Tribhuvan University

Faculty of Humanities and Social Sciences

"House Price Prediction: HPP"

A PROJECT REPORT

Submitted to
Department of Computer Application
Mahendra Morang Adarsha Multiple Campus

In partial fulfillment of the requirements for the Bachelors in Computer Application

Submitted by
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Under the Supervison of
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Supervisor's Recommendation

I hereby recommend that this project prepared under my supervision by **Ushal Koirala** entitled "**House Price Prediction: HPP**" in partial fulfillment of the requirements for the degree of Bachelor of Computer Application is recommended for the final evaluation.

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Signature

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LETTER OF APPROVAL

This is to certify that this project prepared by **Ushal Koirala** entitled "**House Price Prediction: HPP**" in partial fulfillment of the requirements for the degree of Bachelor in Computer Application has been evaluated. In my opinion it is satisfactory in the scope and quality as a project for the required degree.

Er. Yuyutshu Banjara

Project Supervisior

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ABSTRACT

The House Price Prediction System is a user-friendly and useful tool for projecting residential property prices. It was created using Python with Django and is driven by the Random Forest algorithm. Data collection and preprocessing are the first steps in guaranteeing data quality. A Random Forest model that has been optimized for performance serves as the system's central component. The feature is included into a Django web application, allowing customers to enter property information with ease and get immediate pricing estimates. Sensitive data is protected by user authentication and security procedures. In this project, the web development platform Django is combined with Python's data science capabilities.

Acknowledgement

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List of Abbreviations

HPP   House Price Prediction

HTML   Hypertext Markup Language

CSS   Cascading Style Sheets

ORM   Object Relational Mapping

MLS   Multiple Listing System

JS   JavaScript

WSGI   Web Server Gate Interface

CSV   Comma-separated Values

IDE   Integrated Development Environment

GUI   Graphical User Interface

CRUD   Create Read Update Delete

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Chapter 1: Introduction

1.1 Introduction

House price prediction plays a crucial role in the real estate industry, enabling buyers, sellers, and investors to make informed decisions. The dynamic nature of the housing market, coupled with various factors influencing property values, makes accurate price estimation challenging. To address this challenge, researchers and practitioners have turned to machine learning and statistical techniques to develop House Price Prediction Systems. In the real estate sector, making accurate house price predictions is essential since it gives buyers, sellers, and investors useful information. The creation of dependable house price prediction systems has become crucial due to the dynamic nature of the housing industry and the many elements that affect property values. The proposed House Price Prediction System aims to provide an intelligent and through the utilization of the Django framework, a highly computerized process that is stress-free, reliable, and efficient can be achieved for both users and staff involved in registration and management. The front-end will be developed using HTML, CSS, and JavaScript to provide a user-friendly graphical interface, while the back-end will leverage Python programming language and the Django ORM to handle data storage and management within the SQLite database.

1.2 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. 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.

1.3 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.

1.4 Scope and Limitations

1.4.1 Scope

The House Price Prediction: HPP is a web-based solution developed using Python with Django framework. It has been developed to simplify and enhance the process of estimating house prices for both buyers and sellers of real estate.

- To provide accurate property valuations.
- To assist buyers and sellers in making informed decisions.
- To analyze and predict real estate market trends.

1.4.2 Limitations

- Complex model maintenance and updates to reflect changing real estate market conditions.
- Data privacy and security challenges when handling sensitive property information.
- Difficulty of user interface design, particularly when dealing with a large number of features and options.

1.5 Development Methodology

The Waterfall Model was the first Process Model to be introduced. It is also referred to as a linear-sequential life cycle model. It is very simple to understand and use. In a waterfall model, each phase must be completed before the next phase can begin and there is no overlapping on the phases.

The Waterfall model is the earliest SDLC approach that was used for software development. The waterfall model illustrates the software development process in a linear sequential flow. This means that any phase in the development process begins only if the previous phase is complete. In this waterfall model, the model does not overlap.
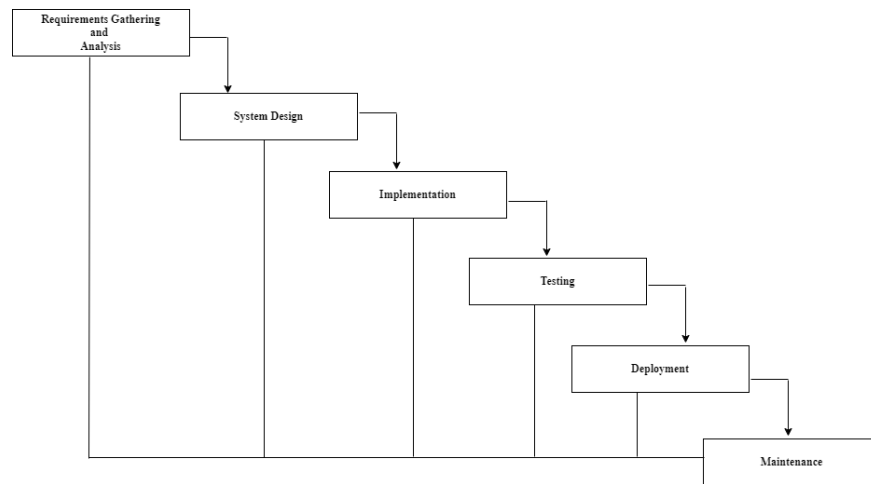
Figure 1: Waterfall model for House Price Prediction

1.6 Report Organization

On completion of our project development, I have documented the milestones and the final document report has been organized under the following chapters:

Chapter 1 deals with the introduction of the system with its objectives and limitations along with the reason why the system is made.

Chapter 2 summarizes the work that has been carried out in the field of data mining and also describes the features about some existing applications related to the House Price Prediction system.

Chapter 3 focuses on the different requirement of the system, which describes about the functional, non-functional, feasibility analysis, Object Modelling: Object and Class Diagram, Dynamic Modelling: State and Sequential Diagram, Process Modelling: Activity Diagram design of the system with Component Diagram, and Deployment Diagram, Refinement of Classes and Object, and the implementations of Algorithm with its details.

Chapter 4 emphasizes tools used in system development, implementing details and result of test performed.

Chapter 5 highlights brief summary of lesson learnt, outcome and conclusion of the whole project and explain what have been done and what further improvements could be done.

Appendices has the screenshots of all the implementation i.e., user interface and their description.

Chapter 2: Background Study and Literature Review

2.1 Background Study

House price prediction is a task of estimating the future value of a property based on various factors, such as location, size, condition, features, market trends, and economic conditions. It is an important and challenging problem for both buyers and sellers, as well as investors and policymakers. House price prediction can help people make informed decisions about buying or selling a property, as well as planning their budget and investment strategies.

There are different methods and techniques for house price prediction, such as statistical models, machine learning algorithms, and artificial neural networks. These methods use historical data and current information to learn the patterns and relationships between the features and the target variable (house price). Some of the common features used for house price prediction are the number of bedrooms, bathrooms, square feet, lot size, year built, year renovated, neighborhood, school district, etc.

These models benefit individuals, real estate agencies, investors, and government planners. They offer insights into property values, inform investment decisions, and guide urban development. However, challenges include data quality, model maintenance, and ethical considerations related to bias and transparency.

