Statistical Learning and Fuzzy Logic Algorithms - CMSC 678
Project No. 3
Due Wednesday, Oct 31th, 2018, 2pm

1) 10% of grade

For a given dataset *cancer* design a multilayer perceptron neural network. For hidden layer neurons use the tangent hyperbolic activation function (AF) given as $y = \dfrac{2}{1+e^{-2u}} - 1$. This is a problem with two classes only. So, we have only one OL neuron and let its AF be linear. Split your data randomly into the training and test dataset as 75% for training and 25% for test.

Your tasks are:

1. to design an NN which will be the best for cancer data classification. This means that you will have to play with various numbers *N* of centers (activation functions, neurons) and various number *I* of iterations steps while learning. (1 iteration step is one sweep through the training datasets, meaning *one epoch*).
   - Play with following numbers N_0 = [5 10 15 25 50 75 100] and I_0 = [100 250 500 1000]

2. For each selection of *N* and *I* after the training is over, calculate the output layer outputs for all the test inputs and see what is the error in percentage on the test data points. Save this error as $E = E(N, I)$. After the training plot the *E* surface (use mesh here) and choose the best *N* and *I*. **Report the smallest *E*, and best both *N* and *I*. Also, report the smallest errors in percent achieved for each class. In the case of tie choose smallest N and then smallest Iteration.**

Some hints:

SOFTWARE MUST BE USER FRIENDLY, so that I can run it easily too. At the top of your routine have the command: `close all, clear all, format compact`. *Now, the calculations can take some time. Be prepared.*

Your report should be in a form of IEEE journal (conference) paper. Use the template given.

Submit both your written report and program to me by Email.

*ZIP your report and all programs and data needed into **a single zip file**, name it with your family name (say, lee.zip) and send it to me. A **Subject** field in your Email should be **CMSC 678, Family name, Project 3**. Don't hesitate to contact me in the case of need. Use my **office hours – Tuesday or Thursday 11am-12pm**.*

My Email is: vkecman@vcu.edu.