

HOUSE PRICE PREDICTION USING MACHINE LEARNING BY RANDOM FOREST ALGORITHM

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ABSTRACT

Machine learning is one field that is currently advancing at a breakneck pace. With the help of machine learning, we can be able to predict the future to a certain level, but sometimes that prediction may be useful or not. In our project, we try to increase the probability of success by considering various factors that may be related or not be. Our project scope is housing price prediction using the linear regression algorithm with high accuracy. We try to achieve better results than before by using preprocessed data. After achieving the desired result, we decide to examine the data that is already available on the internet. To decrease the difficulty, we are using statistical analysis in our prediction algorithm, so we clearly see the difference between the results.

Keywords: Machine Learning, Linear Regression, Data Set, RF Algorithm, House Cost.

I. INTRODUCTION

Everyone in today's world aspires to possess their own home. However, the price of the residence fluctuates for a variety of reasons. Overcome the issue. The topic of our endeavor is housing price forecasting. Machine learning is a topic that is now expanding at a breakneck pace. We can foretell the future to some extent using machine learning, but the forecast may or may not be beneficial. We hope to increase the likelihood of success in our project by considering a variety of factors that may or may not be important. The purpose of our research is to apply the linear regression technique to predict housing prices with high accuracy. We intend to achieve better results than before by using preprocessed data. We begin investigating the data that is already available on the internet once we have achieved the desired result. It is the principle that underpins the step-by-step analysis approach. The first phase in this learning algorithm is to examine the customer's ideas about their house plans that are based on the same planning. We wish to examine the same plan using a learning algorithm that averages the data and applies specific conditions before creating and implementing a new plan for building a new house. The system extracts data using extractors and makes optimal use of machine learning algorithms, ensuring that the user is satisfied by providing correct output and preventing the house price from fluctuating. The random forest algorithm technique is used to obtain our desired result.

A Review on House Price Prediction using Machine Learning by Random Forest Algorithm:

This report includes: This regression study's data collection should be extensive enough to cover more variables and observations. Using a variety of observations and variables will allow you to meet all the requirements while also simplifying the process. There were a lot of variables in the initial Excel file that described thousands of property sales. Because they are easily understood by all users, several "Layman" datasets were removed. Finally, a few important features that are directly relevant to the property for sale are considered. These variables were directly related to the number and quality of the property's attributes. The continuous variables are related to the various area dimensions of the property. The data collection includes measurements of average lot size and total home square footage.[1]

The following elements are mostly related to the quantity of commodities in the house .To predict the data (nominal and ordinal), we require many categorical variables. Categorical variables include the street (gravel) and the neighborhood. The two types of variables are nominal and ordinary variables. Outside or near the property are the nominal variables. Within the property are the ordinal variables.[1]

The PID and the neighborhood are two elements to consider. When used in conjunction with a map, the neighborhood variable models the effect of location.[1]

Over the course of the four-year period, the ownership of over 100 homes was transferred. The most recent property sales data has been used because it lends the information greater weight. Finally, the multiple and non-residential observations were removed. These are the basic facts that we believe are required for property price prediction.[1]

This study shows that machine learning and Artificial Intelligence can be solved different type of problems. One of simple application of ML is to estimate property prices. Before generating a prediction, we need historical and current data to forecast future value. An open poll and the internet provided us with a data set. Prediction entails a number of phases and processes. After obtaining the data, the first step is to remove duplicates and unwanted information. By doing so, we will be able to attain the desired outcome. The next step is to correctly fix and arrange the data. As a result, we will be allowed to proceed with the process. They employed the hybrid regression technique to predict in this research. Finally, offer statistical data for viewing purposes only, and compare the result to the previous result to arrive at a mean error number. Predictions are submitted and evaluated.[2]

This study demonstrates how the housing price prediction fluctuates depending on a variety of characteristics such as schools, colleges, and kindergartens, among others. This research clearly shows that there is a shift in the price of houses that are closely associated to kinder garden schools as a result of the investigation. Some Research demonstrates that, from both a theoretical and practical standpoint, it is possible to divide house price prediction into two categories: with Kinder-garden and without Kinder-garden.[3]

