Assignment -4

Title: Demonstrate the Perceptron learning law with its decision regions.

Aim: With a suitable example demonstrate the perceptron learning law with its decision regions using python. Give the output in graphical form.

Objective: To learn perceptron laws with decision regions.

Theory: Neural networks are a branch of-Artificial Intelligence". Artificial Nemal Network is a system loosely modeled based on the human brain. Neural networks are a powerful technique to solve many real world problems. They have the ability to learn from experience in order to improve their performance and to adapt themselves to changes in the environment. In addition to that they are able to deal with incomplete information or noisy data and can be very effective especially in situations where it is not possible to define the rules or steps that lead to the solution of a problem. In a nutshell a Neural network can be considered as a black box that is able to predict an output pattern when it recognizes a given input pattern. Once trained, the neural network is able to recognize similarities when presented with a new input pattern, resulting in a predicted output pattern.

$$Sum = \sum_{i=1}^{N} I_i W_i + b,$$

where b represents the bias value.

Algorithm:

Perceptron Leaming Algorithm: The perceptron learning rule was originally developed by Frank Rosenblatt in the late 1950s. Training patterns are presented to the network's inputs; the output is computed. Then the connection weights are modified by an amount that is proportional to the product of the difference between the actual output, y, and the desired output, d, and the input pattern, x. The algorithm is as follows:

1. Initialize the weights and threshold to small random numbers.
2. Present a vector x to the neuron inputs and calculate the output.
3. Update the weights according to: where d is the desired output, t is the iteration number, and eta is the gain or step size, where 0.0 < n < 1.0 4.

$$w_j(t+1) = w_j(t)+\eta(d-y)x$$

Repeat steps 2 and 3 until: 34 Department of Computer Engineering:

1. The iteration error is less than a user-specified error threshold.
2. A predetermined number of iterations have been completed.

Conclusion:

In this way have successfully implemented perceptron learning law with its decision regions using python.

Questions:

1. Explain Associate Learning with an example
2. Explain Hopfield Network with example.
3. Explain simulated annealing.
4. Explain Boltzmann Machine.
5. Explain Boltzmann Learning.