

Assignment No: 2

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Q.1 Explain Perceptron Model?

Sol:

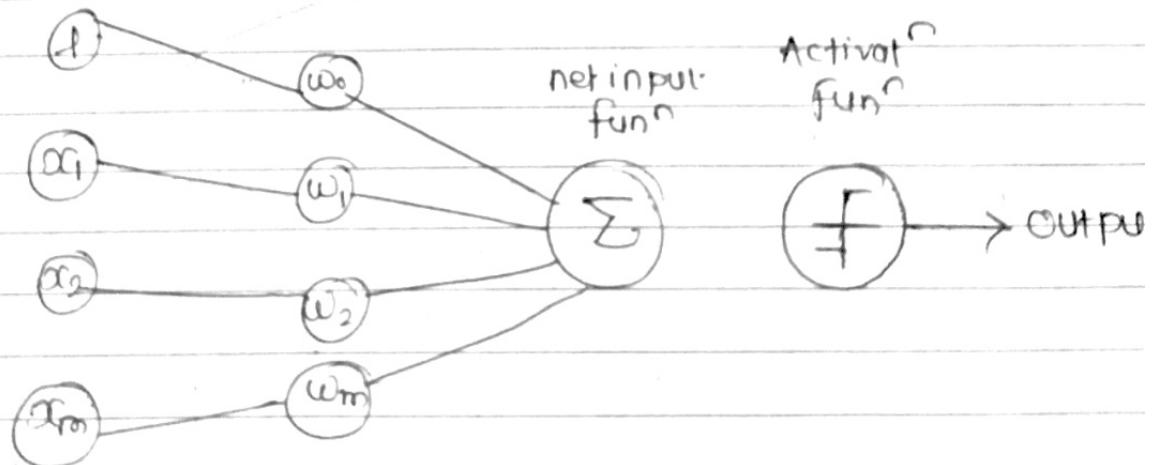
- perceptron is a type of Artificial neural network used for supervised learning of various binary classification tasks. It is a linear classifier that consists of set of weights, inputs value and a threshold.

- the perceptron model begins with multiplying all inputs value and their weights, then add these value to create the weight sum.

- The perceptron also understood as an Artificial neuron or neural network unit that help to detect certain input data computations in business Intelligence.

- Basic component of Perceptron:

Input Weights



- Input Node or Input layer:-

This is the primary component of perception which accepts the initial data into the system for further processing. Each input node contains a real numerical value.

- Weights and Bias:-

Weight parameter represents the strength of the connection b/w units. This is another most important parameter of perception components. Weight is directly proportional to the strength of associate input neuron in deciding the output. Hence, Bias can be considered as the line of intercept in linear eqn.

- Activation fun:-

These are the final & important component that help to determine whether the neuron will fire or not. Activation fun can be considered primarily as a step fun.

Q.Q. What are learning laws in neural networks? List it?

Sol:

Learning rules in neural networks are method, mathematical logic or algo. that improve the new performance & training time. These rule are applied repeatedly over a network, updating the weight and bias levels of a network where network is simulate in a specific data environment. There are several learning rules in neural networks, including Hebbian Learning Rule,

perception learning rule, Delta Learning rule, correlation learning rule, Out star learning rule, & competitive learning rule. These learning rule are used to update the weight and bias of neural network during the ~~the~~ training process, allowing the network to learn from the data and improve its performance.

- The learning rules are one of the factors that decide how fast or how accurately the artificial networks can be developed.

Q.3. Explain Gradient Decent Rules ?

Ans: - Gradient decent rule, also known as learning rules, are algo. used to adjust the weights and bias of a neural network during the training process. These rule help minimize the error b/w the predicted & actual output. One of the most common gradient decent rule is the backpropagation algo. which is a supervised learning method that use the chain rule to calculate the gradient of the error with respect to weight.

- The Backpropagation algo. can be describe as follow:

- 1) forward pass: compute output of nw for given input-
- 2) calculate error b/w the predicted output & the actual output
- 3) backward pass: calculate the gradient of the error with respect to the weight one lineage using chain rule.

