

House Rent Prediction using Machine Learning and Deep Learning

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ABSTRACT

As the population grows every year, rental rates rise as well. Studies have shown that for people who wish to sell their own homes and rent them out, the fluctuations in housing rental prices are a major concern. A system should therefore be put in place to predict the rental of a house according to its location, features, number of bedrooms, kitchen and dining room and floor area. This project focuses on developing a model which can predict house rent based on various factors and interior image of house.

I. INTRODUCTION

Apart from food, sleeping and water, houses are one of the most important needs. The demand for rented houses is growing, due to an increase in the population. Among the population, there are people who make houses their investment and property yet most of the people buying the house for their livelihood and shelter. The rent for a house is dependent primarily on its furnishing, i.e. whether it's fully furnished, partially furnished or unfurnished. House prices are a major contributor to the national economy, as the highest percentage of a person's salary goes to renting a house for a living, people buy furniture for their houses, builders and contractors buy raw materials for building houses, and indirectly contribute to the national economy. It's a tedious and time-consuming task of collecting information about rents at different locations for major cities with hundreds of thousands of inhabitants. Hence, it's important to establish an automated and online easy to access system that can predict price accurately.

II. OBJECTIVE

The aim of this project is to build a model that can predict the rent of a house in the Mumbai region by providing an image of the interior of the house and the needs of the user in relation to the house. The purpose of the system is to provide users with reliable rental prices for housing, in accordance with this model.

III. EXISTING SYSTEM

During the research, we have come across a number of websites where existing homes can be rented in Mumbai. For example, Magic Bricks rent houses on the basis of the number of BHKs and facilities. 99 Acre is also a relevant site that helps buyers and agents in selling and buying their houses for rent.

It is true that these sites do not forecast the rent of a house, but they have identified which houses are available and how much it will cost. To date, there are several solutions that can be used to predict rental values using machine learning and linear regression.

IV. SCOPE

- This system provides an easy-to-use interface for all users who wish to predict the rental price of their house/flats/apartment so that they can sell it.
- A lender may set an appropriate price for a house by using the prediction system.
- Users who have moved to Mumbai may look for rentals in particular places that are the price they will pay if they take up residence in a certain location with special facilities.
- By using this system, users will be able to compare prices and make up their own mind which items they are going to add or ignore.
- The future scope of this idea is to scale up with the websites which provide information about rented house in a particular society so that we can use their updated list of houses and update our dataset frequently to serve users with best and accurate value every time.

V. DESIGN AND USE CASES

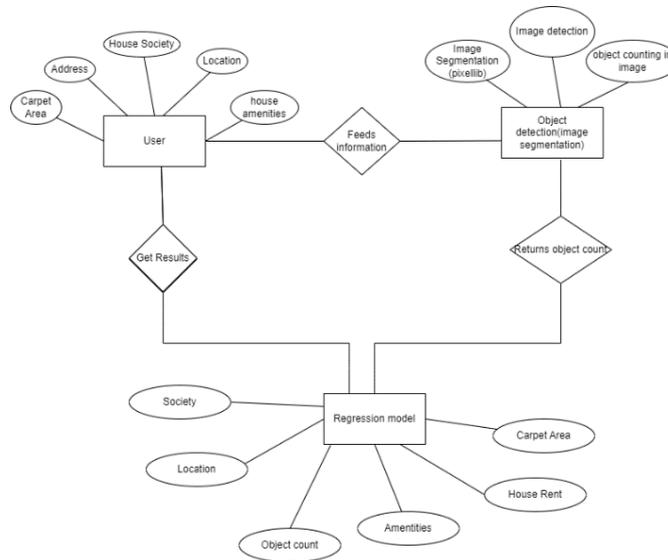


Fig. 1: Entity relationship Diagram

- **ERD:**

ER diagram consist of 3 entities – User, Object Detection module and Regression model module. User has its own ideas about house they want to rent out or buy on rent which acts as attribute of user. Attributes of object detection modules are the entries and functionality they perform during processing. And all dependent variables in Regression model acts as its attribute.

- **Activity Diagram:**

Activity diagram represents the flow of process. In this project information flows from user and pass on to two modules. If user feeds in images then flow divert towards object detection module and if user feeds in text then regression module becomes active. At the end both modules integrate and gives out the predicted price.

