Deep Learning Assignment-6 (Autoencoder)

Submission Policy and Requirements :

1. Programming languages and framework allowed: Python + PyTorch.
2. Do cite references (if using any)
3. Submissions should include a working code for the questions asked, and a report to show the analysis of results in each of the part.
4. Submission of the report is mandatory (**pdf only**).

Guidelines for Submission:

1. Separate colab files for each question.
2. A single report (pdf) for all questions
3. Mention all the relevant results and comparisons as asked or wherever required for a better understanding of the results (colab + report)
4. Submit code **(colab/notebook files only)** and report **(PDF file only)**
    a. Name the file with roll number and the assignment number.
    Ex: *Roll_Number_A2a.ipynb, Roll_Number_A2a.ipynb, Roll_Number_A2.pdf*

Problem Statement: Implement an Autoencoder in PyTorch to denoise noisy images and visualize the latent space using t-SNE.

Tasks:

1. Data Preparation [10]
    a. Use the Coloured MNIST dataset
    b. Add Gaussian noise (goal: to create noisy data)
2. Model Implementation [35]
    a. 4-layer Encoder and Decoder
        i. Use filters in this order: 128, 64, 32, 16
3. Evaluation [30]
    a. Pass the noisy images to your AE and get denoised images.
    b. Calculation metrics + {**Bonus: loss function + any other evaluation metrics}**
        i. SNR (Singal-to-noise-ratio)
        ii. Loss Function (MSE or/and *relevant loss function)
4. T-sne + Regularization [25]+ **{Bonus: t-sne visualizations and regularization technique }**
    a. Make use of t-sne to give intuitive visualization**s**
    b. Make use of the regularization technique/s.

Note:

- If you writing just theory, try to write crisp/point-wise (diagrams expected).
- If you producing/generating results, Add those to your report after that, write your observations/intuition.