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Real Estate Price Estimation Using Deep Neural Network

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Abstract

REAL estate appraisal, which is the price estimation process for real estate properties, for both buyers and sellers it is essential as the basis for compromise and deal. Customarily, the repeat sales model has been widely adopted to estimate real estate price. Though, it depends on the design and calculation of a complex economic related index, which is challenging to estimate accurately the estate's price. Nowadays, real estate brokers provide easy access to detailed online information on real estate properties to their clients. In a smart city, effective and accurate real estate assessments governed by a local government is crucial for determining the property taxes. Such assessments have never been trivial, and inappropriate assessments may result in disputes between property owners and the local government. Generally for price prediction Regression is used (Prediction of continuous valued-function). But here we are going to use Structured Deep Neural Network in order to improve efficiency and accuracy. We introduce a deep learning approach to smartly and effectively assessing real estate values. We propose a systematic method to derive a layered knowledge graph and design a structured Deep Neural Network (DNN) based on it. Neurons in a structured DNN are structurally connected, which makes the network time and space efficient; and thus, it requires fewer data points for training. The structured DNN model has been designed to learn from the most recently captured data points; therefore, it allows the model to adapt to the latest market trends.

Keywords: *Deep Neural Network (DNN), Structured Deep Neural Network, layered knowledge graph, structurally connected, deep learning approach.*

INTRODUCTION

Real estate appraisal, which is the price estimation process for real estate properties. A report published by EPRA (European Public Real Estate Association) real estate in all its forms accounts approximately 18-20 percent of its economic activity, therefore accurate prediction of real estate properties are crucial. For most of the working classes housing has been one of the largest expense, so to make right decision on the real estate investment is much crucial. As we seen the report published by EPRA and why investment in housing is important that's why accurate prediction of real estate properties are crucial.

Traditionally previous work for prediction of price is based on regression analysis and machine learning, but due to rapid development in Deep Neural Network field it is much beneficial to use DNN instead of Regression. Because of recently developed deep learning, computer becomes smart enough to interpret visual content in similar way that human can. People can able to estimate price more accurately in this system as compared to previous systems only because of DNN.

GOALS AND OBJECTIVES

- The Goal of this System is to predict the price of the real estate property more precisely.
- Prediction of prices of real estate property more accurately (Using DNN).
- Elimination of Role of Middle Person(Agent).
- Assessments are not only for urban areas but also for rural areas.

LITERATURE SURVEY

J. Frew and G. Jud, "Estimating the Value of Apartment Buildings," Journal of Real Estate Research

In this paper the technique used is Hedonic modeling techniques to estimate the price.

The advantage of this paper is we are able to estimate prices correctly in proportion of size and number of units.

R. E. Lowrance, "Predicting the Market Value of Single-Family Residential Real Estate," Technical Report

In this paper Local Linear model and Random Forest model are used.

We found lowest expected error on unseen data and model is tailored to zip codes using indicator variables.

In this paper we concluded that Random forest model may perform better than the local linear model.

X. Hu and M. Zhong, "Applied Research on Real Estate Price Prediction by the Neural Network,"

In this paper Back propagation neural networks and Elman neural network is used.

Thus, it has been found out that Elman neural network could forecast more accurate and constringe faster than other approaches.

N. Nguyen and A. Cripps, "Predicting Housing Value: A Comparison of Multiple Regression Analysis and Artificial Neural Networks," Journal of Real Estate Research

In this paper ANN and multiple regressions analysis is used.

Thus we found the advantage is that when enough data points were available for training, ANNs could perform better than multiple linear regressions

Y. E. Hamzaoui and J. A. H. Perez, "Application of Artificial Neural Networks to Predict the Selling Price in the Real Estate Valuation Process"

The techniques used are Feed-forward back propagation neural network with a single hidden layer

The main advantage is that reliable prediction of house selling prices.

PROPOSE SYSTEM

We have collected real estate data from website. The website conserves all recent and past house listings data including house features, market features, public records of houses, neighborhood features, etc. An entire number of 15 features are predefined and their associated values are collected. The predefined features include number of beds, number of baths, square footage, lot size, built year, yearly tax, similar houses average sold price, adjacent schools average ratings, fireplace, waterfront, the number of stories, heating, cooling, patio, and park.