4) Update the weight & bias in the direction opposite to gradient.

- this process is repeat for all training example & the weight & bias are update after each example.

Q.4 List application of Back propagation network.

- Backpropagation is a gradient learning algo used to train feedforward neural network such as multilayer perceptron & convolutional neural network. It is a supervised learning method that calculate the gradient of the error with respect to the weight and bias of the network, allowing the net to adjust weight & bias to minimize error between predicted & actual output.

• App:

- 1) Optical Character Recognition (OCR)
- 2) Natural Language Processing (NLP)
- 3) Image processing
- 4) Speech Recognition
- 5) Source target Recognition
- 6) Face recognition
- 7) Autonomous Vehicle control
- 8) Medical image Analysis.

Q.5 Mention the Merits & Demerits of backpropagation networks?

Sol:

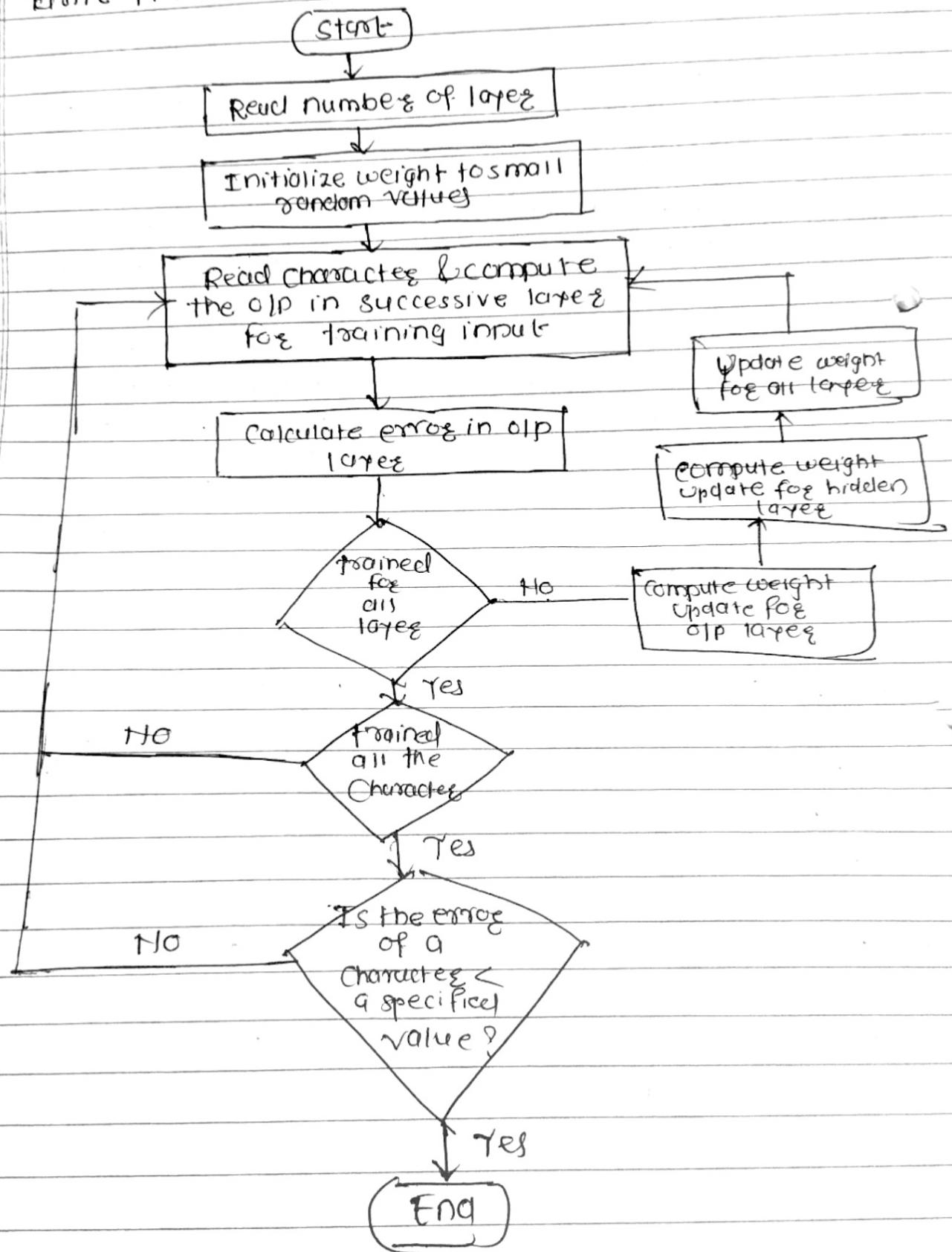
Merits

Demerits

- 1) It is widely used algo for training feedforward Neural Network.
- 2) It is a fast method & is rather easy to implement.
- 3) The approach tends to work rather well in most situations.
- 4) It can handle complex problem & can leave feature that are difficult to discover manually.
- 5) It can be used for various appn, such as image processing, Speech Recognition & financial time series analysis.
- 1) It could be rather sensitive to noisy data and irregularity.
- 2) The performance of backpropagation relies very heavily on the learning data.
- 3) It needs a very large amount of time for training.
- 4) It is Supervised Learning method. Which means it require labeled data for training.
- 5) It is not suitable for unsupervised learning tasks, such as clustering & dimension reduction.

Q.6
Sol?

Write flowchart of error Backpropagation training algo?



Q.7. Give the step by step procedure of Backpropagation
Algo :-

Sol:-

- Procedure:-

- 1) Initialize Network: set the initial weight & bias for the neural network.

- 2) Forward Pass:

- Input training data into the network
- compute the outputs of the network using the current weight and biases.
