

NAME:- AFNAN ATTAR PRN:- F19112003 SUBJECT:- DL
ASSIGNMENT NO.: 01

Q1) What is Linear Regression?

- Ans 1. Linear regression is a statistical approach that is commonly used to model the relationship between a dependent variable and one or more independent variable.
2. It assumes linear relationship between variables and uses mathematical models to best fit the data.
 3. Linear regression using deep neural networks combines the principles of linear regression with the power of deep learning algorithms.
 4. In this approach, input features are passed through one or more layers of neurons to extract features and then a linear regression model is applied to the output of last layer to make predictions.
 5. It is often used in finance, health care and image recognition.

Q2) What is Deep Neural Network?

- Ans 1. Deep neural network is a type of machine learning algorithm that is modeled after the structure and function of human brain.
2. It consists of multiple layers of interconnected nodes that process data and learn from it to make predictions or classifications.
 3. Each layer performs a specific type of processing on the data.
 4. The layers closest to the input are known as the "input layer", while layers closest to the output are "output layers".

5. The intermediate layers between input and output layers are known as hidden layers.
6. Deep neural networks are trained using back propagation, to increase its accuracy.
7. These networks are used in NLP, image and speech recognition and other variety of subjects.

(Q3) What is the concept of standardization?

- Ans 1: Standardization is one of the feature scaling techniques which scales down the data in such a way that the algorithms that are dependent on distance and weights should not get affected by uneven-scaled dataset.
2. If the data is scaled evenly such that points are mean centric and standard deviation of the distribution is 1 then the weights will be treated equally by the algorithm giving more relevant and accurate results.

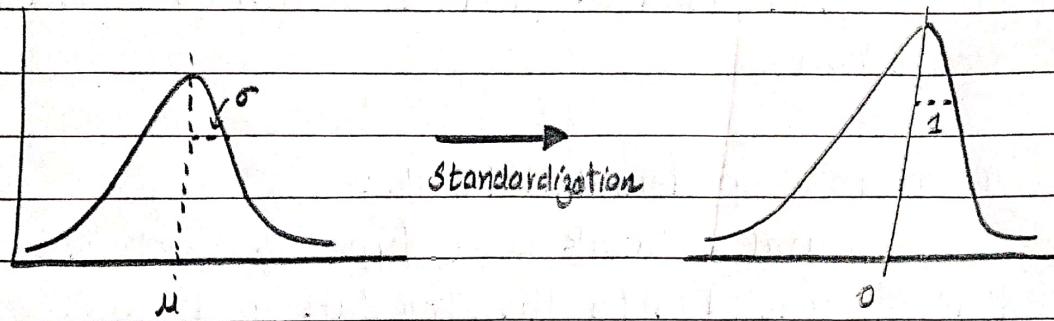


Fig: Concept of Standardization

(Q4) Why split data into train and test?

- Ans 1: Data splitting is an important aspect of data science, particularly for creating models based on the data.
2. In basic two-part data split, the training data set is used to train and develop models.
 3. Training sets are commonly used to estimate different

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parameters or to compare different model performance.

4. The testing data set is used after the training is done.
5. The training and test data are compared to check that the final model works correctly.

Q5) Write down applications of Deep Neural Network?

Ans Applications of deep neural network are as follows:-

1. Virtual Assistants:-
Cloud Based applications that understand natural language voice commands and complete tasks for the user.
2. Chatbots:-
Chatbots solve customer problem in seconds.
3. Healthcare:-
Computer-aided disease detection and computer-aided diagnosis.
4. Entertainment:-
Companies such as Netflix, Amazon, YouTube use recommender system.
5. Content Creating:-
NLP and DNN Trained Models such as ChatGPT are being used not only in content creation but also in completing assignments, code writing.

NAME:- AFNAN ATTAR PRN:- F19112003 CLASS :- BE COMP 2
 SUBJECT:- DL ASSIGNMENT NO:- 03

Q1) What is Binary classification?

- Ans 1.
1. In a binary classification task, the goal is to classify the input data into two mutually exclusive categories.
 2. The training data in such a situation is labeled in a binary format: true and false; positive and negative; 0 and 1; spam and not spam etc. depending on the problem being tackled.
 3. For instance, we might want to detect whether a given image is a truck or a boat.

Q2) What is Convolutional Neural Network?

