House price Prediction using Regression Analysis

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APPROVAL

This Project titled House Price Prediction using Regression Analysis submitted by Md. Sazzadur Rahman and Nilufar Jannat to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 05.01.2022

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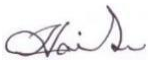

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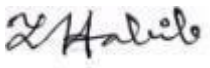

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DECLARATION

We thus declare that we completed this research under the supervision of Mr. Ahmed Al Marouf, Sr. Lecturer, Department of Computer Science and Engineering, Daffodil International University. We further certify that no component of this project, or any part of it, has been submitted to any other institution for the granting of a degree or certificate.

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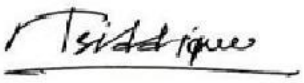

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We would like to offer our heartfelt appreciation to -----, -----, and Head, Department of CSE, for his invaluable assistance in completing our project, as well as to other members of the Department of CSE.
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Finally, we must recognize and thank our parents' unwavering support and patience.

ABSTRACT

Everyone want to live in his or her own home. For a human, a house is a magnificent thing. Consider the case of a person in need of a home. As a result, he will look for a property that he can purchase at a fair price. He will also be able to view the characteristics that are appropriate for him. Similarly, in the case of a seller who wants to sell his or her home, he may learn what sorts of features he can include and how to sell his or her home for the highest possible profit.As a result, we may conclude that this initiative benefits both the buyer and the seller. This project uses machine learning to forecast the price of a property based on a variety of factors. The customers input information about the property, and using machine learning, he may see the house price and decide whether or not to buy it.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

In this project, We will develop a system. That system can predict the house price of Bogra city. If we get a good fit, We will use a regression model to predict the monetary value of a house located in Bogra's area. A model will be very valuable for a real estate agent. After completing this model we will connect this model with a web application. We will use Html, CSS and JavaScript for this web application. This project will help to predict house prices based on various entities.

1.2 Motivation

There are many house price prediction software. Such as Bangalore house price prediction, Boston house price prediction etc. But there is not any software that can predict Bogra house prices. As my hometown is Bogra, so I decided that I Will create a software which will predict Bogra house prices and anyone who uses this software, he can get an estimated house price easily in Bogra city.

1.3 Objectives

In this project has four parameters:

I. Location: In this location parameter, Users can use the location of bogra city.
II. Size: Size parameter means the number of bedrooms. Users can input bedrooms that are realistic.
III. Bath: Bath parameter means a number of bathrooms. Users can also input any realistic number of bathrooms.
IV. Sqft: Sqft parameter is total square feet. Users can input any area as they want.

After input, these four parameter users can see an estimated price of their desired location of Bogra city.

1.4 Expected Outcomes

If Users use this web application, they can get an idea about Bogra house prices. Suppose a user wants to know the house price of Puran Bogra which has 3 bedrooms and 2 bathrooms and area is 1500 sqft then what will be the price of this house. Using this web application the user will get an estimated price of this particular location.

1.5 Report Layout

Chapter 1: Introduction In this Chapter we've discussed Introduction, Objectives, Motivation, Expected Outcome and Report layout of the project.

Chapter 2: Background This chapter contains Project Introduction, Related works, Comparative Studies, Scope of the Problem and Challenges of our project.

Chapter 3: Requirement Specification This chapter contains Business Process Modeling, Requirement Collection and Analysis, Use Case Model and Description, Logical Data Model and Design Requirement.

Chapter 4: Design Specification This Chapter describes our application description which is related to Design Specification like Front-end Design, Back-end Design, Interaction Design and UX and Implementation Requirements.

Chapter 5: Implementation and Testing This chapter contains Implementation of Database, Front-end Design, Interactions, Testing Implementation and Test Results and Reports.

Chapter 6: Conclusion and Future Scope In this chapter we will discuss conclusion and Scope for Further Development.

Chapter 2

BACKGROUND

2.1 Preliminaries/Terminologies

Our project name is House Price Prediction Using Regression Analysis. Our Project will predict Bogra house prices. For Predicting house price, at first I had collected a dataset from Bogra register office. After collecting the dataset, I had processed the dataset. Then I was using a machine learning algorithm. The algorithm name was regression model. When I successfully completed the machine learning model of this project, I had connected this model with a web application. For web applications I had used HTML, CSS and JavaScript.

2.2 Related Works

The fact is that this is Bogra house price prediction that's why other related work for reference is limited. But there are some related works from different regions that should be mentioned.

I. Boston House price prediction

II. Bangalore House price prediction etc.

2.3 Comparative Analysis

If we compare this project with other projects such as Boston house price prediction and Bangalore house price prediction, our project can be a little bit similar to Bangalore house price prediction. Because the Boston House price prediction project has three parameters: number of rooms, number of students per teacher in the classroom for the school in the area and last parameter is 'is this house near to the river or not ?'. On the other hand, Bangalore house price prediction has four parameters: location, number of rooms, number of bathrooms and total square feet. Our project has four parameters too:

location, number of rooms, number of bathrooms and total square feet.

According to these parameters, Users can calculate the estimated prices of houses. Our project's parameters are related to the Bangalore house price prediction, so we can say that our project is a little similar to the Bangalore house price prediction.

2.4 Scope of the Problem

If Users use this application, they will have to input realistic values. If users input unrealistic values, they will get unusual values. Suppose users want to buy a house, that house is 1000 sqft but he/she wants 4 rooms, 4 bathrooms. That is Unrealistic. For unrealistic input predicted house prices will be unusual. Or Users input 2 rooms, 2 bathrooms in 1000 sqft then users will get realistic values. So using this web application, Users have to input realistic values.

2.5 Challenges

The most difficult Challenge was collecting the dataset of this project. First I had searched on google but there was no dataset about Bogra house prices.
I didn't know where I could get this data. I would take advice from my father then I would be able to collect the dataset from the registered office of Bogra. My next Challenge was applying the algorithm of the dataset. I used a regression model. When I was applying this algorithm there were many bugs, many unrealistic things and my last challenge was the front-end part. I can not imagine the UI design of this application. But finally, I can imagine my desired UI design and now my project is ready.

