**MACHINE LEARNING FROM DATA**

**Fall 2018**

**Report: Lab Session 5 – Neural Networks**

**Names:**

**Group:**

Instructions

* Answer the questions
* Save the report and Matlab code in a folder, and upload the compressed folder (zip, rar).

Questions

Q1: List the main network features: training function, performance function, number of hidden layers, learning rate (for traingd), epochs, early stopping criterion. You will need to search Matlab help documentation to find the default values of some of the hyperparameters (ex. help traingd)

Q2: Train the network using gradient descent. Copy Performance and Confusion figures and discuss the results.

Q3: Repeat the experiment in Q2 changing the values of the learning rate (ex. 0.05 or 0.1). If necessary, change the default number of epochs so that the training stops when there are no improvements on the validation set. Discuss the results

Q4: Train the network using Levenberg-Marquadt (net.trainFcn=’trainlm’). Compare with gradient descent in terms of convergence speed and performance.

Q5: Which are the network settings and hyperparameters? (training algorithm, performance function, number of epochs, etc.)

Q6: Compute confusion matrices and performance plots for the training, validation and test sets. Insert the figures in the report. Discuss results.

Q7: Try to improve the network performance by increasing the number neurons in the hidden layer. Edit the script, add the code to validate the number of neurons. Choose the number of neurons that minimize the classification error on the validation set. Try with the following numbers: 10, 50, 100, 150, 200, 250, 300. Compute the error on the test set.

Q8: Plot the network accuracy vs the number of hidden layers