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Real Estate Master

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***Abstract*: We have built a real estate portal that allows users to post property for sale as well as search sort property and contact its owner. It also consists of an innovative feature that allows users to post reviews and give feedback of the dealing process. A user may post bad reviews about another user he has dealt with if any payment issues are encountered during the deal. Users may look for property as per Type of house, No. of bedrooms, bathrooms as well as other amenities like lift, furnished, semi-furnished etc. The system sorts property and displays results list as desired by user. Users may also post a property for sale along with desired price, location and contact details. New users can register with permission of admin.**

We have applied an innovative feature of future price prediction of the properties using Machine Learning. The website learns about the previous price patterns from the dataset and then predicts the price of the properties according to the time of year.

***Keywords*: Real Estate Information, Property Listings, Real Estate Website, Future Price Prediction, Property Search.**

1. Introduction

Real estate is one of the major businesses of the world at present. It is also one of the fastest growing markets in the current scenario and it has the ability to shape our future. Thus, it is obvious that we get to see a great number of innovations in this field and hence, its popularity is steadily rising in the developer market. Nowadays, more number of developers are striving to work on this field and do something new in order to grasp the opportunity. Real estate websites and apps are becoming a norm and we no longer hear of offices where real estate agents deal with clients on a daily basis and clients have to wait for days, even months to get things done. These websites and apps really have revolutionized the real estate market and have streamlined it.

Real estate apps are rarer because not every client has a smartphone (although that would very soon change in the near future). Also, real estate apps are harder to make and to update and not many developers are willing to risk their jobs in order to work on something that is so unpredictable. Android OS is also very volatile and the developers who dare to develop a real estate app have to continually provide updates for the ever changing android environment. This leads to developers preferring developing websites over apps. This is the reason why we see lesser number of apps than websites in the current scenario.

Real estate websites are an altogether different story. Unlike apps, they do not require a smartphone for their operation but rather a computer. Even though everyone does not have access to a computer, they can easily access one at a net café anytime they want at a cheap price. Also, developing websites requires the knowledge of HTML, CSS, Javascript, jquery, php, etc. which means only the best can develop a proper website. Also, theses languages aren't hard to learn and it can be quite a bit fun to program a website. All these above factors mean websites are much more preferred in the real estate market compared to apps. Hence, it is not a wonder that there are so many websites operating in the real estate market and the best ones of them are quite successful as they face nearly zero competition. For example: MagicBricks, 99Acres, etc. These websites have seized the opportunity and have built something that the clients have loved so far and hence, they have been to withstand the threats of the ever changing real estate market just because they were able to adapt to the changes. Hence, the ability to adapt is one of the recurring factors that we get to notice in the existing real estate websites as well as apps.

In our project, we have tried to do something similar by taking inspiration from the existing project. We have created a suitable UI for our website and we have tried to use machine learning to enhance the quality and credibility of our website.

2. Literature survey

Qualitative Study of E-Business Adoption in the Real Estate Sector in China, Yan Sun, Okwenna Ifeanyi.

The purpose of this qualitative study is to investigate e-business adoption into real estate agencies in China. This research focuses on the advantages and disadvantages of IT/IS (Information Technology/Information Systems) integration through face to face interviews with property agency managers in Suzhou. Particularly, it looks into the real estate sector in China today and provides implications to improve service quality and stay competitive within local real estate agencies in Suzhou, China. The objective of this study is to show that e-business if properly deployed can improve the service quality and increase general performance of real estate agencies in China; also, to propose a few implications to bring to light the problems faced by real estate agents currently in China today.

The appropriation of e-business in numerous industries has

been seen to improve efficiency and productivity. However,"The benefits that the Internet is expected to deliver won't be realized unless an organization adjusts its hierarchical structure and methods to meet the radical better approaches for working this new technology makes possible".

