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Automated Property Valuation Using Machine Learning

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ABSTRACT: Property valuation gives contribution mainly to market economic activities, while it has been continuously questioned on its low lucidity, incorrectness and ineffectiveness. With Big Data applications in real estate domain growing fast, computer-automated valuation systems such as AI-enhanced automated valuation models (AVMs) have the potential to address these issues. While anexcess of research has focused on improving predictive performance of AVMs, little effort has been made on information requirements for valuation models. In this project we developed a Decision tree algorithm based model to calculate cost of the property depending upon the property attributes. Along with the property valuation we proposed city and area wise property searching system.

KEYWORDS: Artificial intelligence, Machine Learning, AVM, Decision Trees, Property Valuation.

I. INTRODUCTION

In recent years, machine learning (ML) techniques have been used for examine the housing markets of more and more cities around the world. The field of ML is loyal to the building and testing of supervised, unsupervised and semi-supervised learning algorithms that automatically recognize patterns in the ever-increasing quantity of available data.
In general, real estate may have the valuation of land may be require to furnish. A calculable measure of the profit is carried out by many different Players in the trade center, for example, land agents, Appraisers, assessors, mortarboard lenders, brokers, Developers, gurus Also reserve managers, lenders, etc. Business worth will be evaluated through that order. From claiming valuation systems Also methods that reflect those nature Of property and the condition under which those provided for. The property might well on the way exchange in open market under many conditions and situation, people are the unknown amount the current situations and they start losing their money, the change in prices of properties would affect both the common people and the government, to avoid certain situations there is a need of price prediction.

II. RELATED WORK

Trends in housing prices indicate the current economic situation and also are a concern to the buyers and sellers. There are many factors that have an impact on house prices, such as the number of bedrooms and bathrooms. House price depends upon its location as well. A house with great accessibility to highways, schools, malls, employment opportunities, would have a greater price as compared to a house with no such accessibility. Predicting house prices manually is a difficult task and generally not very accurate, hence there are many systems developed for house price prediction. Sifei Lu, Zengxiang Li, Zheng Qin, Xulei Yang, Rick SiowMong Goh [1] had proposed an advanced house prediction system using linear regression. This system's aim was to make a model that can give us a good house price prediction based on other variables. They used the Linear Regression for Ames dataset and hence it gave good accuracy. The house price prediction project had two modules namely, Admin and the User. Admin can add location and view the location. Admin had the authority to add density on the basis of per unit area. Users can view the location and see the predicted housing price for that particular location.

This paper [1] proposed on Hybrid Regression technique for housing Prices Prediction focused on the use of creative feature engineering to find the optimal features and their correlation with Sales Prices. Feature engineering enhanced

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the data normality and linearity of data. Their system showed that working on the Ames Housing dataset was appropriate and showed that the use of Hybrid algorithms (65% Lasso and 35% Gradient Boost) provided results in predicting the house prices rather than using one from lasso, ridge or gradient boost.

The paper proposed by Ayush Varma Abhijit Sharma Sagar Doshi Rohini Nair[2] suggested that the use of neural networks along with linear and boosted algorithms upgraded prediction accuracy. The dataset used here contained various vital parameters. The dataset was cleaned up. Three algorithms were used namely Linear Regression, Forest Regression and Boosted Regression. The dataset was tested on all three and the results of all the above algorithms were fed as an input to the neural network. Neural networks were used mainly to compare all the predictions and display the most accurate result. A neural network along with Boosted Regression was used to increase the accuracy of the result.

The paper proposed by Adyan Nur Alfiyatin, Hilman Taufiq, Ruth EmaFebrita, Wayan Firdaus Mahmudy[3] shows the prediction model is based on regression analysis and particle swarm optimization(PSO). Hedonic pricing is carried out using regression techniques to predict the NJOP price(Dependent Variable) in the city of Malang, based on factors such as land area, NJOP land price, NJOP building price. PSO is a
stochastic optimization technique used for the selection of affect variables. The results obtained show a minimum prediction error RMSE of 14.186. This paper[4] surveyed to predict a continuous target value, using algorithms Logistic Regression, Support Vector Machine, Lasso Regression Technique, Decision Tree are used to build a predictive model. They have used a step-by-step approach from Data Collection, Data Processing, Data Analysis, to Evaluating Models. Then the predicted output is stored in a CSV file. It was found that the Decision Tree had the best accuracy of 84% approx., they tried to implement the problem of Regression using the Classification Algorithm which was successful. They had used predefined open-source Kaggle Dataset consisting of 80 parameters, from which 37 parameters were chosen which were affecting house prices.