2.2 Literature Review

Different article, documentation, and project have been referred related to house price prediction system in the preparation of this report. A short summary of these report sources is mentioned below:

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. [1]

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. [2]

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 them surrounding areas. [3]

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 considers 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. [4]

Zolo.ca Find out how much your home is worth with Zolo's Home Value Calculator Tool. Get an instant estimate of the current value of your house by entering your address above. Zolo estimates Canadian home values based upon many factors, including nearby homes, comparable properties, recently sold properties, Canadian Census data, location, and other real estate market information. Our home value estimator is a starting point for determining your home's value and not an official appraisal or REALTOR® recommended selling price. Looking for other ways to value your house? Contact your real estate agent to do a market comparison report or get an appraisal done by a licensed real estate appraiser. A licensed home appraiser or REALTOR® can visually inspect your home to determine fair market value and assist with pricing recommendations before listing on the MLS® database. Understanding the value of your house can be helpful in determining to sell, estimating list price or simply evaluating your real estate assets and home equity. Zolo uses a proprietary method for evaluating your home online to give you an idea of your home's worth in the current Canadian real estate market and property valuation. [5]

Chapter 3: System Analysis and Design

3.1 System Analysis

This system is designed with the series of processes starting with requirement analysis, design, implementation, testing and maintenance. During requirement analysis, all the functional and non-functional requirement are analyzed and system is developed according to the requirement then designing of the system is carried out. After the design process, coding and development part is started then after integrating the system there is testing of the system. If the testing is positive then system is implemented otherwise some maintenance is done and system come in operation.

3.1.1   Requirement Analysis

Requirement collection plays a key role. Requirement's collection is not only important for the project, but it is also important for the project management function.

Through requirements, the project management can determine the end deliveries of the project and how the end deliveries should address client's specific requirements.

Requirements are basically two types. They are functional requirements and non-functional requirements.

- **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. Some of such requirements needed for house price prediction system are:

  ➢ Only authentic user must have access to the system.

  ➢ Prediction can be done only after login to the system.

  ➢ After logging user must be able to:

     I.   Predict the price of the House.

    II.   View and Delete their previous history

  ➢ After the authentic admin/user gets logged in admin must be able to:

     I.   Delete and View Users

    II.   View and Delete Users History

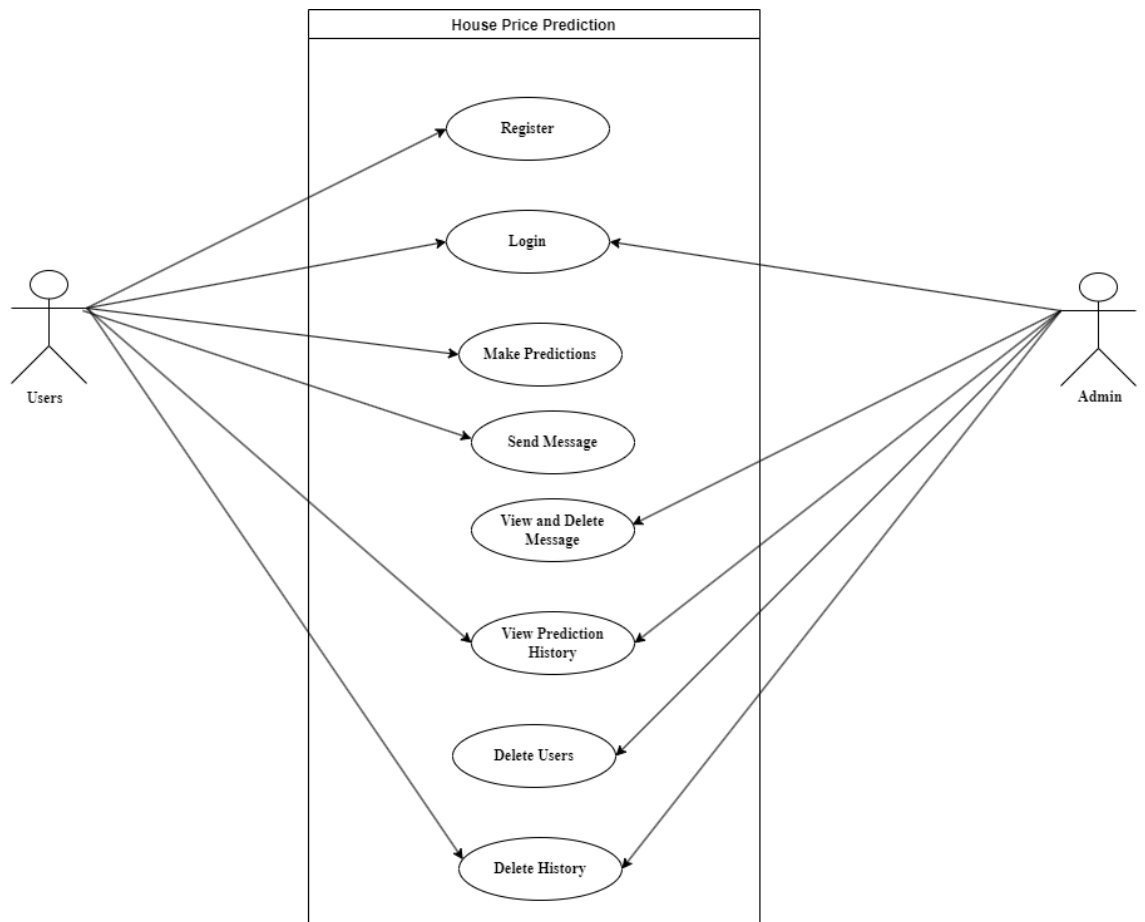 ➢ The system must alert the user after the account is created.

Figure 2: Use case Diagram of House Price Prediction

- **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 nonfunctional 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.

3.1.2 Feasibility Analysis

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 Study**

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 Study**

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 Study**

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.

IV. **Schedule Feasibility**

This assessment is the most important for project success; after all, a project will fail if not completed on time. In scheduling feasibility, an organization estimates how much time the project will take to complete.

The scheduling feasibility of our system is displayed below:

Table 1: Gantt Chart for House Price Prediction System

Weeks → / Activities ↓	1	2	3	4	5	6	7	8	9	10	11
Planning	█	█									
Analysis		█	█	█							
Design				█	█	█	█				
Implementation						█	█	█	█	█	
Testing									█	█	█
Documentation						█	█	█	█	█	█

3.1.3 Object Modelling: Class Diagram

The figure is the class diagram for House Price Prediction system. In House Price Prediction system there are four tables each of them has their own fields like user has first name, last name, email, password, admin has username and password, message has name, email, subject and password and message and predict price history has bedroom, bathroom, floors, parking, road size, road type, area, predicted price and timestamp.

