D Y PATIL INTERNATIONAL UNIVERSITY

AKURDI PUNE

PricePredictor

By

Rohan Ramesh Pandit **PRN:20220804004**

Chetan Manohar Chaudhari **PRN:20220804027**

Pratik Ravindra Yadav **PRN:20220804048**

Under Guidance Of

Dr. Somya Dubey

Submitted to

School of Computer Science, Engineering and Application

In partial fulfilment of the requirements

For the award of the degree

Master of Computer Applications (MCA)

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D Y PATIL INTERNATIONAL UNIVERSITY
AKURDI PUNE

School of Computer Science, Engineering and Applications

CERTIFICATE OF COMPLETION

This is to certify that the project report entitled **'PRICEPREDICTOR' submitted** to **School of Computer Science, Engineering and Application, *D Y Patil International University, Akurdi*** in partial fulfilment of the requirements for the ***Project- I course,* SEM II** of the degree of **Master of Computer Applications (MCA),** is an original work carried out by Mr. **Rohan Pandit, Chetan Chaudhari, Pratik Yadav** with PRN **20220804004, 20220804027, 20220804048** under my guidance.

The matter embodied in this project is genuine work done by the student and has not been submitted whether to this university or to any other university for the fulfilment of the requirements of any course of study.

_____ _____

Signature of the student:
Date: _____
Name of the student**:** Rohan Ramesh Pandit
Chetan Manohar Chaudhari
Pratik Ravindra Yadav
PRN**:** 20220804004
20220804027
20220804048

Signature of the Guide:
Date: _____
Name of the **Guide:** Dr.Somya Dubey
Name of the School: SCSEA

Signature of the project In-charge: _____
Date: _____
Name of the **project In-charge:** Ms.Sarika Jadhav
Name of the School: SCSEA

_____ _____

Signature of the HOD:
Date: _____
Name of the **HOD:** Dr. Maheshwari Biradar
Name of the School: SCSEA

Signature of the Director:
Date: _____
Name of the **Director:** Dr. Bahubali Shiragapur
Name of the School: SCSEA

Abstract:

Analysing various fields, associate numbers, events became the need of time and most important step to do anything and hence data science became an important part in every field. Using the concept of data science, the project of Real Estate Price Prediction is built. The motive of creating a project on Real Estate Price Prediction was just to implement the concepts of data science and python language that is used in analysing for designing an application. This was done to get better understanding of the skills that are needed in python language, analysis using data science. The project focuses on the different features and algorithm available in python and data science. In this project various library of python is used to design an attractive, effective, and beautiful project. The project will introduce a Real Estate price estimation system that done estimate based on various mathematical algorithms and tricks and then gives best possible result. So basically, what this application does is identify the need of user in any specific area in Bangalore.

ACKNOWLEDGEMENT

It gives me immense pleasure to express my deepest sense of gratitude and sincere thanks to my highly respected and esteemed guide **Dr. Somya Dubey, SCSEA, D Y Patil International University,** for her valuable guidance, encouragement, and help in completing this work. Her useful suggestions for this whole work and cooperative behaviour are sincerely acknowledged. I would like to express my sincere thanks to the project in-charge **Mrs. Sarika Jadhav, Schools of Computer Science, Engineering and Application.** And Head of The Department **Dr. Maheshwari Biradar**, **Schools of Computer Science, Engineering and Application.** For giving this opportunity to undertake this project.

Also wish to express my gratitude to the Director **Dr. Bahubali Shiragapur**, **Schools of Computer Science, Engineering and Application.** For his kind-heartedsupport.

I am also grateful to my faculty members for their constant support and guidance. I also wish to express my indebtedness to my parents as well as my family member whose blessings and support always helped me to face the challenges ahead. The endI would like to express my sincere thanks to all my friends and others who helped me directly or indirectly during this project work.

Place: Akurdi, Pune

Student Name:

Rohan Pandit	20220804004
Chetan Chaudhari	20220804027
Pratik Yadav	20220804048

Date:

1. INTRODUCTION:

1.1. Introduction:

In the business of Real Estate there are a lot of sellers who is selling their property in that area and if the buyer has a limited budget for spending, so one must have to do a lot of research to meet his requirements. So here the need of data science occurs as with the help of analysis one can get an approximate cost and general idea of price and availability of the property. There is a lot of difference in doing analysis and deep & good analysis. Analysis is just an overview of the records whereas deep analysis gives us much better result by analysing peak, average factors alone with outlier values etc. As it is supposed that outliers affect the mean result, so all algorithmic calculation are done to overcome that inconsistency in result. This gives user a best result to do things and hence this saves the time of the user and benefits him a lot in searching desired result only. Also, in some cases sometimes seller put cost of his property so high. So, after analysis of data an average estimation is provided that might help the user from fraud type activities and false result. In this project database is taken is of Bangalore city. Algorithms made calculation on data present in dataset only.

1.2. Objectives:

- To gather and analyze large datasets of real estate information to identify relevant factors that impact real estate prices.
- To develop and train a machine learning model that can accurately predict real estate prices on the analyzed data.
- To evaluate the performance of the model using a set of unseen data and identify the areas for improvement.
- To provide a web-based tool that can be used by real estate professionals, property investors, and home buyers and receive an estimate of the future price of a property
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1.3. Purpose:

The Scope of the Real Estate Price Prediction project is vast, with many opportunities for improvement and expansion. By continuously evolving and expanding the system, this project has the potential become a leading tool for real estate price prediction, helping users make informed decisions about their property investments. The project will provide a comprehensive solution for real estate price predictions, from data collection and analysis to model development, training and development.

1.4. Scope:

The Scope of the Real Estate Price Prediction project is vast, with many opportunities for improvement and expansion. By continuously evolving and expanding the system, this project has the potential become a leading tool for real estate price prediction, helping users make informed decisions about their property investments. The project will provide a comprehensive solution for real estate price predictions, from data collection and analysis to model development, training and development.

1.5. Applicability:

1) **Real Estate Professionals:** Real estate agents, brokers, and developers can use the system to get a better understanding of the real estate market, making it easier to price properties, negotiate deals, and make informed decisions about investments.

2) **Property Investors:** Property investors can use the system to access the future value of potential investment properties, helping them make more informed decisions about where and when to invest.

3) **Bank and Financial Institutions:** Banks and financial institutions can use the system to access the risk associated with leading money for real estate transactions, helping them make more decisions about leading.

4) **Government:** Government Can use the system to access the impact of policy changes on real estate, helping them make informed decisions about economic development and land-use planning.

5) **Marketing and Sales:** Real estate price prediction models can help real estate agents and brokers to determine the optimal selling price for a property. It can also be used to identify the most attractive features of a property and target the right buyers.

2. SURVEY OF TECHNOLOGIES:

Linear regression is a commonly used machine learning algorithm for real estate price prediction systems. The algorithm works by fitting a linear equation to the historical data, where the input features (such as square footage, number of bedrooms, etc.) are used to predict the output (the price of the property).

Here's how linear regression can be used in a real estate price prediction system:

Data Collection: Historical data on real estate prices is collected from various sources, such as real estate websites, government databases, and MLS (Multiple Listing Service) listings.

Data Pre-processing: The collected data is cleaned, transformed, and pre-processed to prepare it for modelling. This includes handling missing data, encoding categorical variables, and scaling the features.

Feature Engineering: The most relevant input features are selected based on their correlation with the output variable (price) and their predictive power.

Model Training: A linear regression model is trained on the pre-processed data using techniques such as gradient descent or normal equations. The model learns the relationship between the input features and the output variable and generates a set of coefficients that represent the linear equation.

Model Evaluation: The trained model is evaluated on a test set to measure its accuracy and generalization performance. The evaluation metrics can include mean squared error (MSE), root mean squared error (RMSE), and R-squared.

Prediction: Once the model is trained and evaluated, it can be used to make predictions on new data. The user inputs the features of a property, and the model predicts its price based on the learned coefficients and linear equation.

Data Analytics: Real estate price prediction systems require large amounts of data to be collected, cleaned, and analyzed. Data analytics tools such as Excel, SQL, and Python can be used to extract, transform, and load the data into the system.

Machine Learning: Machine learning algorithms such as linear regression, random forests, and neural networks can be used to build models that can predict real estate prices. These models are trained on historical data and can learn to identify patterns and relationships between variables.

HTML/CSS: HTML is used to structure the content of web pages, while CSS is used to style and layout the content. Together, these technologies provide a foundation for building user interfaces for real estate price prediction systems.

