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1. Introduction

House price prediction is the estimation of the value of a residential property based on various features and factors. I propose using Python and Django to create a price of a home prediction for my academic project. The objective of this project is to develop a web-based platform that uses machine learning to forecast home prices based on a variety of factors.

For house price prediction web application, I will start by acquiring a dataset containing information about houses and their prices. Using Python libraries like Pandas and NumPy, I will clean and preprocess the data to make it suitable for training a machine learning model. Next, I will select the most appropriate regression algorithm and train the model on the preprocessed dataset. After training, I will integrate the model into a Django web application, creating a user-friendly interface where users can input house features.

Based on the features provided, my web application will use the trained model to forecast the price of a house and show the user the expected price. To improve user comprehension, additional information and visualizations can be added.

2. Problem Statement

When it comes to effectively predicting house prices, the current real estate market presents a number of difficulties for buyers, sellers, and investors. Traditional valuation techniques sometimes rely on limited information and subjective evaluations, which can result in gaps and confusion when estimating property values. The decision-making process for people and businesses engaged in real estate transactions is hampered by the lack of accurate and objective house price estimates. Buyers can find it difficult to judge a fair offer, which could result in overpaying or missing out on chances. Setting the best listing price may be challenging for sellers, which could delay sales or result in undervalued properties.

An advanced house price prediction system that makes use of data analysis, machine learning, and large datasets is essential to overcome these issues. Such a system would produce reliable and precise predictions by using past sales data, market trends, and numerous relevant components.

3. Objectives

The proposed web-based system has the following features that will be included in the online House Price Prediction system. With the proposed system, the achievable advantages are as follows:

- To use advanced techniques and data analysis to minimize errors and provide precise predictions.
- To create a user-friendly system with an easy-to-understand interface that enables users to easily enter property details and generate price projections.
- To present the expected price range and other relevant information to users in an easy and simple way.

4. Methodology

a. Requirement Identification

i. Study of Existing System

The analysis of existing systems in the field of house price prediction offers helpful details about the current state of the art and can assist in determining areas for development. It involves analyzing multiple aspects of these systems in order to understand their advantages, disadvantages, and improvements. Examining the data sources and features used in current systems, such as housing listings, historical sales data, property characteristics, geographical data, and economic indicators, is an important part. Researchers can find any gaps or missing variables that might affect prediction accuracy by evaluating the selection and significance of features.

Some of the existing house price prediction system services which even provide their services online and use computerized method for recording information established in countries are:

- **realtor.com**

Realtor.com provides detailed property listings that include essential information such as property photos, descriptions, floor plans, and neighborhood details. It also offers additional resources, including mortgage calculators, affordability tools, and market trends, to assist users in making informed decisions. One of the notable features of Realtor.com is its commitment to accuracy and up-to-date information. The platform works directly with multiple listing services (MLS) and real estate professionals to ensure that the listings are accurate and reflect the current status of

properties on the market. Realtor.com also provides resources and guidance for homebuyers and sellers, offering tips on the home buying process, financing options, and negotiation strategies. [1]

- **zillow.com**

Zillow.com is a prominent online real estate marketplace that provides a wide range of resources and tools for homebuyers, sellers, and renters. Founded in 2006, Zillow has become one of the most recognized and utilized platforms in the real estate industry. Zillow.com offers a comprehensive database of property listings, including homes for sale, rental properties, and even properties that are not currently on the market. Users can search for properties based on location, price range, property type, and various other criteria to find options that match their specific needs. In addition to property listings and valuation estimates, Zillow offers various resources and tools to aid in the home buying and selling process. Users can access mortgage calculators, affordability tools, and detailed neighborhood information, allowing them to make informed decisions about potential properties and their surrounding areas. [2]

- **fazwaz-np.com**

FazWaz-NP.com Estimate is one of the most accurate among leading automated home-value tools. At FazWaz-NP.com, we strive for accuracy and our valuations are calculated using a complex algorithm which takes into account local market conditions, recently sold prices in your area as well as averages for neighboring properties that are similar to yours. In fact, our algorithms and statistical models provide figures within 15 per cent of real-time property values. [3]

ii. Literature Review

House is one of human life's most essential needs, along with other fundamental needs such as food, water, and much more. Demand for houses grew rapidly over the years as people's living standards improved. While there are people who make their house as an investment and property, yet most people around the world are buying a house as their shelter or as their livelihood.

