LAND RATE PREDICTION USING COMPUTATIONAL INTELLIGENCE

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Abstract:

Predicting land rates is an essential challenge in the real estate industry. Several deep learning algorithms have been applied to forecast land prices. These three algorithms forecast land values using a dataset of real estate properties. The dataset includes information such as location, surrounding retailers, a nearby train station, and the size of the property. We trained our models on the dataset and evaluated their performance using the accuracy. Deep belief networks beat both multi layer perception and radial base function networks in forecasting land values, according to our findings. This is owing to its capacity to manage complicated, structured datasets as well as its ability to automatically handle missing values and outliers. As a result, we advocate using Deep belief networks for land price prediction jobs in the real estate business.

Keywords: Land rate Prediction, Computational Intelligence, Deep belief networks, multi layer perception, radial base function networks.

1. INTRODUCTION

Predicting land values is vital in the real estate industry because it helps buyers and sellers make informed decisions. As a result of breakthroughs in deep learning, several algorithms have been developed to reliably predict property values. In this study, we anticipate land values by using a dataset of real estate properties and deep learning algorithms. A powerful deep algorithm efficiently maintains structured datasets. It has been discovered to perform well in predicting complicated datasets and has been used in a variety of deep-learning systems.

The goal of land rate prediction is to develop a model that can exactly anticipate the price of a new piece of land based on its properties, utilizing historical data on home aspects (such as location, adjacent train station, local retailers, and so on) and their related prices. Because it is capable of handling a huge number of attributes and capturing detailed connections between the features and the target variable (price).

2. LITERATURE REVIEW

Mulchandania, Harsha The dataset is divided into two pieces for training and testing in the proposed machine literacy model. Twenty percent of the data is utilized for testing, whereas eighty percent is used for training. Shaikh, Arshiya. In this proposed system, we focus on forecasting housing prices using machine learning methods such as multivariate retrogression. Kulkarni, Sushant (in 2021).

P. Durganjali proposed utilizing classification algorithms to forecast the cost of resale properties. In this study, the selling price of a property is forecasted using a number of classification algorithms, including Leaner regression, Decision Tree, K-Means, and Random Forest. The physical characteristics of a property, its geographic location, and even the status of the economy all impact its price. Here, we use these strategies, using RMSE as the performance matrix for diverse datasets, to discover the best accurate model that predicts improved results.

Sifei Lu presented a hybrid regression technique to forecasting housing prices. The creative feature engineering approach is investigated in this study using a small dataset and data characteristics. Manasa and Gupta picked Bangalore as the case study city. The property's square footage, location, and amenities are all important price factors. There are 9 distinct attributes used. Multiple Linear Regression (Least Squares), Lasso/Ridge Regression, SVM, and XG Boost are used in the experimental work.

3. IMPLEMENTATION

To estimate land price values in this work, we used a number of well-known deep learning methods. Deep learning algorithms used in our investigation. Python and the scikit-learn package, a popular machine learning toolkit in Python, were used to develop these algorithms.

- Deep Belief Networks
- Multilayer Perception
- Radial base functions network

Deep Belief Networks

A powerful generative model using a deep architecture is called a Deep Belief Network (DBN). One algorithm for unsupervised probabilistic deep learning is DBN.

A Deep Belief Network is made up of several constrained Boltzmann machines connected in a particular order. We successively add the outcome of the Boltzmann machine's "output" layer as input to the subsequent Boltzmann machine. Then, after training it till it converges, we'll apply it until the entire network is built.

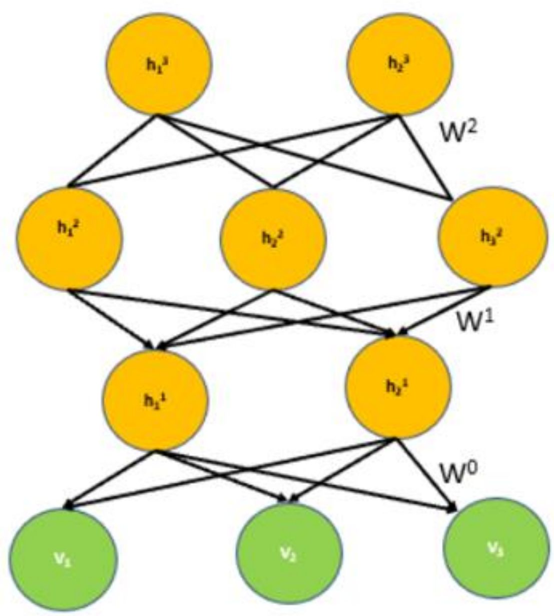

Figure 1 Deep Belief Network sample

Working

Training a property layer that can directly gain input signals from pixels is the initial step. Learn the characteristics of the preliminary acquired features in a different retired subcaste by treating its values as pixels. Every new subcaste of parcels or characteristic we add to the network raises the lower bound on the log-liability of the training data set.