Chapter 3

REQUIREMENT SPECIFICATION

3.1 Business process Modeling

Every project has a business process model. Our project business process model too.

Our project's business process modeling is given below:

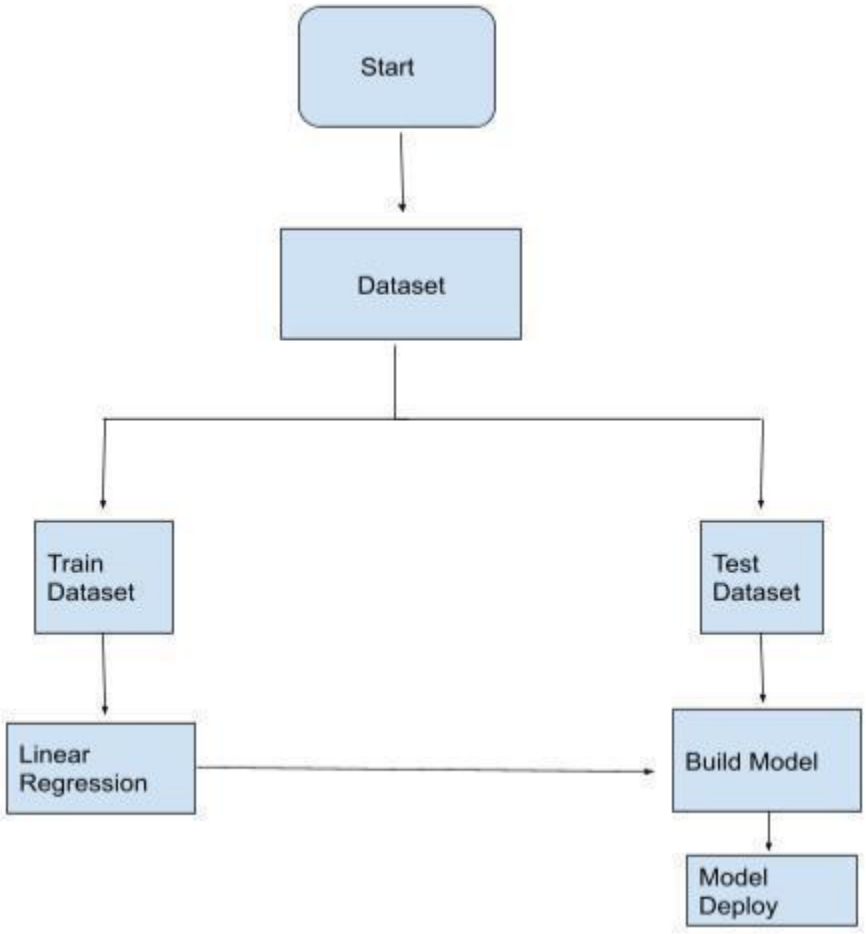

figure: 1

3.2 Requirement Collection and Analysis

This project has two parts.

I. Machine Learning

II. Web development

So It has some Requirements. The Requirements are given below:

Hardware Configuration:

- Mobile
- Computer
- Minimum 512mb ram

Software Configuration:

- Internet Connection
- Tools: Jupyter notebook, pycharm, postman
- Regression algorithm
- Html, CSS, JavaScript

Features:

This project has four text fields.

- Location
- Number of bedrooms
- Number of bathrooms
- Total Square feet

And it also has a button that says Estimate price. Clicking this button anybody can know the estimated price of the desired house.

3.3 Use Case Modeling and Description

For use case modeling it has some process.

- Collecting data
- Preprocessing data
- Determine dependent variable, Independent variable
- Calculate coefficient using regression analysis
- Calculate prediction test
- Get predictions

Now we will show this description by modeling:

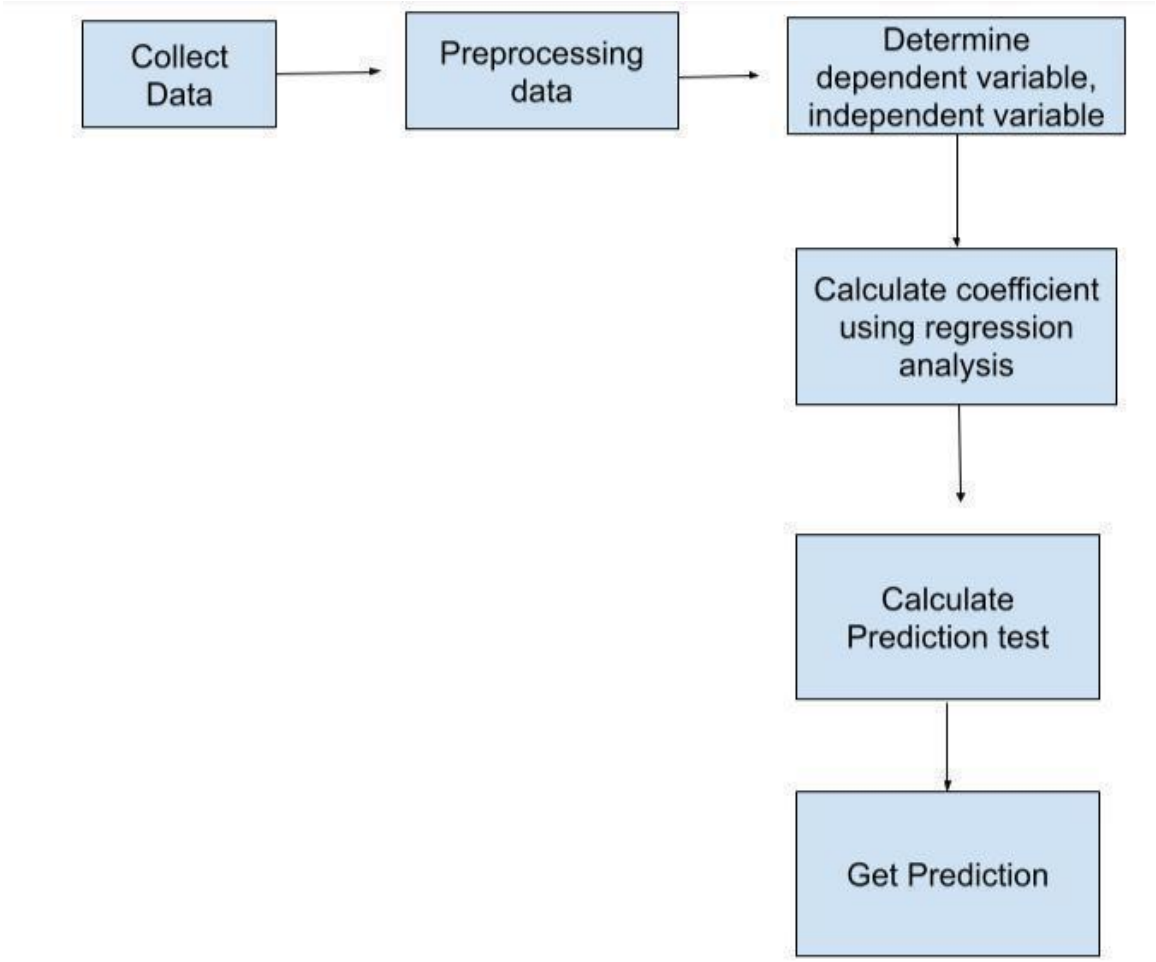

figure: 2

3.4 Logical Data Model:

I had used the back-end as a machine learning model that I had created and created a machine learning model. I had used a regression model and I also had collected data from the Bogra register office. I was not using any database management in this project because this is not important for this project.

3.5 Design Requirement

First of all, I need to research my user's Requirements. As my project was intended for helping those users who are searching for houses in Bogra city. To keep this perspective in my mind I had implemented user friendly design that will ease the way of searching house prices. My Software has four text fields and one button. My project's design is very easy to use. Anybody can use my software who can just operate a computer.

Chapter 4

DESIGN SPECIFICATION

4.1Front-end Design

For Front-end design we had used Html, CSS and JavaScript. My project has one page only. In this page we had added an image as a background design. And in the middle of this page we had added four text field, one button and one result showing field. The Text fields Color is white and button color is light green. And the result is yellow. Those are all about our front-end design of our project.

This is our front-end part of our project.

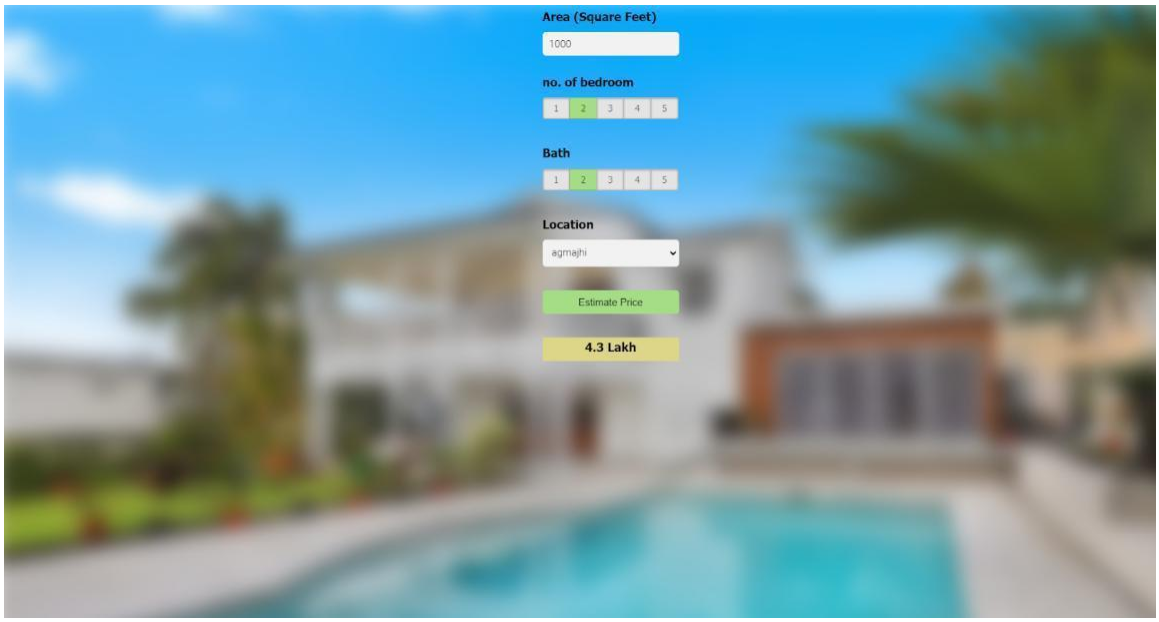

Figure: 3.1.1

4.2Back-end Design

We had used machine learning as a back-end design. For developing machine learning models we had used python language and as an algorithm we had used a regression model.

This is a house price prediction project. That's why I had calculated some ratios such as what will be the price per square feet, maximum and minimum number of bathrooms. The accuracy was 84% of regression model.