III. PROPERTY VALUATION TECHNIQUES

1. Decision Trees

Decision trees are dynamic and popular tools for classification and prediction. Decision trees represent rules, which can be understood by humans and used in knowledge system such as database. A decision tree is a hierarchical model for supervised learning whereby the local region is identified in a sequence of recursive splits in a smaller number of steps. A decision tree is composed of internal decision nodes decision node and terminal leaves. Each decision node m implements a test function fm(x) with discrete outcomes labelling the branches. Given an input, at each node, a test is applied and one of the branches is taken depending on the outcome. This process starts at the root and is repeated recursively until a leaf node is hit, at which point the value written in the leaf constitutes the output. A decision tree is also a nonparametric model in the sense that we do not assume any parametric form for the class densities and the tree structure is not fixed a priori but the tree grows, branches and leaves are added, during learning depending on the complexity of the problem inherent in the data. Decision tree is a classifier in the form of a tree structure which consists of:

- Decision node: specifies a test on a single attribute.
- Leaf node: indicates the value of the target attribute.
- Edge: split of one attribute
- Path: a disjunction of test to make the final decision

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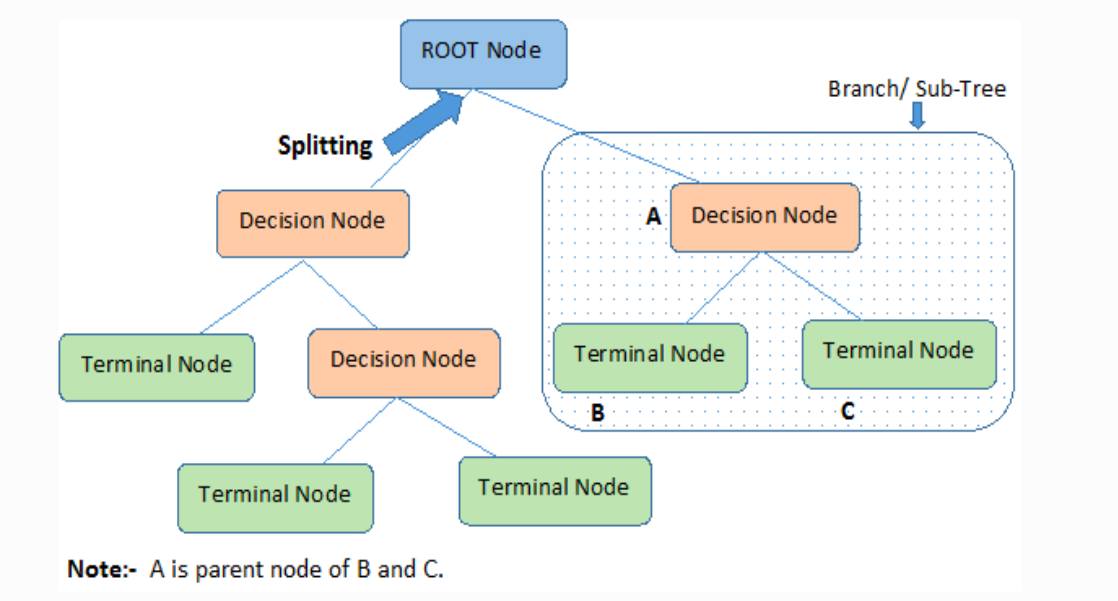