According to housing markets have a positive impact on a country's currency, which is an important national economy scale. Homeowners will purchase goods such as furniture and household equipment for their home, and homebuilders or contractors will purchase raw material to build houses to satisfy house demand, which is an

indication of the economic wave effect created by the new house supply. Besides that, consumers have capital to make a large investment, and the construction industry is in good condition can be seen through a country's high level of house supply.

House price prediction can be done by using multiple prediction models such as support vector regression, artificial neural network, and more. There are many benefits that home buyers, property investors, and house builders can reap from the house-price model. This model will provide a lot of information and knowledge to home buyers, property investors and house builders, such as the valuation of house prices in the present market, which will help them determine house prices. Meanwhile, this model can help potential buyers decide the characteristics of a house they want according to their budget. Previous studies focused on analyzing the attributes that affect house price and predicting house price based on the model of machine learning separately. [4]

iii. Requirement Analysis

• Functional Requirements

Functional requirements are product features or functions that as a developer one must implement to enable users to accomplish their tasks. So, it's important to make them clear both for the development team and the stakeholders. Generally, functional requirements describe system behavior under specific conditions. Some of such requirements needed for house price prediction system are:

- Only authentic user must have access to the system.
- Predictions can be done only after user login to the system using authentic credentials.
- After logging user must be able to:
 - I. Predict the price of the House
 - II. Can see their previous history
- After the authentic admin/user gets logged in admin must be able to:
 - I. Edit, Delete and View Users
 - II. View and Delete Users History
- The system must alert the user after the account is created.

• Non-Functional Requirements

Non-functional requirements are the requirements that specifies how the system performs a certain function. In other words, a non-functional requirement will describe

how a system should behave and what limits there are on its functionality. The non-functional requirements are:

- The user interface should be easy to navigate and understand.
- It must provide accurate and reliable predictions with minimal error rates.
- It must have proper security measures in place to protect user data and prevent unauthorized access.
- The system must be compatible with different platforms and browsers for easy accessibility.

- **System Requirements**

Software Configuration

- Operating System: Windows/ Linux/ Mac
- Technology: HTML, CSS, JavaScript, Django
- Server : Web Server Gateway Interface (WSGI)

Hardware Configuration

- Pentium IV Processor
- 2GB RAM
- 512GB HDD
- 1024*768 Resolution Color Monitor

b. Feasibility Study

A feasibility study is an assessment of the practicality of the proposed plan or project. According to its workability, impacts on the organization, ability to meet user needs and effective use of the resources. The main tasks done during feasibility study are:

i. Technical Feasibility

This involves questions such as whether the technology needed for the system exists, how difficult it will be to build, and whether the firm has enough experience using that technology. The system is the fact that it will be developed on windows 11 platform and a high configuration of 12GB RAM on AMD Ryzen 5 processor. The technology or tools used are HTML, CSS, JS, Django framework and WSGI. The Google Chrome web browser is used for the testing. So, the system is technically feasible.

ii. Operational Feasibility

This project is operationally feasible due to its compatibility with commonly available devices like laptops or Android devices and its web-based interface. The potential users, including real estate agents, property developers, and financial institution

owners and staff, possess a moderate level of computer literacy. The system will feature a user-friendly interface that allows for intuitive navigation and interaction. These factors contribute to the project's operational feasibility by ensuring easy accessibility, minimal training requirements, and user satisfaction. So, the system is operationally feasible.

iii. Economic Feasibility

Economic analysis could also be referred to as cost/benefit analysis. It is the most frequently used method for evaluating the effectiveness of a new system. The system which is going to be developed does not require any additional hardware or software as the interface of this system is developed using the existing resources and technologies available more closely. So, the system is economically feasible.

c. High Level Design of System

High Level Design (HLD) is a system design and includes the description of the System architecture and design. Data flows, flowcharts, data structures are included in HLD documents so that developers/implementers can understand how the system is expected to work with regards to the features and the design. House Price Prediction System will be developed using HTML, CSS ,Python and Django framework. There will be administrator who will have the right to add and delete users, view the user information and so on. Following are the system design of the system:

- Login to the system
- Admin Panel
- Add user, view history
- View, Edit and Delete user and their history

i. Methodology

The methodology of the proposed system involves a systematic approach to develop the web application of house price prediction system. The methodology I would be using for developing this project would be waterfall methodology. The waterfall methodology is a linear and sequential approach to software development, where each phase is completed before moving on to next. It follows a structured flow from requirements gathering to deployment, with limited flexibility for changes once a phase is completed.

