**DL theory : Assingments-2**

1. An artificial neuron, also known as a perceptron, is a mathematical model that is designed to mimic the behavior of a biological neuron. Like a biological neuron, it receives input signals through its dendrites, processes these signals through its cell body, and sends output signals through its axon. The main components of an artificial neuron include the input layer, the weights, the bias, the summation function, and the activation function.
2. Some popularly used activation functions include:

* Sigmoid: This function produces output between 0 and 1, making it useful for binary classification problems.
* ReLU (Rectified Linear Unit): This function returns the input if it is positive and returns 0 if the input is negative.
* Tanh (Hyperbolic Tangent): This function produces output between -1 and 1, making it useful for multi-class classification problems.
* Softmax: This function normalizes the output of the activation function so that the sum of the outputs is equal to 1.

1. Rosenblatt’s perceptron model is a simple algorithm used for binary classification problems. The model takes in input data, multiplies each input value by a weight, and sums the results. The sum is then passed through an activation function, which produces a binary output (1 or -1). A set of data can be classified using a simple perceptron by adjusting the weights and bias until the desired output is achieved.
2. A multi-layer perceptron (MLP) is a neural network that contains more than one layer of artificial neurons. It can solve the XOR problem (a problem that is not linearly separable) by using multiple layers of neurons. Each layer is able to extract a different set of features from the input data, which allows for more complex decision boundaries to be formed.
3. Artificial neural networks (ANNs) are a type of machine learning algorithm that is modeled after the structure and function of the human brain. There are several architectural options for ANNs, including feedforward networks, recurrent networks, and convolutional networks. Some salient highlights include the ability to learn from data, the ability to generalize to unseen data, and the ability to model complex relationships between inputs and outputs.
4. The learning process of an ANN involves adjusting the synaptic weights between neurons in order to minimize the error between the predicted output and the actual output. One challenge in assigning these weights is that there may be many possible solutions, or local minima, which can make it difficult to find the optimal solution. This challenge can be addressed by using optimization algorithms such as stochastic gradient descent or backpropagation.
5. Backpropagation is a supervised learning algorithm used to train artificial neural networks. It involves propagating the error backwards through the network, adjusting the weights in each layer in order to minimize the error. The steps in the backpropagation algorithm include: forward propagation, calculating the error, backpropagation of the error, and updating the weights. A multi-layer neural network is required in order to use backpropagation because it allows for the extraction of features at multiple levels of abstraction.
   1. Artificial neuron: An artificial neuron, also known as a perceptron, is a mathematical model designed to mimic the behavior of a biological neuron.
6. Multi-layer perceptron: A multi-layer perceptron is a neural network that contains more than one layer of artificial neurons.
7. Deep learning: Deep learning is a subfield of machine learning that focuses on building neural networks with many layers, or "deep" networks.
8. Learning rate: The learning rate is a hyperparameter that controls the step size at which the algorithm updates the weights during training.
9. Activation function vs threshold function: An activation function is a mathematical function that is applied to the output of a neuron to determine its output signal, while a threshold function is a simpler mathematical function that maps input values to a binary output.
10. Step function vs sigmoid function: A step function maps input values to a binary output, while a sigmoid function produces output between 0 and 1, making it useful for binary classification problems.
11. Single layer vs multi-layer perceptron: A single layer perceptron is a neural network that contains only one layer of artificial neurons, while a multi-layer perceptron contains more than one layer. A multi-layer perceptron is able to extract features at multiple levels of abstraction, which allows for more complex decision boundaries to be formed.

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