**Advanced Data Analysis MTH 9797 & STA 9797**

**Machine Learning - Homework #4**

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Due: Friday, 12/1 by 6:00pm

Submit via Blackboard

**Machine Learning**

* Dataset: Excel\_HW04\_Data.xlsx.
* Train a Neural Network & Estimate Output Value from the trained NNet.

**Machine Learning for Pattern Recognition**

* The input data is a digital scoreboard with ten input values: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.
* The data grid is segmented into 15 pixels = 5 rows x 3 column.
* Input Data and Response/Output Data is on sheet “DATA” in fields x1 through x15. The Input Data has a 1 if the light is on and a 0 if the light is off. The Response/Output Data is on sheet “DATA” in field “y.” It has values from 0 to 0.9. The actual value of each output is the output data value multiplied by 10. E.g., 0=0, 0.1=1, 0.2=2, …., 0.9=9.
* Prediction Data is on sheet “Prediction.” This is the data vector that we will use to predict the output data from our trained NNet.
* The digital scoreboard values and corresponding vectors for the complete number is on the sheet “Scoreboard.”
* The input data includes the vector for the complete number, and for the number with 1 or 2 incorrect values. This is similar to a scoreboard malfunction where a light is not working and never on, or a light that is not going off.

**4.1: Training a Neural Network to recognize the Input data.**

* You will need to copy the data from the Excel Spreadsheet into the Neural Network software.
* Depending on the NNet, you may need to transpose the data so that it is written as column vectors.
* The data in the Spreadsheet is written as row vectors. In MATLAB, we would need to transpose this data.

**4.2: Estimate Output Values**

* Using the 10 input vectors on sheet “Prediction,” estimate the output value from your trained NNET.
* How could we get better results for both the in-sample and out-sample (output predictions)?