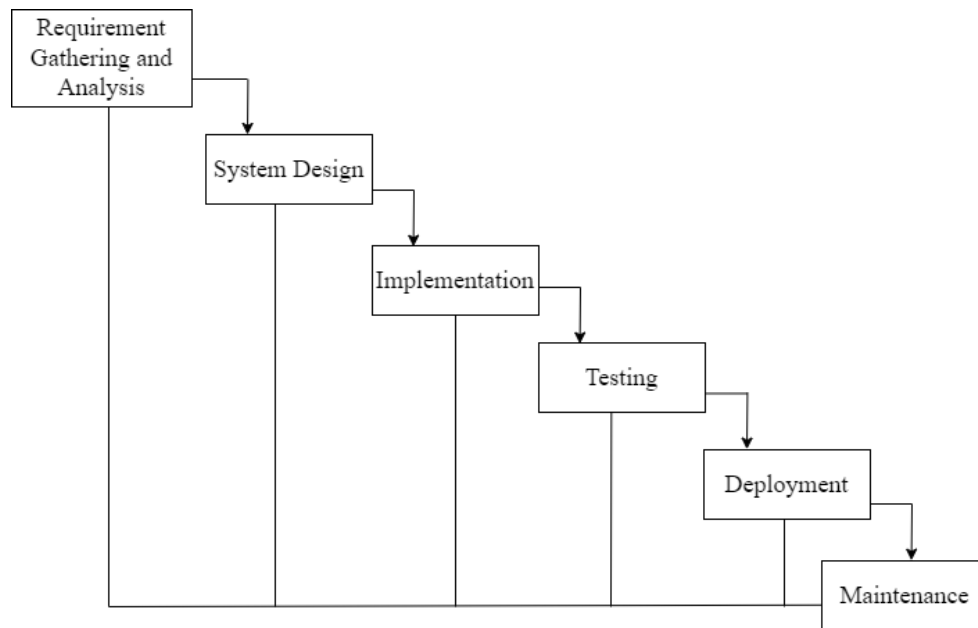


Figure 1: Waterfall Methodology

ii. System Flowchart

This will display how does the data flowing in system. To illustrate this, symbol are used. They are connected together to show what happens to data and where it goes.