JavaScript: JavaScript is used to add interactivity to web pages, such as dynamically updating content or handling user input. It can be used to implement features such as real-time price updates, interactive charts and graphs, and data visualization tools.

Web Frameworks: Web frameworks such as Flask can be used to build web applications quickly and efficiently. These frameworks provide a set of tools and libraries for handling user input, managing databases, and building user interfaces.

3. REQUIREMENTS AND ANALYSIS:

3.1. Problem Definition:

- The problem of real estate price prediction is to develop a model that accurately predicts the price of a property based on various features such as the area per square foot, the number of bedrooms, the number of bathrooms, and the location. The model should be able to take into account the complex interplay of these features and how they affect the price of a property.
- The goal of real estate price prediction is to provide buyers and sellers with a reliable estimate of the value of a property. Accurate price predictions can help buyers make informed decisions about which properties to purchase and at what price, while also helping sellers set a fair and competitive price for their property.
- Real estate price prediction can be a challenging problem because of the large number of factors that can affect the price of a property. These factors can include not only the physical features of the property but also the broader economic and market conditions in the local area. Therefore, developing an accurate model requires careful consideration of the relevant features and a robust modeling approach that can capture the complexity of the problem.
- This project has the potential to provide valuable insights into the real estate market and help users make informed decisions about their investments.

3.2. Requirement Specification:

3.2.1. Functional Requirements:

i. Data Gathering**:** The system should be able to gather data from various sources, including real estate listings, public records, and other data sources. It should also be able to clean and pre-process the data to ensure that it is accurate and ready for analysis.

ii. Feature Selection: The system should be able to identify and select relevant features that can affect the price of a property. These features may include the area per square foot, the number of bedrooms, the number of bathrooms, the location, and other relevant factors.

iii. Model Building: The system should be able to build a robust linear regression model that can accurately predict the price of a property based on the selected features. The model should be trained on a large and diverse dataset to ensure that it can generalize well to new properties.

iv. Model Evaluation: The system should be able to evaluate the performance of the model using various metrics such as Mean Squared Error (MSE), Root Mean Squared Error (RMSE), and R-squared. The evaluation metrics can help the users understand the accuracy and reliability of the model.

v. Prediction: The system should be able to use the trained model to predict the price of a property based on its features. The prediction should be fast and accurate, allowing users to get real-time estimates of property values.

3.2.2. Non-Functional Requirements:

i. Performance: The system should be able to handle large volumes of data and make predictions. The prediction time should be fast, and the system should be able to scale to handle increased traffic

ii. Security: The system should have appropriate security measures in place to protect the privacy and confidentiality of the data.

iii. User Interface: The system should have a user-friendly interface that is easy to use and navigate. It should be accessible on various devices and platforms.

iv. Usability: The system should be easy to use and understand for non-technical users. It should have clear documentation and provide user support when needed.

v. Compatibility: The application should be compatible with various operating systems, including Windows, Linux and macOS.

3.3. Feasibility Study:

Feasibility study is an important step in process of developing a real estate price prediction system, as it assesses whether the project is economically, technically, and operationally feasible. Following factors should be considered when conducting a feasibility study for this project:

3.3.1. Technical Feasibility:

This involves accessing the technical capability of the project, including the availability of data, the ability to develop a model that can accurately predict real estate prices and the ability to deploy the system.

3.3.2. Economic Feasibility:

This involves assessing the cost of developing and maintaining the system, as well as the potential financial benefits of the project

3.3.3. Operational Feasibility:

This involves assessing the practically of the project, including the availability of resources, the ability to integrate the system into existing processes, and the ability to train users on how to use the system.

3.4. Planning and Scheduling:

3.5. Software and Hardware Requirements:

3.5.1. Software Requirements:

- Operating System: Windows 7 Or higher version.
- Browser should be of version (112.05615.137)

3.5.2. Hardware Requirements:

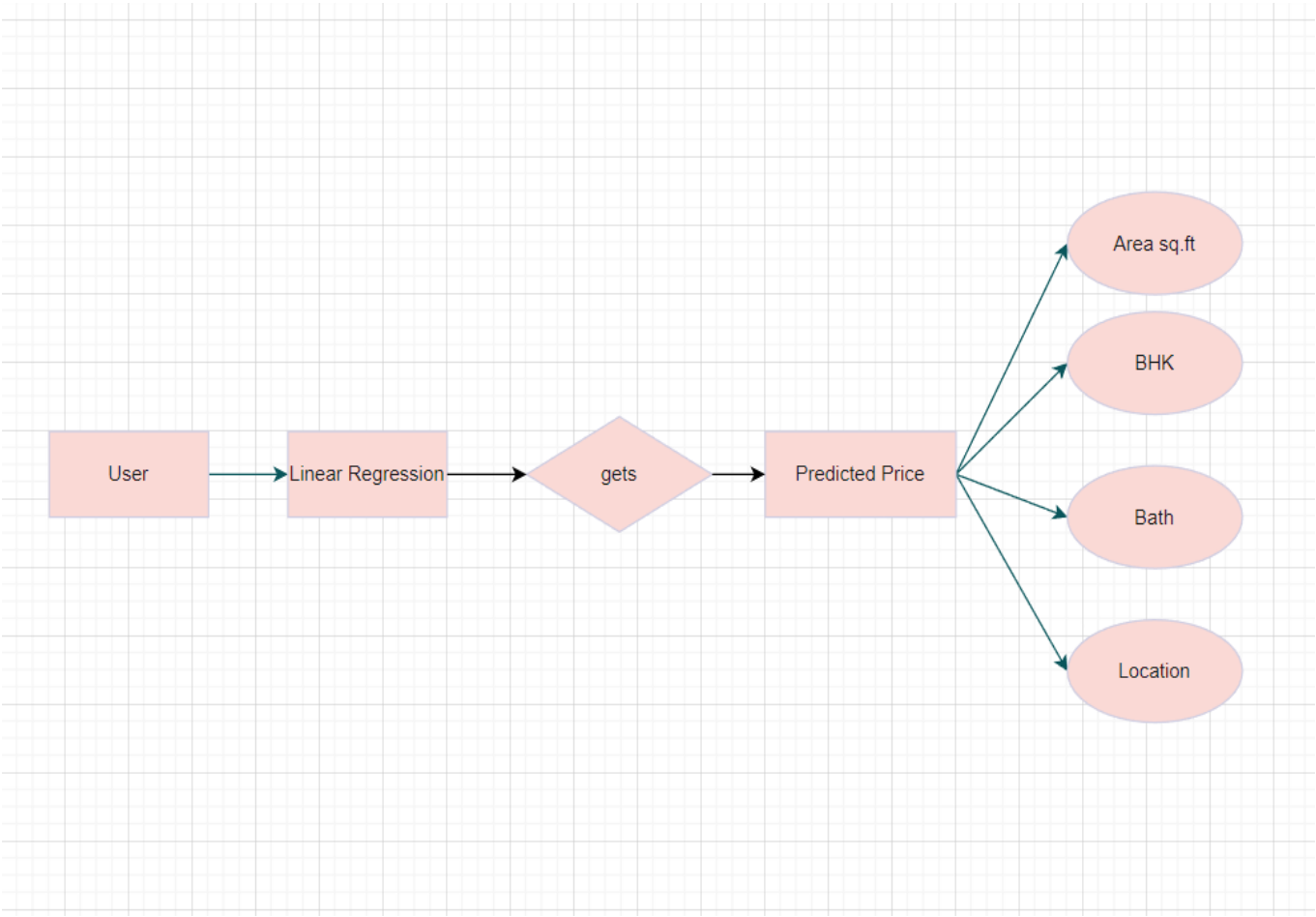
- Recommended PC specifications are Intel i3/Ryzen 3 and 4 GB RAM or more. As the system has to execute tasks and give response in least time.
- Minimum PC specifications: Pentium-pro processor or later. RAM 512MB or more ○ Memory-> 1GB or above.
- HDD Space-> 50MB or above.