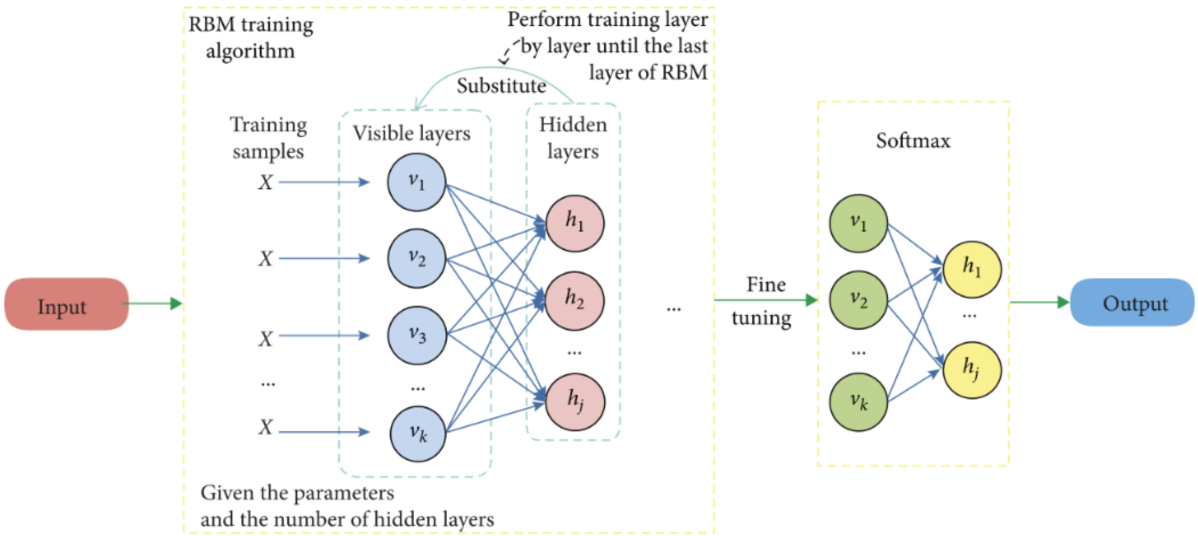

Figure 2 Deep belief networks representation

The following describes the Deep Belief Network's operational pipeline:

DBN will be pre-trained using the Greedy learning algorithm. The greedy learning method, which takes a layer-by-layer approach, is used to learn the top-down generating weights. Variables in one layer and variables in the layer above are related according to these generative weights.

Multilayer Perception

MLP is another name for multi-layer perception. Any input dimension is transformed to the desired dimension via fully connected dense layers. Having numerous layers in a neural network is known as multi-layer perception. The outputs of some neurons become the inputs of other neurons when we join neurons to form a neural network. A multi-layer perceptron contains one input layer with one neuron (or node) for each input, one output layer with one node for each output, and it can have any number of hidden layers, each of which can include any number of nodes.

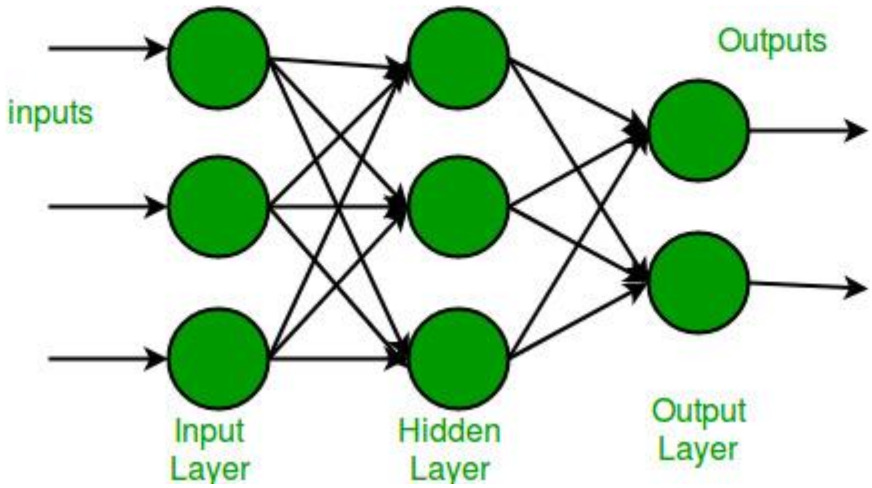

Figure 3 multi layer perceptron

Radial Base Function Networks

The majority of neural network topologies, which have many layers and produce nonlinearity by repeatedly using nonlinear activation functions, differ fundamentally from this in this regard. The hidden layer, where the calculation takes place, receives input data from the input layer and transmits it there. The most potent and distinct component of Radial Basis Functions Neural Networks is their hidden layer. Prediction tasks like classification or regression are reserved for the output layer.