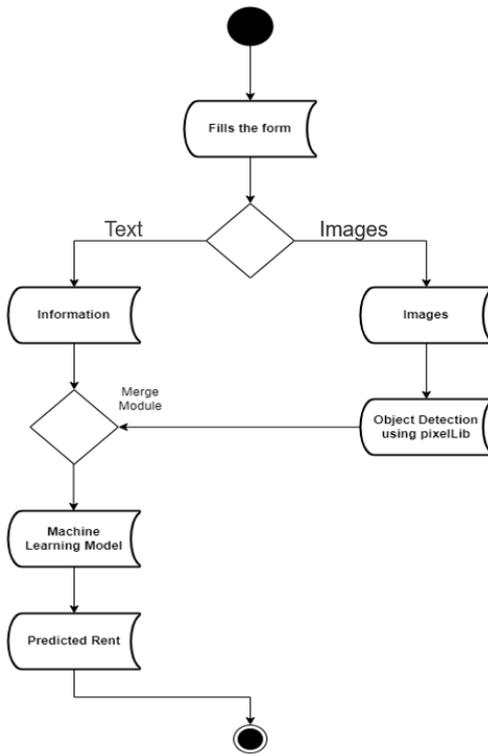


Fig.2: Activity Diagram

- **Dataflow Diagrams**

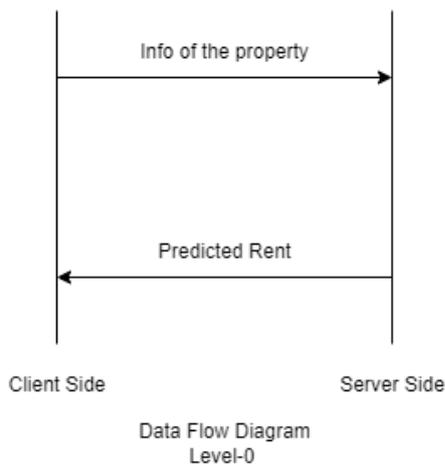


Fig.3: Data Flow Diagram Level-0

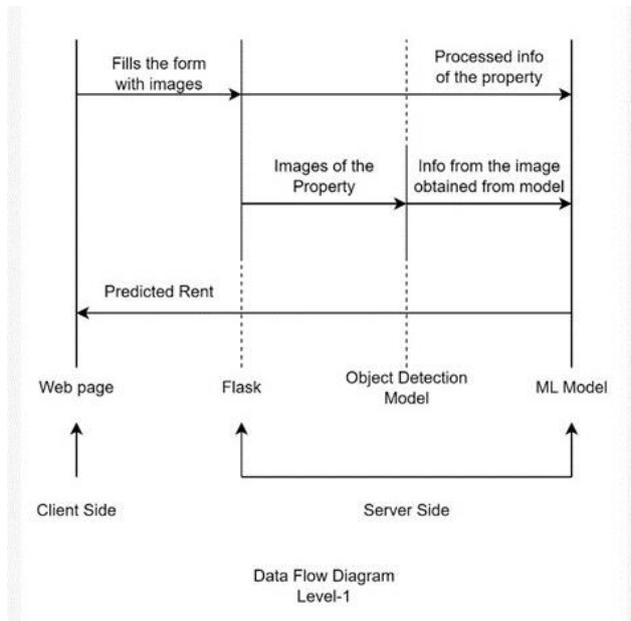


Fig.4: Data Flow Diagram Level-1

- Use Case Diagram

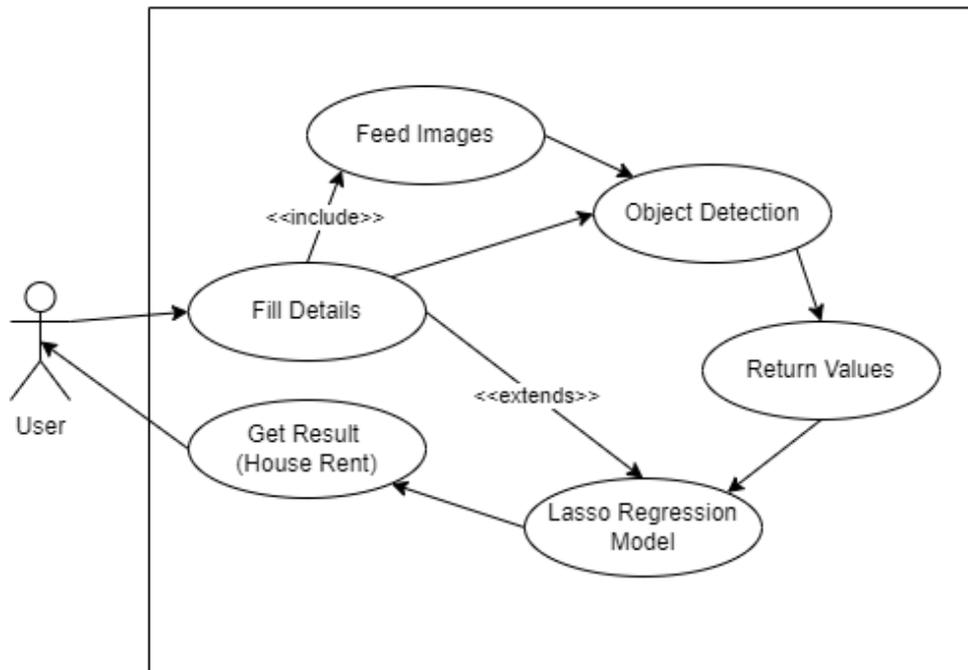


Fig.5: Use Case Diagram

VI. PROJECT DESCRIPTION

This project is a system that enables users to estimate the most accurate rent of their homes, in specific locations and with particular features. The application consists of a number of interfaces based on users' task, which is divided into two parts first for tenants who wish to rent their property and second for the user looking for properties flat or apartment. This project takes location, carpet area, amenities, number of BHKs and image of interior of house as input for those who want to rent out their property and performs regression analysis on these dependent variables to predict the value of independent variable "Rent". User inputs interior images of the house, which are then used to analyse the furnished state of rented property. This results in an accurate estimate of the rent of the house.

VII. METHODOLOGY

1. Requirement Analysis:

The requirements of the project are a windows computer, python installed libraries and a good network connection.

2. Data Collection:

To predict the outcome (Rent) a labelled dataset has to be prepared on which training and testing is to be performed. Web scraping of MagicBricks.com content will be used to prepare the dataset for this project, which requires preprocessing with panda library in order to remove null values and invalid data so that a clean dataset is created.

3. Technology Analysis:

Since Rent depends on various attributes like number of BHKs, location, amenities, carpet area and society and output a continuous value, by the problem statement a decision is made to use Regression techniques to predict the outcome. In addition to regression techniques, we have also performed object detection on images of the interior of the house to obtain information on the condition of the house that the user wishes to rent.

4. Design Flow:

The flow of data inside the system starts from filling the form by user, if the entered data is not an image then it will go to regression model and get fit into the attribute of its type, else, first the number of objects are counted using object detection model and according to threshold it gives output about

furnishing detail of the house and then this result works as an independent variable in regression model and according using lasso regression, the prediction are displayed as output.

5. Working:

The working of prediction system is divided into two parts: Image Segmentation and Regression analysis.

Image Segmentation Module:

