WEEK-1

Challenge

(1) Briefly Illustrate a Neural Network ?

Neural Networks also known as Artificial Neural Networks (ANN's) (or) Simulated Neural Networks (SNNs) are subset of ML & are heart of DL. Thier name & structure are inspired by human brain mimicking the way Biological neurons signal to one another.

ANN are Comprised of Node layers Containing an Input layer one (or) moe hidden layers and an output layer. Each node (or) artificial neuron Connects to another & has weight & Threshold.
Neural networks rely on training data to learn & Improve their accuracy over time.

(2) Enumerate the Components of a Neural Network ?

Neural Network are broadly used with applications for financial operations enterpise planning, trading, bussiness analytics and product maintainance

There are three main Components of Neural Network
① Processing layer ② Input layer & ③ output layer.

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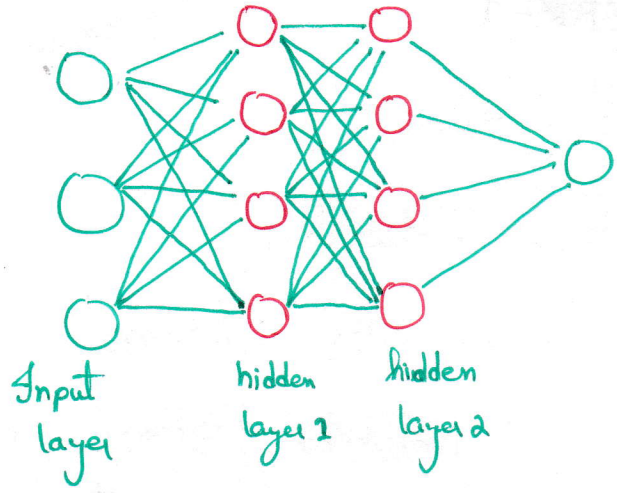


Input layers, Neurons & weights :

A neuron is the basic unit of Neural Network. They receive input from an external source (or) other nodes. Each node is connected with another node from next layer and each such connection has particular weight.

Hidden layers & output layers :

The layer (or) layers hidden b/w the input & output layer is known as hidden layer. It is called the hidden layer since it is always hidden from external source.

The main computation of Neural Network takes place in hidden layers. Hidden layers take input from input layers and performs necessary calculations

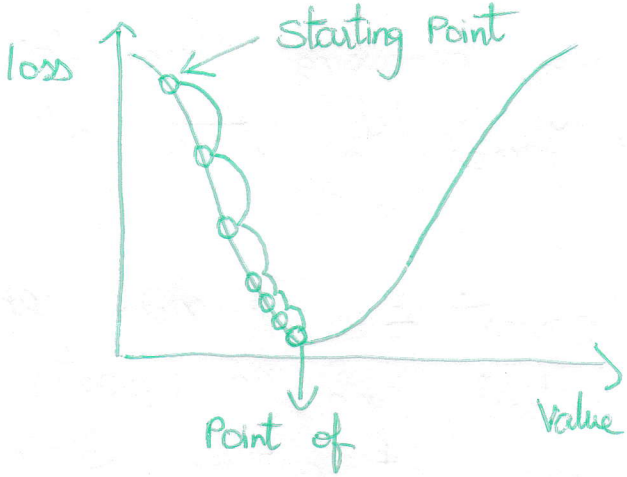
(3) Briefly Illustrate gradient descent ?

Gradient descent is an optimization algorithm which is commonly used to train ML models & neural networks training data helps these models learn over time and the

ameter, gauging its accuracy with each iteration of
ameter updates. Until the function is close to or
equal to zero the model will continue to adjust its
Parameters to yield the smallest possible errors.

(4) Breifly explain how Gradient Descent works with an example?

Before we ~~divide~~ dive into gradient descent, it may help to review some Concepts from linear regression. You may recall the following formula for the slope of a line which is $y = mx + b$, where m represents the slope & b is the intercept on the y-axis.



The starting point is just an arbitary point for us to evaluate performance. From that starting point we will find the derivative (or) slope & from there we can use tangent line to observe the steepness of slope.

The slope at starting point will be steeper but as new

(5) Briefly explain the different types of gradient descent?

Types of Gradient descent

3 types of gradient descent learning algorithms

① Batch gradient descent ② Stochastic gradient

③ Mini - Batch descent

① Batch gradient descent : It sums the errors for each point in a training set, updating the model only after all training examples have been evaluated. This process reffered to as training epoch.

While this batching provides computation efficiency, it can still have a long processing time for large training datasets as it still needs to store all of data into memory.

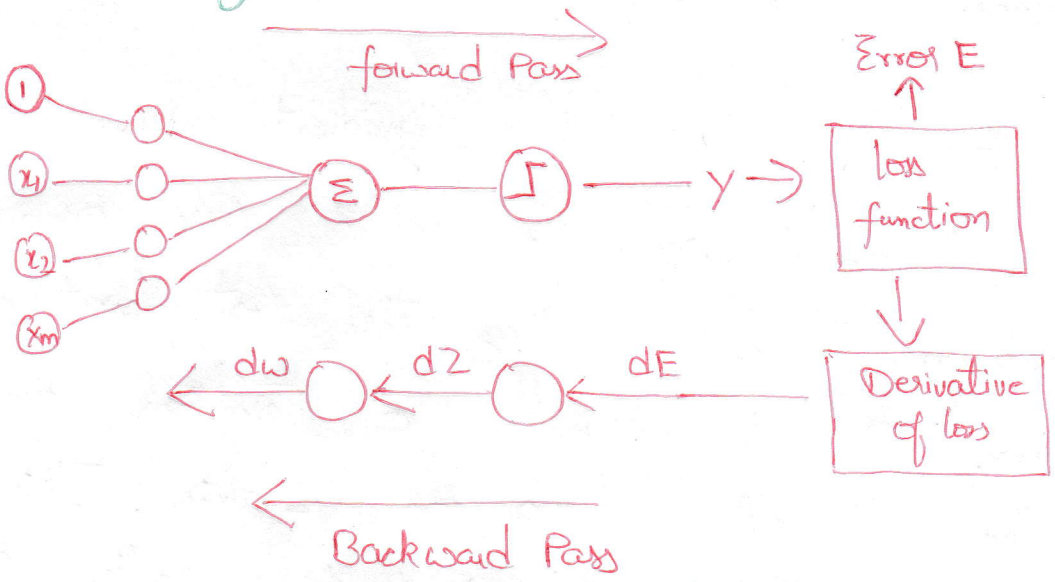
② Stochastic gradient descent : It runs epoch for each example within the dataset and it updates each training example parameters one at a time. Since you need to hold one training example they are easier to store in memory.