Generally, children aged 4 to 5 attend kinder garden, so transportation costs are cheap. However, as time passes, pollution and other factors have an impact on their health. As a result of this type of problem, many parents prefer kinder garden schools that are close to their job or home. This saves parents a lot of time and work, which is one of the reasons for "home price adjustments near the kindergarten school." The Norway mentioned in this research had high fertility rates and female labor force involvement, resulting in a large need for child care. 4 This need has been met by Norwegian legislation since 2009, which grants all children aged 1 to 5 an individual statutory right to a place.[3]

The best result of the House Price Prediction Machine Learning was obtained by this article. They use D. D. Cock as their base article, which means their results are considerably more useful for monitoring the data set and assisting us in analyzing and comparing the results.[4]

The Hedonic regression approach is used in this paper. The nuclear family is commonly reduced these days for a variety of reasons such as population, economy, and so on. This results in a tiny family of four or five members. The reduction of large families will result in the relocation of small families to diverse locations.[5]

Their most basic requirement is a place to live. The cost of a single family residence in Berlin might be quite considerable. As a result, the paper's author decided to investigate the online prediction of a single family dwelling in Berlin using machine learning and the Hedonic Regression technique.[5]

The basic data set comes from Berlin's Surveyor Commission for Real Estate and is based on its Automated Transaction Price Data Base "Automatisierte Kaufpreis sammlung", AKS. The AKS contains information on single-family dwelling transactions in Berlin. Each observation has over 60 characteristics, including lot size, floor space, house age, location, availability, and several qualitative factors indicating unique conditions of the property, neighborhood, and transaction.[5]

They employ an online system to continuously update details based on many criteria, updating data and projecting housing prices.[5]

This paper carries records about cellular software that could be subject to housing charges in the UK. Regression approaches come in a variety of shapes and sizes and were investigated and examined in order to choose a prediction method. Because of their workable and stochastic study and version selection technique, GP was chosen for prediction. We use the dataset's geographical shape to interrupt calculations into smaller, unbiased neighboring models in order to regulate the large dataset of previous asset transactions in the UK. Overall projections are acquired through merging forecasts from nearby models. We can delegate computationally intensive tasks while maintaining mindfulness. Educating the model and submitting housing projections Cost Predictions.[6]

The research's scope is to see how house characteristics have an impact on home prices in five different countries. This study analyzes data from sold houses posted on Zillow, Trulia, and Redfin, three famous real estate websites, to predict house prices using Linear Regression, Random Forest (RF), and Support Vector Regression (SVR). The anticipated scores and ratios of overvalued and undervalued dwellings are compared to Zillow's price estimates for scores and ratios. In terms of price prediction, the data shows that SVR outperforms the Zillow baseline. In three additional counties, RF produces prediction scores that are equal to or identical to the baseline. According to this article, the four most important criteria in a housing price projection across counties are assessment, similar properties, sold price, and listed price.[7]

This document provides information about India's housing market. It is only second to the agriculture industry in terms of job creation. One of the most important aspects of real estate is housing. Pune is rapidly establishing itself as one of India's major metropolises, with numerous famous educational institutions and IT parks. This makes it an excellent spot to invest in real estate. The lack of consistency in property pricing makes it difficult for a buyer to choose their dream home. Both the buyer and the seller's interests must be met in order for the price to not be overestimated or underestimated. This property price prediction algorithm assists buyers and sellers, as well as real estate agents, in making more educated decisions. To do this, various features from the feature set are chosen as input, and various algorithms, such as Random Forest and Decision Tree, are used.[8]

This paper offers information on utilizing several machine learning techniques to forecast the deal price of houses. Real Estate Property is not only a man's essential requirement, but it also signifies his wealth and prestige today. Real estate investment appears to be profitable in general since property values do not depreciate rapidly. Housing costs are determined by a number of factors, including the size of the property, its location, the materials used in its construction, the age of the building, the number of bedrooms and garages, and so on. In this paper, ML algorithms are used to build a prediction model for dwellings. To build a predictive model in this case, ML allows logistic regression & support vector regression, as well as the Lasso Regression methodology and Decision Tree, are used.[9]

The primary focus of this article is the real estate market. It is an exceptional amidst cost-conscious and is constantly changing. It is foremost important domains in which machine learning techniques can be used to improve and accurately predict value. The goal of this article is to forecast the market value of a property. This method, which is geographically based criteria, aids in determine a beginning cost of estate. Anticipated costs can be forecasted by looking at previous market examples and assessments, as well as anticipated developments. The purpose of this research is to estimate house values in Mumbai using decision tree regression.[10]