For this we use PixelLib library. PixelLib is a flexible library used to perform image and video segmentation in few lines of code. We used "Pointrend Resnet 50" model to segmentize the objects in the house interior images. This model helps to classify the objects in 80 classes. Since coco dataset consist of various daily used product, we limit the classes into 5 to 6 categories like couch, bed, storage, refrigerator, TV stand, etc. Based on this segmentation and identification, if the count of classes is high, which will be decided by threshold hardcoded already during development phase, we will classify the house as fully-furnished, if this count of classes is moderate number, the house will be classified as semi furnished and if this count of classes is low or zero the house will be considered as unfurnished. Now this classification of the house will be used in Regression Model.

Regression Model:

Regression Technique is a method generally used for prediction and it relates dependent variables to independent variables. This technique shows the changes observed in dependent variables associated with independent variables. The result of Image Segmentation is used as an independent variable in regression model and hence using Regression techniques, we predict the house rent. Here, Dependent variable: Rent, and independent variable: Furnishing Status, Amenities, Locality, Society, BHK, and Carpet Area. We implemented three regression model: linear regression, lasso regression and ridge regression on the dataset. The $r2_score$ value of lasso regression is more than the other two regression techniques. So, the Lasso regression technique is used.

VIII. EXPECTED OUTCOME

This project is expected to return a true and most precise value of house rents in Mumbai. It is therefore expected that such an application will remove the difficulties and efforts to obtain the most accurate rent for a house. People are also expected to be able to prioritize their needs and make good decisions about necessity

and budgets safely after this application has been developed. This project will give users access to renting apartments at any location of Mumbai in just one click. This application filters their choices for the number of BHKs and makes it easy to estimate rental income, in addition to enabling easy access to house rentals.

IX. CONCLUSION:

The most significant need for human survival next to food is shelter, which on a daily basis becomes more in demand as the population grows. There are fluctuations in house prices, which is why the choice of price for a rental home is so important. This system aims to make it easier and more secure for them to obtain rents on their flat, apartment or house. It can therefore affect their choice in a positive way. This system is intended to avoid devious acts of fraud being carried out by contractors. In order to eliminate manual effort and time when looking for houses in the area of our description, it is very useful to use a prediction system based on machine learning.

X. REFERENCES

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