

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 Jupyter 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.

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?