# Real Estate Properties Assessment using Deep Neural Network

A. Shinde[1], N. Dange[2], N. Patane[3], S. Gholap[4], V. Beera[5]

*1,2,3,4,5UG Student, Department of Computer Engineering, SVPM College of Engineering, Malegaon, India*

*Abstract*: **Real estate properties assessment is the price estimation process for real estate properties. Nowadays, real estate brokers provide easy access to detailed online information on real estate properties to their clients. Regularly, the repeat sales model has been widely adopted to estimate real estate price. Generally, for price prediction Regression is used i.e. prediction of continuous valued-function. But here we are going to use Deep Neural Network in order to improve productivity and accuracy. We introduce a deep learning approach to smartly and effectively evaluating 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 DNN model has been planned to learn from the most recently taken data points. We propose a systematic method to derive a layered knowledge graph and design a structured Deep Neural Network based on it. We introduce a deep learning approach to smartly and effectively assessing real estate values.**

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

## 1. Introduction

Real estate assessment, which is the price estimation process for real estate properties. 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 [2]. 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 [6].

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 [6]. Usually earlier work for prediction of price is based on regression analysis and machine learning, but due to quick growth in Deep Neural Network field it is much beneficial to use DNN instead of Regression [2]. People can able to estimate price more precisely in this system as compared to previous systems only because of DNN. Because of newly established deep learning, computer becomes smart enough to interpret visual content in similar way that human can.

### A. Motivation

As we seen the report published by EPRA and why

speculation in housing is important and that's why accurate prediction of real estate properties are vital [2]. 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 efficient to use DNN instead of Regression [4]. 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.

## 2. Literature survey

[1] R. E. Lowrance, "Predicting the Market Value of Single-Family Residential Real Estate," Technical Report We found lowest expected error on unseen data and model is tailored to zip codes using indicator variables. In this paper Local Linear model and Random Forest model are used. In this paper we concluded that Random forest model may perform better than the local linear model.

[2] 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 constrige faster than other approaches.

[3] 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.

[4] 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 regression analysis is used. Here thus we found the advantage is that when enough data points were available for training, ANNs could perform better than multiple linear regressions

[5] 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.

**International Journal of Research in Engineering, Science and Management**
**Volume-2, Issue-5, May-2019**
**www.ijresm.com | ISSN (Online): 2581-5792**

950

*A. Goals and objectives*

- Goal is to estimate prices of real estate property more accurately using DNN.
- The Goal of this System is to predict the price of the real estate property more precisely.
- There is no need of Middle Agent.
- Valuations are not only for urban areas but also for rural areas. This system is user friendly and precise.

### 3. Proposed system

In this system we have gathered all real estate data from website. The website keeps all recent and past house entries data with 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 [2]. 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 exist 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.
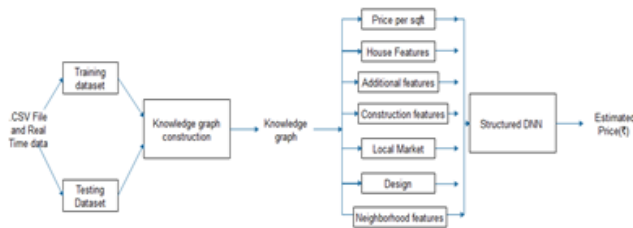


Fig. 1.  System architecture

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 it using algorithm such as standard feed forward and back propagation algorithm with problem-specific real-time training and fitting techniques [3]. Remind 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 [2]. 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 simplification.

### 4. Result

We compare the proposed framework with the following algorithm:

Regression Model: The Regression model has been working to examine real estate price value as shown in figure 2 [4]. We compare the Prediction Vs Reality graph using regression model with the graph using DNN. We found that using DNN it gives more accurate results.

We calculate mean % error of both models. As we compare mean % error of both models, we found that model with DNN gives minimum error as compared with regression model [2]. To further verify the effectiveness of our approach, we gathered additional real estate properties data within earlier 5 years (2014-2019) with different zip codes [2]. We compare our earlier results with new results using the new data.
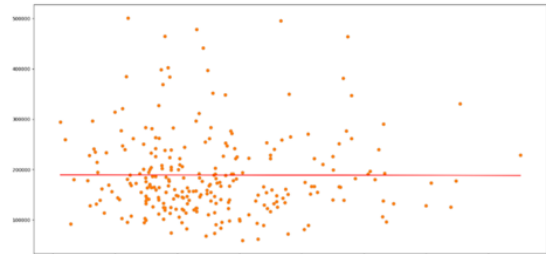


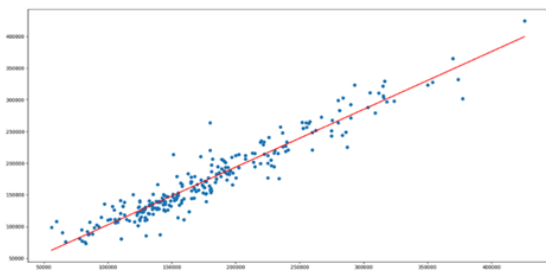Fig. 2.  Prediction vs. reality graph with regression



Fig. 3.  Prediction vs. reality graph with DNN

The graph shown in figure 3, this graph using DNN gives more precise value of estate price. As we calculate error, it gives less error and more accurate results compared with regression model. Also as compared with Zillow and Redfin websites results, our DNN model is giving more precise price value of real estate [2].

Based on our research, we observed that the most recent 6-month data will well symbolize the real estate market. Thus we selected real estate property data of a small town in the previous two years (2017-2019) for training and testing [2]. The same training dataset and testing datasets are used for all our experimentations [2]. Thus we found our system using DNN gives more precise price value of real estate.

### 5. Conclusion and future scope

We have successfully implemented price appraisal system using 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 investigational results given in research paper show that the proposed approach outperforms

other straight methods and leading real estate companies such as Zillow and Redfin, with significantly improved accuracy for house-price prediction. For upcoming 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. We will also add image processing for price estimation. 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. We will additionally make image based appraisal for price prediction.

## References

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

[2] Hu Xiaolong and Zhong Ming, "Applied research on real estate price prediction by the neural network," *2010 The 2nd Conference on Environmental Science and Information Application Technology*, Wuhan, 2010, pp. 384-386.

[3] J. Frew and G. Jud, "Estimating the Value of Apartment Buildings," Journal of Real Estate Research, 2003.

[4] 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

[5] 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.

[6] Quanzeng You, Ran Pang, Liangliang Cao, and Jiebo Luo, Fellow, IEEE "Image Based Appraisal of Real Estate Propertie" in CIKM, 2017, pp. 481–490.