**Project 2. Neural Network – Dataset Writeup**

1. **How to use the program**

The program consists of two parts: training and testing. The first part of the program will prompt for an initial neural network file, a train file, number of epochs, and a learning rate. The second part of the program will prompt for a trained network file and a test file. The following is a list of what each of my files represent. To compile each program, either type make train of make test!

***List of inputs to the program***

1. Initial Neural Network file: wine.init
2. Train file: wine.train
3. Test file: wine.test
4. **Data Description**

The data set that I used was a wine data set. The inputs to the data set include 13 attributes such as alcohol percentage, color intensity, magnesium mass and so forth. The output is a classification of wine class from one to three. The data was obtained from the UC Irvine Machine Learning repository (<http://archive.ics.uci.edu/ml/datasets/Wine>). For a more detailed information about the dataset refer to the wine.name.txt file in the attached files. To process the data, the input attributes were normalized using the formula . In other words, all data was normalized to a value between 0 and 1 using linear scale. Class 1 wines were output as 1 0 0, class 2 wines as 0 1 0, and class 3 as 0 0 1. The initial dataset included 178 data samples. There were 59 class 1 wines, 71 class 2 wines, and 48 class 3 wines initially. I took 100 of the samples as a training set, and 78 as testing set.

1. **Training and Testing**

For the initial file, I set the number of hidden layers as 4. I have read that “*the optimal size of the hidden layer is usually between the size of the input and size of the output layer*” from Introduction to Neural Networks in Java by Jeff Heaton. The initial weights were randomly generated. I found that epoch of 200 and learning rate of 0.1 worked well. The test ended with a 98.3 percent overall accuracy. Using theses settings, the trained file was named wine.1.200.trained, and the result file was wine.1.200.result.