This report offers information on the forecasting of individual houses that were sold. In this study, the author employs a MR technique to estimate the cost of houses in India. The price of a home is determined by a variety of factors, including the quantity of bathrooms, rooms, basements, and parking spaces. The author categorizes the houses as Colonial, Contemporary & Tudor. In our prediction model, each of these three categories has a different house price. The author took a random sample of all property values sold in Indiana in 2014. This paper has also taken a reference from a similar paper in which the variables are classified into two types: continuous independent variables and indicator independent variables. The continuous independent variable focuses on variables such as the number of bedrooms, kitchens, bathrooms, and so on. Constrains are consider the important part for cost prediction Finally, the objective of the project is to use LR to accurately realize the cost of real estate housing. [11]

Bengaluru, the capital of Karnataka, is one of India's tourist hotspots. Many people are now beginning to invest in real estate. As a result, housing prices in major cities such as Bengaluru, Chennai, Mumbai, Kolkata, and Delhi are rapidly rising. This project helps the land buyers and seller to predict the best land price and helps to reduce the broker cost. So that both the buyer and seller gets mutual benefit. The house/land price depends on the where it is located and also the facilities near it like schools, colleges, parks, hospitals etc. The author uses LR algorithm to predict the house price. The main reason behind using linear regression algorithm is it predicts the output very accurately, and it is one of the most reputed algorithms in ML. This project also develops a user-friendly user interface for users to use when modeling according to their needs. The author used data from previous existing data in Bengaluru over the last few years. The datasets were trained and processed in our

custom-building an ML model, and the model's output is precise. As a result, the LR model is used to forecast housing prices. [12]

The author of this paper used a dataset containing 21,613 different house sales that occurred in the previous five years in the United States. In this case, the author employs a variety of ML algorithms such as Lasso Recursive Feature Elimination (RFE), Ridge, and others, and compares the results to the results of the author's SV Regression. These results were compared, and in the United States, the most precise algorithm was chosen for cost prediction. This project discovered that SV regression produces accurate results. However, the drawback of using SV regression is that there are numerous factors that affect the house cost, such as the quantity of bedrooms, bathrooms, kitchens, and so on. Thus, using SV Regression to predict housing prices outperformed other machine learning algorithms. [13]

This paper contains the information about the various ML algorithms and to find the best algorithm which predicts the accurate results from the various data which we collected for the past few years. This paper helps the user to find the best existing algorithm for predicting the house cost from the raw data. The algorithm used in this project are Random forest regression, decision tree, Ridge, Lasso and Linear regression. The usage of house cost prediction model in Malaysia is comparatively low when compared to other countries. Since it is a developed country the house cost in Malaysia is very high and people need to give much money to buy house. But using the machine learning model we can get the accurate price of the house and it can be useful for both buyers and the sellers for the best price and their price for the broker will reduced. Thus the model developed mainly focus on two things namely 1.accuracy of the result 2.average of the errors occurred during the processing of the data.[14]

The author uses the Support vector regressor, a machine learning method, to estimate house prices in this research. The author uses statistical analysis to try to improve the model. The author processes data in a model that we constructed using Dean De Cock's Iowa house price dataset in this work. The author discovers a trade-off between model complexity and performance in this section. They came up with a supervised machine learning model for predicting home prices as a consequence. Statistical approaches such as data cleansing, feature engineering, normalization, and standardization were employed to prepare data for the model. The two most difficult difficulties in machine learning are overfitting and underfitting. The author uses the stratified k-CV approach to reduce over-fitting.[15]

The author proposed in that paper is Predicting House Prices in the metro city like Chennai, Bengaluru because they have the construction work more when compare to author area, so they can choose that place in that they're using the Regression Techniques. House Price prediction is depending on some key feature such as area, structure of house, location, current raw material price. The paper is branched into five following such as location of the area because each area has different value of the price, analysis the all the related data such as past construction history and before regression model is built, analysis the data based upon some condition and concludes with the future scope of the proposed work, lists the applicability of the model.[16]

The author indicate some following condition such as Data Collection, Data Preprocessing, Data Analysis, Application of Algorithms, Evaluating the Module in that first is data collection means collecting the all the information related to construction house such as raw material, plan for construction, structure of the house, how to build it how many rooms will build it for the house. Second is we want to allocate the all the data for the protection planning in correct manner. And third is data analysis it is filtered the data for the plan. Which unwanted data are removed and modified the data in correct form the plan and fifth is application of algorithm is what method is used to pretext the house price. So we choose the random forest algorithm for the project and final one is evaluation in that process we find the output for the plan and executed.[17]

