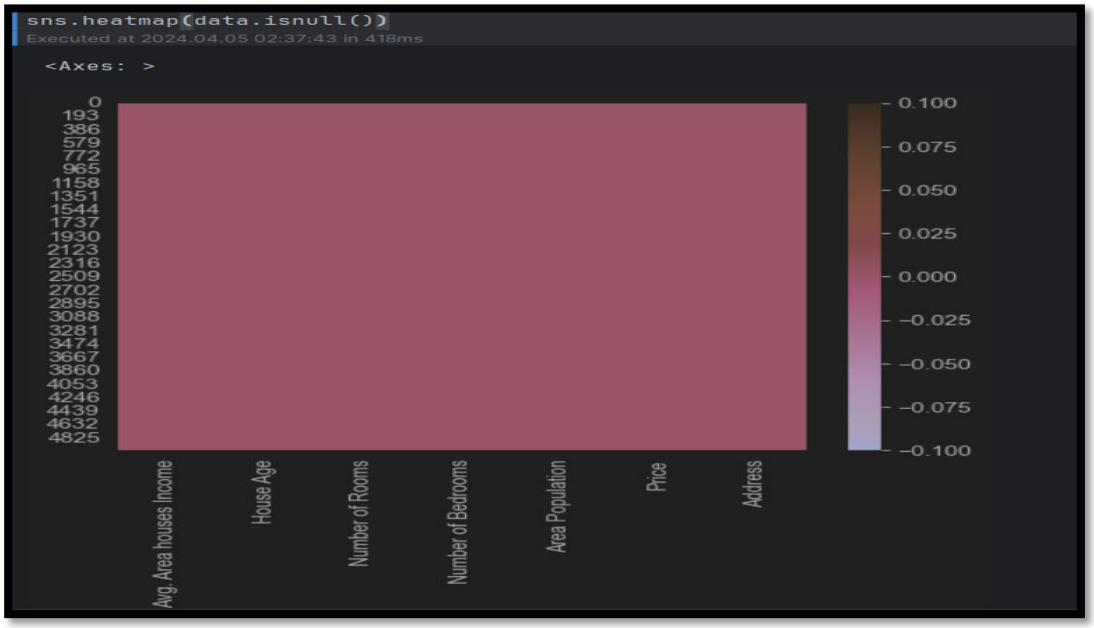
## II. IMPLEMENTATION

Predicting house prices using machine learning is a common task in data science and real estate. Here's a simplified overview of the process:




1. Data Collection:- Gather data on various features of houses such as square footage, number of bedrooms and bathrooms, location, age of the house, amenities, etc. This data can be obtained from public datasets, real estate websites, or collected through surveys.

2. Data Preprocessing:- This step involves cleaning the data, handling missing values, encoding categorical variables, and scaling numerical features if necessary. It's crucial to ensure that the data is in a format suitable for machine learning algorithms.




3. Feature Selection/Engineering:- Identify the most relevant features that affect house prices. This may involve analyzing correlations between features and the target variable (price), and potentially creating new features that could be more informative for the model.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 | A Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 4, April 2024 ||