3.6. Preliminary Product Description:

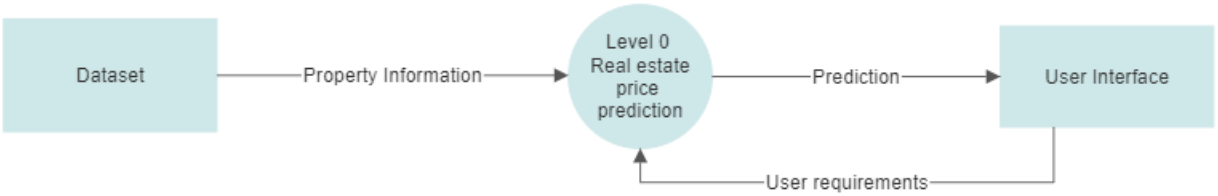
Our real estate price prediction product aims to solve the problem of accurate and reliable predictions of real estate prices. It is designed for real estate professionals, home buyers, sellers, and investors who want to make informed decisions about property transactions. The product features an intuitive interface that allows users to input property features such as location, area per sqft, bath, bhk and generate a predicted price based on machine learning algorithms. Our technology stack includes Python, Flask, Scikit-learn, and we source our data from publicly available real estate dataset. We believe our product offers a unique value proposition in the market, with its accuracy, user-friendliness, and ability to compare prices across multiple properties. We will continually monitor and update the product to stay ahead of the competition and meet the evolving needs of our users.

3.7. Conceptual Models / Design Documents:

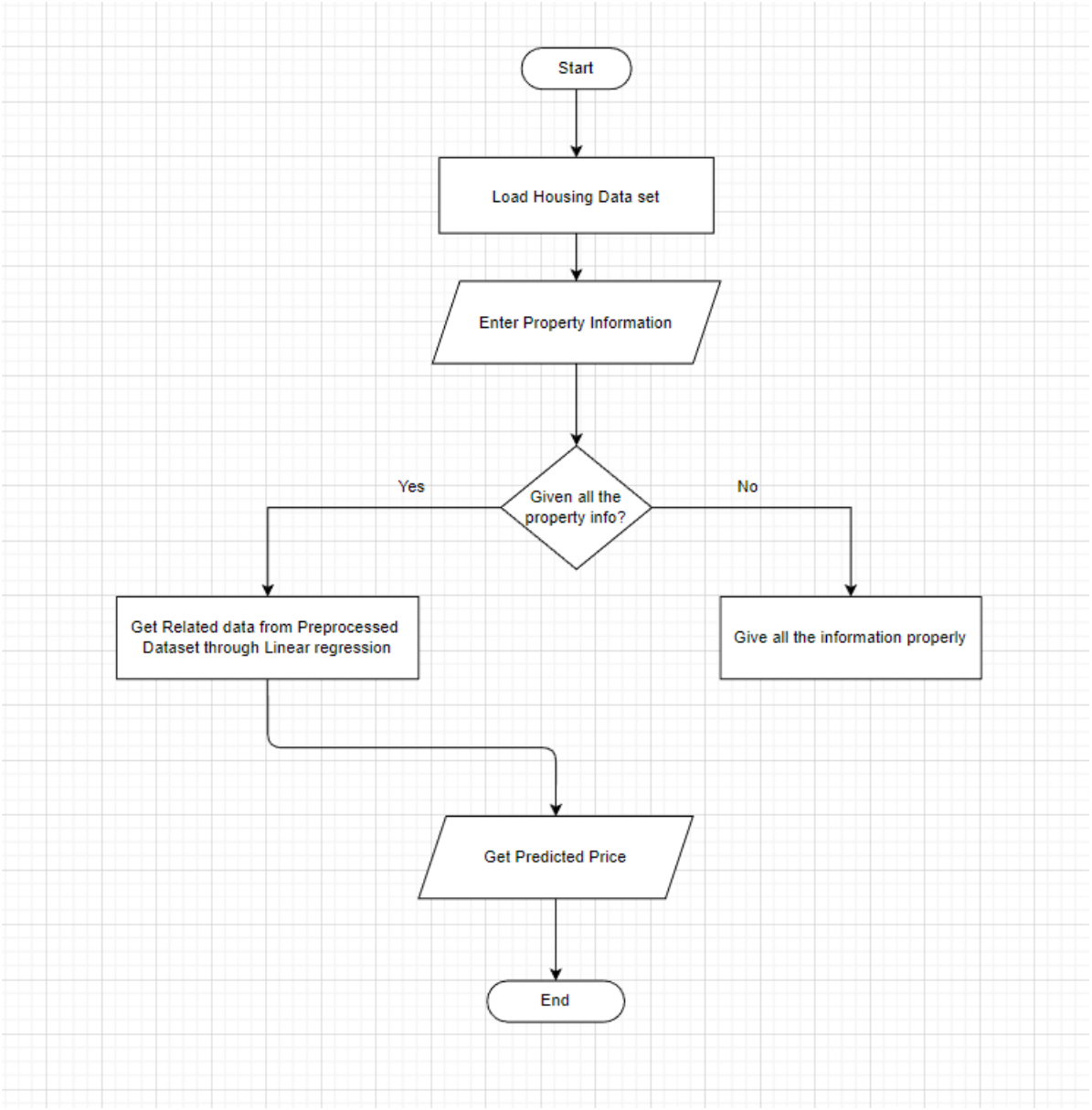
3.7.1. Entity Relationship Diagram:



3.7.2. Data Flow Diagram (DFD):

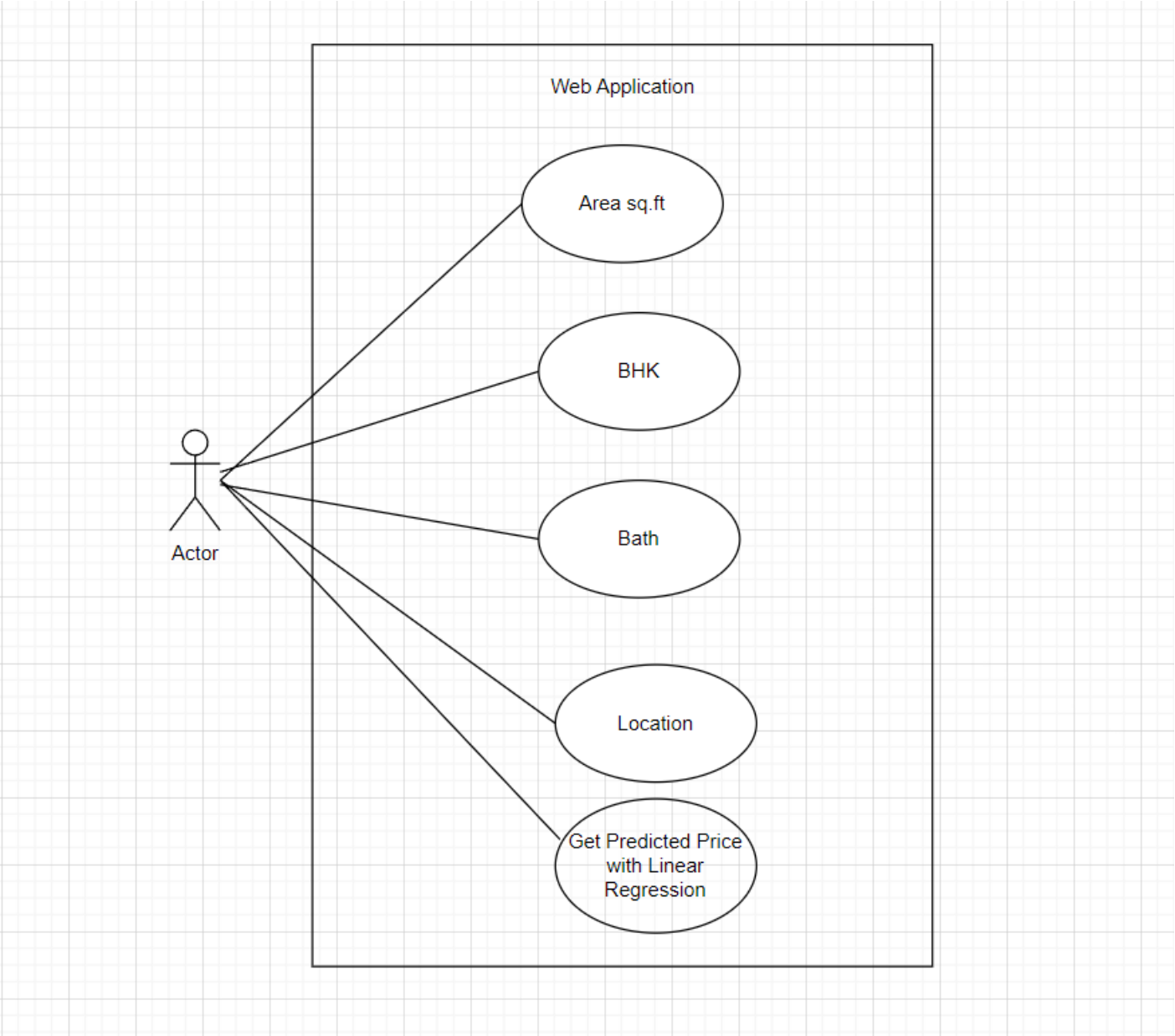


3.7.3: Flow Chart:

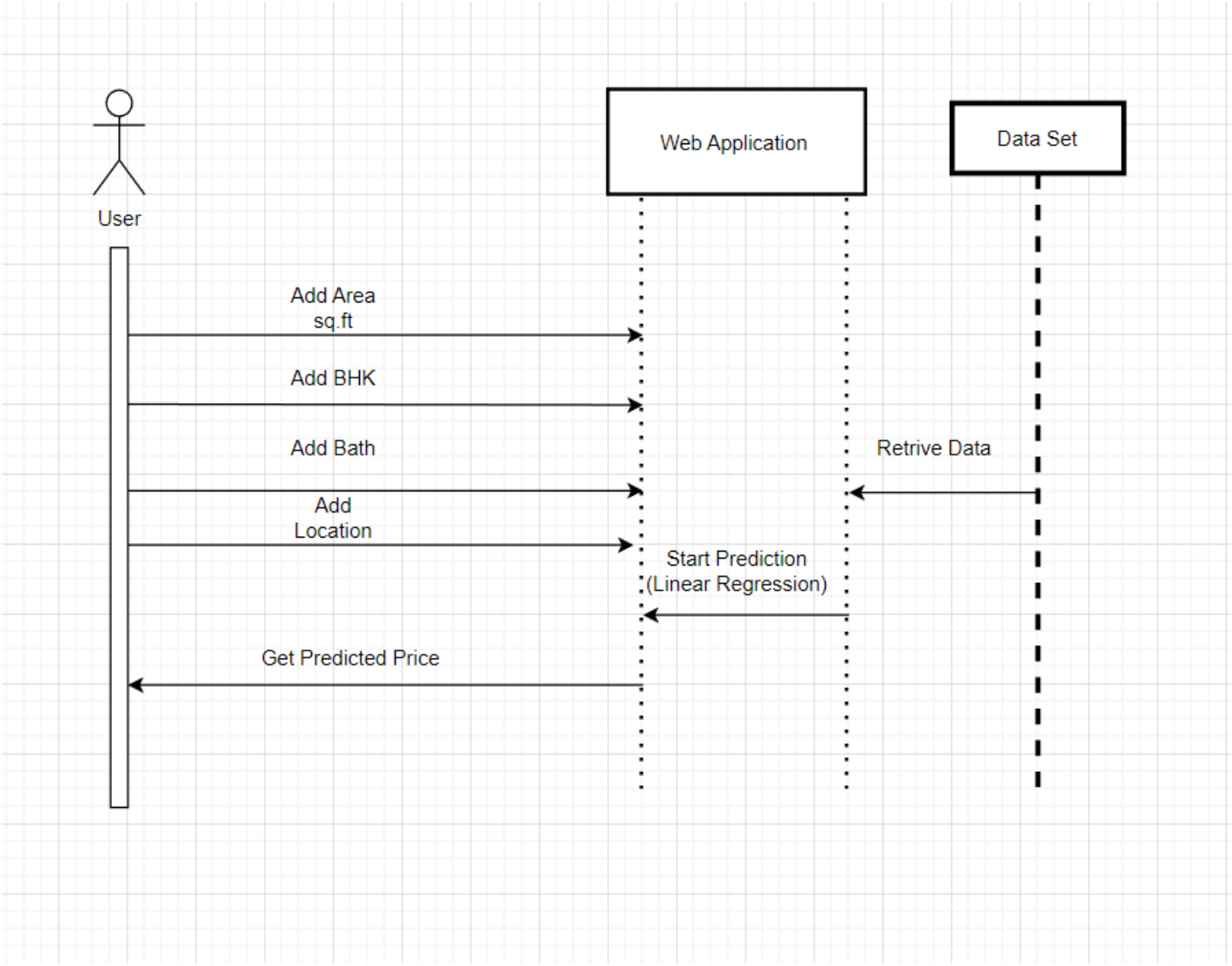


3.7.4. UML Diagrams:

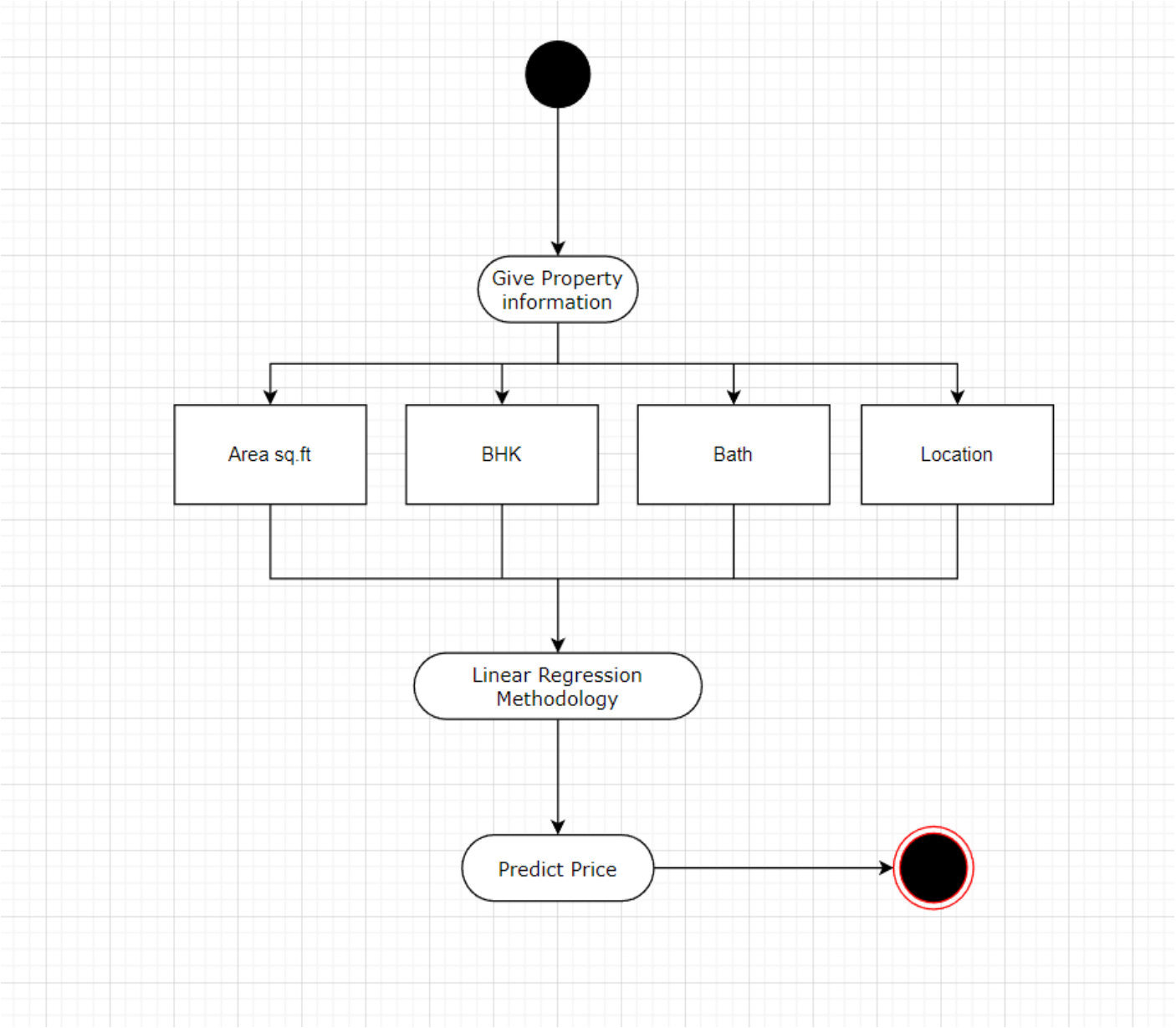
3.7.4.1. Use Case Diagram:



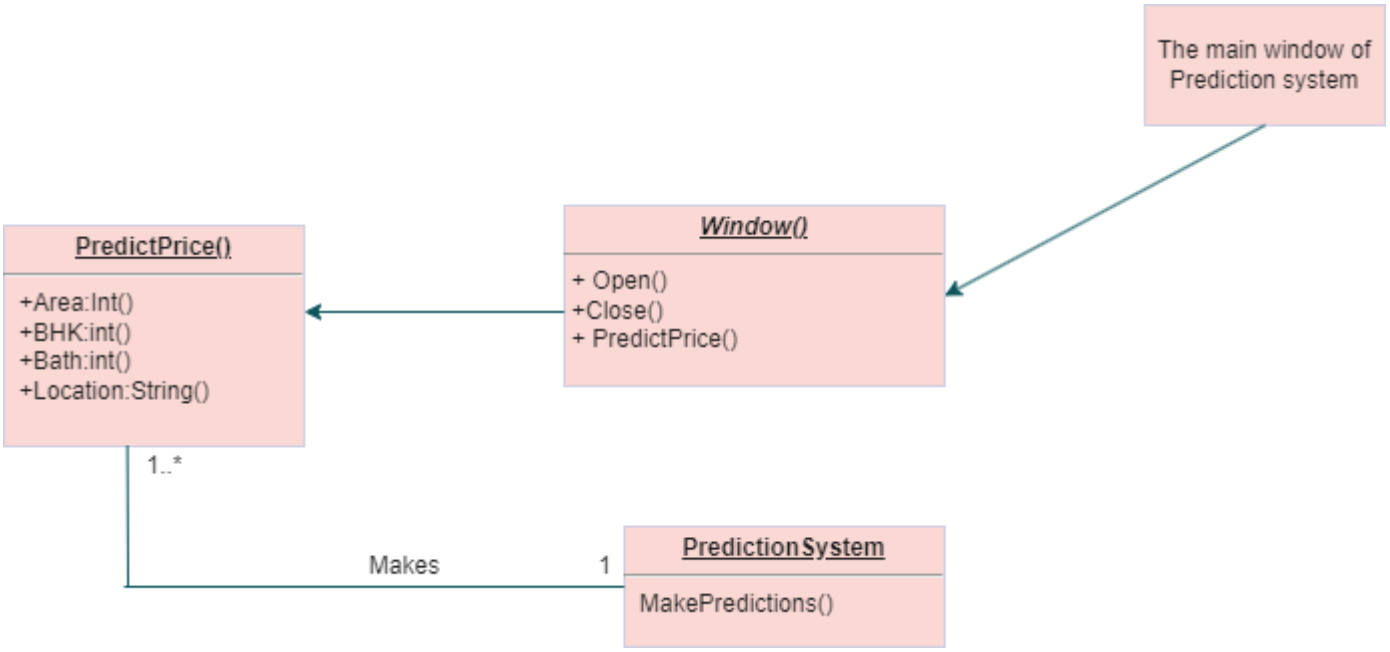
3.7.4.2. Sequence Diagram:



3.7.5. Activity Diagram:



3.7.4.3. Class Diagram:



3.7.5. Pseudo Codes:

3.7.5.1. Linear Regression:

This Python code defines a Linear Regression model using scikit-learn library and trains it on the given training data (X,train and y.train). Then, it evaluates the model performance on testing data (X,test and y.test) using the score() function. The code also defines a dictionary of models to be used for hyperparameter tuning and a function named predict price) that takes in some input parameters such as location, square footage, bathrooms, and bedrooms to predict the price of a house using the previously trained Linear Regression model.

```
# Define a Linear Regression model
lr_clf = LinearRegression()

# Fit the model on training data
lr_clf.fit(X_train, y_train)

# Evaluate the model performance on testing data
score = lr_clf.score(X_test, y_test)

# Define a dictionary of models to be used for hyperparameter tuning
algos = {
        'linear_regression' : {
            'model': LinearRegression(),
            'params': {
                'normalize': [True, False]
            }
        }
    }

# Define a function to predict house prices
def predict_price(location, sqft, bath, bhk):
    # Find the index of the given location in the feature matrix
    loc_index = np.where(X.columns==location)[0][0]

    # Create a feature vector for the given house
    x = np.zeros(len(X.columns))
    x[0] = sqft
    x[1] = bath
    x[2] = bhk
    if loc_index >= 0:
```

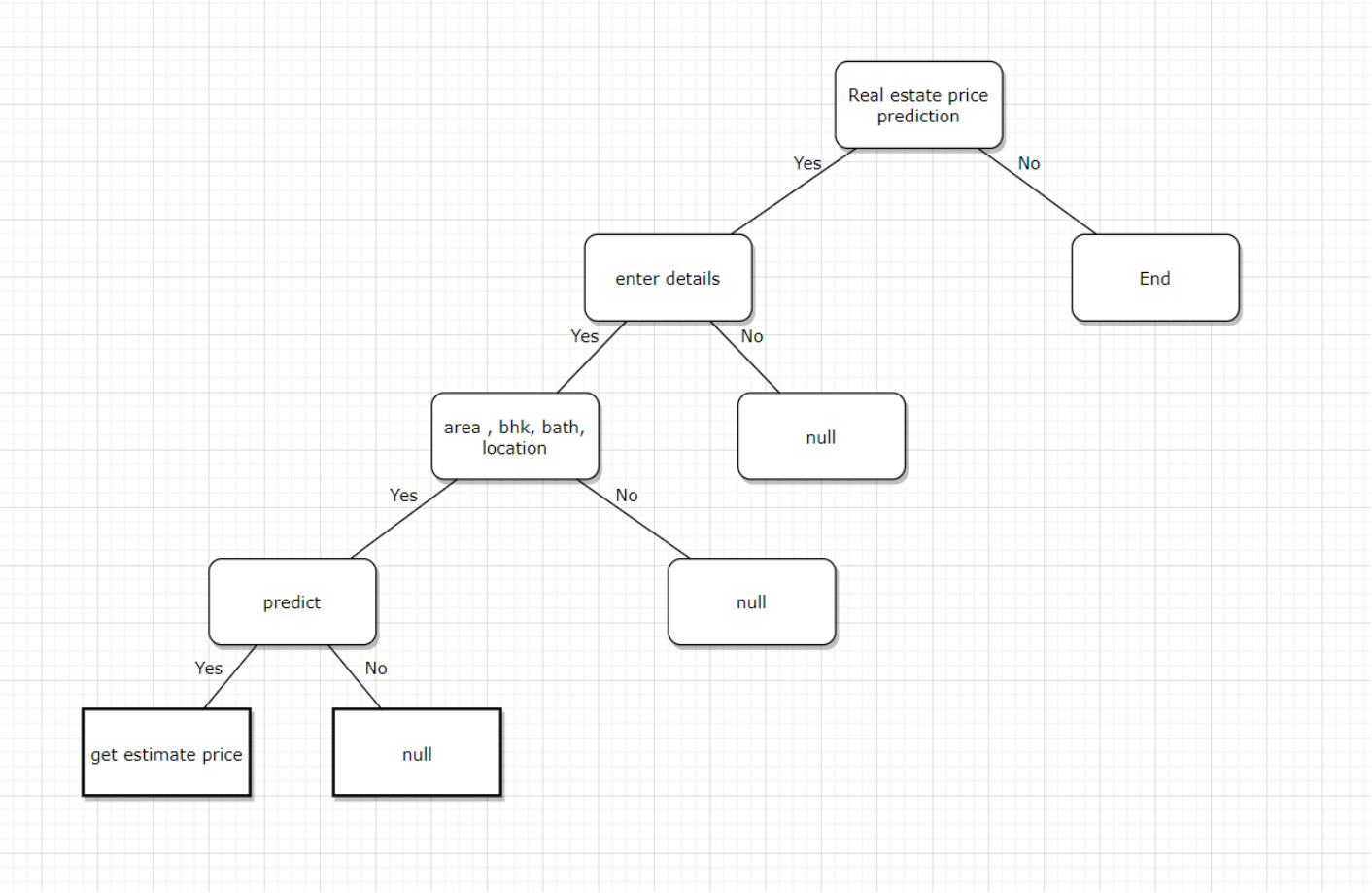
```
    x[loc_index] = 1

# Predict the house price using the previously trained model
return lr_clf.predict([x])[0]
```

3.7.6. Decision Tables:

Conditions	Rule 1	Rule 2	Rule 3
Property Location	Urban	Suburban	Rural
No. of BKH	3 BKH or more	2 BKH	1BKH
No. of bath	2 or more	1	1
Total Area	>2000	1000-2000	<1000
Price Prediction	High	Medium	Low

