BITS Pilani, Post Graduate Programme in AI/ML
C6: Deep Learning and ANN

Assignment-01

Submission Deadline - Tue Mar 10, 2020 [Marks: 14]

Note: Put all the code and findings in a single pdf file for submission.

Q1. Train a Perceptron

Perceptron is a fundamental building block for neural network. Let us try to train a single perceptron.

Consider the data given in adjacent table. As one can see, it has two attributes x_1, x_2 and a class label (either 0 or 1).

x_1	x_2	Class
2	3	0
4	5	0
11	11	1
4	11	1
12	5	0
5	2	0
6	1	0
6	3	0
2	10	1
4	7	1
13	8	0
1	6	1
6	9	1
10	12	1
8	3	0
2	8	1

1. Write a `python script` to implement perceptron training rule and get the appropriate parameters for a single perceptron
2. Write a `python script` to plot the data points and the obtained decision boundary
3. Show how the decision boundary changed with each iteration
4. Also draw the schematic diagram of the trained perceptron with learned weights

[Marks: 3+2+1+1]

Q2. Train a Neural Network

Let us design a neural network to classify a data point in two dimensional space as red or blue. Definitely the input would have two value. Let the first hidden layer has 9 neurons. Second hidden layer has layer has three neurons. Final output layer has two neuron signifying the probability of red or blue color respectively.

1. Use `keras` to design the NN model and train on the data given below

2. Report training accuracy and show how error/loss reduces as the training proceeds for your training. How many epochs are sufficient for the training. Draw the schematic diagram of the NN along with all the weights and specify suitable activation function. How many trainable parameters are there?

3. After training, plot the data-points and the decision boundary of all the nine neurons of the first layer.

4. What is the prediction of your model for the point (15,15) and (7,3).

5. Suggest any other NN architecture that suits the training better or argue that this one is the best.

Class	Points
Blue	(10,18) (7,18) (4,17) (3,16) (1,13) (1,10) (11,10) (16,16) (21,6) (26,10) (10,1) (13,7) (18,12) (22,18) (23,10) (8,9) (6,6) (9,8) (13,5) (22,6) (5,1) (19,5) (4,9) (6,9) (3,5) (3,2) (11,3) (19,10) (26,17) (21,4) (22,6) (20,7) (18,16)
Red	(8,3) (21,13) (8,15) (6,14) (9,4) (25,14) (7,4) (9,14) (22,14) (5,13) (8,2) (6,3) (7,3) (8,14) (22,15) (9,12) (7,12)

[Marks: 2+2+2+1+1]