The author narrates in that paper is pretesting the house price using random forest algorithm it is one of the best algorithm for this project it is widely used in classification and regression problem it can build the many decision tree and take the majority points and average the case and finally execute the result.in that algorithm we collect all the data of the construction work, and we also take the past five history about the raw material price, land price, location and analysis it and filter the data.in the decision tree is created nodes and branches. The random forest starts with a root node, while the internal nodes correspond to an input attribute. The nodes that do not have children are called leaves, where each leaf performs the prediction of the output variable.in

this paper shows a difference between the regression process and artificial neural network when predicting house prices in some areas. The results were showing the public data due to it being rich with features and having strong correlation, whether the others giving the worst outcome when the same process done in the construction work.[18]

They employ the regression process in this way. Preprocessing data refers to gathering additional information about our plan, while data analysis is the act of filtering the data for the plan. The data is updated in the correct form by calculating the values using PSO and getting the best value, then calculating the mean value, and finally getting the prediction. [19]

The first step is data collection, which entails gathering all relevant information about house construction, such as raw materials, construction plans, house structure, how to build it, and how many rooms it will have. The second goal is to properly distribute all of the data for protection planning. The third step is data analysis, which involves filtering data for the plan, wherein unnecessary data is deleted and the data is corrected according to the plan. The fifth step is to apply an algorithm to determine which strategy should be employed to protect the house price. It has a certain modulus that is used to predict the price. [20]

This study demonstrates that housing price prediction is not a real estate. As a result, we can use the random forest machine learning technique. The goal of this article is to forecast a property price that is lower than the current market price. First, we'd want to analyze the land property price utilizing regional variety, and we'd like to gather information about market prices to compare them. As a result, we can use the random forest algorithm, which is based on a number of decision conditions. Customers will be able to put assets to death without having to go to the market price. The random forest yields 93 percent accuracy, according to the findings of this investigation. [21]

In this paper, the linear regression technique is used to predict the house price. Many factors are considered when predicting house prices, such as nearby infrastructure and facilities such as a college, shop, market, hospital, transportation, and so on. These are the things that are absolutely necessary in order to live. Which is the most desired consideration when purchasing a home? Few people want to live in a remote area with nothing around them. In this paper, they satisfy the needs of the customers by correlating house values with those of their clients, forecasting house values based on the territory, and recommending manufacturer value expectations for the new developments anticipated by the customer. [22]

Predicting the price of a house in a city like Chennai or Bangalore is dependent on the module of the house and structure, as well as the current price of raw materials. Based on the structure modules, we can divide them into six modules. We can use the random forest algorithm, which is based on many decision conditions. Finally, the price outcome is considered the final result and is compared to the current market price. It analyzes all related data, such as past construction history, before building a regression model. It analyzes the data based on some conditions and concludes with the future scope of the proposed work, calculating the values by using PSO and getting the best value, and calculating the mean value and getting the best value.[23]

House prices climb year after year, necessitating the creation of a method to guess future values of property. The RF Algorithm is unique in that it can handle data sets with both continuous and categorical variables. A developer can use house price prediction to determine the selling price of a home, and a consumer can use it to determine the optimum time to buy a home. The price of a house is influenced by three factors: characteristics, concept, and location. The scope of the project is to predict property values based on a set of circumstances. Determining house costs is an important model for making decisions. It also decreases the transaction's risk. Lasso regression is employed as a model because of its convenient and stochastic methods for model selection.[24]

In today's world, everyone has a fantasy about their home. However, house prices fluctuate for a variety of reasons. Our project, House Price Prediction, aims to solve this issue. We use ML and RF techniques to create a step-by-step procedure for data analysis. The first step in this algorithm is to analyze the raw material, the location of the area, the environment of that place, and the raw material price, and we want to analyze it for up to five years. We also want to analyze all the data that is related to that building's construction work. The participants in the process are unaware of the many analytical methodologies that can be used to estimate the property price based on factors such as location, environment, and other amenities. As a result, this study will

employ both traditional and advanced ML methodologies to investigate the differences between a variety of advanced models in order to investigate the various influences of features on prediction methods.[25]

