Deep Learning Assignment - 3

Instructions & Guidelines

- For this coding assignment, you're tasked with implementing and training three types of autoencoders: regular autoencoders, variational autoencoders (VAEs), and conditional variational autoencoders (CVAEs). Both the encoder and decoder architectures should follow the **ResNet** style.

- No extensions will be granted for this assignment under any circumstances.

- Use only data which is provided with this assignment

- Submit only the file named as per the following convention: `rollnoA3.py`. Ensure strict adherence to this naming convention. Any deviation from it, including the presence of multiple files, .ipynb files, or additional files, will result in non-evaluation. For example, if your roll number is 1234567 or MT34567, your filename should be `1234567A3.py` or `MT34567A3.py`

Coding Guidelines

- Use `requirements.txt` to setup the environment.

- You will receive a pipeline for training the architectures. Within the folder, locate a file named **changerollno.py**. Your task is to edit only this specific file .

- Do not change any variable/class/method name, as the pipeline will break. Modifying any other file's code will result in the pipeline not executing properly, leading to a score of 0 marks.

- Save your checkpoints. Your trained Encoder-Decoders will be tested on separate test-set for this assignment. Refrain for training on any additional data. However you can use any kind of augmentations you wish. You may also optimize number of channels in latent space.

- Do not add any user input variable in any of the class in your file. It will break the pipeline and again no marks.

- In test-set you must score SSIM above 0.6 to be eligible to get evaluated.

40 marks (20 marks for each Question.)

1. Train a Denoising AutoEncoder, encoder and decoder must follow ResNet style and residual connection must be after 2 convolution / 2 convolution-batchnorm layer. You are free to pick all other design choices. Plot 3D TSNE embedding plot for logits/embeddings (output from encoder) of whole data after every 10 epochs.

2. Train a Denoising Variational AutoEncoder, encoder and decoder must follow ResNet style and residual connection must be after 2 convolution / 2 convolution-batchnorm layer. You are free to pick all other design choices. Plot 3D TSNE embedding plot for sampled logits/embeddings from logits/embeddings (output from encoder) of whole data after every 10 epochs.

Bonus Question (5 Marks)

- Train a conditional variational autoencoder to generate one of the classes of MNIST dataset at inference time given class label.