BE 43 SAAKSHI PADAMWAR

LP V DEEP LEARNING

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ASSIGNMENT NO. 1 :-

AIM : Linear Regression by using Deep Neural Network Implement Boston Housing price prediction by Linear Regression using Deep Neural Network. Use Boston House price prediction dataset

OBJECTIVE :- Students should be able to perform linear Regression by using Deep Neural network on Boston House Dataset.

THEORY :-

WHAT IS LINEAR REGRESSION ?

Linear Regression is a statistical Approach that is commonly used to model the relationship between a dependent variable and one or more independent variables.

It assumes a linear relationship between the variables and uses the mathematical methods to estimate coefficients that best fit the data.

Deep neural networks are a type of machine learning algorithm that are modeled after structure and function of human brain. They consist of multiple layers of interconnected neurons that process data & learn from it to make predictions or classifications.

Linear Regression using Deep neural Network combines the principles of Linear Regression with the power of deep learning algorithms. In this approach, the input features are passed through one or more layers of neurons to extract features & then linear regression model is applied to the output of the last layer, to make predictions. The weights & biases of the neural network are adjusted during training to optimize the performance of the model.

This approach can be used for variety of tasks including predicting numerical values, such as:

- stock prices or housing prices.
- classifying data into categories
- detecting whether an image contains a particular object or not
- Finance healthcare and image recognition

EXAMPLE OF LINEAR REGRESSION :-

A suitable example of linear regression using deep neural networks would be predicting the price of a house based on various features such as:

- size of the house
- number of bedrooms
- location
- age of the house.

In this example, the input features would be fed into a Deep Neural network, consisting of multiple layers of interconnected neurons.

The first few layers of the network would learn to extract features from the input data, such as identifying patterns, and correlations between the input features.

The output of the last layer would then be passed through a linear regression model, which would use the learned features to predict the price of the house.

During training, the weights and biases of the neural network would be adjusted to minimize the difference between the predicted price and actual price of the house.

This process is known as gradient descent, and it allows iteratively adjusting the model's parameters until the optimal values are reached.

Once the model is trained it can be used to predict the price of a new house based on its features. This approach can be used in real estate industry to provide accurate & reliable estimates of house prices, which can help both buyers & sellers make informed decisions.

CONCEPT OF DEEP NEURAL NETWORK :-

A deep neural network is a type of machine learning algorithm that is modeled after the structure & function of the human brain.

It consists of multiple layers of interconnected nodes, or artificial neurons, that process data & learn from it to make predictions & classifications.

Each layer of the network performs a specific type of processing on the data, such as identifying patterns or correlations between features & passes the results to the next layer.

The layers closest to the input are called input layers & the layers closest to the output are called as output layers.

The intermediate layers between the input and output layers are known as "hidden layers". These layers are responsible for extracting increasingly complex features from the input data & can be deep or shallow.

DNN are trained using a process called backpropagation This process is repeated for multiple iterations until model reaches an optimal level of accuracy.

DNN are used in variety of applications, such as Image & speech recognition.

HOW DEEP NEURAL NETWORK WORK ?

Here's how a DNN can work for Boston House Price Prediction:

1 Data Preprocessing: Involves normalizing the input features to have a mean of 0 & standard deviation of 1, which helps the network learn more efficiently. The dataset is then split into training & testing sets.

2. Model Architecture :- A deep neural network is then defined with multiple layers. The first layer is input, which takes in the normalized features. This is followed by several hidden layers, which can be deep or shallow. The last layer is output layer which predicts the house price.

3. Model training: The model is then trained using the training set. During training, the weights and biases of the nodes are adjusted based on the error between the predicted output and the actual output.
This is done using an optimization algorithm such as stochastic gradient descent.

4. Model evaluation: Model is evaluated using testing set and its performance is measured using metrics like mean squared error or mean absolute error.

5. Model Prediction: The trained model is used to make predictions on the new data, such as predicting the price of new house.

