Deep Learning Interview Questions & Answers

1. **What is Deep Learning?**

Deep Learning is the subset of Machine Learning that uses Artificial Neural Nets to allow machines to simulate decision making like humans. Neural Nets are inspired by the neuron structure of the human brain. Deep Learning has found numerous applications in areas like feature detection, computer vision, speech recognition, and natural language processing.

2. **What is Perceptron?**

To understand this, you must first understand how a biological neuron works. A neuron consists of a cell body, an axon, and dendrites.

While dendrites receive signals from other neurons, the cell body sums up all the inputs received, and the axon transmits the information compiled by the cell body as signals to other cells.

Just like this, Perceptron in a neural net receives multiple inputs, applies various transformations and functions to those inputs, and finally combines the information to produce an output. It is a linear model used for binary classification.

3. **What is the function of Weights and Bias?**

To activate a node within a neural network, we have to use the following formula:

output = activation_function(dot_product(weights, inputs)+ bias)

Here, weights determine the slope of the classifier line, whereas bias enables the activation function to shift the slope either to the left or right. Generally, bias is treated as a weight input having the value x0.

4. **What is the role of an Activation Function?**

An activation function is used to interject non-linearity into a neural network to help it learn complex tasks. It triggers or activates a neuron by calculating the sum of the weights and adding further bias to it. Without an activation function, a neural network will only be able to perform a linear function, that is, the linear combination of its input data.

5. **What is Gradient Descent?**

Gradient Descent is an optimization algorithm that is used to minimize the cost function of a particular parameter by continually moving in the direction of steepest descent as determined by the negative of the gradient.

6. **What is a Cost Function?**

A cost function (also referred to as "loss") is a measure of the accuracy of the neural network in relation to a specific training sample and expected output. It determines how well a neural network performs as a whole. With neural networks, the goal always remains the same - to minimize the cost function or errors.

7. What is Backpropagation?

Backpropagation is a training algorithm used in multilayer neural networks to enhance the performance of the network. The method requires to move the error from one end of the network to all the weights contained inside the network, thereby facilitating efficient computation of the gradient and minimizing the error. Here's how it works:

First, the training data is moved forward propagation to produce the output.

Use the target value and output value to calculate the error derivative in relation to the output activation.

Backpropagate the data for all the hidden layers and update the parameters (weights and biases). Continue this until the error is reduced to a minimum.

Now you can feed inputs into your model, and it can predict outputs more accurately.

8. What is Data Normalization? Why is it important?

Data normalization is a preprocessing step during backpropagation. It aims to eliminate or minimize data redundancy. Data normalization helps rescale values to fit within a specific range to obtain better convergence for backpropagation - the mean of each data point is subtracted and divided by its standard deviation.

9. How do you initialize weights in a neural network?

Basically, there are two ways for weight initialization -

Initialize the weights to zero (0): By doing this, your model becomes just like a linear model, which means that all the neurons and all the layers will perform the same function, thereby hampering the productivity of the deep net.

Initialize the weights randomly: In this method, you assigning the weights randomly by initializing them very close to 0. Since different neurons perform different computations, this method ensures better accuracy.

10. What are Hyperparameters?

Hyperparameters are variables whose values are set before the training process. They determine both the structure of a network and how it should be trained.

There are many hyperparameters used in neural networks like Activation Function, Learning Rate, Number of Hidden Layers, Network Weight Initialization, Batch Size, and Momentum, to name a few.

11. **What is a CNN? What are its different layers?**

CNN or Convolutional Neural Network is a kind of deep neural networks primarily used for analyzing visual representations. These networks use a host of multilayer perceptrons that require minimal preprocessing. While neural networks use a vector as an input, in a CNN, the input is multi-channeled images.

12. **The different layers of CNN are as follows:**

Convolutional Layer - This layer performs a convolutional operation to create many smaller picture windows to parse the data.

ReLU Layer - This layer introduces non-linearity to the network. It changes all the negative pixels to zero.

Pooling Layer - This layer performs a down-sampling operation to reduce the dimensionality of each feature map.

Fully Connected Layer - This layer recognizes and classifies all the objects present in the sample image.