Username is foreign key that link with message and predicted price history table. In this system user can predict the price of the house, send message to admin along with view history and admin manage the information of the users along with history.
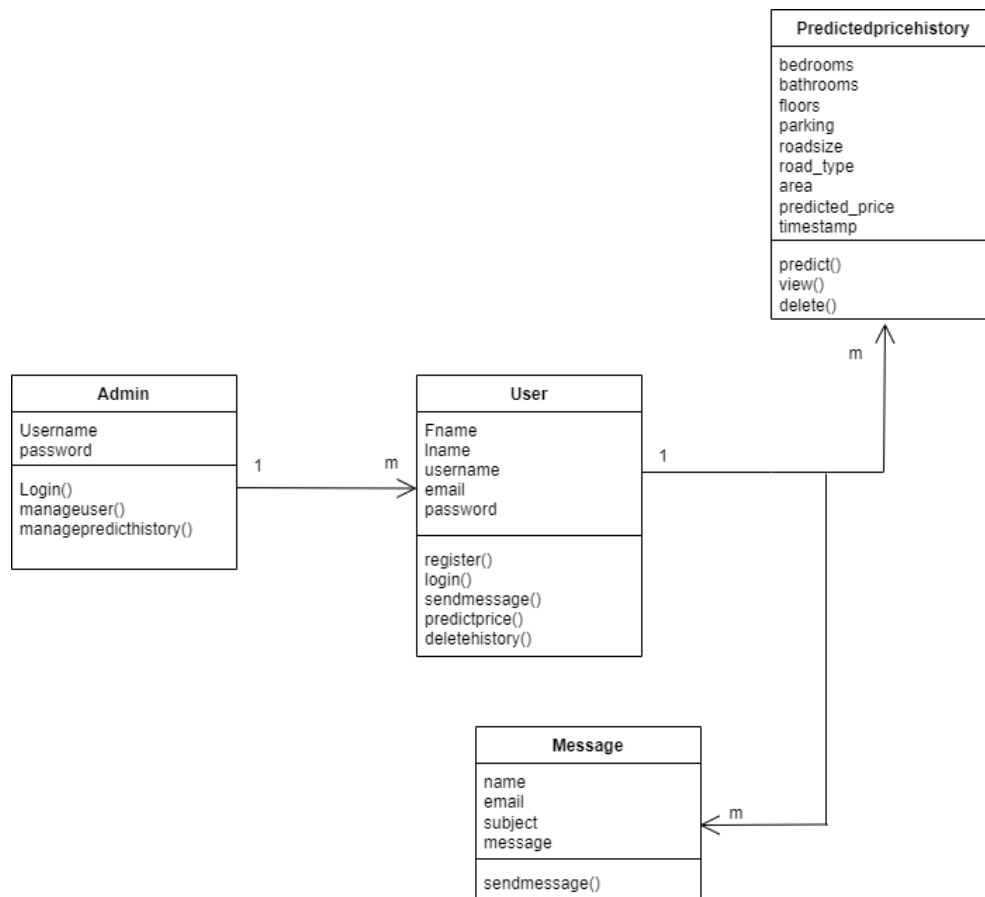
Figure 3: Class Diagram of House Price Prediction: HPP

3.1.4 Dynamic Modelling: State and Sequence Diagram

The sequence diagram used in this system helps to understand the existing and the requirements of the new features and applications

Sequence Diagram: For Admin

The admin needs to login with valid username and password to login in the system after login, they redirected to dashboard page. They can manage information of the users, view the user's message and see the predicted price history and manage them.
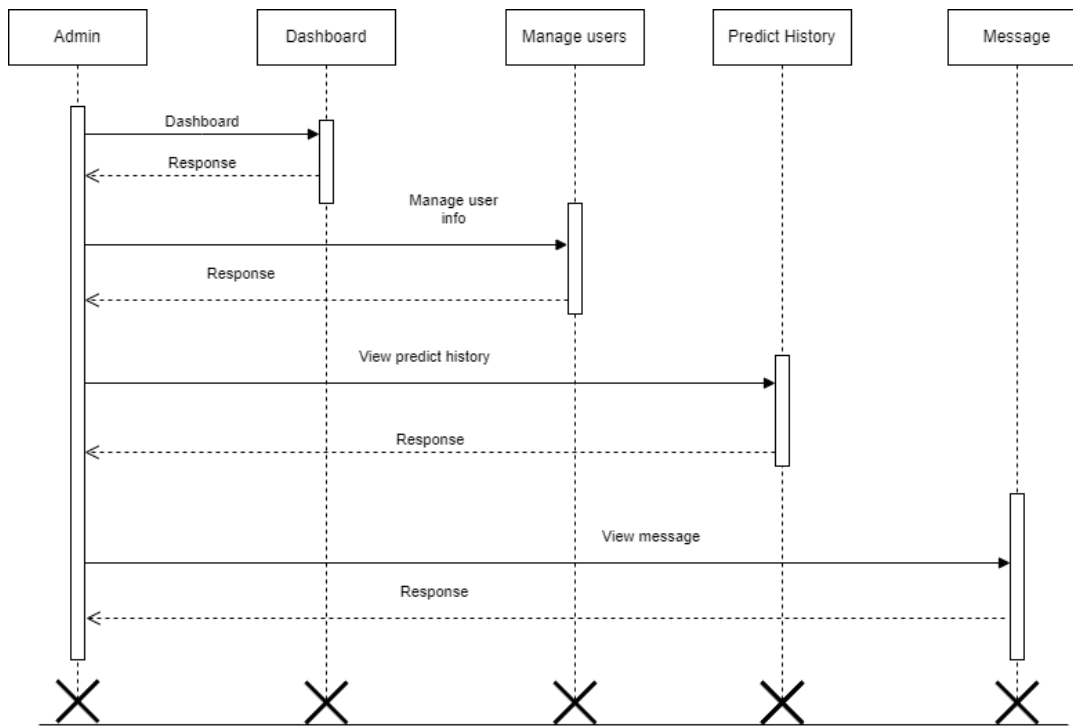
Figure 4: Sequence Diagram for Admin of House Price Prediction: HPP

Sequence Diagram: For User

The user needs to register with all their details then they need to login to the system after login they have to input data for making prediction. After filling all the data, the predicted price will be display and they can view and delete predict history.
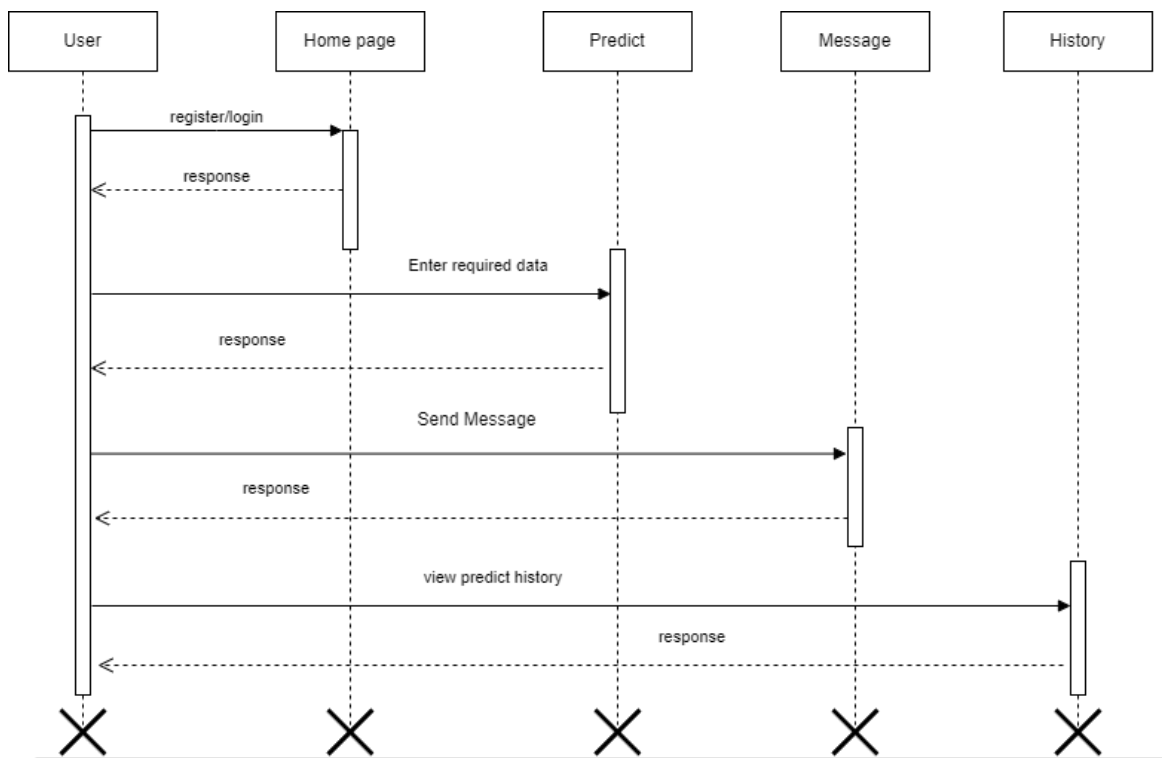

