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Assignment - 1

Title -
Linear regression by using deep Neural Network: Implement Boston housing price prediction problem by Linear regression using Deep Neural network. Use Boston price prediction dataset.

Objective -
Apply the technique of Deep Neural network for implementing Linear regression and classification.

Theory -

- **Deep learning =**
  Deep learning is a subfield of machine learning focusing on learning data representations as successive learning of increasingly meanigful representations.

- **Linear Regression =**
  It is a machine learning alogorithm based on supervised learning. It performs a regression task. Regression models a target prediction value based on independent variables. Different regression models differ based on - the kind of relationship between dependent & indepent values number of being used.

Conclusion =
Housing Prices of Boston city predicted using Linear Regression.

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FAQ's

1) What is linear regression?
= Linear regression models the relationship a dependent variable and one or more independent variables by fitting a linear equation to observed data. It aims to minimize the difference betⁿ observed and predicted values, estimating co-efficients for intercept & slopes. Widely used in offers insights into variable relationships & predictive capabilities.

2) What are different types of linear regressions?
= Different types of linear regressions include simple LR, multiple linear regression, polynomial regression and ridge regression. They are used to model various relationships betⁿ dependent & independent variables in data analysis & protection tasks.

3) Application where linear regression is used.
= Linear regression is used in diverse applications such as finance, economics, marketing, healthcare and engineering. It aids in understanding relationship betⁿ variables, making fore-casts and guiding decision making processes across numerous industries & research domains.

4) What are the limitations of linear regression?
= Linear regression assumes a linear relationship variables, which may not always hold true.

It's sensitive to outliers and can be affected by multicollinearity. Additionally, it cannot capture complex, non-linear relationship without modifications like polynomial regression. Lastly it require features to be independent, violating this assumption can lead to inaccurate results.

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Assignment - 2

Title -
Binary classification using Deep Neutral Networks
Example: Classify movie reviews into positive reviews and negative reviews, just based on the text content of the reviews. Use the IMDB dataset.

Objective -
To implement different deep learning model.

Theory -

In this case study, our objective is to classify movie reviews as positive or negative. This is a classify binary classification, which aims to predict one of two classes (positive vs. negative). To predict whether a riviem is positive or negative, we will use the text of the movie reviem:

Throughout this case study you will learn a few new couples.

- Vectorizing text with one-hot encoding.
- Regularization with:
    - Learning rate
    - Model capacity
    - Weight decay
    - Dropout.

Conclusion.

In this story, we applied the concepts of Deep Neutral Network on the IMDB data set. I would recommend trying out other datasets as well.

FAQ's

1) Explain types of loss function with example.
= In mathematical optimization and decision theory, a loss function or cost function is a function that maps an event or values of one or more variables onto a real no. intuitively representing some "cost" associated with the event

2) What are L1 & L2 loss function?
= L1 & L2 are two common loss functions in machine learning which are mainly used to minimize the error. L1 loss function is also known as least Absolute Deviations in short LAD. L2 loss function is also known as Least square errors in short L2

3) What is deep networking?
= What is a deep neural network. At its simplest, a neutral network with some level of complexity, usually at least two layers, qualifies as a deep neural network, or deep net for short. Deep nets process data in complex ways to employing sophisticed math modeling.

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4) What is a deep neural network with an example?

= DL deals with training large neural network with complex input output transformations one example of DL is the mapping of a photo to the name of the person in photo as they do on social networks & describing a picture with another recent application of DL.

5) Why are deep neural networks used?

= Deep networks require a large amount of annotated data for training. With efficient training algorithms, deep neural networks are capable of seperating millions of labelled images. Moreover, the trained network can also be used for learning efficient image representations for other similar benthic data sets.

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Assignment - 3

Title -
Use MNIST Fashion Dataset and create a classifier to classify fashion clothing into categories (Convolutional neural network) (CNN)

Objective -
To implement different deep learning model.

Theory -

The Fashion - MNIST dataset is proposed as a more challenging replacement dataset for the MNIST dataset.

It is a dataset composed of 60,000 square 28 * 28 pixel grayscale images of items of 10 types of clothing, such as shoes, t-shirts, dresses and more.

In more challenging classification problem that MNIST and top results are achieved by deep learning convolutional neural networks with a classification accuracy of about 90% to 95% on the hold out test dataset. The loads Fashion MNIST dataset using the Keras API and creates a plot of the first nine images in the training dataset.

Conclusion -
In this story, we applied the concepts of Convolution Neural Network on the MNIST Fashion dataset.

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FAQ's

1) What is the use of the convolution layer in CNN?
= The convolution layer in the Convolution Neural Networks (CNNs) extracts features from input data by applying filters across the input's spatial dimensions. This process captures local patterns, enabling the network to learn hierarchical representations of the input, crucial for tasks like image recognition, object detection and natural language processing.

2) What are the advantages of using CNN over DNN?
= Convolutional Neural Network (CNNs) excel over traditional Deep Neural Networks (DNNs) due to their ability to extract spatial hiearchical features efficiently from data like images. They leverage parameter sharing, offer translation invariance, automate feature learning and demonstrate computational efficiency, making them ideal for tasks like image recognition & processing.

3) Why is CNN preferred over ANN for image data?
= CNNs outperform ANNs for image data due to their ability to capture spatial hierachies of features efficiently. They exploit local connectivity, shared weights, and parameters sharing, enabling them to automatically learn relevent features, making the ideal for tasks like recognition and processing.

4) How would you visualise features of CNN is an image classification task?

= To visualize features landed by a CNN in a image classification task, techniques like activation maximization, gradient - weighted class mapping, or feature maps can be used. These methods highlight areas of the input image but contribute most to specific feature activations or class predictions, providing insight into the network decision - making process.

5) What do you understand about shared weights in CNN?

= In CNNs shared weights refer to using the same set of parameters across different parts of the input data. This allows the network to learn local patterns efficiently by reusing the learned parameters, reducing the no. of parameter to be learned and improving generalization.