- calculate the error between predicted output and actual output.

- 3) Backpropagation Pass:

- calculate gradient of the error with respect to the weight & biases using chain rule.
- update weight & biases in the direction opposite to the gradient to minimize error

- 4) Repeat:-

- Repeat the forward & backward passes for all training examples.
- Update weight & bias after each example.

- 5) Calculate Convergence Check:-

- check if error has converged to an acceptable level.
- If not, repeat process from forward pass

Q) End :-

- Once error has converged, end training process.

Q.8. Explain supervised, unsupervised & Reinforcement learning with example?

Sol:-

i) Supervised Learning :-

- It is a type of machine learning algo. that learns from labeled data. Labeled data is data that has been tagged with a correct answer of classification. It is when we teach or train the training using data that is well labelled. The Machine learning provided with a new set of example(data), so that the supervised learning algo. analyses the training data and predicts the output for new input data.

ii) Unsupervised learning :-

- It is also called as clustering.
It is work on a unlabeled data set - It's mean a data has not output of classification. The training of a model is not happen.

- It is work like when similar type of data got it combine it to each other that has some feature & form a cluster.

③ Reinforcement learning :-

- It is a type of machine learning algo. that learn through trial and Error. The machine interacts with an environment and learns to take actions that minimize a reward signal. The machine learns from feedback in the form of rewards or punishment. Example of Reinforcement learning include game playing, robotics & Autonomous driving.

Q.q. Explain feed forward & feedback Network :-

sol:-

1) Feed forward Network:-

- It is a type of neural network where signals travel in only one direction, from input to output. There are no feedback loops, meaning that output of any layer does not affect that same layer. Feedforward net is considered as non-recurrent network with input, output & hidden layers.

