Assignment # 1

Generative AI **Deadline: September 29, 2024**

Instructor: Dr. Akhtar Jamil

Instructions

Note: There is no extension in the deadline. Please submit on or before the deadline. There is a **grace time of 2 hours** after the submission deadline expires. You must verify that your submissions are correct. Any submission received after this slack time will be considered late and NO marks will be awarded. There should be no comments provided on each line of code. You must provide detailed comments about functions that you create; that is enough to understand the function.

Deliverables:

1. Original Source file, including all code.

2. **Technical Report.** It must be written in Overleaf. Use IEEE Conference Paper Format for composing the report.

IEEE Conference Paper Format

Your report should include:

1. Introduction: A brief overview of the assignment.

2. Methodology: Description of the dataset, preprocessing steps, and model architecture.

3. Results: Training and validation loss and accuracy, examples of completed sentences.

4. Discussion: Analysis of sentence coherence, how the model's predictions improve over time, and any challenges encountered.

5. Conclusion: A summary of your findings.

6. Prompts

7. References

ZIP File Submission

Put all your files inside one folder and name it according to the following convention:

RollNo_Name_Ass1.ZIP

You must upload this ZIP file

Question # 1 CNN Implementation

Objectives:

You will develop a program that processes the images of signatures, segments the signatures for each person into different folders, performs a train-test split, and applies CNN to recognize which person the signature belongs to. Additionally, you will compare CNN-based feature extraction with manual feature extraction techniques and analyze the model performance using various evaluation metrics. For evaluation, you can use precision, recall, f-measure and overall accuracy. If needed, you can use additional evaluations as well.

Additionally, compare the performance of other feature engineering techniques such as HOG or SIFT and then train the model to see which one is better.

Add detailed description and visualizations in report to support your work. For all implementations, you must plot train and test error or accuracies.

Question # 2 Word Completion using LSTM

Objectives:

In this task, students will build a word-level LSTM model for sentence completion. They will train the model on a text dataset (Shakespeare's plays), to predict the next word in a sequence. After completing the training, students will create a user-friendly interface where users can input partial sentences, and the model will automatically suggest the next word in real-time. The user interface will dynamically update as user type, providing word suggestions based on the trained LSTM model. Students will also explore how different hyperparameter settings affect the word suggestions and will evaluate the coherence and fluency of the generated sentences.

Dataset: You can use **Shakespeare plays** data set for this part. You can download it from the following link:

https://www.kaggle.com/datasets/kingburrito666/shakespeare-plays