This is a picture of price per square feet

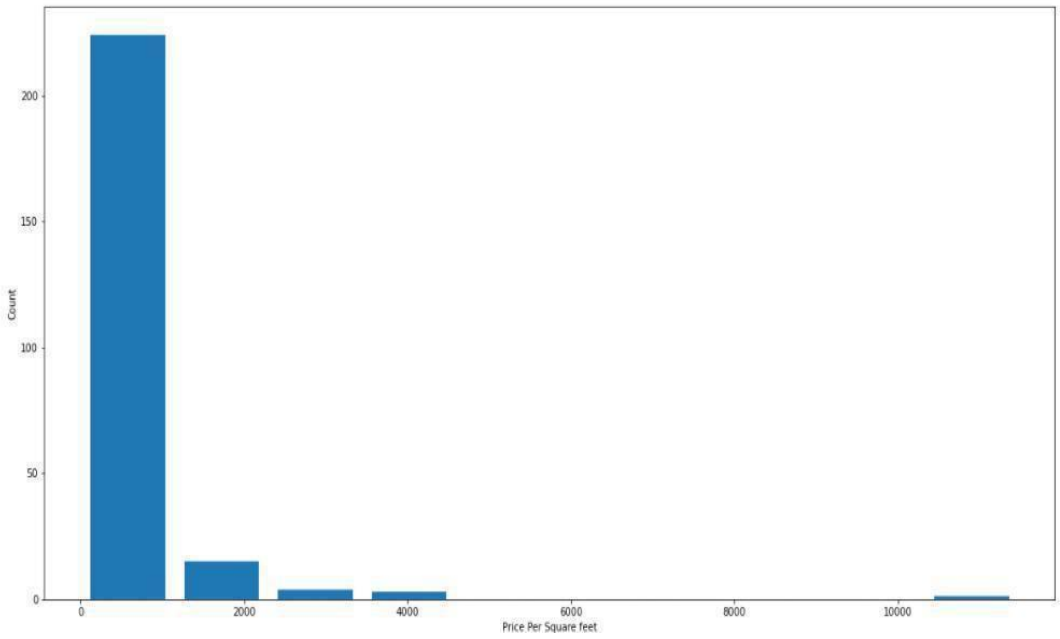

Figure: 3.1.2

This is a picture of maximum and minimum number of bathrooms

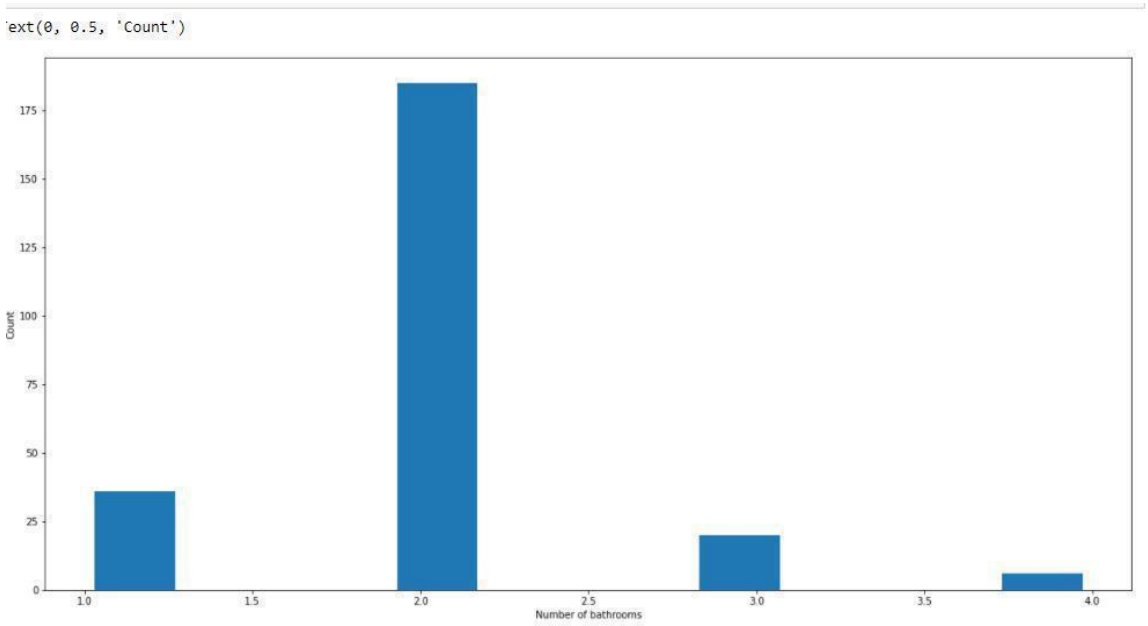

Figure: 3.1.3

4.3Interaction Design and User Experience (UX)

User Experience or UX is defined as any interaction a user makes with a product or service. The UX design takes into consideration each and every element involved that helps in shaping the experience, how it makes the user feel and how easy it is to fulfill the tasks User Experience or UX is defined as any interaction a user makes with a product or service. The UX design takes into consideration each and every element involved that helps in shaping and experience. How it makes the user feel and how easy it is to fulfill the tasks.