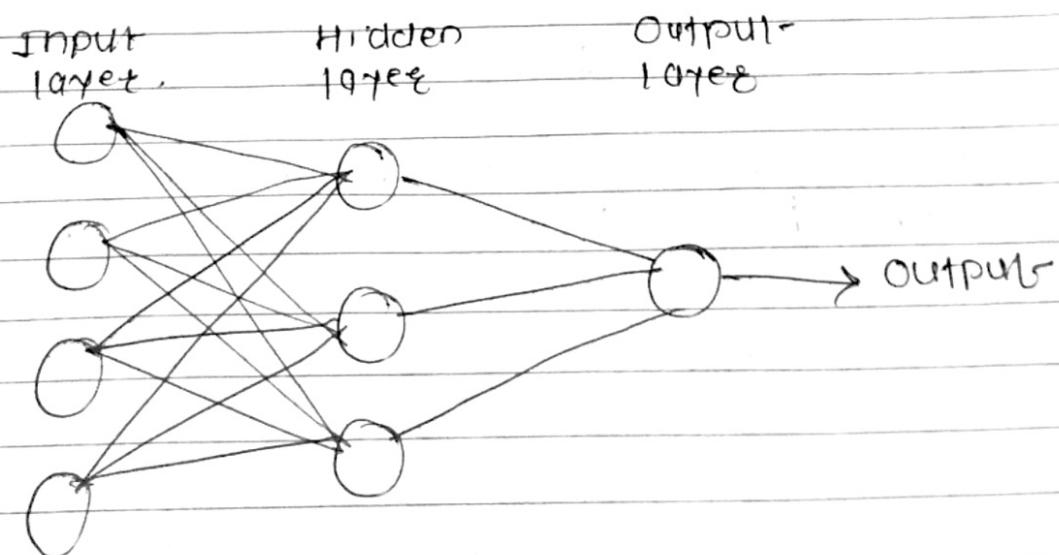


fig. feedforward ANN

a) Feedback Network :-

- A feedback network, also known as a recurrent neural network (RNN), allows signals to travel in both directions by using loops to travel in both forward as well as backward.

- Feedback networks are dynamic and can get extremely complex. They aim to achieve a state of equilibrium and maintain it until there is a change in input. Feedback networks are used for tasks that require memory, such as speech recognition and handwriting recognition.

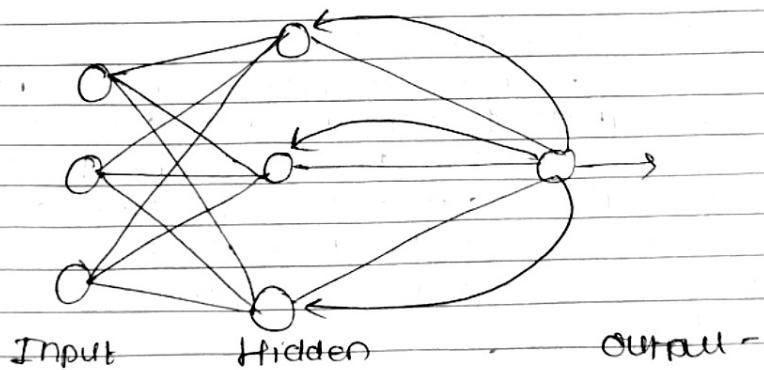


fig. Feedback net.

Q.10 How to determine the number of hidden neurons in single hidden layer feed forward neural net?

A: Determine the number of hidden neurons in a important aspect of network design. While there is no magic formula for selecting the optimum number of hidden neurons, there are several rule of method and guideline that can be used.

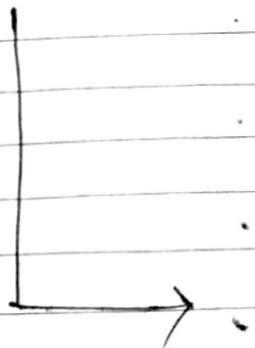
As a starting point, some of these method includes

- i) The number of hidden neuron should be return the size of output layer.
- ii) The number of hidden neurons should be 2/3 the size of the input layer, plus the size of the output layer.
- iii) The number of hidden neurons should be less than twice of size of input layer.

Q-11 Sketch the architecture of 10/16/5 multilayered feed forward neural network?

Sol:

10/16/5 multilayered feed forward neural network mean that There is 10 input layer, 16 hidden layer & 5 will be the output layer connected to each other.