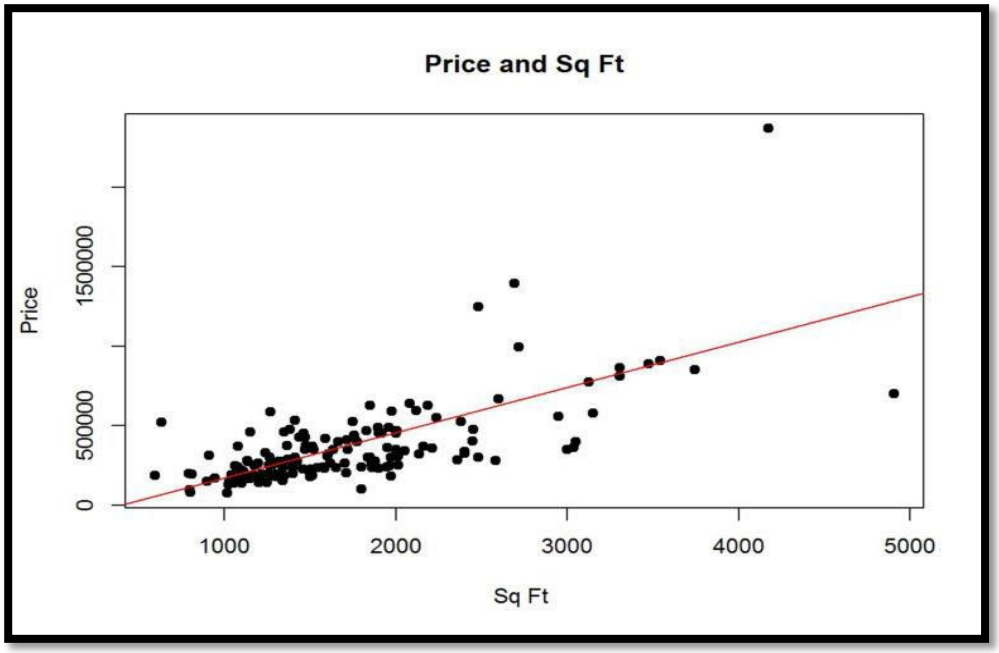
| DOI: 10.15680/IJIRCCE.2024.1204176 |

4. Splitting the Data:- Divide the dataset into training and testing sets. The training set is used to train the machine learning model, while the testing set is used to evaluate its performance.

```
#split Data into 2 parts one for train and other for test
x=data.drop('Price',axis=1)
#x contains all input variables(beds,bath,size)
y=data['Price']
#y contain output variables(Price)


x_train, x_test, y_train, y_test=train_test_split(x,y,test_size=.30)
```

5. Model Selection:- Choose a machine learning algorithm suitable for regression tasks. Common choices include linear regression, decision trees, random forests, gradient boosting machines, and neural networks. Experiment with different algorithms to see which one performs best for your specific dataset.

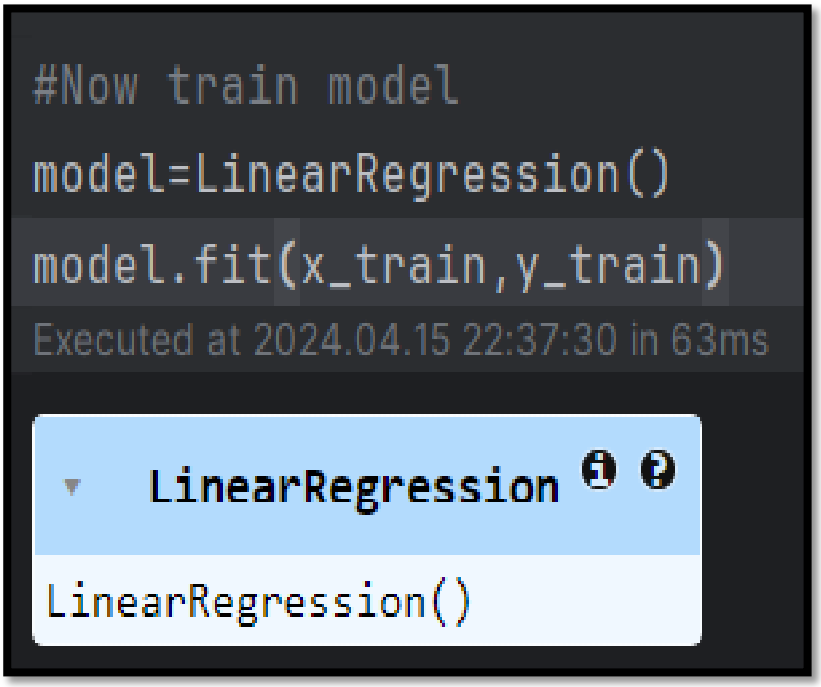



6. Model Training:- Train the selected model on the training data. During training, the model learns the relationship between the input features (e.g., square footage, number of bedrooms) and the target variable (house price).