- Ans 1.
1. The goal of convolutional neural networks or CNN is to learn higher-order features in the data via convolutions.
 2. CNNs transform the input data from the input layer through all connected layers into a set of class scores given by the output layer.
 3. There are many variations of the CNN architecture, but they are based on the pattern of layers.

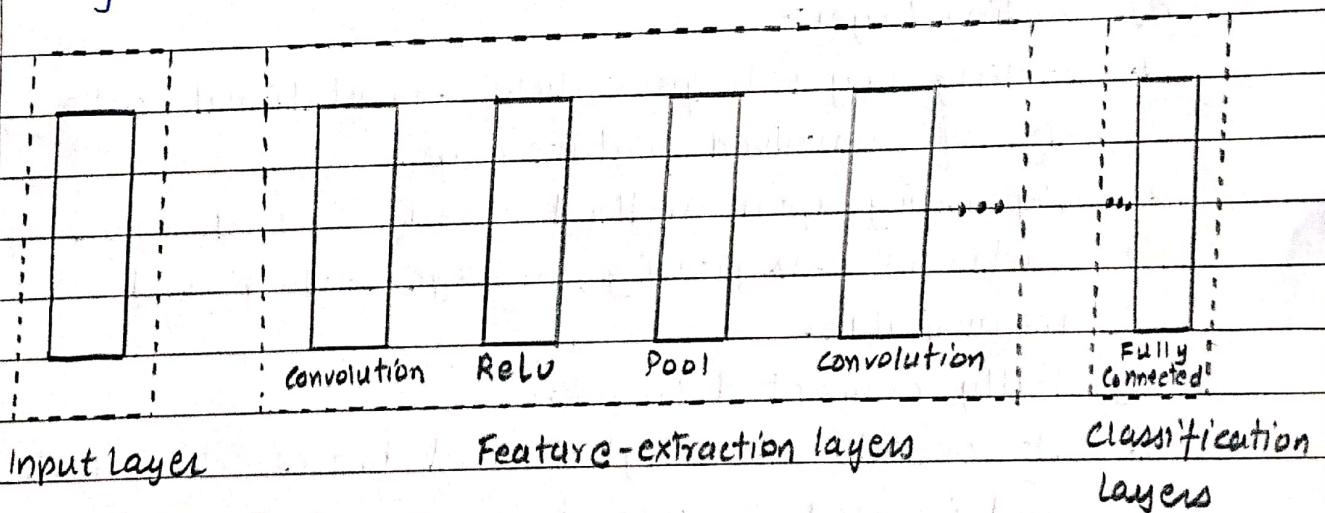


Fig: Architecture of CNN

4. Input layer generally accepts three-dimensional input, generally in the form spatially of the size of image and has depth representing image channels.
5. Convolution layers transform the input data by using a patch of locally connecting neurons from previous layer.
6. Resulting output generally has the same spatial dimensions but sometimes has an increase in third dimension of the output.

(Q3) Enlist and explain convolution neural network layers in detail.

Ans Three layers make up the convolution neural network, let us look at each one of them in detail:-

A] Convolution Layer:-

1. This layer is used to extract various features from the input images.
2. In this layer, the mathematical operator of convolution is performed between the input image and a filter of particular size $M \times M$.
3. Filter slides over the image and dot product between filter and image is taken.

B] Pooling layer:-

1. Pooling layer helps reduce computational costs by decreasing size of convolved feature map.
2. Depending upon method used several types of pooling such as max pooling, average pooling and sum pooling are available.

C] Fully Connected Layer:-

1. It consists of weights and biases along with neurons and is used to connect neurons between two different

layers.

2. These layers are usually placed before the output layer and form the last few layers of CNN architecture.
3. This is the layer where classification process takes place.

Q4) What is the difference between Machine Learning and Deep learning?

Ans

Machine Learning

Deep learning

- | | Machine Learning | Deep learning |
|---|--|------------------------------------|
| 1. A subset of AI | | A subset of machine learning |
| 2. Can train on smaller data sets. | | Requires large amount of data. |
| 3. Requires more human intervention to correct & learn. | | Learns on its own. |
| 4. Shorter training & lower accuracy. | | Longer training & higher accuracy. |
| 5. Makes simple, linear correlation. | Makes non-linear, complex correlation. | |
| 6. Can train on a CPU. | | Needs a specialized GPU to train. |

Q5) Write short note on feature extraction in CNN.