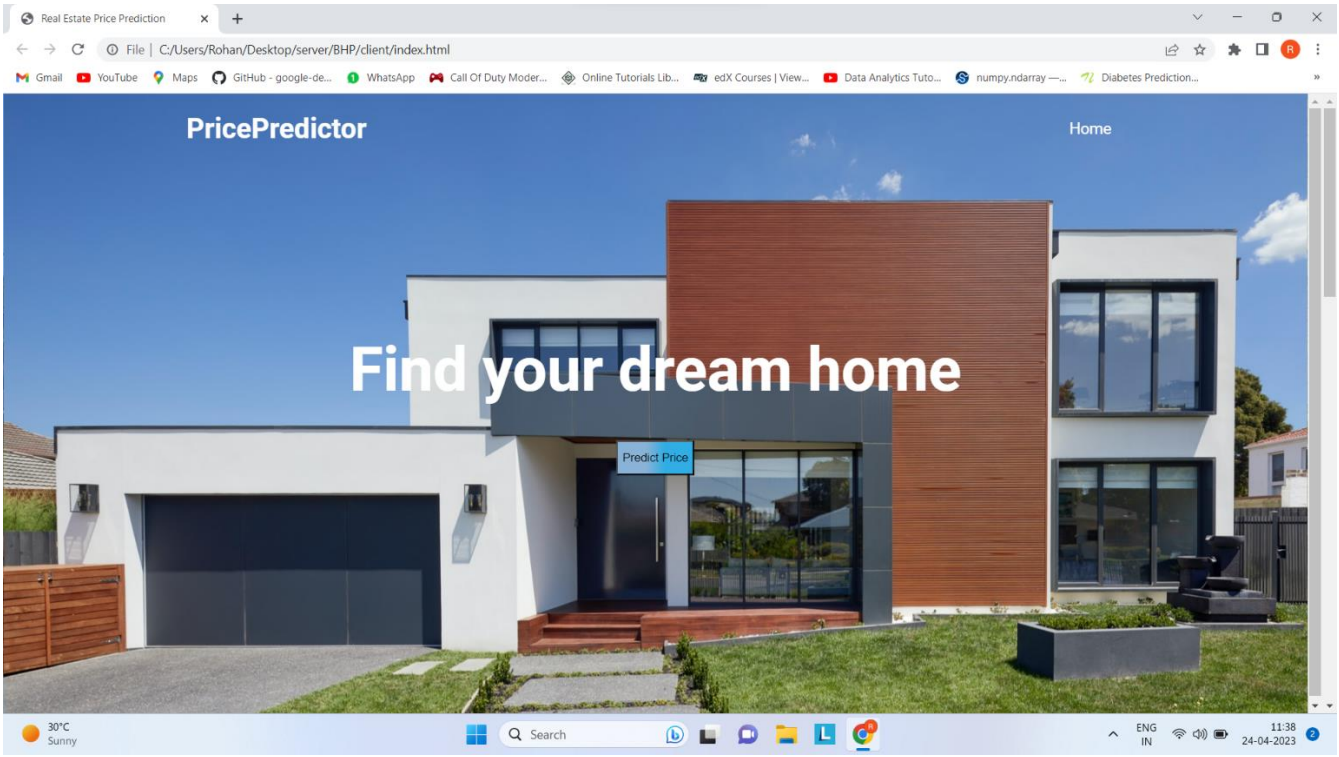
3.7.7. Decision Tree:



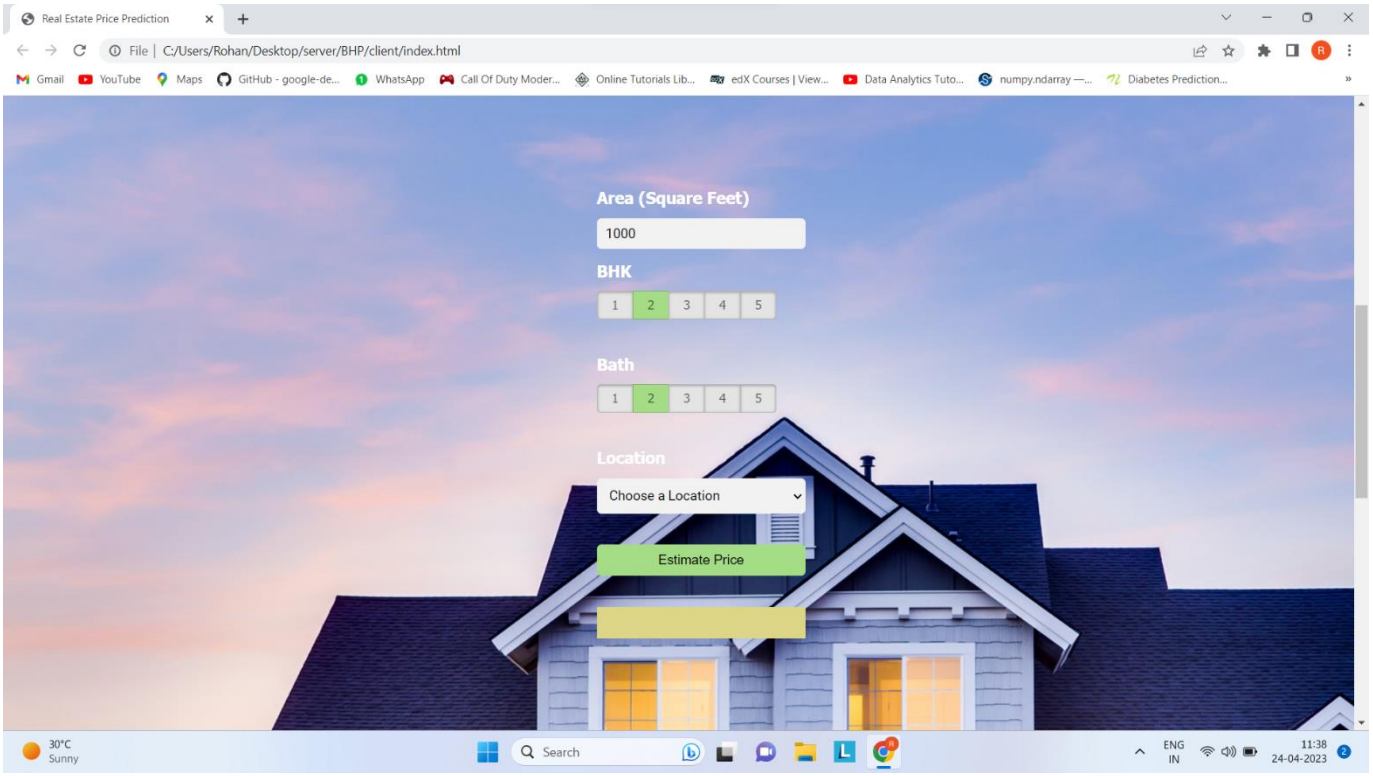
4. System Design:

4.1. Output Screens:

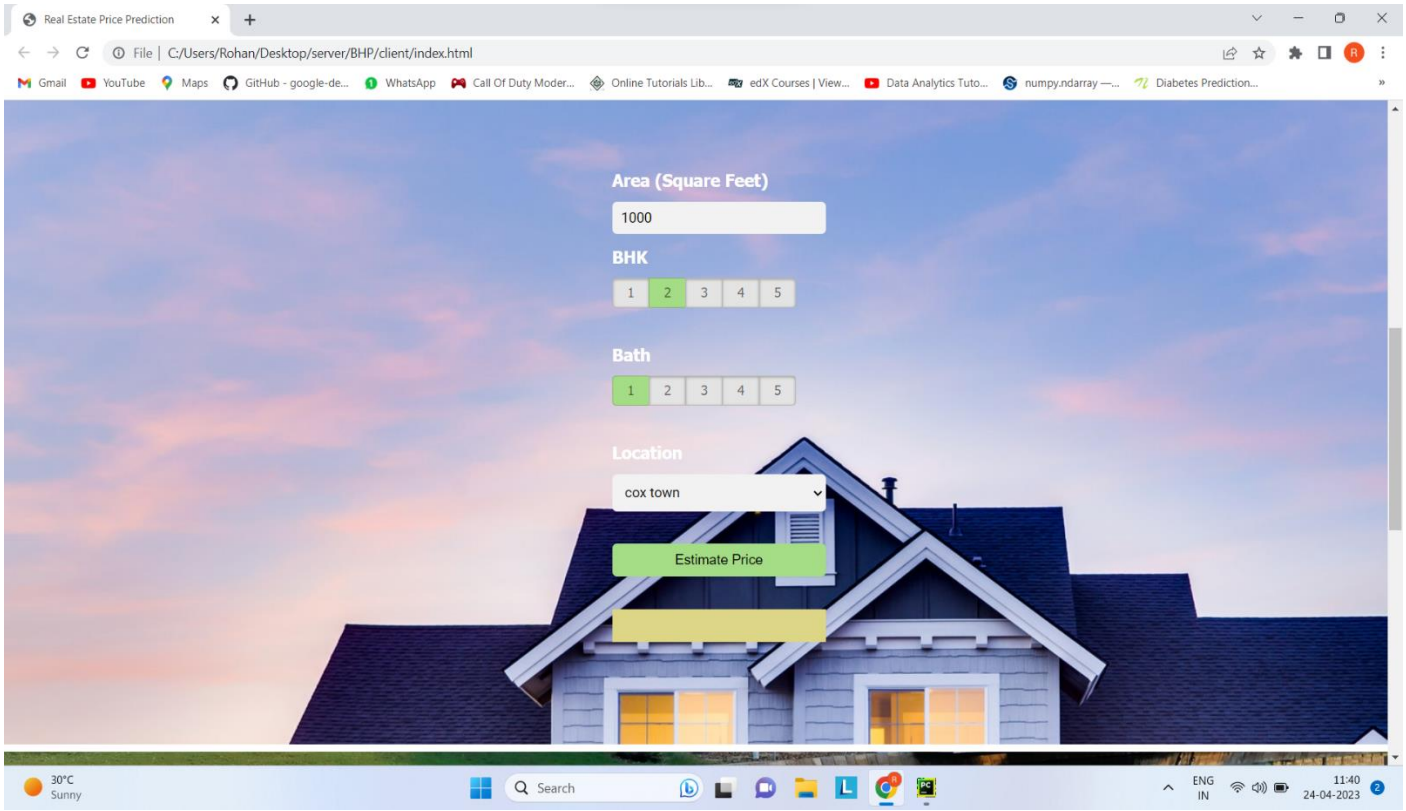
1]Home Window:



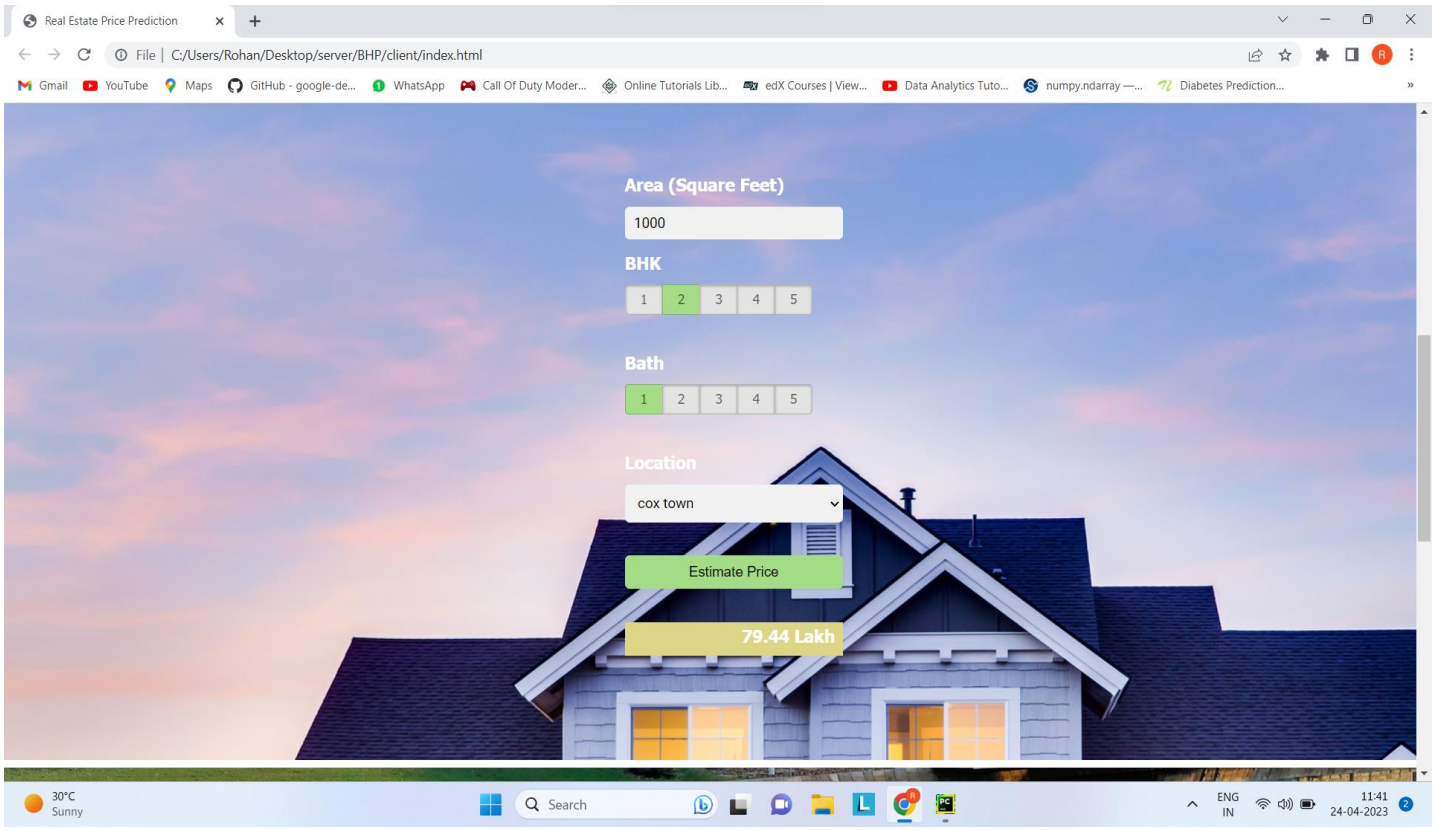
2]The Input Window:



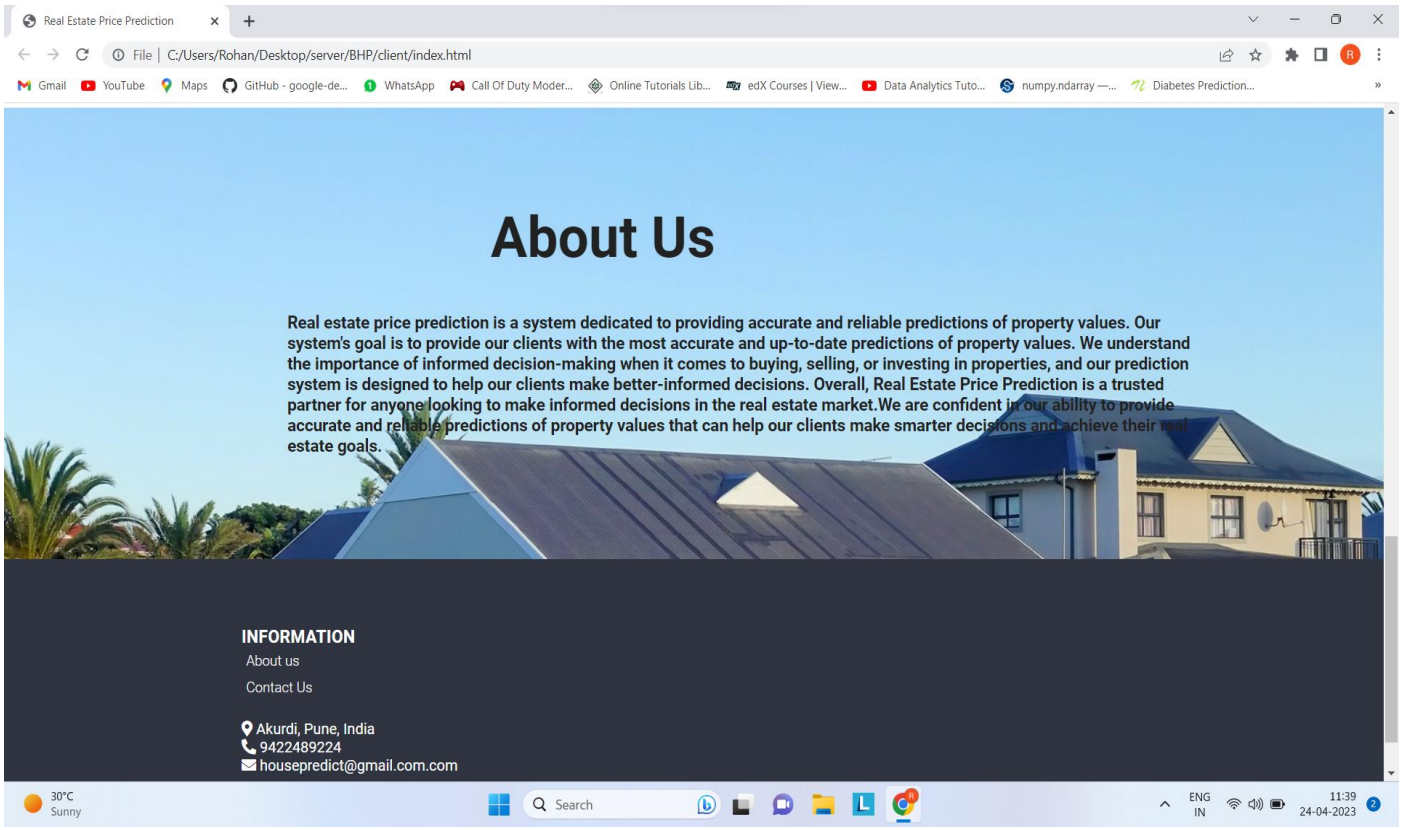
3] Input:


