Assignment 5– Multilayer Perceptron.

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

Submission. Create a folder called ML_Assignment5 and put all the files inside the folder. Compress this folder to create either ML_Assignment5.zip or ML_Assignment5.rar. Submit this compressed folder as your assignment submission on Brightspace.

Submission deadline. Thursday, Oct 26, 10:00 pm.

Late submission policy. If submitted after the due date, the penalty will be 10% per day.

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

Python: We will be using Python for the programming exercises based on scientific Python libraries like

- **numpy** - mainly useful for its *N*-dimensional array objects.
- **matplotlib** - 2D plotting library producing publication quality figures.

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. **[50 marks, 40 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. **Plot** a training curve and **interpret** your results.
2. **[30 marks, 20 marks for Grads]** Investigate how much noise the MLP can tolerate in the pattern before being unable to recognize a letter. **Report** your results.
3. **[20 marks, 10 marks for Grads] Which** letter is represented in file *pattern2*?
4. **Grad Students only [30 marks]** Investigate the network performance when training on noisy patterns. Also, **how** the number of hidden nodes influence the performance?

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