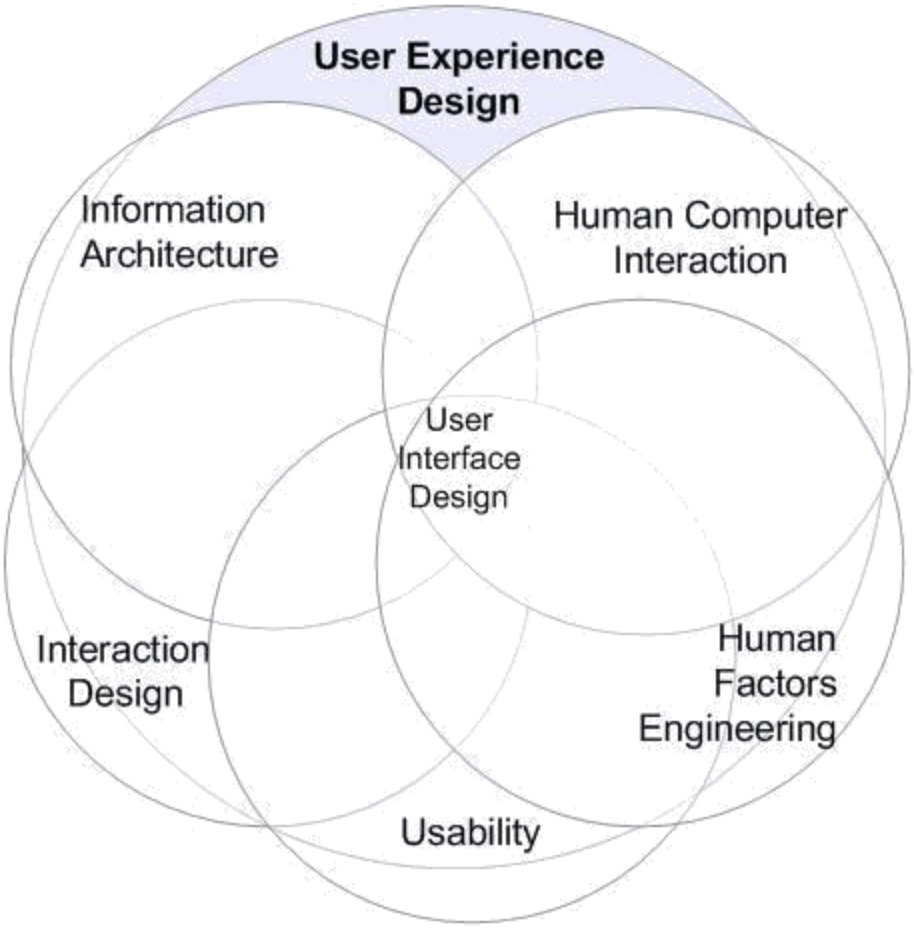

Figure 3.1.4

4.4Implementation Requirements

To make the project, We need a jupyter notebook editor for developing machine learning model. As a machine learning model I chose a regression model. After developing a machine learning model I had created a json api by a package named import pickle. Then I used postman software for checking api. For developing the front-end part I had used pycharm as an editor and I also used html, CSS and JavaScript.

Inshort we need.

- Jupyter notebook
- Regression model
- Postman
- Pycharm
- Html
- CSS
- JavaScript

Chapter 5

IMPLEMENTATION AND TESTING

5.1 Implementation of database

We didn't use a database for developing this project but for loading data we had used machine learning as a back-end. Machine learning is a method of data analysis that is building models and it is a branch of artificial intelligence that systems can learn from data, patterns and make decisions. As a machine learning model I had used a regression model that I wrote before many times. There are many machine learning algorithms but I chose a regression model because implementing a regression model I had got better accuracy than other algorithms. Regression model is the most popular algorithm. Regression model can predict values based on dependent and independent variables. Using this algorithm we can analyze two or more variables.

5.2 Implementation of Front-end Design

We designed the front-end of our website by HTML, CSS and JavaScript. HTML is the basic markup language which describes the content and structure of the web pages. On the other hand, CSS is the extension to the HTML which modifies the design and display of the web pages. HTML files can contain CSS code while CSS stylesheets can never contain HTML code in it. And JavaScript is used for logical parts. JavaScript is the most famous and powerful language.

Our project has one page. There is no navigation. In this page we had added a picture for background image and there are four text field locations, square feet, number of bedrooms and number of bathrooms. Then there is one button that is the color green and the last one is the result text field.

5.3 Testing Implementation

Testing entails putting anything to the test in order to ensure its quality. Testing is an essential component of every application or computer program. By testing our site, we are always looking for flaws in advance of a planned event and attempting to resolve them. To ensure that our site functions as expected, we use end-to-end testing for each of its functions. Stack testing was also used to verify the performance of our website. For this application, we also use a relapse test. Following the discovery of a flaw in a usefulness, a regression test is performed on the entire website.

5.4 Test Results and Reports

This is a test of machine learning model which is back-end of our website

```
    return round(lr_clf.predict([x])[0], 3)

In [40]: predict_price('Lotifpur',6,2000,6)
Out[40]: 51.062

In [41]: predict_price('Ranirhat', 2, 1050, 2)
Out[41]: 22.0

In [42]: predict_price('Ranirhat', 2, 2050, 2)
Out[42]: 26.894

In [43]: predict_price('Natai', 2, 1500, 3)
Out[43]: 36.489

In [44]: predict_price(location='Ashokola', size=3, sqft=1000, bath=1)
Out[44]: 0.031

In [45]: predict_price(location='Lotifpur',size=2,sqft=1000, bath=2)
Out[45]: 67.056

In [46]: predict_price('Lotifpur', 2, 1500, 3)
Out[46]: 66.949
```

Figure 4.1.1

And These are test of our main website

This is an one testing chalk lokman place in bogra. If Users want to buy a house which has 1000 sqft, 2 bedrooms, 2 bathrooms the estimated prices will be 21.3 lakh.

