1. What is the function of a summation junction of a neuron? What is threshold activation function?

Ans- Summation is used to sum all the weights coming from different inputs to a neuron , then a threshold function is applied to it which helps in activating the neuron.

Example- Step Function- activation function is the Step function which says with the output of summation reaches the threshold value defined the neuron will fire with the threshold value otherwise will be zero.

1. What is a step function? What is the difference of step function with threshold function?

Step Function is one of the simplest kind of activation functions. In this, we consider a threshold value and if the value of net input say y is greater than the threshold then the neuron is activated.

1. Explain the McCulloch–Pitts model of neuron.

The McCulloch-Pitts model was an extremely simple artificial neuron. The inputs could be either a zero or a one. And the output

was a zero or a one. And each input could be either excitatory or inhibitory.

1. Explain the ADALINE network model.

The Adaline model compares the actual output with the target output and with the bias and the adjusts all the weights.

1. What is the constraint of a simple perceptron? Why it may fail with a real-world data set?

The perceptron is a linear classifier, therefore it will never get to the state with all the input vectors classified correctly if the training set D is not linearly separable, i.e. if the positive examples cannot be separated from the negative examples by a hyper plane.

1. What is linearly inseparable problem? What is the role of the hidden layer?

Linearly inseparable problems cannot be solved by the simple network, more sophisticated architecture is needed. Hidden layer makes the network more complex but we can always back propagate and adjust weights in order to learn more complex dataset

1. Explain XOR problem in case of a simple perceptron.

The X-Or problem is a common example of non-linearly separable problems, problems simple perceptrons cannot solve. Usually,BP feed-forward multi-layer perceptrons are used and a common solution involves 2 hidden neurons and 1 output neuron.

1. Design a multi-layer perceptron to implement A XOR B.
2. Explain the single-layer feed forward architecture of ANN.

It is the simplest and most basic architecture of ANN’s. It consists of only two layers- the input layer and the output layer. The input layer consists of ‘m’ input neurons connected to each of the ‘n’ output neurons.

1. Explain the competitive network architecture of ANN.

These kinds of networks are based on the competitive learning rule and will use the strategy where it chooses the neuron with the greatest total input

11. Consider a multi-layer feed forward neural network. Enumerate and explain steps in the Back propagation algorithm used to train the network.

12. What are the advantages and disadvantages of neural networks?

Ans. **Advantages of neural network**:

Artificial neural networks have the ability to provide the data to be processed in parallel, which means they can handle more than one task at the same time.

Artificial neural networks have been in resistance. This means that the loss of one or more cells, or neural networks, influences the performance of Artificial Neural networks.

Artificial neural networks are used to store information on the network so that, even in the absence of a data pair, it does not mean that the network is not generating results.

Artificial neural networks are gradually being broken down, which means that they will not suddenly stop working and these networks are gradually being broken down.

We are able to train ANN’s that these networks learn from past events and make decisions.

**Disadvantages of Neural Network:**

Artificial neural networks have the ability to provide the data to be processed in parallel, which means they can handle more than one task at the same time.

Artificial neural networks have been in resistance. This means that the loss of one or more cells, or neural networks, influences the performance of Artificial Neural networks.

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We are able to train ANN’s that these networks learn from past events and make decisions.

13. Write short notes on any two of the following:

1. Biological neuron

2. Relu function: RELU :- Stands for Rectified linear unit. It is the most widely used activation function. Chiefly implemented in hidden layers of Neural network.

Equation :- A(x) = max(0,x). It gives an output x if x is positive and 0 otherwise.

Value Range :- [0, inf)

Nature :- non-linear, which means we can easily backpropagate the errors and have multiple layers of neurons being activated by the ReLU function.

Uses :- ReLu is less computationally expensive than tanh and sigmoid because it involves simpler mathematical operations. At a time only a few neurons are activated making the network sparse making it efficient and easy for computation.

In simple words, RELU learns much faster than sigmoid and Tanh function.

3. Single-layer feed forward ANN:

It is the simplest and most basic architecture of ANN’s. It consists of only two layers- the input layer and the output layer. The input layer consists of ‘m’ input neurons connected to each of the ‘n’ output neurons.

4. Gradient descent:

Gradient Descent is an optimization algorithm used for minimizing the cost function in various machine learning algorithms. It is basically used for updating the parameters of the learning model.

5. Recurrent networks:

Recurrent Neural Network(RNN) are a type of Neural Network where the output from previous step are fed as input to the current step. In traditional neural networks, all the inputs and outputs are independent of each other, but in cases like when it is required to predict the next word of a sentence, the previous words are required and hence there is a need to remember the previous words. Thus RNN came into existence, which solved this issue with the help of a Hidden Layer. The main and most important feature of RNN is Hidden state, which remembers some information about a sequence.