Figure 5: Sequence Diagram for Users of House Price Prediction: HPP

3.1.5   Process Modelling: Activity Diagram
Activity Diagram

Activity diagram consists of the workflow of the system. The activity of the system begins from creating a user and verifying a new user or not. After verifying that the user can predict the house price, send message to admin and view the history result.
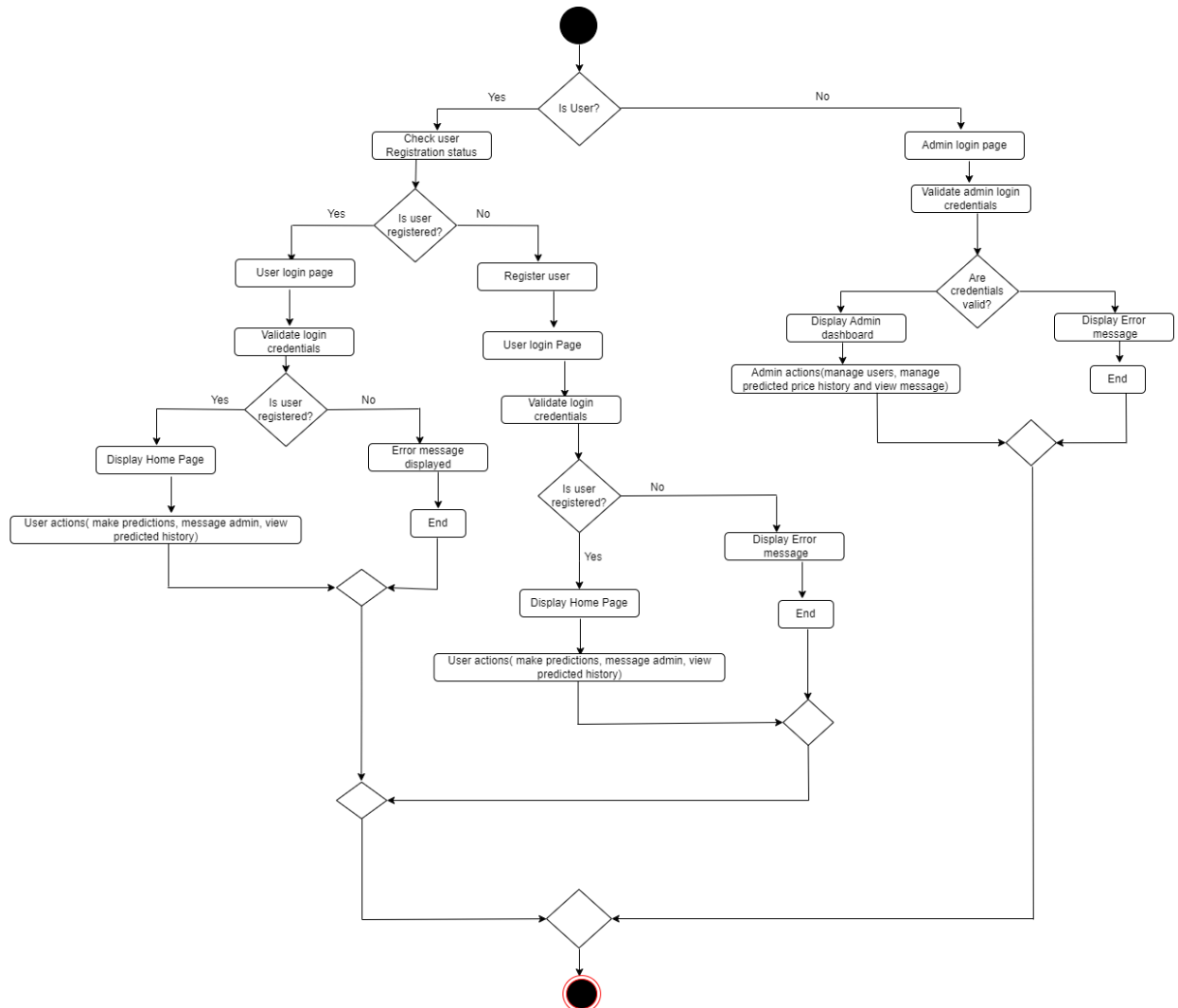

Figure 6: Activity Diagram for House Price Prediction: HPP

3.2 System Design

To realize the different functional requirement of the system in graphical form, different design diagram of the system has been prepared which are as follows:

3.2.1   Refinement of class and object

The figure below is the refinement of class diagram for house price prediction. In House Price Prediction system there are four tables each of them has their own fields like user has first name, last name, email, password, admin has username and password, message has name, email, subject and password and message and predict price history has