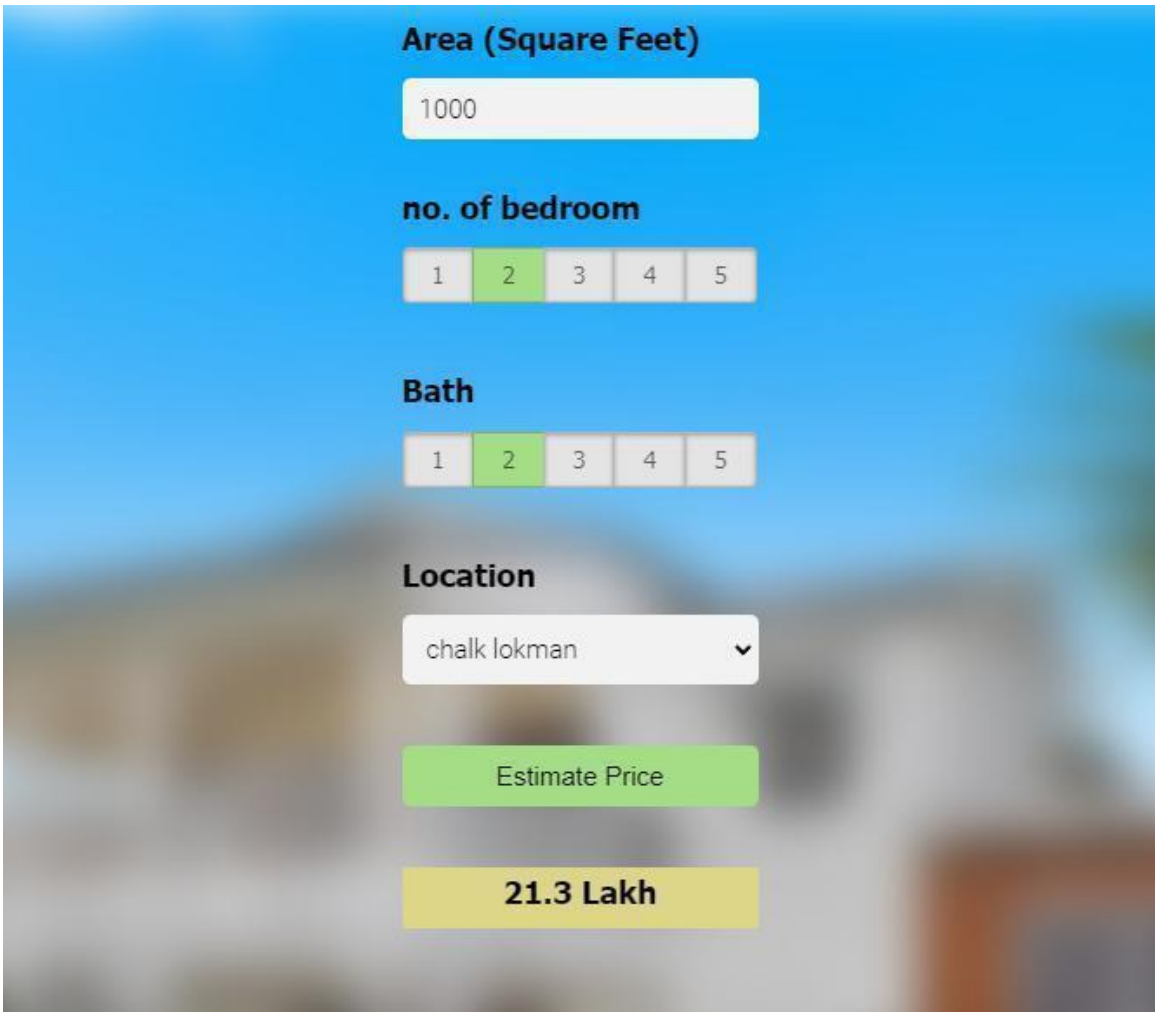

Figure: 4.1.2

This is an one testing chelo place in bogra. If Users want to buy a house which has 1000 sqft, 2 bedrooms, 2 bathrooms the estimated prices will be 4.3 lakh.

