CS89BD Deep Learning, Spring 2025

Assignment 4

Due: April 9, 2025

Total Points: 100

Question 1 (50 Points): Design a language translation model using Recurrent Neural Networks (RNNs) where your translation machine will convert sentences from English to French.

Dataset: the datasets are uploaded to the Blackboard for both languages:

- Small_vocab_en
- Small_vocab_fr

Reference code and databases are Assignment 4 reference code

Other resources:

The necessary codes for the following steps:

- Row data reading
- Encoding
- Tokenization
- Padding

They are uploaded to my GitHub link, which you can use to prepare the inputs for the models. In addition, an example of machine translation with a single-layer GRU has been provided as a reference.

Tasks:

1. Implement stacked (2-layer) RNN, stacked (2-layer) LSTM, and stacked (2-layer) GRU models for machine translation from English to French and compare the performance among them.
2. Please **provide at least ten** translations from English to French from each model in the report.

Question 2 (50 Points): Design a denoising auto-encoder model for document denoising. T

Dataset: denoising-dirty-documents

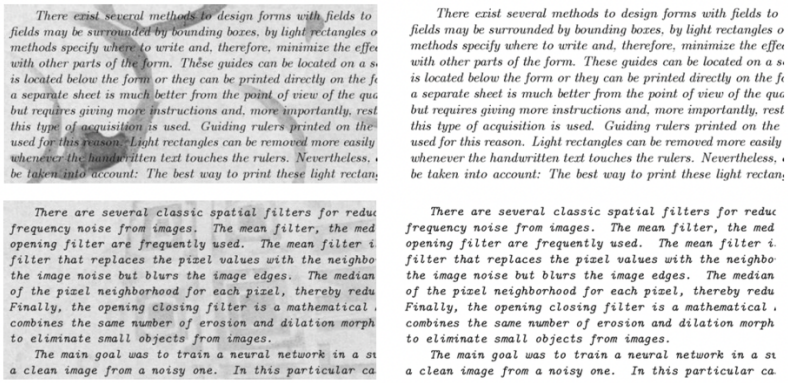

Figure 1: Example images from document denoising dataset: Noisy images on the left and clean images on the right

Task:
Implement and evaluate an autoencoder for denoising the document images. The dataset includes training and testing samples. The example images are shown in Figure 1. After training the model successfully, please provide MSE and Structural Similarity Index Measure(SSIM) analysis for the independent **testing samples** (e.g., for each image, you have to report the mean squared error (MSE) and SSIM

Write a report that represents a comparison of two models.
The report outlines: The report must contain:

- The title page includes course title, course number, your name, WSU ID, and assignment number
- Introduction
- Methodology
- Deep Learning Architecture
- Experiment and Results (graphs)
    - A graph that represents training error (y-axis) and training time(x-axis)
    - A graph that represents errors (i.e., training error and testing error on the y-axis) and training time (x-axis)
    - A graph that represents loss (training loss and testing loss) and number of epochs (x-axis)
    - Report **state-of-the-art** accuracy for this dataset
- Conclusion
- Reference