Real Estate Price Prediction
File | C:/Users/Rohan/Desktop/server/BHP/client/index.html
Gmail
YouTube
Maps
GitHub - google-de...
WhatsApp
Call Of Duty Moder...
Online Tutorials Lib...
edX Courses | View...
Data Analytics Tuto...
numpy.ndarray —...
Diabetes Prediction...
Area (Square Feet)
1000
BHK
1 2 3 4 5
Bath
1 2 3 4 5
Location
cox town
Estimate Price
30°C
Sunny
Search
ENG
IN
11:40
24-04-2023

4] Output Window:



5] About Us:


Real Estate Price Prediction
File | C:/Users/Rohan/Desktop/server/BHP/client/index.html
Gmail YouTube Maps GitHub - google-de... WhatsApp Call Of Duty Moder... Online Tutorials Lib... edX Courses | View... Data Analytics Tuto... numpy.ndarray —... Diabetes Prediction...
About Us
Real estate price prediction is a system dedicated to providing accurate and reliable predictions of property values. Our system's goal is to provide our clients with the most accurate and up-to-date predictions of property values. We understand the importance of informed decision-making when it comes to buying, selling, or investing in properties, and our prediction system is designed to help our clients make better-informed decisions. Overall, Real Estate Price Prediction is a trusted partner for anyone looking to make informed decisions in the real estate market.We are confident in our ability to provide accurate and reliable predictions of property values that can help our clients make smarter decisions and achieve their real estate goals.
INFORMATION
About us
Contact Us
Akurdi, Pune, India
9422489224
housepredict@gmail.com.com
30°C Sunny
Search
ENG IN
11:39 24-04-2023

5. IMPLEMENTATION AND TESTING:

5.1. Testing Approach:

1) **Unit testing:** This approach involves testing individual components or units of the recommendation system to ensure that they are working correctly. For example, the algorithm used to recommend movies based on user preferences could be tested to ensure that it is producing accurate recommendations.

2) **Integration testing:** This approach involves testing how different components of the recommendation system work together to ensure that they are functioning correctly. For example, the integration between the user interface and the recommendation algorithm could be tested to ensure that the recommendations are being displayed correctly to the user.

5.1.1 Unit Testing: (Test Cases):

1) Positive test case:

Test Scenario ID	Predictio_01	**Test Case ID**	TC_REPP_01
Test Case Description	Prediction – Positive test case	**Test Priority**	High
Pre-Requisite	User entered valid requirements	**Post- Requisite**	NA

Test Execution Steps:

S.No	**Action**	**Inputs**	**Expected Output**	**Actual Output**	**Test Brow**	**Test Resul t**	**Test Comments**
1	Launch the systerm	Real Estste Price Prediction.html	System home should open	System home opened	Chrome - 112.0.5 615.49	Pass	Launch successful
2	Enter the valid requirements .	Area= 1200 BHK = 2 Bath = 2 Location = 1st block jayanagar	Requirements can be entred	Requiremen ts can be entred	Chrome - 112.0.5 615.49	Pass	Successfully entered the requirements
3	click price estimate	click on Price Estimate Button	Get the predicted price	Get the predicted price	Chrome - 112.0.5 615.49	Pass	Successfully entered the requirements

2) Negative test case:

Test Scenario ID	Prediction_02	**Test Case ID**	TC_REPP_02
Test Case Description	Prediction – Negative test case	**Test Priority**	High
Pre-Requisite	NA	**Post- Requisite**	NA

Test Execution Steps:

S.No	**Action**	**Inputs**	**Expected Output**	**Actual Output**	**Test Browse r**	**Test Resul t**	**Test Commen ts**
1	Launch System	Real Estste Price Prediction.html	system home	System home opened	Chrome - 112.0.5615 .49	Pass	Launch successful
2	Enter invalid requirements	Area= asdf BHK = 2 Bath = 2 Location = 1st block jayanagar	Did not get the prediction	Did not get the prediction	Chrome - 112.0.5615 .49	Pass	

5.2. Modifications and Improvements:

Feature Engineering: Feature engineering involves selecting the most relevant and important features that impact the price of real estate properties. Selecting the right set of features is critical to building accurate prediction models.

Improved Data Cleaning and Pre-processing: Accurate predictions rely on quality data, and improving data cleaning and pre-processing can improve the accuracy of prediction models.

Integration of External Factors: Real estate prices are not only affected by internal factors like property location, size, and amenities but also by external factors such as the economy, interest rates, and government policies. Incorporating these factors into prediction models can improve their accuracy.

User interface improvements: The user interface should be designed in a way that is easy to understand and navigate. Users should be able to input their property details and receive accurate price predictions in a simple and user-friendly manner.

Hybrid Models: Hybrid models combine two or more machine learning algorithms or statistical models to improve the accuracy of predictions. For example, combining regression models with decision trees can lead to more accurate predictions.

Regular Updating: Prediction models need to be updated regularly to account for changes in the real estate market and the economy.

6. Results and Discussion:

The purpose of this system is to determine the price of a house by looking at the various features which are given as input by the user. These features are given to the ML model and based on how these features affect the label it gives out a prediction. This will be done by first searching for an appropriate dataset that suits the needs of the developer as well as the user. Furthermore, after finalizing the dataset, the dataset will go through the process known as data cleaning where all the data which is not needed will be eliminated and the raw data will be turned into a .csv file.

Moreover, the data will go through data pre-processing where missing data will be handled and if needed label encoding will be done. Moreover, this will go through data transformation where it will be converted into a NumPy array so that it can finally be sent for training the model. While training various machine learning algorithms will be used to train the model their error rate will be extracted and consequently an algorithm and model will be finalized which can yield accurate predictions.

Users and companies will be able to log in and then fill a form about various attributes about their property that they want to predict the price of. Additionally, after a thorough selection of attributes, the form will be submitted. This data entered by the user will then go to the model and within seconds the user will be able to view the predicted price of the property that they put in.

7. CONCLUSIONS:

7.1 Conclusion:

The framework makes ideal utilization of the Linear Regression Algorithm. It makes use of such information in the most effective way. The direct relapse calculation satisfies customer by expanding the exactness of their decision and diminishing the danger of putting resources into a home. One of the real future extensions is including home database of more urban areas which will give the client to investigate more domains and achieve an exact choice. More factors like subsidence that influence the house costs should be included. Top to bottom subtle elements of each property will be added to give plentiful points of interest of a coveted domain. The authors were able to create a system with more than 80% accuracy and the utilization of dataset was done with great efficiency which ultimately gave quite impressive results.

7.2 Limitations of the System:

Data quality: The accuracy of the predictions is heavily reliant on the quality of the data used. Incomplete or inaccurate data can lead to flawed predictions.

Lack of transparency: The algorithms used in real estate price prediction models can be complex and difficult to interpret, which can make it challenging to understand how a particular prediction was generated.

Market volatility: Real estate markets can be unpredictable, with sudden shifts in supply and demand that can affect prices. Economic downturns, natural disasters, and other events can also impact the accuracy of predictions.

Geographic specificity: Real estate price prediction models may not work well in regions where there is limited historical sales data, such as rural areas or emerging markets.

7.3. Future Scope:

The Scope of the Real Estate Price Prediction project is vast, with many opportunities for improvement and expansion.

By continuously evolving and expanding the system, this project has the potential become a leading tool for real estate price prediction, helping users make informed decisions about their property investments.

The project will provide a comprehensive solution for real estate price predictions, from data collection and analysis to model development, training and development.

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