Using machine learning algorithms for housing price prediction: The case of Fairfax County, Virginia housing data

The continuous rise in interest rates since 2005 has markedly slowed the housing market in the US Lehman Brothers Holdings, Inc., a US investment bank, was forced into bankruptcy on September 15, 2008 because of excessive borrowing of financial instruments that were devalued because of a serious reduction in housing prices. The insolvency of Lehman Brothers Holdings, Inc. and the sub-prime mortgage crisis intensified the slowdown of the actual economy and the decline of asset values. These depreciated the global real estate market and housing prices and sparked a global financial crisis.

Housing price indices can be important indicators for stakeholders in the real estate market including real estate agents, appraisers, assessors, mortgage lenders, brokers, property developers, investors and fund managers, and policy makers, as well as to actual and potential homeowners.

Moreover, the development of a housing price prediction model would greatly assist in the prediction of future housing prices and the establishment of real estate policies. This study uses machine learning algorithms as a research methodology to develop a housing price prediction model.

Machine learning has been used in disciplines such as business, computer engineering, industrial engineering, bioinformatics, medical, pharmaceuticals, physics, and statistics to gather knowledge and predict future events. With the recent growth in the real estate market, machine learning can play an important role to predict the price of a property. However, few researchers have

experimented on the selling price for real estate properties using machine learning algorithms. In the real estate market, real estate agents, buyers, and sellers are all important players.

Development of a pricing tool for the real estate agencies in Copenhagen.

This paper aims to conduct a real estate search in the city of Copenhagen, Denmark. The Danish developers have, in this research paper, tried to find the apartments that are over-priced inside the city. They have analysed the factors that influence the cost of real estate in Copenhagen and have used regression to predict future fluctuations in the price of real estate. They have successfully created a regression model that can predict over-priced apartments in the city and have thus made a valuable contribution to the real-estate market. To extract data, the developers have used web scraping. Web scraping involves downloading data from a server (in this case boliga.dk) and converting the data into a .csv file. This helps storing a large amount of data in the database of the model proposed here. The proposed model is highly successful with an accuracy of 79% and a working prototype has also been made out of this model.

Toward a user recommended orientation for real estate websites.

This paper aims to create a better web program for the real-estate market than the existing applications which, although effective, are a huge waste of time. The proposed model is a user-centric system which uses case based reasoning and ontological structure which improve management efficiency and recommendation accuracy. This model converts a real estate search engine into web-based real estate recommendation application. Map-based recommendation feature has also been included. The model supports a multi- variable search. Ontological structure helps in a better logical storage of data which leads to better performance of the application. The model proposed has been successful on a small scale but has not been implemented on a large scale. Nevertheless, the system, with a better database could be used in the mainstream market in the future.

The Residential Real-Estate Industry in India

The objective of this thesis is to examine the differences in residential property prices across different cities in India. Soaring prices have led to increasingly unaffordable property prices in large metropolitan cities. As a result, there has been academic discourse about the existence of a housing bubble in recent years. In the past, empirical research has focused on national level trends due to a lack of city-level data. I investigate the city-fixed effects on growth in house prices across fifteen different cities. Although different empirical models suggest different conclusions about these effects, point estimates suggest above-normal growth in house prices in Delhi for the period 2009-2013.

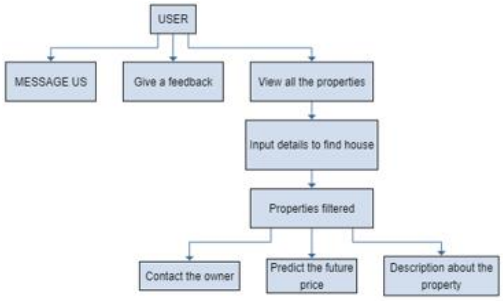

Fig. 1. System Architecture

3. Related works

House prices increase every year, so there is a need for a system to predict house prices in the future. House price prediction can help the developer determine the selling price of a house and can help the customer to arrange the right time to purchase a house. There are three factors that influence the price of a house which include physical conditions, concept and location. There are several approaches that can be used to determine the price of the house, one of them is the prediction analysis.

Prediction house prices are expected to help people who plan to buy a house so they can know the price range in the future,

then they can plan their finance well. In addition, house price predictions are also beneficial for property investors to know the trend of housing prices in a certain location.