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bedroom, bathroom, floors, parking, road size, road type, area, predicted price and timestamp. In this figure the minus (-) sign indicates private and plus (+) sign indicates public access.
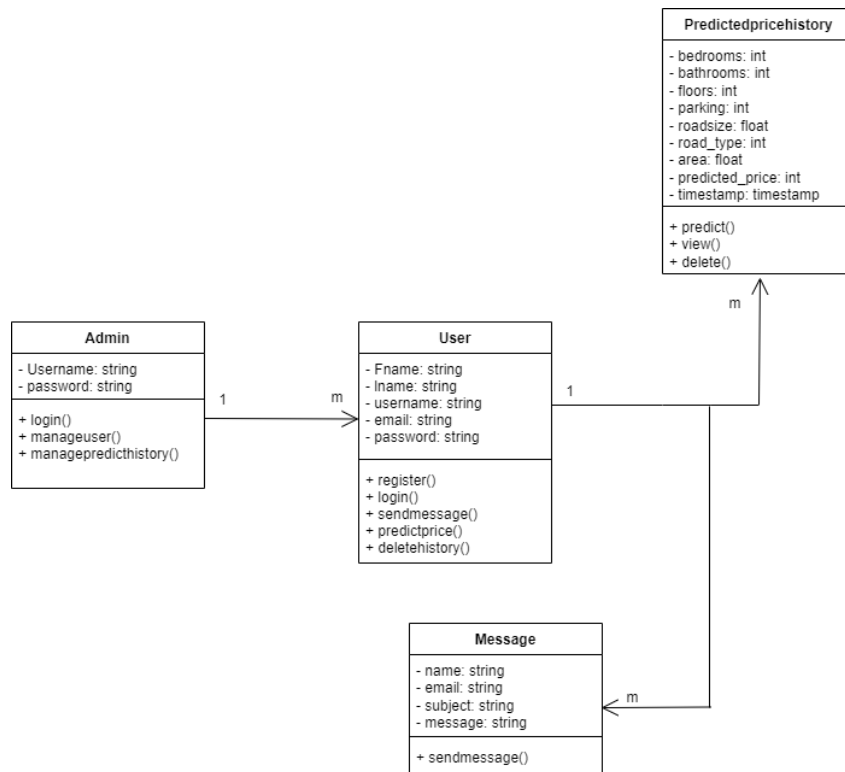

Figure 7: Classes and Object diagram for House Price Prediction: HPP

3.2.2 Component Diagram

To visualize the physical components of the system and their dependency relationship, component diagram has been prepared. Here admin can add user, view their information, view predict history and message sent by the users. Likewise, user can predict the price of the house entering the given detail, can see their predicted history and also can send message to the admin.
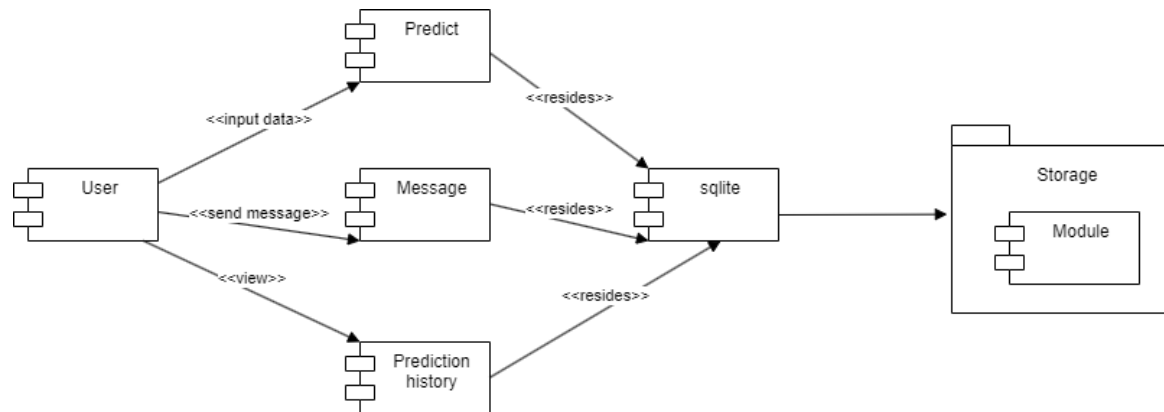
For Admin
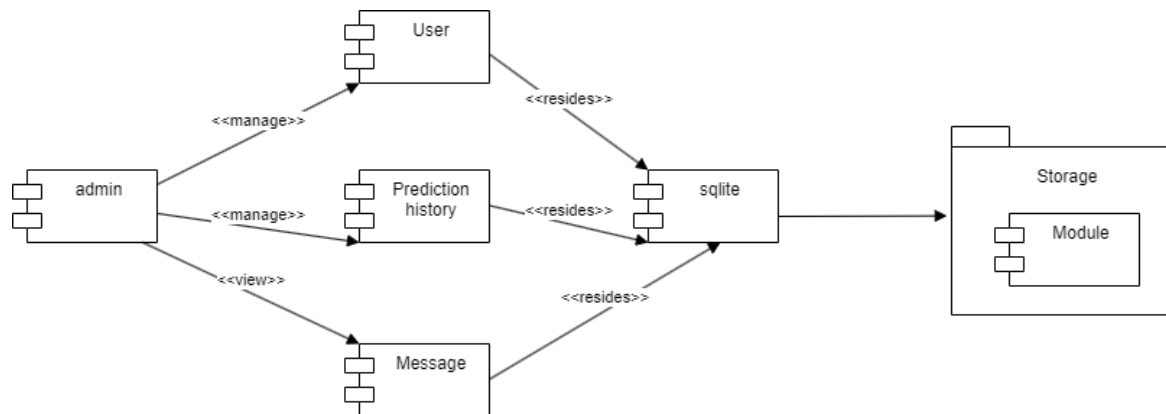
For Users

Figure 8: Component Diagram for House Price Prediction: HPP
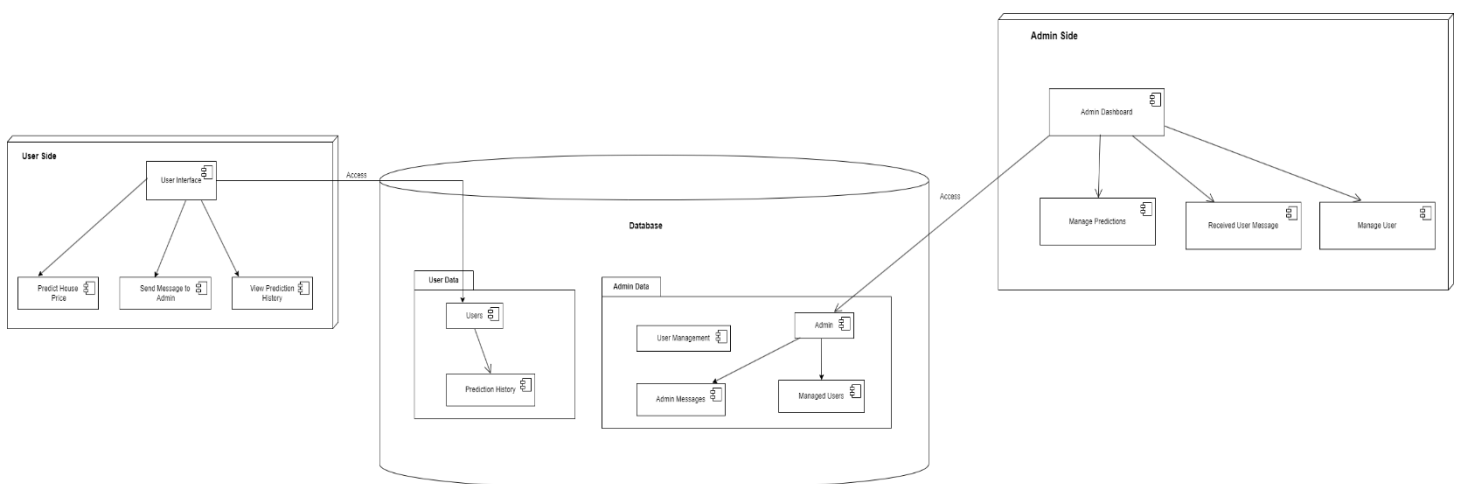
3.2.3 Deployment Diagram

Figure 9: Deployment Diagram for House Price Prediction: HPP

3.3 Algorithm Details

Random Forest Algorithm

Random Forest is a popular machine learning algorithm that belongs to the supervised learning technique. It can be used for both Classification and Regression problems in ML. It is based on the concept of ensemble learning, which is a process of combining multiple classifiers to solve a complex problem and to improve the performance of the model.