The House Price Index (HPI) is a widely used tool for predicting housing prices. This is one of the methods for determining the value of a home anywhere in the area. The house cost is strongly related to many factors, such as location, area, and population, and assuming the house price cost requires information other than the HPI, This paper will also be related to some features in a general way. In many countries, including the United States, the United Kingdom, and Germany, the HPI is used to track changes in residential housing prices. The RF technique is used with ML. It is the concept that underpins the step-by-step analysis procedure. The first step in this algorithm is to analyze the raw material, the location of the area, the environment of that location, and the raw material price. We intend to study it for up to five years. We want to examine all the data pertaining to the building's construction work. The users who participate in the technique are unaware of the various analytical techniques available to guess the property price based on some features such as surroundings, environment, and other amenities, etc.[26]

This paper employs machine learning methods to collect data on the sales prices of various residences and land. The cost of a house is determined by a number of criteria, including when it was built, how it was built, the materials used in construction, the size of the property, the number of rooms on the property, and so on. algorithms like SVM, Lasso regression, and supply-side regression techniques were used to build the model.

The major goal of this work is to develop a user-friendly model for predicting real estate prices. As a result, both real estate investors and land buyers benefit from employing this concept. The user received the house price prediction in the form of a csv file comprising information about the house's sales price. According to the author, employing a larger dataset will ensure that your forecast is as precise as feasible.[27]

The author of this report claims that people have begun to invest in land in recent years. As a result, the cost of land and property began to skyrocket. On the other hand, people or investors who invest in land were unaware of the many methods for projecting property prices. To accurately anticipate the house price, numerous approaches and statistical techniques were used. The paper's major goal is to show investors the different factors that influence home prices, such as the size of the property, the environment in which it is located, and so on. Also, the numerous methods for predicting the price for users. The housing industry, according to the author, supports a variety of economic growth options for the country. The majority of the houses were brought by real estate agents, and customers bought the houses/land through them, although this resulted in a price hike for the intermediary. As a result of this concept, the user can acquire land directly from the sellers. Thus, the house price is projected using multiple machine learning techniques.[28]

The author attempts to compute the home price in Catonsville, Maryland in this study. ML methods such as linear, ridge, and Lasso regression are utilized to estimate the home price. The author conducted a case study and discovered that Maryland had 11,000 property sales records. The price of a house is determined by a number of factors, including the age of the house, the neighborhood in which it is located, the size of the house, the number of rooms in the house, the street on which it is located, and the condition of the house, which includes maintenance and other work to keep the house safe, among others. House buying is a difficult undertaking because the buyer will need the assistance of a real estate agent to complete all of the paperwork, and the fee for his services will be substantial. To avoid this hassle, the buyer can buy the house directly from the seller, lowering the amount of money spent on a real estate agent. However, the paperwork becomes more difficult. By using this model, the buyer can obtain an exact housing price for the house he is looking for. Because the population and home prices in Catonsville have lately surged, the author created an ML model to determine the exact housing price. Both the algorithms, Ridge and Lasso, are used to avoid the problem of overfitting, which has been caused by various linear regression models.[29]

In today's world, everyone has a fantasy about their home. However, the value of a home fluctuates for a variety of reasons. Overcome this issue. Our project is house price prediction. We use the random forest algorithm for machine learning. It is the idea of creating a step-by-step analysis approach. The first phase of this algorithm is to look at the raw material, the location of the region, the environment of that location, and the raw material pricing for up to five years, as well as find all data relevant to the construction activity of that building. The goal of this study is to forecast house prices based on a set of conditions. Using a number of parameters to anticipate

the price of a desired property, determining housing prices is an important model for customer decision-making. The modulus can display the expected house price in the next few years, month by month, in which some months it will rise by a certain amount to build the house and, conversely, other months it will fall, based on factors such as raw material prices, financial problems, climate, and so on.[30]

II. CONCLUSION

In our project, we decided to predict the house cost based on the data set we received. To improve the quality of the prediction, we assumed a large number of constraints would be used. At the end of the project, we will be able to predict the cost with greater accuracy than a real estate expert. As a result, this project will assist us in working with both the real estate agent and the client on the same project. For comparison, we will redo the overall analysis as well as the expert analysis. We achieve better results with the assistance of comparison. It will also be possible to include all types of fields.

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