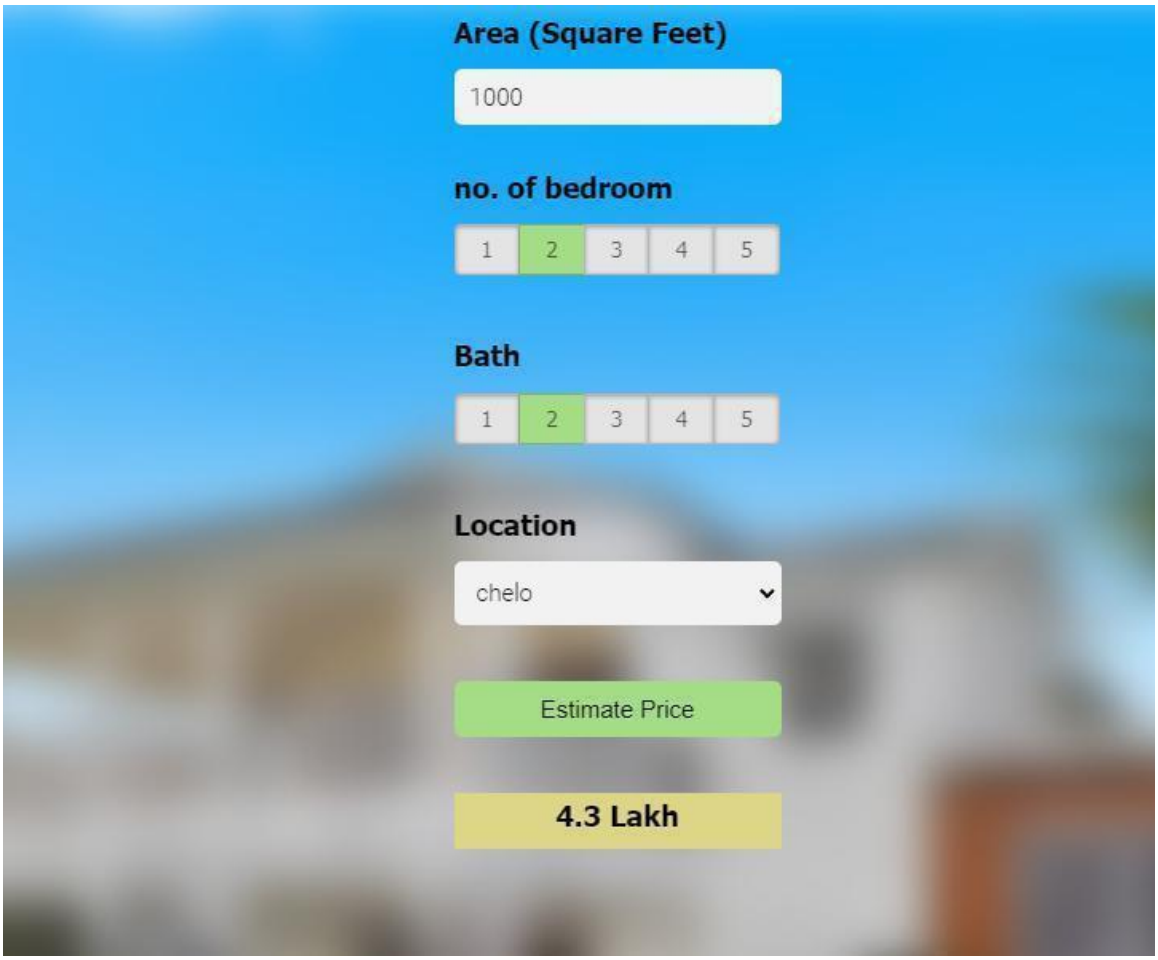

Figure: 4.1.3

This is an one testing maltinagar place in bogra. If Users want to buy a house which has 1000 sqft, 2 bedrooms, 2 bathrooms the estimated prices will be 9.1 lakh.

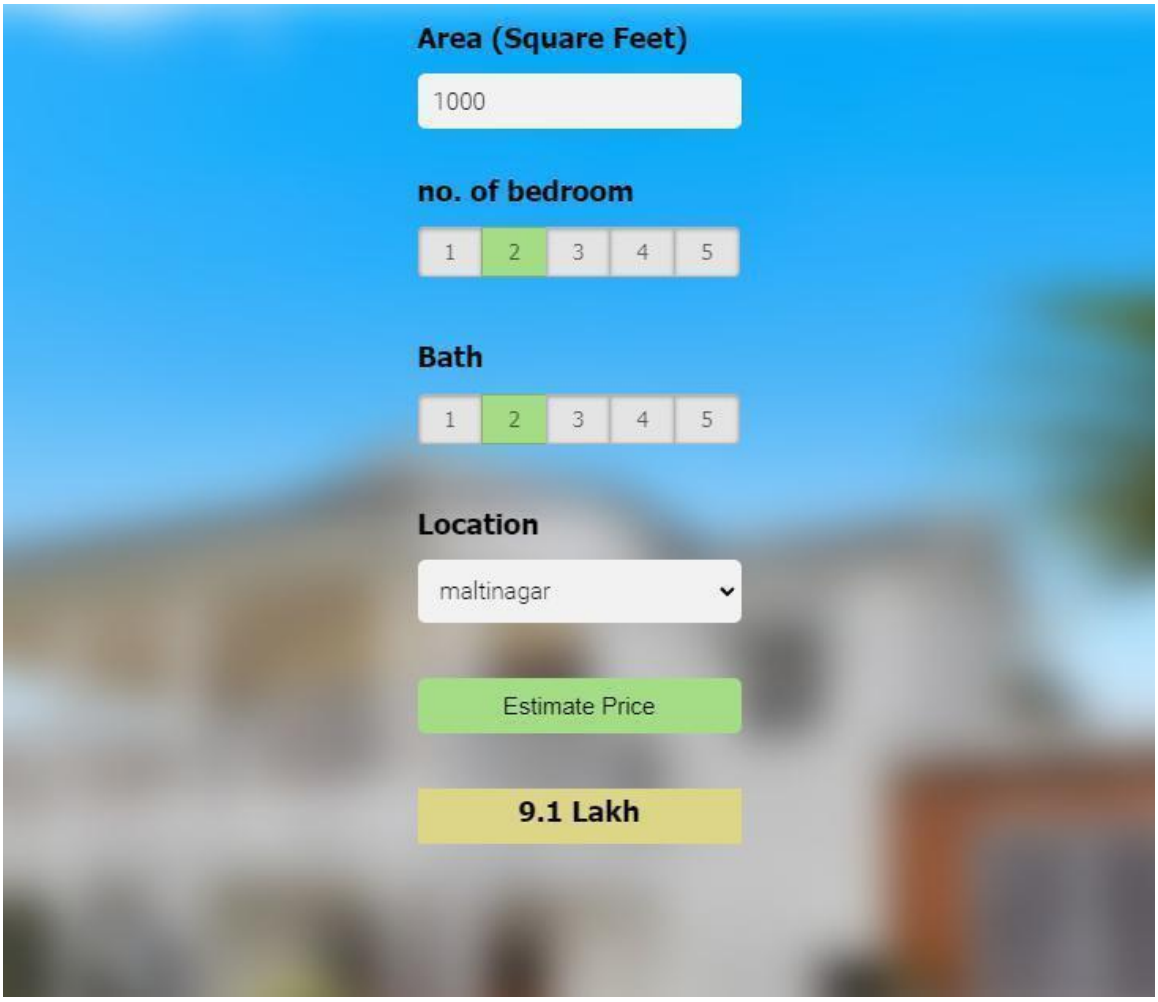

Figure: 4.1.4

This is an one testing malgram place in bogra. If Users want to buy a house which has 1000 sqft, 2 bedrooms, 2 bathrooms the estimated prices will be 21.3 lakh.