As the name suggests, "Random Forest is a classifier that contains a number of decision trees on various subsets of the given dataset and takes the average to improve the predictive accuracy of that dataset." Instead of relying on one decision tree, the random forest takes the prediction from each tree and based on the majority votes of predictions, and it predicts the final output. The greater number of trees in the forest leads to higher accuracy and prevents the problem of overfitting. [6]

In this system, the Random Forest algorithm is central to predicting house prices. The process begins with loading and preprocessing data from a CSV file containing Kathmandu house-related information. The Random Forest algorithm used in this system employs an ensemble approach by constructing multiple decision trees. Each tree is built using a random subset of the dataset and a subset of features, ensuring diversity among the trees. During tree construction, the algorithm recursively splits the data by identifying the best feature and threshold that optimally segregate the dataset. This splitting process continues until a predefined stopping criterion, such as reaching the maximum depth or no further improvement in purity, is met. The handling of missing values involves replacing them with averages for certain columns and encoding categorical variables using LabelEncoder for effective data representation. When predicting with this model, each individual tree generates its own prediction for the input data, and the final prediction is obtained by averaging these individual tree predictions. This ensemble strategy helps mitigate overfitting and improves generalization by combining the diverse predictions of multiple trees. Overall, the Random Forest algorithm excels in regression tasks, like predicting house prices here, by harnessing the collective intelligence of numerous decision trees to provide robust and accurate predictions.
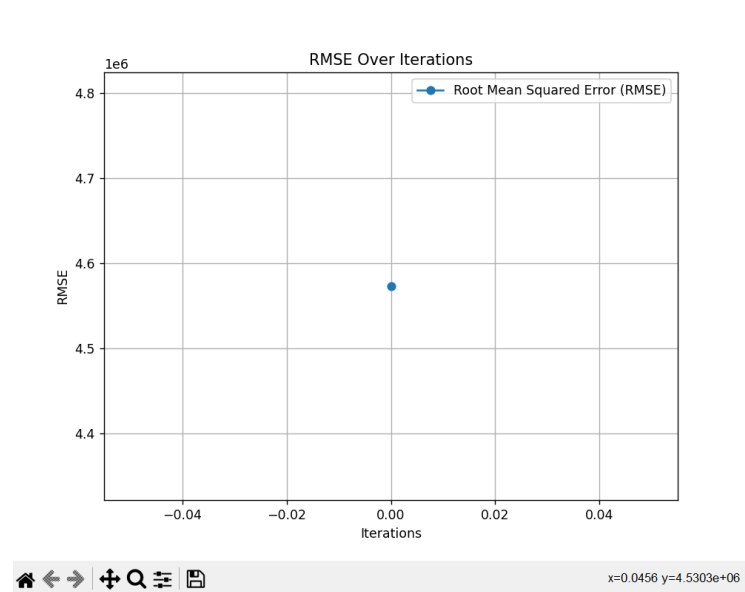
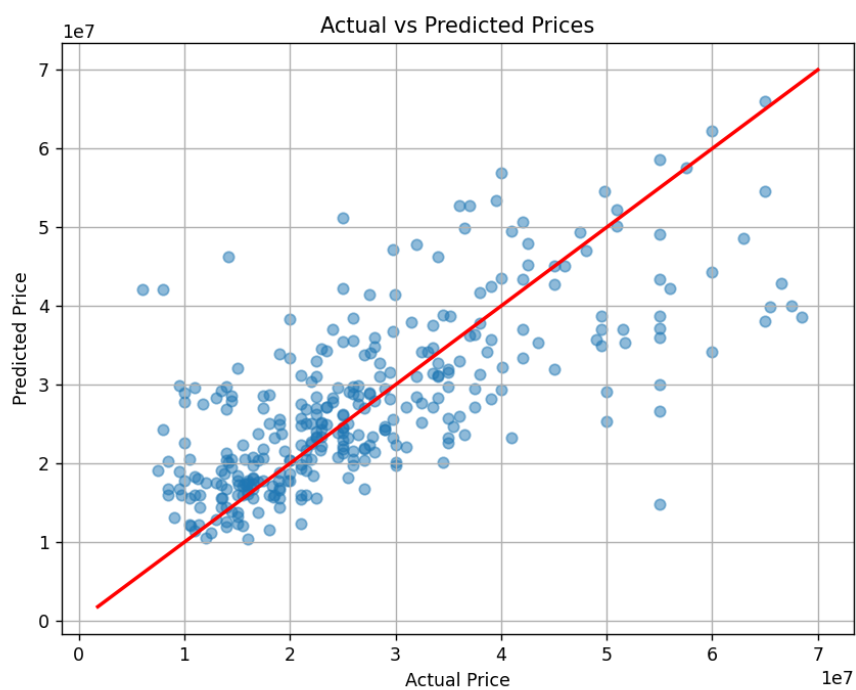**Figure 10: Root Mean Squared for House Price Prediction: HPP**

Figure 11: Actual Price vs Prediction Price for House Price Prediction System

Chapter 4: Implementation and Testing

4.1 Implementation

4.1.1 Tools Used

Following are the tools and framework used for the accomplishment of the project:

- **Visual Studio Code**

  Visual Studio Code is an Integrated Development Environment (IDE) developed by Microsoft to develop GUI (Graphical User Interface), console, Web apps, mobile apps, clouds and web services, etc.

- **Django**

  In House Price Prediction System, Django framework which is provide by python is used as back end for development of project.

- **HTML**

  HTML is a markup language use for creating web pages. A structured document like heading, paragraph, list, link, and other items using html have done for this project.

- **CSS**

  This CSS help us to make this website attractive using different tools, using colors.

- **SQLite**

  SQLite is use for storing all the information requires to the database in House Price Prediction. It is used for performing CRUD operation such as create, update , delete and read data from the database.

- **MS Word**

  MS Word or Microsoft Word is used for writing and editing documentation of House Price Prediction: HPP.

- **Draw.io**

  This is used to generate diagrams for the system analysis and design of House Price Prediction: HPP. Diagrams were created using this tool in order to save time since all components are available with drag and drop functions.