Fig: Decision Tree

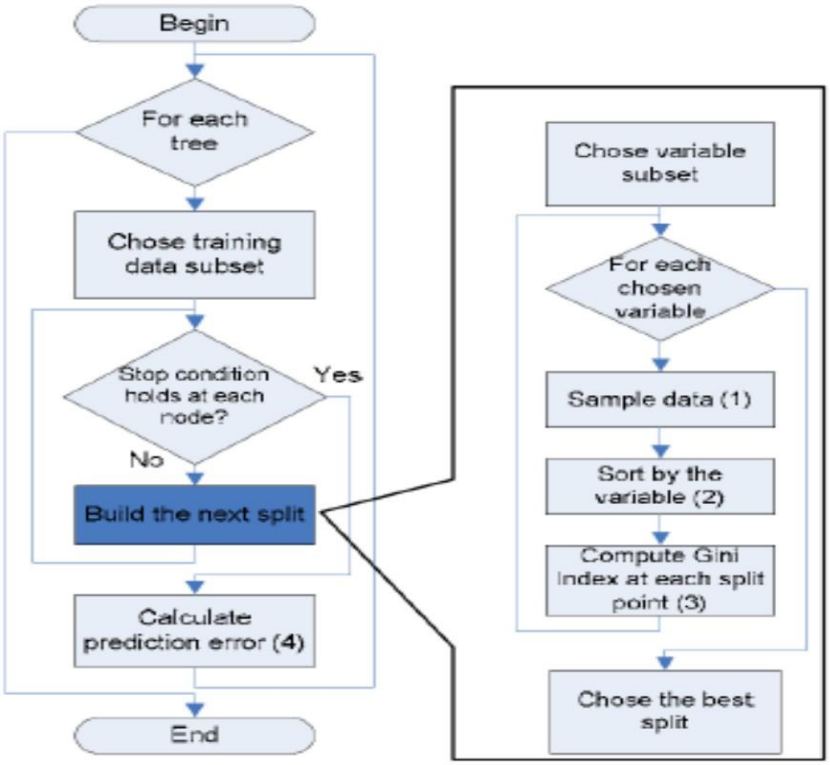

Fig: Diagrammatic representation of Decision Tree

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2. System Architecture-Working

Working of the project includes three important modules:

1. **Admin:** The admin will login the server using its login details. Then he will Register property attributes on the python application server. Along with this he will create dataset of the attributes like property age, property's condition, distance from the main road, schools, colleges near properties etc. And will upload this on the python application server. Admin can also able to see the sellers and buyers and the property details.

2. **Seller:** The seller will login using its login details and will register the property with required attribute values on the application server along with this he will calculate the cost of the property using the decision tree algorithm of the machine learning. Decision tree will classify the attributes and will calculate the cost of the registered property. Seller will also add all the property details and property photos.

3. **Buyer:** buyer will login to the server using its login details the he will search the required property according to the area and city, then after finding the desired property match he will look for the property and seller details which will be shown on the server itself. The buyer will get all the property details along with the ai generated property cost. Buyer can also able to see property photos and can contact the seller if he wants to buy any property.

All these operations by the modules will be performed on the python application server**.**

