Statistical Machine Learning Winter 2022
Assignment - 4 Deadline : $14^{th} May, 11:59 PM$

April 2022

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1 Instructions

- You are free to use either python or MATLAB for this assignment.
- You can use inbuilt libraries for Math, plotting, and handling the data (eg. NumPy, Pandas, Matplotlib).
- Usage instructions for other libraries can be found in the question.
- Only (*.py) and (*.m) files should be submitted for code.
- Create a (*.pdf) report explaining your assumptions, approach, results, and any further detail asked in the question.
- You should be able to replicate your results if required.

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2 Question: [4 Marks]

Use MNISTdataset and follow below instructions to solve this question. **NOTE :** To solve this question you are allowed to use any python packages or DL framework.

- Create a AutoEncoder with following instructions:
  - Create feed forward Neural Network as follows:
    - **Input layer** : (input = 784, output = 512,activation = ReLU)
    - **Hidden layer** : (input = 512, output = 128, activation = ReLU)
    - **Latent Space** : (input = 128,output = 64, activation = ReLU)
    - **Hidden layer** : (input = 64, output = 128,activation = ReLU)
    - **Hidden layer** :(input = 128,output = 512,activation = ReLU)
    - **Output layer** : (input = 512, output = ?,activation = ReLU)

  - Use appropriate loss function, and state why you used this loss function.
  - Use Adam optimizer to optimize the loss function with proper learning rate.
  - Use training data to train the autoencoder and plot epoch-wise loss.
  - After Training autoEncoder remove the decoder from the autoEncoder architecture.

- Create Classifcation Model called **MNIST Classifcation Model** with following configuration.
- Use the encoder and then argument it with the following.
  - **Input Layer** :(input = 64 , output = 32 , activation = ReLU)
  - **output Layer** : (input = 32 , output = ? , activation = Softmax)
- Use **MultiClass Cross Entropy loss** function and **Adam** optimizer to optimize the loss function with appropriate learning rate.
- Train **MNIST Classifcation Model** using training dataset.Plot epochwise training loss.
- Test using testing dataset and report accuracy and classwise accuracy.