**Assignment 4– Multilayer Perceptron.**

***Assignment overview.*** This assignment is designed to introduce you to a basic neural network. Your task is to modify the MLP program from class that we used to solve the XOR problem to apply it to a letter recognition task.

***Submission.*** As usual, please submit your program and answers as Jupyder notebook on Brightspace as ML\_Assignment3.

***Submission deadline.*** Tuesday, March 6 at 2:00 pm.

***Late submission can not be accepted. policy.***

***Academic Integrity.*** Dalhousie academic integrity policy applies to all submissions in this course. You are expected to submit your own work. Please refer to and understand the academic integrity policy, available at <https://www.dal.ca/academicintegrity>

***If you have a question:*** Teaching Assistants (TAs) will be present during the labs to help you with any questions you may have. If you still have questions, feel free to email me at [tt@cs.dal.ca](mailto:tt@cs.dal.ca).

**Questions:**

1. **[20 marks, 15 marks for Grads]** Implement a multi-layer perceptron (MLP) by modifying the MLP program from the class to solve the XOR problem and train it to translate the digital letters given in file *pattern1* into the corresponding ASCII representation. In the file, each letter of the alphabet is represented by a matrix of 12x13 binary values so that each consecutive 12 rows represent one letter. **Plot** a training curve and **interpret** your results.
2. **[20 marks, 10 marks for Grads]** Investigate how much noise the MLP can tolerate in the pattern before being unable to recognize a letter. Explain your implementation of noise and report your results.
3. **[10 marks, 5 marks for Grads] Which** letter is represented in file *pattern2*?
4. **Grad Students only [20 marks]** Investigate the network performance when training on noisy patterns. Also, **how** does the number of hidden nodes influence the performance?

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