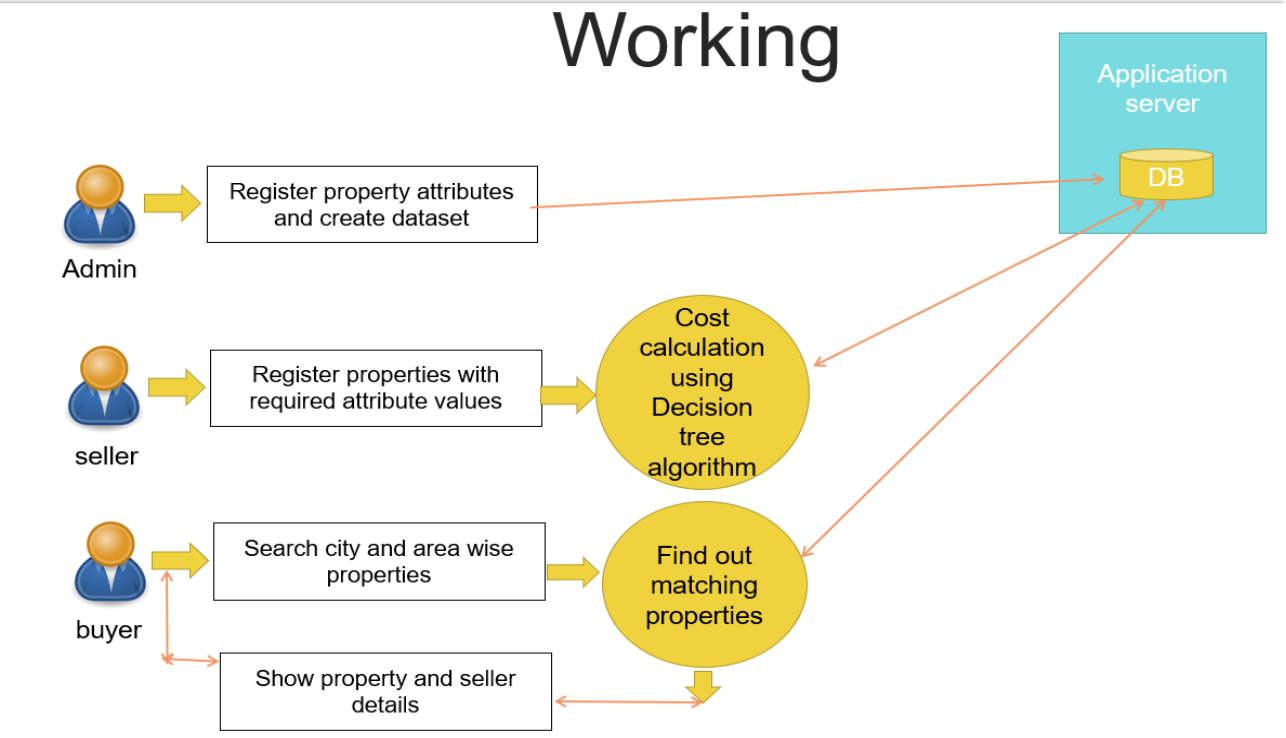

Fig: Working Flow of Application

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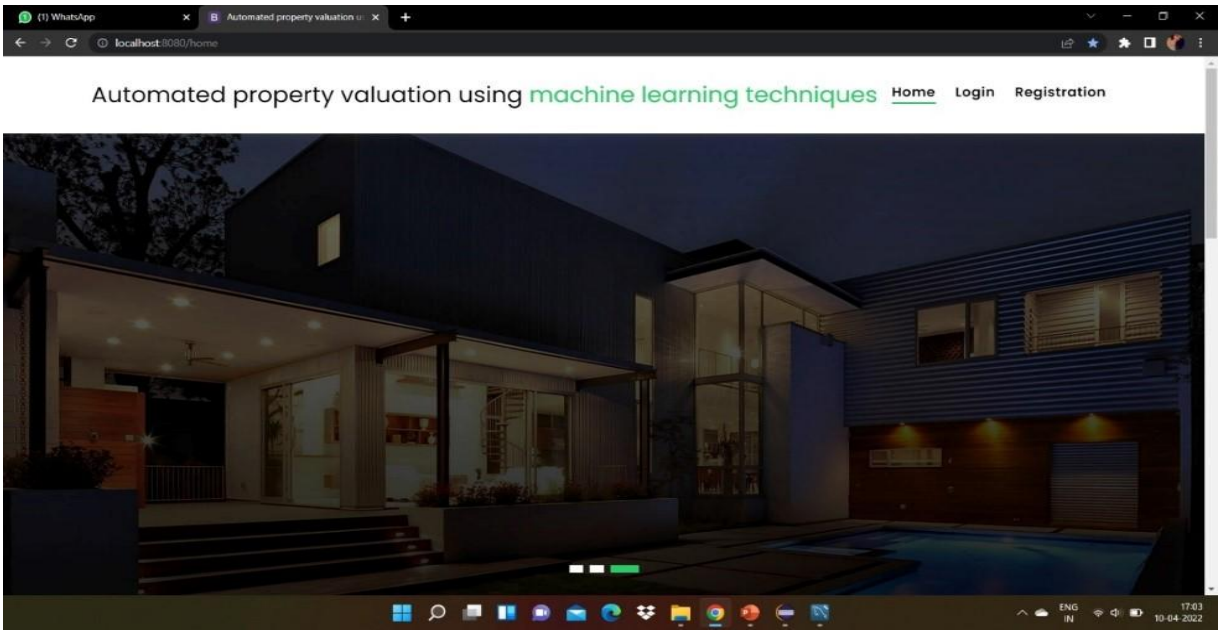
IV. RESULTS

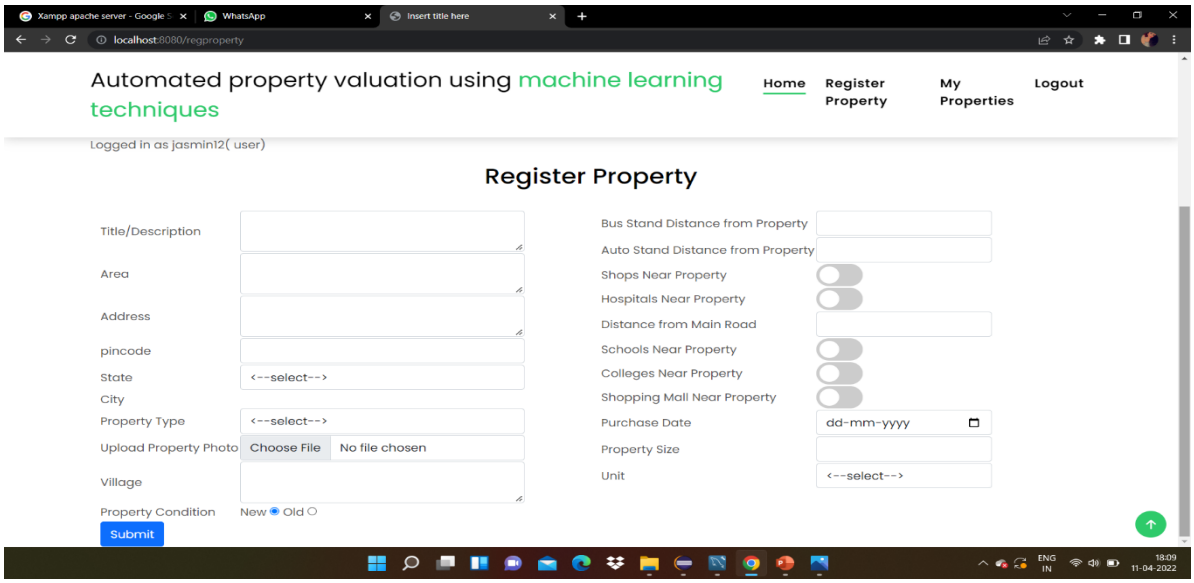
The accuracy of Decision Tree Model is 98%.