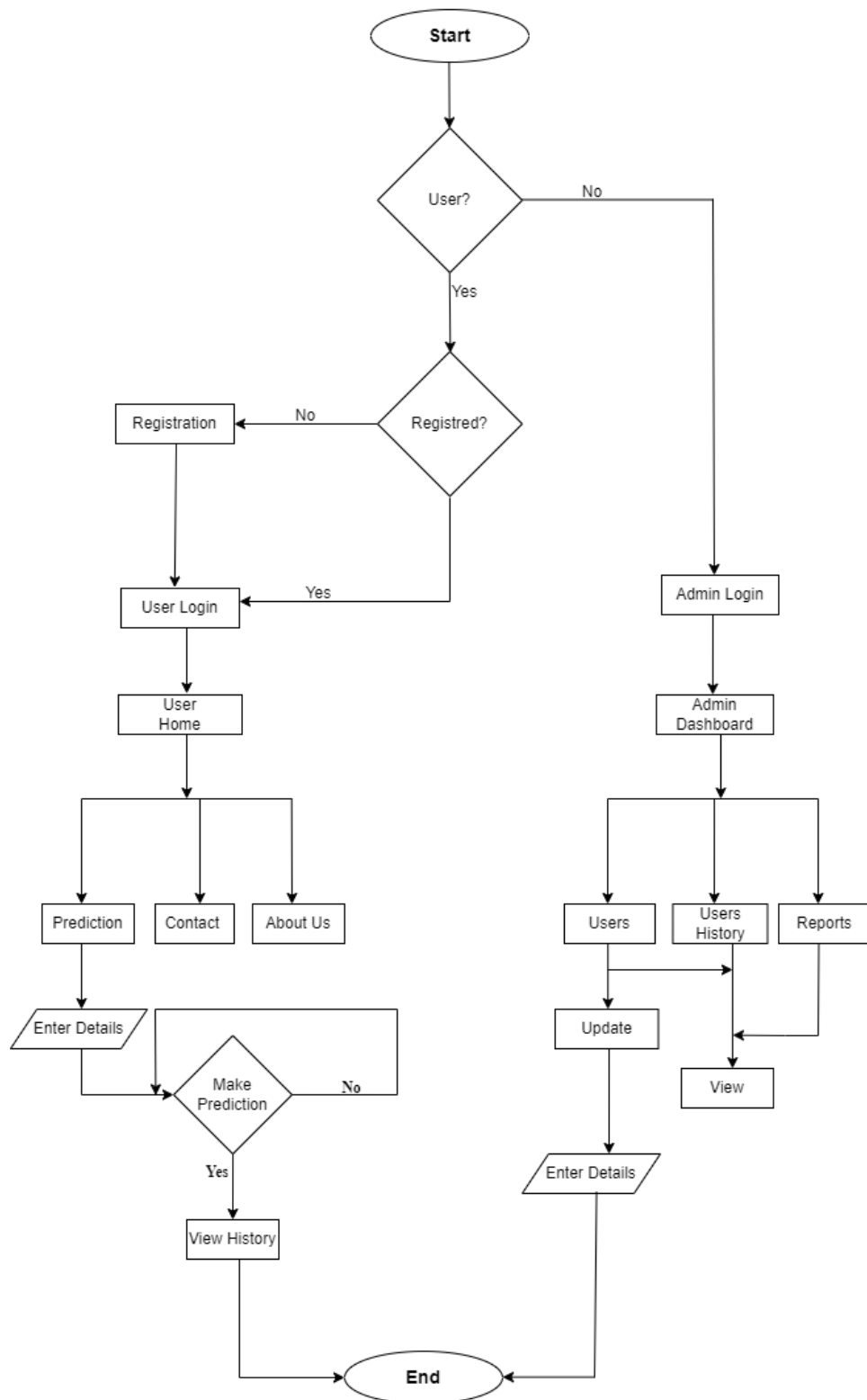


Figure 2: System Flowchart of House Prediction System

iii. Description of Algorithm Used

The algorithm used for this project is Random Forest for making prediction of price for house price prediction system. Random forest is a commonly-used machine

learning algorithm trademarked by Leo Breiman and Adele Cutler, which combines the output of multiple decision trees to reach a single result. Its ease of use and flexibility have fueled its adoption, as it handles both classification and regression problems. Random Forest combines multiple decision trees to make accurate predictions. Each decision tree is built using a random subset of features and data samples from the dataset. Random Forest is effective for house price prediction as it can handle various types of features and datasets, and is less prone to overfitting compared to individual decision trees. It also provides feature importance rankings, allowing us to understand the significant factors influencing house prices. [5]

Algorithm to predict the price of house:

Step 1: Read the house price dataset using pandas, and perform data cleaning tasks such as removing rows with missing values.

Step 2: Encode categorical features, such as 'HouseType', into numerical values using a mapping.

Step 3: Split the data into input features (X) and the target variable (y).

Step 4: Define the DecisionTree class, which includes methods for splitting the data, building the tree recursively, and making predictions.

Step 5: Implement the fit method in the DecisionTree class to build the decision tree using the training data.

Step 6: Implement the predict method in the DecisionTree class to make predictions based on the built tree.

Step 7: Define the RandomForest class, which includes methods for fitting multiple decision trees and making predictions using the ensemble of trees.

Step 8: Implement the fit method in the RandomForest class to train the random forest model by fitting multiple decision trees on randomly selected samples.

Step 9: Implement the predict method in the RandomForest class to make predictions by aggregating predictions from all decision trees in the forest.

Step 10: Create an instance of the RandomForest class and specify the number of trees and maximum depth for the random forest model.

Step 11: Train the random forest model by calling the fit method with the input features (X) and target variable (y).

Step 12: Prepare a new sample (house) with the same feature columns as the training data.

Step 13: Use the trained random forest model to predict the price of the new house by calling the predict method with the sample as input.

5. Gantt Chart

The Gantt Chart representing the schedule of my project is as follows:

Table 1: Gantt Chart

Weeks → Activities ↓	1	2	3	4	5	6	7	8	9	10	11
Planning											
Research											
Designing											
Implementation											
Testing											
Documentation											

6. Excepted Outcome

The expected outcome of the house price prediction system project proposal is to develop a web-based application that accurately predicts house prices based on input features, aiding users in real estate decision-making. The key points include:

- Implement accurate and reliable prediction algorithms.
- Enable users to input relevant house features and receive predicted prices.
- Maintain data privacy and security of user information.
- Continuously improve the system's accuracy and usability.

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