4. RESULT AND DISCUSSIONS

The model is trained and tested using Python codes. The dataset description is given as follows

	No	X1 transaction date	X2 house age	X3 distance to the nearest MRT station	X4 number of convenience stores	X5 latitude	X6 longitude	Y house price of unit area
0	1	2012.917	32.0	84.87882	10	24.98298	121.54024	37.9
1	2	2012.917	19.5	306.59470	9	24.98034	121.53951	42.2
2	3	2013.583	13.3	561.98450	5	24.98746	121.54391	47.3
3	4	2013.500	13.3	561.98450	5	24.98746	121.54391	54.8
4	5	2012.833	5.0	390.56840	5	24.97937	121.54245	43.1

Figure 4 Dataset Description

The pair plot and Dis plot is given as follows

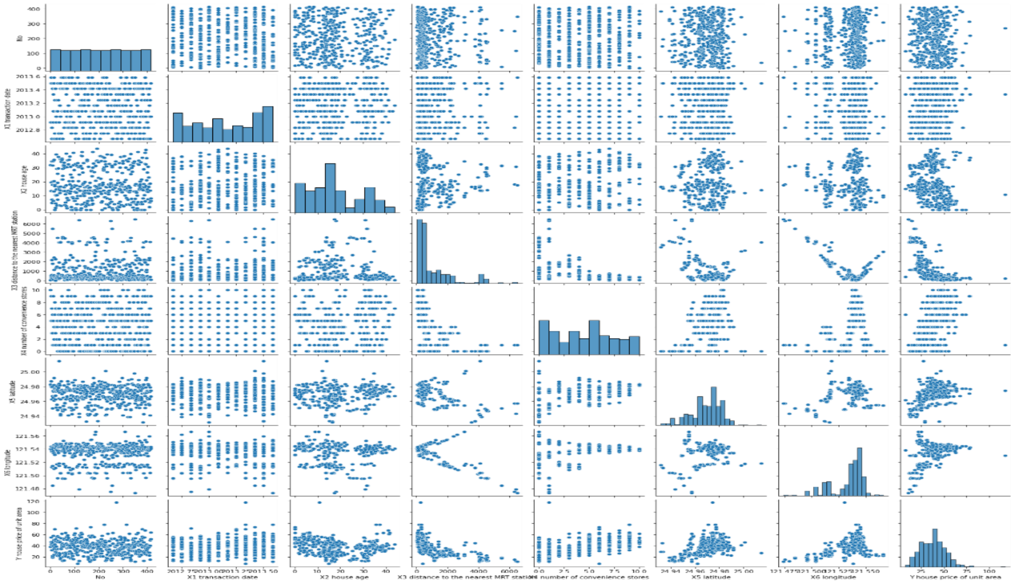

Figure 5 Pair plots

The dataset is divided into Training and testin

	X1 transaction date	X2 house age	X3 distance to the nearest MRT station	X4 number of convenience stores	X5 latitude	X6 longitude
114	2012.667	30.6	143.83830	8	24.98155	121.54142
25	2013.083	29.3	1487.86800	2	24.97542	121.51726
99	2013.417	6.4	90.45606	9	24.97433	121.54310
90	2012.833	0.0	274.01440	1	24.97480	121.53059
230	2013.500	4.0	2147.37600	3	24.96299	121.51284
364	2013.417	35.3	614.13940	7	24.97913	121.53666
181	2013.167	11.6	201.89390	8	24.98489	121.54121
146	2012.750	0.0	185.42960	0	24.97110	121.53170
48	2013.417	24.2	4605.74900	0	24.94684	121.49578
191	2013.167	13.2	750.07040	2	24.97371	121.54951

Figure 6 Training and testing data

The data is trained with the model

	coefficient
X1 transaction date	4.638521
X2 house age	-0.254850
X3 distance to the nearest MRT station	-0.005068
X4 number of convenience stores	1.065967
X5 latitude	246.785307
X6 longitude	-52.648118

Figure 7 Training the model

The test data gets predicted with the trained deep belief networks model

	Test	Prediction
150	48.5	40.784905
269	23.0	32.208973
89	25.3	15.942830
403	39.7	45.697886
115	46.4	38.820431
310	24.7	30.733054
227	40.2	44.150564
160	57.8	47.242472
272	40.5	40.291484
349	47.0	43.798899

Figure 8 Testing Prediciton

The overall accuracy of deep belief networks is 93% which is higher than multilayer perceptron which is 89% and radial base functions which is 88% and very high than other state of art models.

CONCLUSION

The best accuracy was around 93% after training and testing. To make this model distinct from other prediction systems, we must include more parameters like tax and air quality. People can purchase lands on a budget and minimize financial loss. Numerous algorithms are used to determine land values. The selling price was determined with greater precision and accuracy. People will benefit greatly from this. Numerous elements that influence land prices can be taken into account and handled and we assure Deep belief networks gives an accurate results compared to all other state of art models.

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