20CS6037

Fall 2021

Instructor: Anca Ralescu

**Homework Assignment #5**

**Assigned on 11/2/2021**

**Due on Canvas on 11/16/2021**

**NO LATER THAN 11:59PM**

**50 points**

Implement a classifier using a neural network with the **back-propagation rule** for the data set ‘data\_banknote\_authentification.txt’ provided on Canvas.

A full description of the data set is available at [https://archive.ics.uci.edu/ml/datasets/banknote+authentication#](https://archive.ics.uci.edu/ml/datasets/banknote+authentication)

Two issues are to be considered as follows:

1. The selection of the squashing function, and
2. The selection of the **number of nodes in the hidden layer.**

**With respect to (1), two squashing functions should be considered:**

1. **the sigmoid function:** whose derivative is
2. **the hyperbolic tangent:**  with derivative is

**With respect to (2), to decide the number of nodes in the hidden layer, use cross validation.**

1. First, divide the data set into three sets: training, validation and test.
2. **For each selection of the squashing function, execute the steps below**
   1. Use the same training, validation and test sets in all the experiments.
   2. Start with the number of hidden nodes equal to the input nodes, decrease the size hidden layer by one node at a time, train the network, and test the result on the validation set.
   3. Select the best size of the hidden layer based on the results on the validation set.
   4. Then test the network obtained on the test set.

**Turn in your code along with a one-page analysis of the results (accuracy).**