

1. Consider the single neuron for classification three data sets from DataSet1. The “txt” files with data must be downloading from Sigarra web to your PC. Assume that we do not query the neural network outside of the training domain. In this problem you shall develop a script for *Matlab* that implement a single neuron which learns to separate two classes.

Your algorithm reads a number of 3 value training examples: each such example consists of two inputs, X and Y value and a desired output value, Z, of +1 or -1.

The exact number of training examples is unknown, but you can safely assume you will read ≤ 1000 .

At some point your algorithm will find a training example “0,0,0”. Do not include the example “0,0,0” in your training set. Note that the desired output of zero means that is invalid. This code only indicates that the training data is completely read, and your algorithm should start training the neuron.

After training, your program continues to read 2-valued evaluation data. For each such example your program should report the corresponding class “+1 or -1” as output.

- a) Study from *Matlab* documentation how your algorithm can read formatted data from text file ‘txt’?
 - b) Think about how you compute the “error” of your neuron for training.
 - c) Use small radon numbers to initializer the weights and choose a small constant value for learning rate.
 - d) Think about how you can normalize the data.
 - e) What is the neuron supposed to output? A linear output neuron can do this task?
 - f) What happen if a *tanh* function is used?
2. Consider a neuronal network for classification three data sets from DataSet2. Same scenario as in problem 1, but here the data is not linearly separable. The “txt” files with data must be downloading from Sigarra web to your PC.
 - a) What is the reason for it being necessary to use a multi-layer neural network to solve this problem?
 - b) Develop a script for *Matlab* that implement a multi-layer neural network.
 3. Develop a model for a Photovoltaic (PV) panel using a neural network technique. The main goal neural network model is to estimate the values of output voltage of the panel. The performance goal is specified as 0,15 (MSE). The train data (DataSet3) must be downloading from Sigarra web to your PC. The “txt” file with data sets were chosen to cover all the typical input space in order to get good performance where temperature ranges from -40 °C to 52 °C, solar irradiation ranged from 50 to 1000 W/m² and data for validation. For each line of data, the first element is the value of solar irradiation, the second element is the temperature and the third corresponds to the target voltages. The first 23 sets of input data are given to the network training and the last nine for validation.

Remarks:

You should complete this sheet with one classmate or you can choose to work on your own. The report will be submit one week after the class and it should contain the answers to specific questions above and the descriptions of the neural networks developed, the *Matlab* plots of the input data with blue dots for class +1 and red dots for class -1. The query points in black dots. The outputs of the algorithm should be presented as one table for each example and in annex your code.