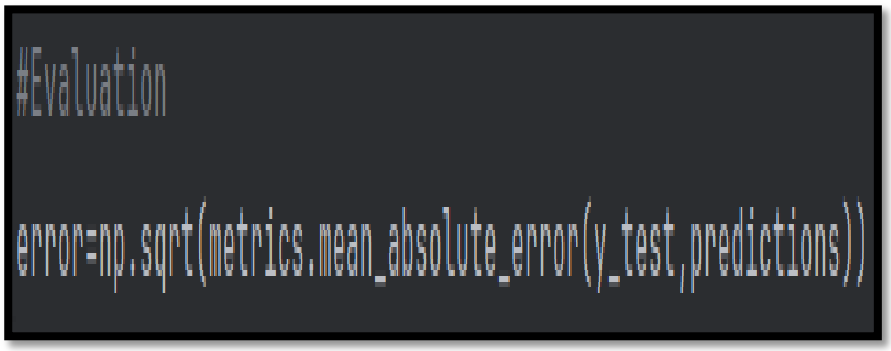
| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 | A Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 4, April 2024 ||

| DOI: 10.15680/IJIRCCE.2024.1204176 |




7. Model Evaluation:- Evaluate the trained model using the testing set. Common evaluation metrics for regression tasks include mean squared error (MSE), root mean squared error (RMSE), mean absolute error (MAE), and R-squared.




8. Hyperparameter Tuning:- Fine-tune the hyperparameters of the chosen model to optimize its performance. This can be done using techniques like grid search or random search.

9. Prediction:- Once the model is trained and evaluated satisfactorily, it can be used to make predictions on new, unseen data. Given the features of a house, the model will output an estimated price.

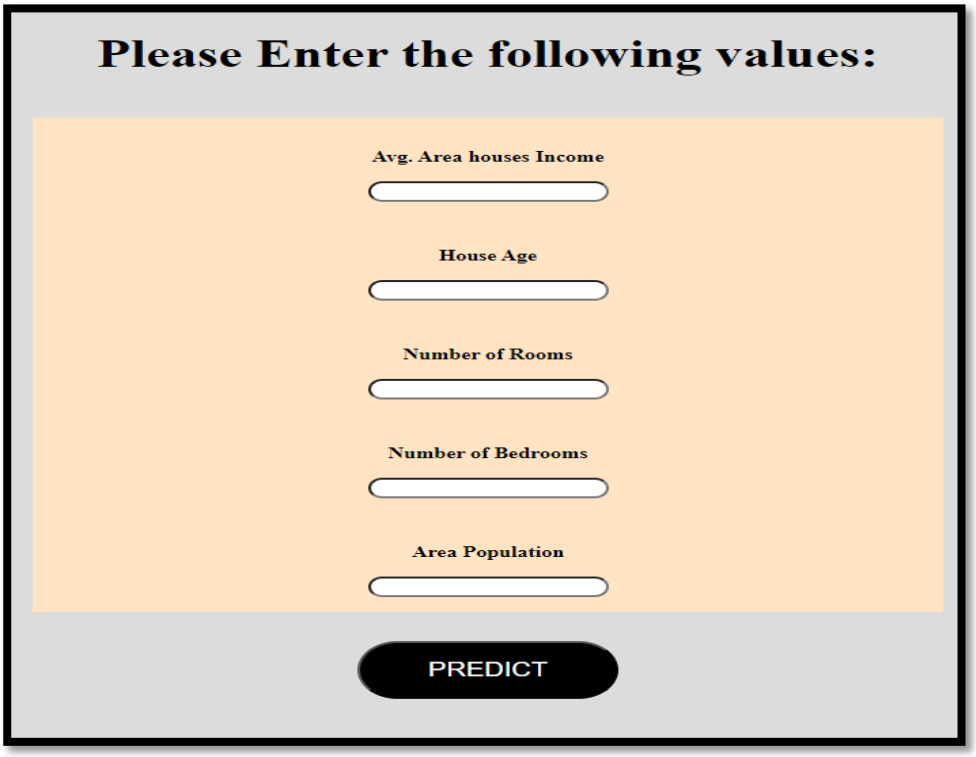
10.Deployment:- Deploy the trained model in a production environment where it can be used to predict house prices in real-time. This could be through a web application, API, or integration with existing real estate platforms.

