

Neural Network- 19B16CS311

Assignment-7(a) & 7(b)

Evaluative Assignment [20 Marks]

Evaluation Date: 28th Feb (for Thursday Batch)

2nd March (for Saturday Batch)

Note: No extension in evaluation deadline. If any student is on leave then Evaluate your implementation to your faculty before evaluation date.

Q1:[3 marks] Answer the following

1. Following are the specification for a two input neuron

Input=[-5 6]

Weight= [3 2]

Bias=-1.2

- (a) What is the input to the transfer function?
- (b) Write the output by using linear and hyperbolic tangent sigmoid transfer function?

Q2: [2 marks] Implement the backpropagation algorithm that will train the following conditioned network

The network has three neurons in the input layer, two neurons in the hidden layer, and three neurons in the output layer. Run this exercise for the following dataset

Input(1, 0.25, -0.5) Output(1, -1, 0)

Q3. [7 Marks] Implement a two-layer perceptron with the backpropagation algorithm to solve the parity problem. Showcase results of your implementation; and your python code.

Parity Problem: The desired output for the parity problem is 1 if an input pattern contains an odd number of 1's and 0 otherwise.

Input Layer: 4 binary input elements,

Hidden Layer: 4

Output: 1 output unit for the second layer.

The learning procedure is stopped when an absolute error (difference) of 0.05 is reached for every input pattern. Initialize all **weights and biases** to random numbers between **-1 and 1**. Use a logistic sigmoid with $a = 1$ as the activation function for all units.

Q4 [8 marks]: Write Neural Network code in python for soil exploration and classification to find the suitability of soil for the construction of structures.

Output class is as follows:

0.1	0.2	0.3	0.6
Clayey sand (SC)	Clay with medium compressibility (CI)	Clay with low compressibility. (CL)	Slit with medium compressibility (MI)

Architecture used for grouping the soil is 6(Inputs) - 6(Hidden Neurons) -1(output neuron).

Inputs represent color of soil, percentage of gravel, percentage of sand, percentage of fine grained particles, liquid limit, and plastic limit. Network training iterations: 250, **learning rate: 0.6, momentum : 0.9.**

Training data

Color	Gravel (%)	Sand(%)	Fine Grained particles (%)	Liquid Limit (%)	Plastic Limit (%)	Classification
0.2	0.111	0.682	0.5	0.508	0.529	0.1(0.1)
0.2	0	0.536	0.666	0.576	0.647	0.292(0.3)
0.1	0	0.329	0.869	0.711	0.735	0.203(0.2)
0.3	0	0.756	0.452	0.491	0.529	0.129(0.1)
0.5	0	0.585	0.619	0.627	0.852	0.608(0.6)
0.2	0	0.524	0.678	0.576	0.676	0.328(0.3)
0.5	0	0.573	0.63	0.61	0.823	0.595(0.6)
0.2	0	0.512	0.69	0.576	0.647	0.296(0.3)
0.1	0	0.341	0.857	0.694	0.705	193(0.2)
0.2	0	0.548	0.654	0.576	0.647	0.289(0.3)
0.7	0	0.353	0.845	0.677	1	0.614(0.6)
0.5	0	0.585	0.619	0.61	0.823	0.594(0.6)
0.2	0.222	0.682	0.476	0.508	0.529	0.0842(.1)
0.1	0	0.317	0.88	0.728	0.764	211(0.2)
0.1	0	0.341	0.857	0.711	0.735	0.21(0.2)
0.2	0.166	0.67	0.5	0.525	0.558	0.112(0.1)

Test Data

0.1	0	0.304	0.892	0.728	0.754	204(0.2)
0.2	0	0.536	0.666	0.576	0.647	292(0.3)

0.5	0	0.597	0.607	0.61	0.823	592(0.6)
0.1	0	0.951	0.261	0.627	0.676	0912(0.1)
0.2	0	0.512	0.69	0.593	0.676	326(0.3)
0.1	0	0.926	0.285	0.627	0.676	0961(0.1)
0.2	222	0.658	0.5	0.525	0.529	0887(0.1)
0.1	0	0.341	0.857	0.728	0.735	206(0.2)