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CONCLUSION :-

In this way we have created a deep learning model using Linear Regression & Deep Neural network for Boston House Price Prediction.

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ASSIGNMENT NO: 2.

AIM :- Classify movie reviews into positive reviews and negative reviews, just based on the text content of the reviews. Use IMDB dataset

OBJECTIVE :- Students should be able to classify movie reviews into positive reviews and negative reviews on IMDB dataset.

THEORY :-

What is Classification ?

Classification is a type of supervised learning in machine learning that involves categorizing data into predefined classes or categories based on a set of features or characteristics.

It is used to predict the class of new, unseen data based on the patterns labeled from the labeled training data.

In classification, a model is trained on a labeled dataset, where each data point has a known class label. The model learns to associate the input features with the corresponding class labels & can then be used to classify new unseen data.

For example, we can use classification to identify whether an email is spam or not based on its content and metadata, to predict whether a patient has a disease based on their medical records and symptoms, or to classify images into different categories based on their visual features.

Classification algorithms can vary in complexity, ranging from simple models such as decision trees and k-nearest neighbors to more complex models such as support vector machines and neural networks.

The choice of algorithm depends on the nature of the data, the size of the dataset, and the desired level of accuracy and interpretability.

Classification is a common task in DNN, where the goal is to predict the class of an input based on its features.

How Deep Neural Network Work on Classification?

Deep Neural networks are commonly used for classification tasks because they can automatically learn to extract relevant features from raw input data and map them to the correct output class.

The basic architecture of a deep neural network for classification consists of three main parts
- an input layer
- one or more hidden layers
- an output layer.

The input layer receives the raw input data, which is usually preprocessed to a fixed size and format.

The hidden layers are composed of neurons that apply linear transformations & non-linear activations to the input features to extract relevant patterns and observations.

Finally, the output layer produces the predicted class labels, usually as a probability distribution over the possible classes.

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TRAINING OF DNN:

During training, the deep neural network learns to adjust its weights and biases in each layer to minimize the difference between the predicted output and the true labels.

This is typically done by optimizing a loss function that measures the discrepancy between the predicted and true labels, using techniques such as gradient descent or stochastic gradient descent.

One of the key advantages of deep neural networks for classification is their ability to learn hierarchical representations of the input data.

This hierarchical structure allows deep neural networks to learn highly discriminative features that can separate different classes of input data, even when the data is highly complex or noisy.

The effectiveness of DNNs for classification depends on the choice of architecture, hyperparameters and training procedure, as well as the quality and quantity of the training data. When trained properly, DNNs can achieve state-of-the-art performance on a wide range of classification tasks.

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IMDB Dataset :-

The IMDB dataset is a large collection of movie reviews collected from the IMDB website, which is popular source of user generated movie ratings and reviews. The dataset consts of :

- 50,000 movie reviews
- split into 25,000 reviews for training
- 25,000 reviews for testing.

Each review is represented as a sequence of words is represented by an integer index based on its frequency is the dataset.

The labels for each review are binary, with 0 indicating a negative review and 1 indicating a positive review.

The IMDB dataset is commonly used as a benchmark for sentiment analysis and text classification tasks, where the goal is to classify the movie reviews as either positive or negative based on their text content.

The dataset is challenging because the reviews are often highly subjective and can contain complex language and nuances of meaning, making it difficult for traditional machine learning approaches to accurately classify them.

Deep learning approaches, such as deep neural networks, have achieved state-of-the-art performance on the IMDB dataset by automatically learning to extract relevant features from the raw text data and map them to correct op. output class.

The IMDB dataset is widely used in research and eduction for natural language processing and machine learning, as it provides a rich source of labeled text data for training and testing deep learning models.

CONCLUSION :-

In this way, we have classified movie reviews into positive reviews and negative reviews using Deep Neural Networks and learnt the application of DNN for sentiment analysis.