The first approach is a quantitative prediction. A quantitative approach is an approach that utilizes time-series data. The time-series approach is to look for the relationship between current prices and prevailing prices. The second approach is to use linear regression based on hedonic pricing. Previous researches conducted by Gharehchopogh, et. al. using linear regression approach get 0,929 errors with the actual price. In linear regression, determining coefficients generally using the least square method, but it takes a long time to get the best formula.

There are several factors that affect house prices. The main three factors into three main groups, there are physical condition, concepts and location. Physical conditions are properties possessed by a house that can be observed by human senses, including the size of the house, number of bedrooms, the availability of the kitchen and garage of the house, while the concepts is an idea offered by developers who can attract potential buyers, for example, the concept of minimalistic home, healthy and green environment, and elite environment. Location is an important factor in shaping the price of a house. This is because the location determines the prevailing land prices. In addition, the location also determines the ease of access to public facilities, such as schools, campus, hospitals.

Hedonic pricing is a price prediction model based on the hedonic price theory, which assumes that the value of a property is the sum of all its attributes value. In the implementation, hedonic pricing can be implemented using regression model. Equation 1 will show the regression model in determining a price.

$$y = a.x_1 + b.x_2 + \cdots + n.x_i$$

Where y is the predicted price, and x are the attributes of a house. While a, b, ...n indicate the correlation coefficients of each variable in the determination of house prices.

4. Proposed Method

The prediction model used in this research is hedonic pricing, the suitable model using regression, with the standard formula. The dependent variable symbolized as Y is NJOP price and independent variables with symbol x1-x14consist of year, building area, land area, NJOP land price (IDR/m2), NJOP building price (IDR/m2), distance to center of the city, amount number of campuses, amount number of restaurants, amount number of health facilities, amount number of amusement parks, amount number of educational facilities, amount number of traditional markets, amount number of worship places, and easiness to public transportations.

$$NJOP = a.building\ area + b.land\ area + \cdots + n.public\ transportation$$

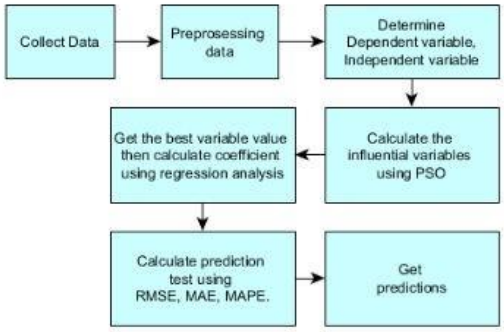

Fig. 2. Algorithm working

The proposed method is a modern real estate online portal where users interested for buying real estate properties can visit the website for choosing the properties according to their suitability.

A. *Property listings*

According to the location we have listed all the properties with all the descriptions such as no. of bedrooms, no of bathrooms, description, address, rating, parking and other facilities.

We take the whole dataset and implemented the same in our own dataset and we can change the same when required. (If the property gets sold then the data will get updated).

B. *Find a property*

There's a search bar where user can type in the following:

1. Type of property (Bungalow, Terraced House, Shop/Office, etc.)
2. No. of Bedrooms Required.
3. No. of Bathrooms Required. According to such details, the system will filter out data from the dataset of properties and will list out all the data that matches the user requirements.

C. *The feature that makes our research unique*

After filtering out the properties, we have a predict button in our website for every property.

The predict button would redirect you to a page where we will use Machine Learning-Multiple Linear Regression to predict the future prices of that property according to the previous prices. The user can see the best time to buy the property at the best deal available.

D. *Feedback and messaging*

User can give feedback on the website about the properties, dealings, issues on the website which would be sent to the admin. It would be posted to the message database.

There's a message tab where all the messages can be seen.

5. Results

A. *Home page*

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Fig. 3. Home page

User can find the properties by giving details according to his wantings in the "Find your house Tab"

B. Property listing

Fig. 4. Property Listings

All the properties are listed here with all the description.

