

Lakehead University  
Computer Science Department  
COMP 5413-AA (AI for Autonomous Systems)

## Assignment #2

Please ensure you answer all questions as each question carries 10 points.

1. Implement K-mean cluster algorithm using the same data in the lecture. Your implementation should include:
  - a. Two clusters
  - b. Three clusters.
  - c. Four clusters.
  - d. Plot the data points for each cluster for each iteration.
2. Implement a neuron network for classifying digits. The input layer has 784 inputs, a hidden layer with 5 neurons and a sigmoid activation function, and an output layer with 10 neurons and a softmax activation function. You can download a dataset from:  
<https://www.kaggle.com/datasets/hojjatk/mnist-dataset>  
<https://paperswithcode.com/dataset/mnist>  
you can use this source as an example  
<https://becominghuman.ai/simple-neural-network-on-mnist-handwritten-digit-dataset-61e47702ed25>

3. Implement a CNN to classify the same dataset in question 2 with the following layers:

Layer	Remark	Activation Function
Input	28×28 nodes	-
Convolution	20 convolution filters ( 9×9 )	ReLU
Pooling	1 mean pooling ( 2×2 )	-
Hidden	100 nodes	ReLU
Output	10 nodes	Softmax

4. Repeat 2 and 3, but use different layers of your choosing.