- Ans 1. In CNNs, the feature extraction process is typically performed by applying a series of convolutional filters to the input data.
2. These filters are designed to capture different types of features at different level of abstraction.
 3. The first set of features may capture low-level

features such as edges & corners, while subsequent layers may capture more complex features such as shapes & textures.

3. The output of each convolutional layer is typically passed through a non-linear activation function such as ReLU (Rectified Linear Unit), which helps introduce non-linearity.
4. Final step in feature extraction is pooling which involves downsampling the output of convolutional layer.
5. Pooling helps reduce dimensionality of feature maps and increases Model's robustness to variations in input data.

NAME:- AFNAN ATTAR PRN: F19112003 CLASS:- BE COMP II
 SUBJECT:- DL ASSIGNMENT NO.: 02

Q1) What is Multiclass Classification?

- Ans :-
1. In machine learning and statistical classification, multiclass classification is the problem of classifying instances into one of three or more classes.
 2. While many classification algorithms naturally permit the use of more than two classes, some are by nature binary algorithms.
 3. Multi-class classification techniques can be categorised into :-

A] Transformation to binary:-

- The techniques developed based on reducing the multi-class problem into multiple binary problem can also be called problem transformation techniques.
- It is further categorized as one vs rest and one vs one.

B) Extension from binary:-

- Several algorithms are developed that are based on neural networks, decision trees, k-nearest neighbours, naive Bayes, support vector machines and extreme learning machine.
- Hence in this existing binary classifiers are extended to solve multi-class classification problems, these are also called as algorithm adaptation techniques.

C) Hierarchical classification:-

- Hierarchical classification tackles the multi-class classification problem by dividing the output space into a tree.
- Each parent node is divided into multiple child nodes and the process is continued until each child node represents only one class.

Q2) What is a Deep Neural Network?

Ans 1.

A deep neural network is an ANN [Artificial Neural Network] with multiple hidden layers between the input and output layers.

2. Similar to shallow ANNs, DNNs can model complex non-linear relationships.
3. The main purpose of a neural network is to receive a set of inputs, perform progressively complex calculations on them, and give output to solve real world problems like classification.
3. Neural networks are widely used in supervised learning and reinforcement learning problems. These networks are based on a set of layers connected to each other.
4. DL models produce much better results than normal ML networks, mostly gradient descent method is used to optimize the network and minimize the loss function.

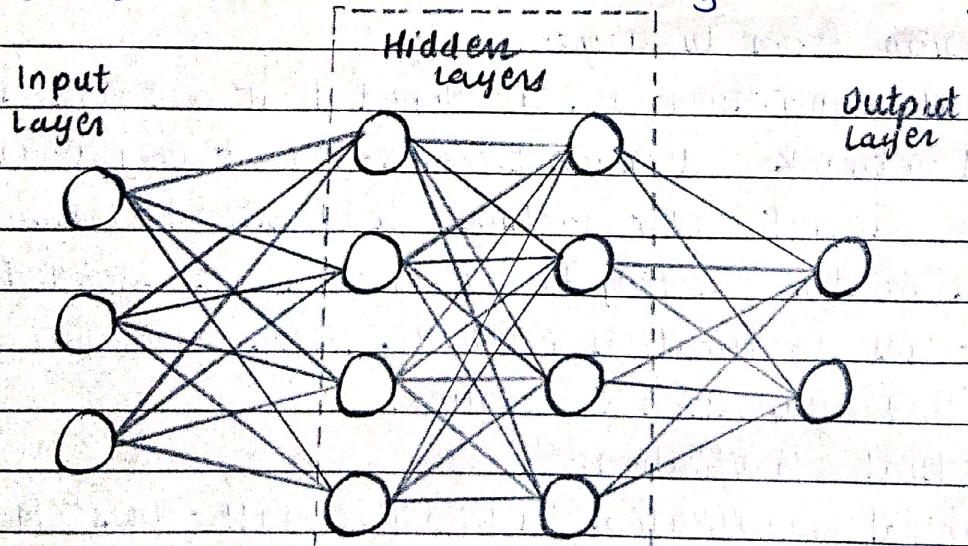


Fig: Deep Neural Network Architecture

5. DNN architecture consists of input [which takes in input], hidden [which performs computations on input] and output layer [which provides the required output].