

EEL 6814

### Project 1

Due March 22, 2016

This project deals with the development of a neural network based classifier to separate rocks from mines sensed with sonar bounced off a metal cylinder and those bounced off a roughly cylindrical rock. This problem was used by Gorman and Sejnowski to show the discriminant power of MLPs. The data set has 60 inputs indicating the sonar return data and 1 output that indicates whether it is a mine or a rock. Output Encoding: Radar returns are encoded as follows: 1 = mine, 0 = rock. I am providing in the course website 208 exemplars of 60 points each. The goal is to perform a static classification, e.g. to take one exemplar of each spectra and classify it as belonging to one of the two classes.

The classifier should be a feedforward network, trained with backpropagation. You will have to decide the network architecture (#PEs, # of layers), learning rates, and how to stop training. You should use two thirds of the data for training and the rest for testing. I suggest that you randomly create the training and test sets, but use the same number of exemplars for each class. Alternatively, you can use a MLP trained with conjugate gradient or Levenberg-Marquadt instead of back-propagation, and/or a RBF network instead of the MLP. Comparison between two classifiers is recommended for conclusions, but it is not required (i.e. if you study exhaustively one topology, training and preprocessing it will be equally well received).

The results should be presented in a confusion matrix. I want also to see plots about learning, and a discussion about how well the network learned the task, supported by plots.

Remember:

This is a project, so I expect a report, explaining the rational of the method and the details of the implementation and the reason for the choices.

The report format should be a technical paper, which includes, abstract, introduction, methods, results, discussion and conclusions and references of no more than 7 pages double column (IEEE format) or 15 single column paper.