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 | A Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 4, April 2024 ||

| DOI: 10.15680/IJIRCCE.2024.1204176 |




## III. LITERATURE SURVEY

Certainly! Here's a literature survey highlighting some key studies and approaches in house price prediction using machine learning:

1. "House Price Prediction: A Comparative Study of Regression Techniques" (2014):-
2. This study compared various regression techniques including Linear Regression, Decision Trees, Random Forests, and Support Vector Regression (SVR) for house price prediction.
3. It evaluated the performance of each method using metrics such as Mean Absolute Error (MAE) and Root Mean Squared Error (RMSE) on real-world housing datasets.
4. "Predicting House Prices Using Multiple Regression Analysis" (2017)-:
5. This research focused on the application of Multiple Regression Analysis for house price prediction.
6. It explored the impact of different features such as square footage, number of bedrooms, bathrooms, location, and amenities on house prices.
7. "House Price Prediction Using Machine Learning Techniques: A Review" (2019):-
8. This review paper provided an overview of various machine learning techniques used for house price prediction.
9. It discussed feature selection methods, data preprocessing techniques, and model evaluation metrics commonly employed in the field.
10. "Deep Learning Approach for House Price Prediction" (2020):-
11. This study investigated the application of deep learning models such as Artificial Neural Networks (ANNs) and Convolutional Neural Networks (CNNs) for house price prediction.
12. It explored the effectiveness of deep learning in capturing complex patterns in housing data and compared the results with traditional machine learning approaches.
13. "House Price Prediction Using Time Series Analysis" (2021):-
14. This research focused on utilizing time series analysis techniques for house price prediction, considering the temporal aspect of housing data.
15. It employed methods like Autoregressive Integrated Moving Average (ARIMA) and Long Short-Term Memory (LSTM) networks to model and forecast house price trends over time.
16. "Spatial Analysis for House Price Prediction: A Geographically Weighted Regression Approach" (2022):-
17. This study employed Geographically Weighted Regression (GWR) to account for spatial variations in house prices.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 | A Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 4, April 2024 ||

| DOI: 10.15680/IJIRCCE.2024.1204176 |

18. It considered geographic factors such as neighborhood characteristics, proximity to amenities, and local economic conditions to enhance the accuracy of house price predictions.
19. These studies provide valuable insights into different methodologies, techniques, and algorithms used for house price prediction using machine learning. Researchers and practitioners can leverage this literature to develop robust predictive models and address challenges in real estate valuation.

## IV. ADVANTAGES

House price prediction using machine learning offers several advantages:

1. Data-Driven Insights:- Machine learning algorithms can analyze large volumes of housing data to identify patterns and relationships between various features and house prices. This data-driven approach provides valuable insights into the factors influencing real estate prices.
2. Accuracy:- Machine learning models can often achieve higher prediction accuracy compared to traditional statistical methods. By learning from historical data, these models can make more precise predictions of house prices, helping buyers, sellers, and real estate professionals make informed decisions.
3. Automation:- Once trained, machine learning models can automate the process of house price prediction. This saves time and effort for real estate agents, appraisers, and property investors who would otherwise need to manually analyze market trends and comparable sales data.
4. Scalability:- Machine learning models can scale to handle large and diverse datasets, including information on housing attributes, neighborhood characteristics, economic indicators, and market trends. This scalability enables robust and comprehensive analysis of housing markets at various scales, from local neighborhoods to global regions.
5. Flexibility:- Machine learning algorithms are flexible and adaptable to different types of housing markets and property types. Whether predicting prices for single-family homes, condominiums, or commercial properties, machine learning models can be tailored to suit specific market conditions and property characteristics.
6. Feature Importance:- Machine learning models can identify the most important features driving house prices. This helps stakeholders prioritize factors such as location, size, amenities, and economic indicators when making real estate decisions.
7. Continuous Learning:- Machine learning models can be continuously updated and retrained with new data to adapt to changing market conditions and trends. This ensures that predictions remain accurate and relevant over time, reflecting the dynamic nature of real estate markets.
8. Risk Mitigation:- By providing more accurate price predictions, machine learning models can help mitigate risks associated with real estate transactions, such as overpaying for a property or selling below market value.
9. Innovative Techniques:- Machine learning enables the exploration of innovative techniques such as deep learning, ensemble methods, and geospatial analysis for house price prediction. These advanced methods can capture complex patterns and interactions in housing data, leading to more accurate predictions.
10. Overall, house price prediction using machine learning offers numerous benefits, including enhanced accuracy, efficiency, scalability, and adaptability, making it a valuable tool for various stakeholders in the real estate industry.