4.1.2 Implementation Details of Modules

Module Description

The House Price Prediction: HPP consists of two modules. Each module of the system is complete module and part of the entire system. The modules given below are the modules which are implemented in our system:

User Module

This is the home page for the user who visits to website. Whenever a customer requests the page via a browser using correct login details this page will display in his/her device. With the help of this module user can easily navigate through website. On this module a user can carry out following task:

➢ He/she can predict the price of the house by filling prediction details through predict menu

➢ He/she can send message to admin through message menu
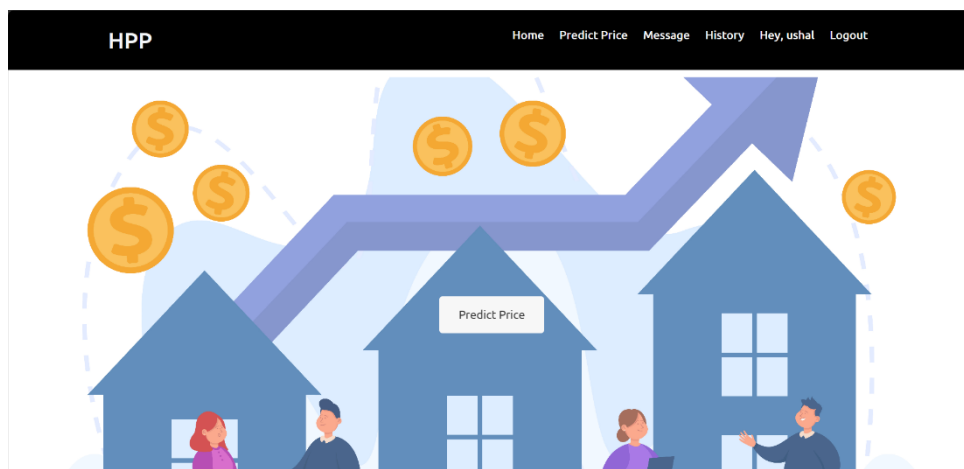
➢ He/she can see their prediction history.

Figure 12: User Module of House Price Prediction: HPP

Admin Module

This is the module of admin of the system. Admin can easily view the side navbar where all the menu relating to his work likes. The below given interface is the dashboard of admin module. By clicking top-right corner button named "Logout" he/she can logout from the system. He/she can view the user details, manage it, manage the prediction history and can see the message send by the user.
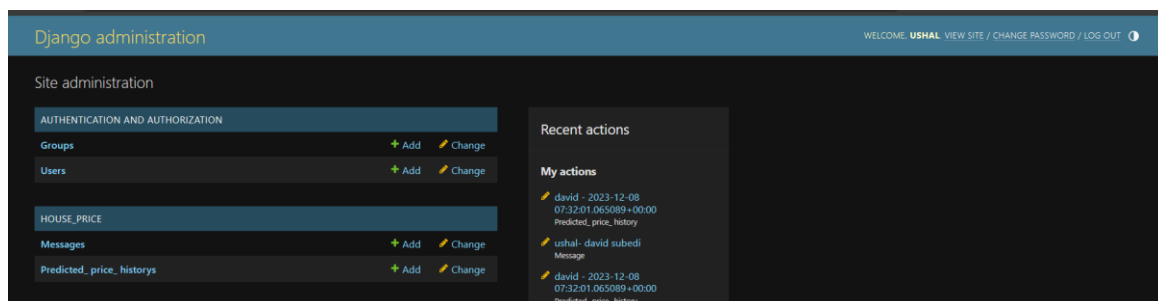

Figure 13 : Admin Module of House Price Prediction: HPP

4.2 Testing

4.2.1 Test cases for Unit Testing

Unit testing is a software testing method where individual units or components of a program are tested in isolation to ensure they work as intended. It involves automating tests for small, specific parts of the code, providing early detection of issues and supporting code maintainability.

Table 2: Test cases for Unit Testing

Test case	Objective	Task	Excepted Outcome	Obtained Outcome
Registration Process	To register a new user	Input details in registration form: Firstname: Ushal, Lastname: Koirala, Username: ushal, Email: ushal@gmail.com, Password: ushal123, Confirm password: ushal123	Registration successful message	Registration successful
Login Process	To login a user	Input details in login form: Username: ushal, Password: ushal123	User profile Login	User profile Loggedin
House Price Prediction module	To get user input data from form and displayed result predicted by machine learning model.	Input user input form's data and click on predict	Display result in new page	Result had been displayed in new page

4.2.3 Test Case for System Testing

System testing is the phase in software development where the entire software system is tested to ensure it meets specified requirements

Table 3: Test Case for System Testing

Test case	Objective	Task	Excepted Outcome	Obtained Outcome
User Authentication	To allow authorized access to the system	Click logout, go back to profile and refresh it	Login required and redirect to login page	Redirected to login page and request for the login to access
Input Validation	To allow only the supported data type in forms.	Input integer type, float type and string data in user input form.	Accepts the integer, float and string	Integer, float and string data accepted and held in a form
Compatibility test	System can be run in any web browser and devices	Open the system in mobile or laptop devices via browser	Smooth running in any platforms.	System run smoothly
Integration test	To show the system's different components like Django application, machine learning model, etc are integrated smoothly	Click predict button in user form	Quick response of model to predict the result.	Output was shown quickly and smoothly.

Security test	To test the user's data is safe	Admin cheks the available user's data	Exact password can't be seen	Hashed password has been displayed

Chapter 5: Conclusion and Recommendation

5.1 Outcome and Lesson Learnt

It has been an immense pleasure, honor and challenge to have this opportunity to take on and complete this project successfully. The project is intended to address that needs that people face as a result of the lack of an online house price prediction system. To meet the aforementioned requirements, software was created using HTML, CSS, Django and SQLite as a database.

Following skills are learnt throughout the process of developing this project.

- Learned how to analyze a problem from the user's perspective and how to make it more user friendly

- It was big help to understand and analyze my own skills and interests, which will help me to choose my field in future
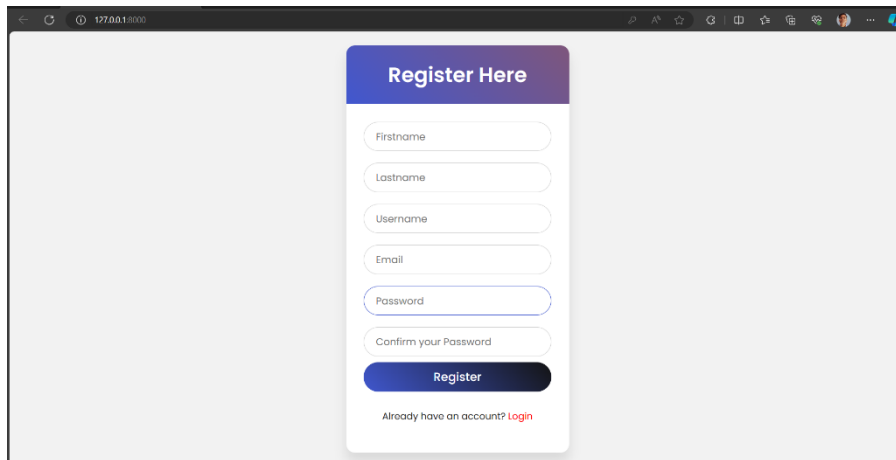
5.2 Conclusion

In conclusion, House Price Prediction System attempts to remove the uncertainty and guesswork that's occasionally involved with property evaluation. It allowed me to apply machine learning techniques to address a practical challenge, honing my skills in predictive modeling while exploring the intricate dynamics of property valuation. This project not only showcased my technical abilities but also deepened my understanding of the intersection between data science and the housing market, preparing me for hands-on challenges in the field.