C. Feedback form

Fig. 5. Feedback Form

D. Property search by input from users

Fig. 6. Property search using filters

It will show all the properties according to the user choice. When we press the predict button it will predict the price of the desired property over the course of future years.

```
train['diff_reg_comm'] = train['REG_FEE'] - train['COMMIS']
test['diff_reg_comm'] = test['REG_FEE'] - test['COMMIS']

def get_month(x):
    txt = str(x)
    y = txt.split('-')
    if len(y) != 3:
        return 'None'
    return int(y[1])

def get_year(x):
    txt = str(x)
    y = txt.split('-')
    if len(y) != 3:
        return 'None'
    return int(y[2])

train['MONTH'] = train['DATE_SALE'].map(lambda x: get_month(x))
train['YEAR'] = train['DATE_SALE'].map(lambda x: get_year(x))

test['MONTH'] = test['DATE_SALE'].map(lambda x: get_month(x))
test['YEAR'] = test['DATE_SALE'].map(lambda x: get_year(x))

train['DATE_SALE'] = pd.to_datetime(train['DATE_SALE'].astype(str), format='%d-%m-%Y')
train['DATE_BUILD'] = pd.to_datetime(train['DATE_BUILD'].astype(str), format='%d-%m-%Y')

test['DATE_SALE'] = pd.to_datetime(test['DATE_SALE'].astype(str), format='%d-%m-%Y')
test['DATE_BUILD'] = pd.to_datetime(test['DATE_BUILD'].astype(str), format='%d-%m-%Y')

train['HOUSE_LIFETIME'] = train['DATE_SALE'] .subtract( train['DATE_BUILD'])
test['HOUSE_LIFETIME'] = test['DATE_SALE'] .subtract( test['DATE_BUILD'])

train['HOUSE_LIFETIME'] = train['HOUSE_LIFETIME'] .divide( np.timedelta64(1, 'D'))
test['HOUSE_LIFETIME'] = test['HOUSE_LIFETIME'] .divide( np.timedelta64(1, 'D'))


feature_names = [x for x in train.columns if x not in
['PRT_ID','SALES_PRICE','DATE_SALE','DATE_BUILD']]
target = train['SALES_PRICE']

from sklearn.preprocessing import LabelEncoder

lb_make = LabelEncoder()
train['AREA'] = lb_make.fit_transform(train['AREA'])
test['AREA'] = lb_make.fit_transform(test['AREA'])

train['SALE_COND'] = lb_make.fit_transform(train['SALE_COND'])
test['SALE_COND'] = lb_make.fit_transform(test['SALE_COND'])

train['PARK_FACIL'] = lb_make.fit_transform(train['PARK_FACIL'])
test['PARK_FACIL'] = lb_make.fit_transform(test['PARK_FACIL'])

train['BUILDTYPE'] = lb_make.fit_transform(train['BUILDTYPE'])
test['BUILDTYPE'] = lb_make.fit_transform(test['BUILDTYPE'])
```

Fig. 7. The machine learning part

```
[5 rows x 26 columns]
6663     9449050
4582    14285850
2083    18282340
938     19300690
6933     4584250
7068    19798550
6712    13719580
1004    14017080
409      9792910
5878     5644750
Name: SALES_PRICE, dtype: int64
[ 7914946.630813   12525301.83666208 10771400.35838818 19954997.9064774
  5818919.75125703 15137258.39509089 13635897.98142937 12438383.87180312
 10598750.84710917  6483594.84148463]
Accuracy is: 81
aditya@Blaze:~/Desktop/iwp$
```

Fig. 8. The results of some properties

6. Conclusion and future enhancements

From the above results, we can conclude that our project was able to create a website which was able to carry out all possible requests of a prospective user and we also incorporated machine learning to predict what could be the future prices of a real estate property that a user might be interested in. The use of machine learning indicates that our website is ever-evolving and can the withstand the threat of change that the real estate market presents as we discussed in the Introduction section. Our website also has a huge dataset of Chennai's real estate properties and can therefore be used to buy/sell properties in Chennai. We have done everything that could be possibly done to make our website presentable and effective while preserving the uniqueness of our methodology at the same time. Hence, in our opinion, this website can be released and can be used in the mainstream market without any further changes.

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