**Assignment 2– MLP and Filters.**

***Assignment overview.*** This assignment is designed to start exploring the capabilities of neural networks and to convolutions. This is a group assignment with groups of two. Please find a partner and work together on this assignment. Please let me know in a timely manner if you have not found a partner. Your task in this assignment is to apply an edge filter to photographs of you and to modify an MLP program in various ways.

***Submission.*** Please submit your program and answers as Jupyter notebook on Brightspace as A2. All programs have to be included in the submission.

***Submission deadline.*** Wednesday, October 3 at 11:00 am.

***Late submission can not be accepted and no extension will be granted for this assignment!***

***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. **[15 marks]** Implement a multi-layer perceptron (MLP) with Sklearn or Keras to memorize 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 (the performance of the model on the training data) and **interpret** your results.
2. **[10 marks]** Investigate how good the network can generalize to noisy versions of the patterns. Explain your implementation of noise and report your results. Show an example where you plot the training and generalization curve together in a plot.
3. **[5 marks] Which** letter is represented in file *pattern2*?
4. **[10 marks]** Investigate the network performance when training on noisy patterns. Also, **how** does the number of hidden nodes influence the performance?
5. **[10 marks]** Take a **photograph** of your team members and apply an edge filter to it. Show the original photo and the filtered images. Your submission has to show the program.
6. **[up to 3 bonus points]** Read the manuscript and report any error you find.