A deep neural network is a type of neural network in which there exists a certain level of complexity. It is a neural network with more than two layers. The structured DNN is considered to match with the knowledge graph. We made experiments

on fully-connected DNNs with different numbers of hidden layers and different numbers of neurons in each hidden layer. The structured Deep Neural Network has four layers such as an input layer, two hidden layers, and an output layer. We set up suitable hyper-parameters for the structured DNN, and trained it using algorithm such as standard feed forward and back propagation algorithm with problem-specific real-time training and fitting techniques. Note that the first layer of the network contains 15 input neurons, which always produce outputs, as there are no biases are connected to the input layer neurons. Even though minor initialized weights create a neural network learn slowly, with sufficient offered data points, adjust a deep neural network with lesser weights which will help to get improved generalization, so to get good performance. ***(See Figure:-1)***

CONCLUSION AND FUTURE SCOPE

For prediction purpose we are going to use Deep Neural network instead of Regression analysis. Due to the large size of a deep learning architecture, deep learning typically requires a large amount of data to train the model, which makes the training process very time and space inefficient. In addition, a large deep architecture may also prone to have the over-fitting issue. Our experimental results given in research paper show that the proposed approach outperforms other conventional methods and leading real estate companies such as Zillow and Redfin , with significantly improved accuracy for house-price prediction.

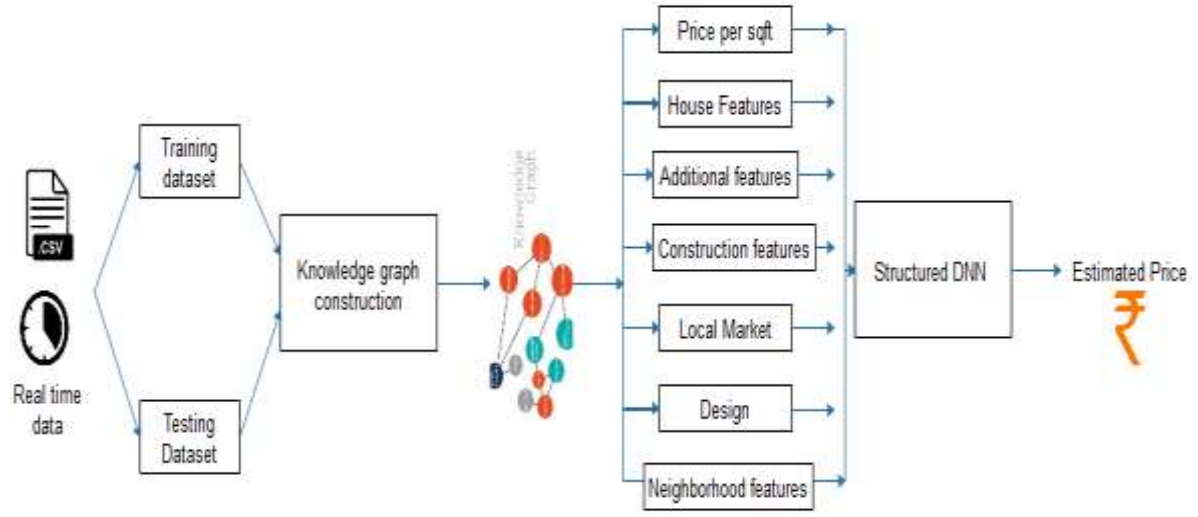

Figure: 1 System Architecture

For future research, we will study how to automate the process of extracting layered knowledge graphs from the real estate domain based on historical data, and design structured DNNs using the graphs. We will allow a DNN model to automatically change its network structure along the time, so it can be more scalable and better adapt to new market changes. Furthermore, we plan to implement our approach using mobile cloud computing. That supports assessments of real estate via mobile devices with computation functions deployed in the clouds.

Finally, we will try to apply our approach to predictive analytic problems from other domains such as stock market, health-care, transportation, marketing, e-commerce, security, business, and many more.

REFERENCES

1. Haiping Xu and Amol Gade, “Smart Real Estate Assessments using Structured Deep Neural Networks” IEEE 2017, pp.255-266.

2. Quanzeng You, Ran Pang, Liangliang Cao, and JieboLuo, Fellow, IEEE “Image Based Appraisal of Real Estate Properties” in CIKM, 2017, pp. 481–490.

3. N. Nguyen and A. Cripps Predicting Housing Value: "A Comparison of Multiple Regression Analysis and Artificial Neural Networks,” Journal of Real Estate Research, vol. 22, no. 3, pp. 313-336, 2016

4. Y. E. Hamzaoui and J. A. H. Perez, “Application of Artificial Neural Networks to Predict the Selling Price in the Real Estate Valuation Process” in MDM, vol. 2, 2015, pp. 31–36.

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