③ Mini - Batch gradient descent : It combines concepts from batch gradient descent and stochastic gradient descent. It splits the training datasets into small batch sizes and performs updates on each of those batches

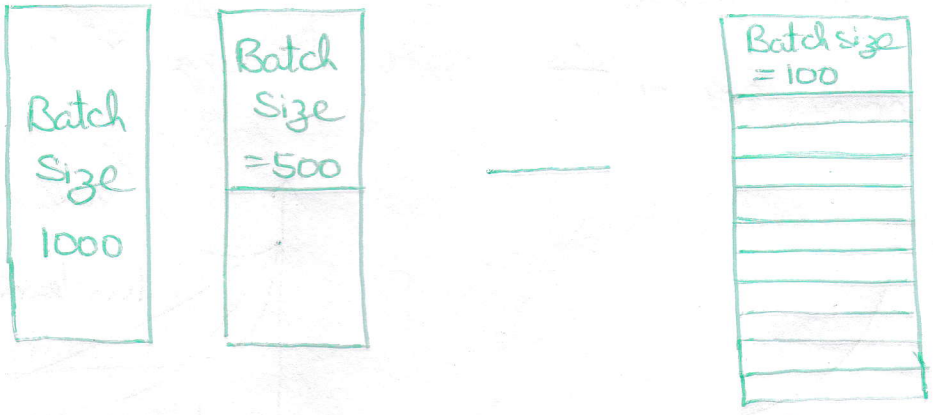
gradient descent & speed of stochastic gradient descent.

6) Explain the need and requirement for Epoch?

An Epoch means training neural network with all the training data for one cycle. In an epoch we use all of the data exactly once. A forward Pass and backward Pass together are counted as one Pass.



An Epoch is sometimes mixed with an Iteration.



Iteration Per Epoch = 10

(7) Elaborately explain the Importance of learning rate.

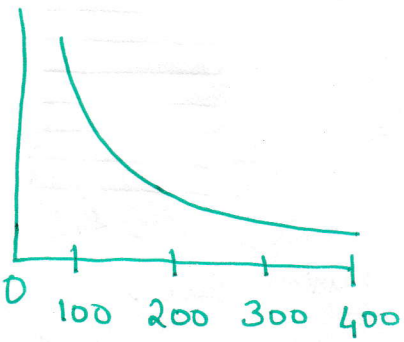
The amount that the weights are updated during training is reffered to as step size (or) "learning rate".

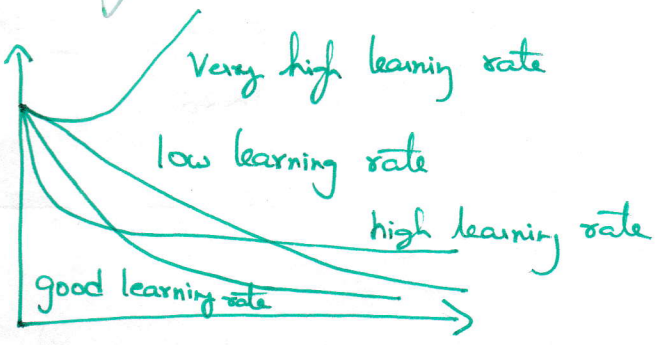
a small Positive value often in the range b/w 0 and 1.0

learning rate controlls how quickly the model adapted to the problem. Smaller learning rates require more training epochs given the smaller changes made to weights each update whereas larger learning rate results in rapid changes & req fewer training epochs.

(8) How to make sure gradient decent works properly?

(Ans) A good way to make sure gradient descent runs properly is by plotting the cost function as optimization runs. Put the number of iterations on the x-axis & value of cost function on y-axis. This helps you see the value of your cost function after each iterations of gradient descent and provides a way to easily spot how appropiate your learning rate is.





If gradient descent is working properly the cost function should decrease after every iteration.

Briefly explain a Batch & also Illustrate how to differentiate a learning algorithm based on batch size?

The Batch size is a hyperparameter that defines the no of samples to work through before updating the internal model parameters.

A training data set can be divided into one (or) more batches

When all training samples are used to create one batch the learning algorithm is called Batch gradient descent

When the batch in the size of one sample the learning algorithm is called stochastic gradient descent.

Batch Gradient Descent : Batch size = Size of training set

Stochastic Gradient Descent : Batch size = 1

Mini-Batch Gradient Descent : 1 < Batch size < Size of training set.

(10) Differentiate b/w Batch & Epoch?

The Batch size is a number of samples processed before the model is updated

The number of epochs is the number of Complete Passes through the training dataset.

The size of batch must be more than (or) equal to one and less than (or) equal to the number of samples in the

The number of epochs can be set to an integer value b/w one and infinity. You can run the algorithm for as long as you like & even stop it using other criteria besides a fixed number of epochs such as change in model error over time.