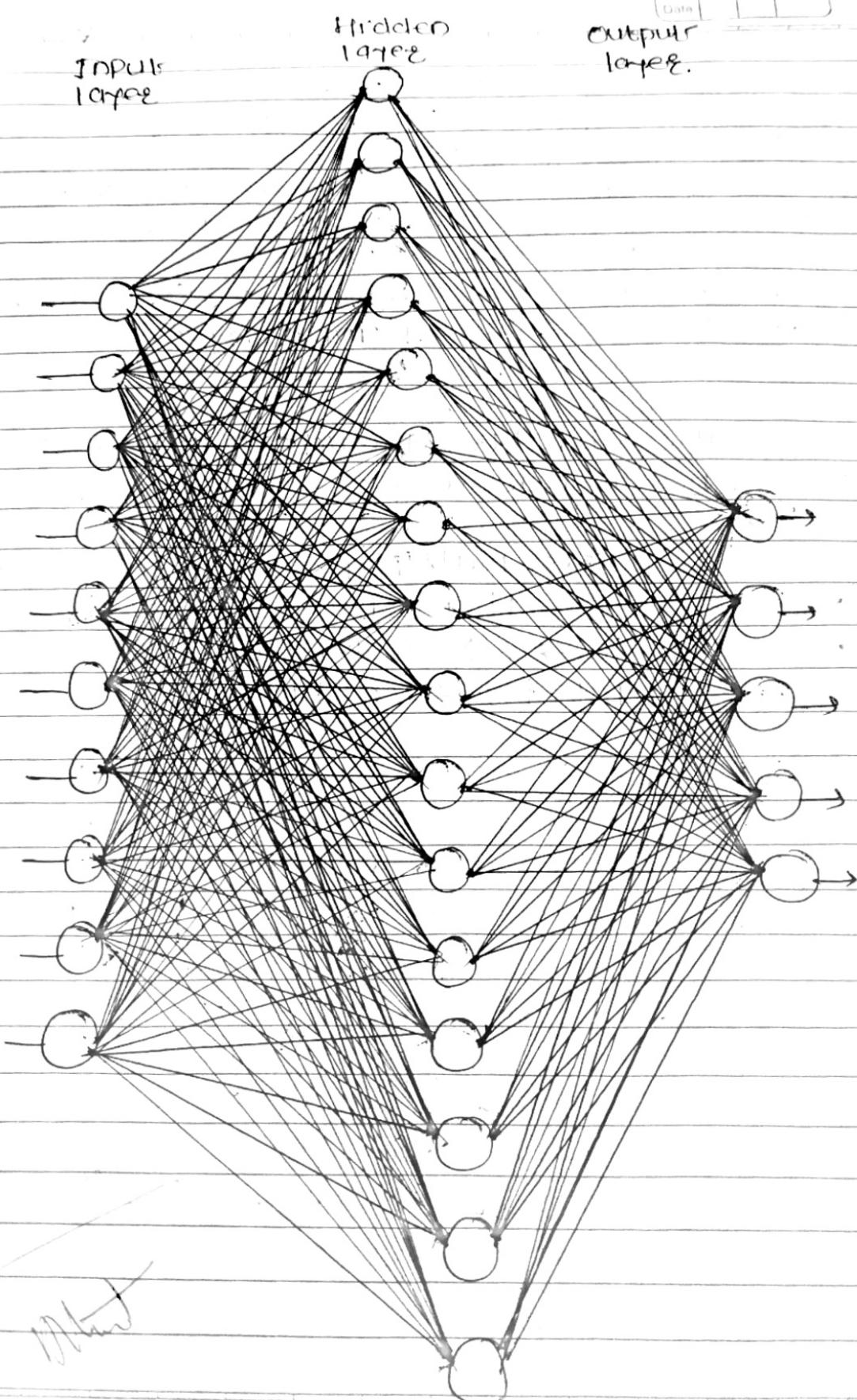


fig. 10/16/15 multilayer feedforward net