Programming Assignment-3
Part-I
Robot Vision

Notes

Programming language for the assignment is **Python** and you will use **PyTorch** framework for deep learning. You can use standard python built-in IDLE, or other IDLEs such as CANOPY, PyCharm Community Edition, PyScripter, CodeSculptor, Eric Python, Eclipse plus PyDev, etc.

Following libraries can be used when necessary:

- PIL (The Python Imaging Library), Matplotlib, NumPy, SciPy, LibSVM, OpenCV, VLFeat, python-graph.

Submit part-1 by **21st April 2021**, 11.59pm.

Question 1: Neural Networks [5 pts]

You goal in this assignment is to train neural networks for digit classification. You will use MNIST dataset which has around 70K images of handwritten digits. You will be provided the template code for this assignment and you have to make some changes to the network and analyze the results after these changes.
Your tasks:

1.5 pt   **Simple neural network**: In this task, your goal is to design a neural network with 3 layers (input, hidden, and output) and in each layer you should use less than 20 neurons. There should be **NO** activation functions in your network. There are 10 classes in MNIST dataset corresponding to each digit, so this will be a 10-way classification network.

1.5 pt   **Activation function**: In this task, you will add activation function to your network. Use ReLU activation in all your layers from the previous task.

2 pt   **Deep network**: In this task, your goal is to increase the size of the network. Your new network should have more than 4 layers and each layer should have more than 200 neurons. Use ReLU activation in all the layers. Note that the last layer will still have only 10 neurons as this is a 10-way classification network.

What to submit:

- Code: The completed code for all the tasks.

- A short write-up about the results and your observations from each tasks. For each task, you should report the training/testing accuracy for the best model. Analyze the variation in training/testing loss as you train your network and discuss what you observe. Also, discuss the time required for training your network.