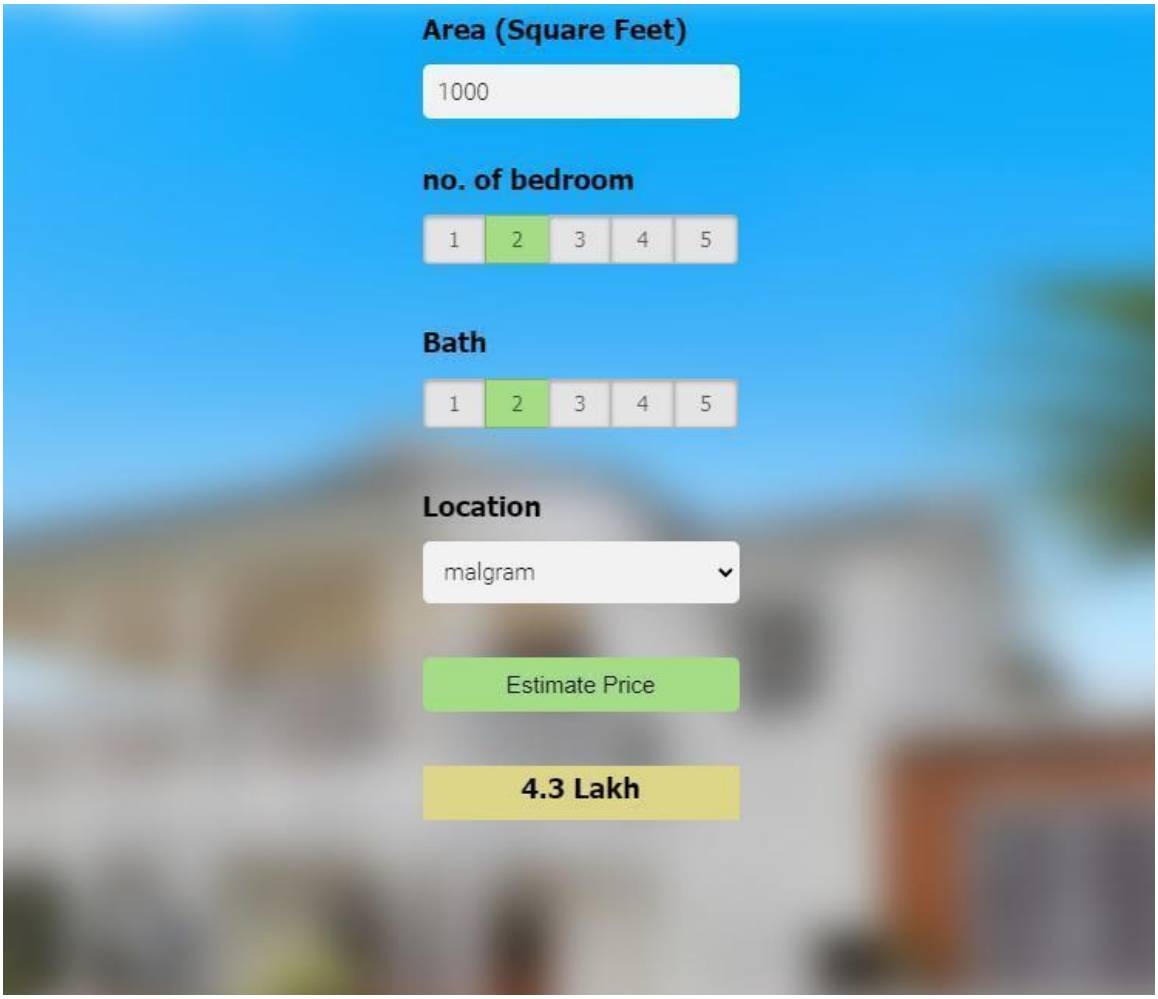

Figure: 4.1.5

Chapter 6

IMPACT ON SOCIETY, ENVIRONMENT AND SUSTAINABILITY

6.1 Impact on Society

Our initiative has a significant social impact. Everyone is aware that we are living in the digital age. So, a computer whiz wants to digitize everything. We want to digitize our country because we are computer engineers. Our initiative is headquartered in the city of Bogra. There is no program that can anticipate the price of a home in Bogra. If somebody wants to know the projected price of a bogra house, they may utilize this application to find out. Predicting house prices is anticipated to assist those who are looking to buy a home by allowing them to understand the price range and organize their budget accordingly.

House price projections, on the other hand, might help property investors understand the trend in home prices in a specific area.

6.2 Impact on Environment

Our endeavor will have an impact on the environment as well. Let's say I want to buy a house in Bogra City, but I don't know how much a house in Bogra costs. Even I am clueless when it comes to the cost of a bogra mansion. If we want to know the price of a bogra house, I'll contact a real estate broker. However, not all brokers are trustworthy. The majority of brokers are liars and fraudsters. Brokers will be unable to deceive us if we use this program since we will be able to see the anticipated pricing. As a result, we can confidently assert that our project will have the greatest environmental effect.

6.3 Ethical Aspects

I obtained the dataset for this research from the Bogra Register Office. As a result, the forecasted price will be based on the registration office, and this price will be the current price in Bogra. However, purchasers will be unaware of the broker's pricing, which differs from the registration office price. This is our project's ethical component.

6.4 Sustainability Plan

The project will need to be updated on a regular basis. Because a project that has been delayed will become unsustainable. The project will be updated when the Register Office's house price is updated, and we will get user input. We will introduce additional features in the future based on customer input. We'll also include the brokers' price in this project so that people may get an idea of how much a bogra home costs. If we can keep these key points in mind, we believe our proposal will be viable.

Chapter 7

Conclusion and Future Scope

7.1 Discussion and Conclusion

We detailed house price prediction using a regression model in our project report. We also make an effort to demonstrate each stage so that everyone understands how the system was created. Furthermore, we have tried a variety of ways and are pleased with the outcomes. As a result, we can state that our initiative is successful and has proven its worth.

However, we must mention that our project has certain restrictions. Our model is unable to forecast property values in other cities. It is solely for the city of Bogra. There is no such thing as an age variable. We were unable to include an age variable in our house price prediction model. As a result, the price of a new house and an old house in the same area will be the same. As a result, these are the project's limits.

Despite these limitations, we feel that our system is more than capable of completing its work and providing consumers with a satisfying outcome.

7.2 Scope for Further Developments

We recognize that our project is a web-based project, but we have planned to create mobile applications for both Android and iOS so that any user may utilize it. I'm going to use the flutter framework to create Android and iOS apps in the hopes of saving time. It is only for the city of Bogra, but we will gather datasets for additional cities in the future, and individuals from other places will be able to use our program.

Reference

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