## V. CONCLUSION

In conclusion, house price prediction using machine learning holds significant promise and has become an invaluable tool in the real estate industry. Through the analysis of large and diverse datasets, machine learning algorithms can uncover intricate relationships between housing attributes, market trends, and economic indicators, enabling more accurate predictions of property prices.

By leveraging advanced techniques such as regression analysis, ensemble learning, and deep learning, machine learning models can provide insights into the complex dynamics of real estate markets. These models offer advantages such as higher prediction accuracy, automation of analysis processes, scalability to handle large datasets, and flexibility to adapt to changing market conditions.

Moreover, machine learning facilitates data-driven decision-making for various stakeholders, including homebuyers, sellers, real estate agents, appraisers, and investors. By identifying the most influential factors driving property prices and quantifying their impact, machine learning empowers stakeholders to make informed decisions, mitigate risks, and optimize their real estate transactions.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 | A Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 4, April 2024 ||

| DOI: 10.15680/IJIRCCE.2024.1204176 |

Furthermore, continuous learning and adaptation are inherent to machine learning models, ensuring that predictions remain accurate and relevant over time. By incorporating new data and updating model parameters, machine learning models can adapt to evolving market dynamics, thus enhancing their predictive capabilities and maintaining their utility in the long term.

Overall, house price prediction using machine learning represents a powerful approach to understanding and navigating real estate markets. As technology continues to advance and datasets grow in complexity, machine learning will play an increasingly vital role in shaping the future of the real estate industry, driving efficiency, transparency, and informed decision-making.

## REFERENCES

1. J. Manasa, R. Gupta, and N. Narahari, "Machine learning based predicting house prices using regression techniques," in 2020 2nd International conference on innovative mechanisms for industry applications (ICIMIA). IEEE, 2020, pp. 624–630.
2. Y. Luo, "Residential asset pricing prediction using machine learning," in 2019 International Conference on Economic Management and Model Engineering (ICEMME). IEEE, 2019, pp. 193–198.
3. P. Durganjali and M. V. Pujitha, "House resale price prediction using classification algorithms," in 2019 International Conference on Smart Structures and Systems (ICSSS). IEEE, 2019, pp. 1–4.
4. R. Sawant, Y. Jangid, T. Tiwari, S. Jain, and A. Gupta, "Comprehensive analysis of housing price prediction in pune using multi-featured random forest approach," in 2018 Fourth International Conference on Computing Communication Control and Automation (ICCUBEA). IEEE, 2018, pp. 1–5.
5. P.-Y. Wang, C.-T. Chen, J.-W. Su, T.-Y. Wang, and S.- H. Huang, "Deep learning model for house price prediction using heterogeneous data analysis along with joint self-attention mechanism," IEEE Access, vol. 9, pp. 55 244–55 259, 2021.

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

INNO SPACE SJIF Scientific Journal Impact Factor

doi crossref

निस्केयर NISCAIR

# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

## IN COMPUTER & COMMUNICATION ENGINEERING

9940 572 462 6381 907 438 ijircce@gmail.com

www.ijircce.com

Scan to save the contact details