5.3 Future Recommendations

In the development of this House Price Prediction, I will recommend that if there is going to be any modification the writer should add extra factors, such as a home's distance to schools or safety, that influence property values. Moreover, advanced methods for price prediction, such as complex algorithms for machine learning, are possible. To ensure that the system continues useful, it is essential that new details on houses are constantly added to it. Everyone will be able to make better decisions about purchasing or selling homes if it is made simple to navigate and understand, with an easy way to enter house facts and view projected values. The system will be more accurate and beneficial for everyone involved in housing with these changes.
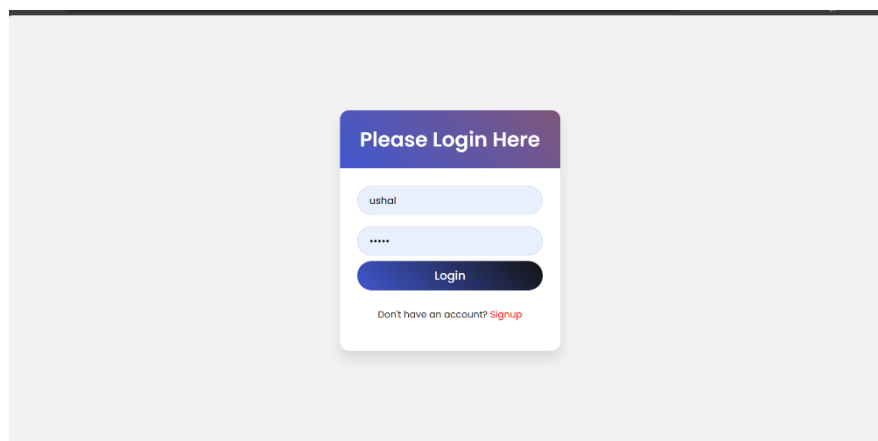
Appendices
Screenshot

Figure 14: Registration Page

Figure 15: Login Page

Figure 16: Home Page

Figure 17: Prediction Page

Figure 18: Prediction Result page

Figure 19: Prediction Result History Page

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Source Code

Some of the source code of the House Price Prediction: HPP are pasted below.

```python
from django.http import HttpResponseRedirect, HttpResponse

from django.contrib.auth.models import User

from django.contrib.auth import authenticate,login, logout

from django.shortcuts import render,redirect

import pandas as pd

import numpy as np

import joblib

from num2words import num2words

from django.contrib.auth.decorators import login_required

from django.contrib import messages

from math import floor

from .models import Predicted_Price_History

from django.urls import reverse

# Load the trained model

model = joblib.load('D:\HousePricePrediction\project.joblib')

from django.http import JsonResponse

def registration(request):

    if request.method == 'POST':

        # Retrieve form data

        fname = request.POST.get('first_name')

        lname = request.POST.get('last_name')

        uname = request.POST.get('username')

        email = request.POST.get('email')

        pass1 = request.POST.get('password')

        c_pass = request.POST.get('c_password')

        # Check if username already exists

        if User.objects.filter(username=uname).exists():

            return JsonResponse({'error': 'Username is already taken'})

        # Check if passwords match

        if pass1 != c_pass:

            return JsonResponse({'error': "Your password doesn't match"})

        # Create new user
```

```python
    my_user    =    User.objects.create_user(first_name=fname,    last_name=lname,
username=uname, email=email, password=pass1)
    my_user.save()
    return JsonResponse({'success': 'Register successfully'})
  return render(request, 'registration.html')
from django.contrib import messages
def Login(request):
  if request.method == 'POST':
    username = request.POST.get('uname')
    pass_1 = request.POST.get('pass1')
    user = authenticate(request, username=username, password=pass_1)
    if user is not None:
      login(request, user)
      return redirect('home')
    else:
      error_message = 'Username or password is incorrect'
      messages.error(request, error_message)
      return redirect('login')
  return render(request, 'index.html')
def logout_page(request):
  logout(request)
  return redirect('login')
@login_required(login_url='login')
def home(request):
  return render(request, 'home.html')
@login_required(login_url='login')
def contact(request):
  return render(request,'contact.html')
@login_required(login_url='login')
def predict(request):
  if request.method == 'POST':
    # Retrieve input data from the form
    bedrooms = request.POST.get('bedrooms')
    bathrooms = request.POST.get('bathrooms')
```

```python
floors = request.POST.get('floors')

parking = request.POST.get('parking')

roadsize = request.POST.get('roadsize')

road_type = request.POST.get('road_type')

area = request.POST.get('area')

# Check if any of the fields are empty or None

if any(val is None or val == '' for val in [bedrooms, bathrooms, floors, parking,
roadsize, road_type, area]):

    # Handle the error

    return render(request, 'predict.html', {'error_message': 'Please fill in all fields'})

# Convert the values to appropriate types

bedrooms = int(bedrooms)

bathrooms = int(bathrooms)

floors = int(floors)

parking = int(parking)

roadsize = float(roadsize)

road_type = int(road_type)

area = float(area)

input_data = np.array([[bedrooms, bathrooms, floors, parking, roadsize, road_type,
area]])

predicted_price = model.predict(input_data)  #  model.predict() method is used for
predictions

predicted_price_history = Predicted_Price_History.objects.create(

    user=request.user,

    bedrooms=bedrooms,

    bathrooms=bathrooms,

    floors=floors,

    parking=parking,

    roadsize=roadsize,

    road_type=road_type,

    area=area,

    predicted_price=predicted_price[0],

)
```

```python
            return HttpResponseRedirect('/predict/result/')
        return render(request, 'predict.html')
@login_required(login_url='login')
def prediction_result(request):
    latest_prediction                                                    =
Predicted_Price_History.objects.filter(user=request.user).order_by('-timestamp').first()
    if latest_prediction is not None:
        predicted_price = latest_prediction.predicted_price
        predicted_price_decimal = int(predicted_price)
        predicted_price_words = num2words(floor(predicted_price), lang='en_IN'
        return render(request, 'result.html', {
            'predicted_price': predicted_price_decimal,
            'predicted_price_words': predicted_price_words
        })
    else:
        default_predicted_price = 0
        predicted_price_words = "Zero"
        return render(request, 'result.html', {
            'predicted_price': default_predicted_price,
            'predicted_price_words': predicted_price_words
        })
from django.shortcuts import render, redirect
from .models import Message
from django.contrib import messages
from django.urls import reverse
@login_required(login_url='login')
def submit_message(request):
    if request.method == 'POST':
        name = request.POST.get('name')
        email = request.POST.get('email')
        subject = request.POST.get('subject')
        user = request.user

        message_content = request.POST.get('message')
```

```python
        new_message = Message.objects.create(user=user, name=name, email=email,
message=message_content, subject=subject)
        new_message.save()
        messages.success(request, 'Message received successfully!')
        return redirect(f'{reverse("contact")}?success=true')
    return render(request, 'contact.html')
@login_required(login_url='login')
def history(request):
    road_type_mapping = {
        1: 'Soil Stabilized',
        2: 'Gravelled',
        3: 'Concrete',
        4: 'Pitch'
    }
    predictions = Predicted_Price_History.objects.filter(user=request.user)
    for prediction in predictions:
        prediction.road_type = road_type_mapping.get(prediction.road_type, 'Unknown')
    return render(request, 'history.html', {'predictions': predictions})
@login_required(login_url='login')
def delete_prediction(request, prediction_id):
    prediction = Predicted_Price_History.objects.get(pk=prediction_id)
    if prediction.user == request.user:
        prediction.delete()
    return redirect('history')
```

References

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