Here are some screenshots of our application:

1. Home Page:



2. Property Registration Page:



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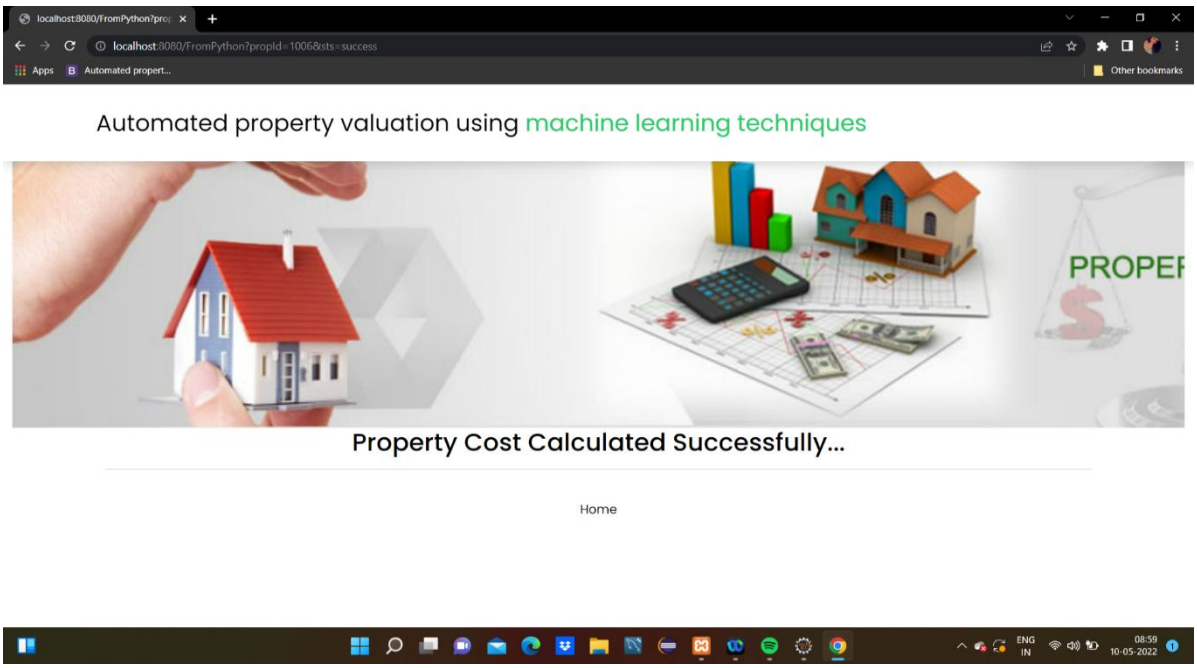
3. Cost Calculated Successfully



V. CONCLUSION

Although the development of artificial intelligence through the application of Machine Learning is applicable in different industries, there are hopes to minimize the error and biases of property valuation by appraisers. The academicians have discussed and compared the performance of the many machine learning algorithms to identify the most suitable algorithms for property valuation. Recent studies have specified Decision Tree as a machine learning algorithm that performs noticeably well.

Machine learning models learns your property valuer could also tell you ways in which you could add value to your existing property. A tax depreciation schedule from a valuer can also help you minimize your tax burden. From a buyer's perspective, valuations help them understand the risk profile of a said property.

Two aspects of the model which were the subject of concern during its development were its computational complexity and degree of interpretability. To achieve our goal of making the AVM valuable in real-life applications, we opted to design a model with substantial computational complexity. At the same time, we have shown that one could significantly decrease this complexity, at the price of a lower model precision. We have also addressed how available tools have been designed to increase the degree of interpretability of the ensemble learning methods, and believe that they are sufficient for the main applications of an AVM.

Using this proposed model, we want people to buy real estate at their rightful prices and want to ensure that they don't get tricked by sketchy agents who just are after their money.

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