CS554 Homework 4: Reconstruction and Classification by Transfer Learning
Spring 2023/2024

In this homework, you will first implement an unsupervised Convolutional Autoencoder to replicate MNIST images. Then you will generate a supervised version of the data set where the input is the hidden representation learned by the encoder and the output is the digit label. You will train a Linear classifier on this preprocessed dataset. This classifier has no feature-extracting hidden layer of its own, but it will be as if it uses the encoder for this purpose.

You will use Python and the PyTorch library.

Your task is to try out and report three different Autoencoder network architectures. You can experiment with different number of layers, connectivity structures and hidden representation sizes. Your task is not to find the best architecture but to try out the effect of different architectures on complexity and accuracy.

Your output and report should contain, **for each of the three autoencoder architectures**:

a) Its description and the total parameter count,
b) A plot of epochs vs Train/Test MSE during training, and the final train and test MSE values,
c) Once the training is complete, for each class, the original and reconstructed versions of one instance per class from the test set,
d) A plot of epochs vs Train/Test Misclassification Error of the linear classifier during training, and the final train and final test misclassification error values.

This homework is due **May 21st, 2024 (Tuesday), 23:00**.

Your submission should include a short report of your findings and your source code. Upload your report **as a pdf file** to LMS alongside your .py code file.