NMJ 40603 ARTIFICIAL INTELLIGENCE

ASSIGNMENT 3

Deep Learning Model Development and Analysis

SEMESTER 1 2024/2025

Due Date: 10 Feb 2025

SUBMISSION INSTRUCTIONS

(1) Due Date: 10 Feb 2025 Bonus mark for early submission!!
(2) This assignment must be submitted individually.
(3) Deliverables:
- Jupyter Notebook (.ipynb) file with your code, results, and framework description.
- Report (.docx or .pdf) answering the questions in Part 2.
- A 5-minute video file or a link to an uploaded video (e.g., on YouTube or Google Drive).
- **DO NOT** submit your assignment in compressed form (zip/rar).
- **DO NOT** submit your report in Microsoft Word format. Instead, the report must be submitted in pdf form.

LATE POLICY

Submission after the due time without being granted an extension by your lecturer will mean that your work is 'late.' Late work will have a penalty of 10% of the total possible marks deducted from the mark that your work is worth per day (including weekends). Early submission before the due date will be given extra marks.

PLAGIARISM POLICY

Submitted work copied from or written jointly with others is not acceptable. Any two or more similar submissions will be considered copying, and a severe penalty will deduct your mark.

GENERAL INSTRUCTION

- Design and write a code to implement a **deep learning** algorithm for **classification task**
- Select any dataset for classification tasks from Kaggle or UCI database or any resource. You can also collect your own dataset. Only a maximum of two person can use the same dataset.
- You must add sufficient comments in the code to show your understanding.
- You can use the available Python code from the following sources:
  (a) Provided by your lecturer.
  (b) Codes from Datacamp
  (c) Any code that you find from the Internet.

However, **please include the references to the sources in your report** and as comments in your code.

OBJECTIVE

The objective of this assignment is to develop, implement, and analyze a deep-learning model for a chosen problem using a relevant dataset. You will demonstrate your understanding of coding practices, model design, evaluation techniques, and analytical thinking.

PART 1: DEEP LEARNING MODEL DEVELOPMENT (CODING)

1. **Task Description**
    - Select a real-world problem (e.g., image classification, sentiment analysis, object detection).
    - Identify and justify the dataset used for the task, ensuring it is relevant, complex, and aligns with the problem.
    - Design and implement a deep-learning model using Python (e.g., TensorFlow or PyTorch).
    - Preprocess the data appropriately (e.g., normalization, augmentation) and split it into training and testing sets.
    - Train the model and evaluate its performance using appropriate metrics (e.g., accuracy, F1-score).
    - Provide visualizations of training results (e.g., loss curves, confusion matrices).
    - **Framework Requirement**:
      Describe the process of designing your deep-learning model. This may include:
        - Preprocessing methods
        - Classification algorithm(s)
        - Evaluation method(s)
        - Any other related processes implemented
          The description can be provided as text or using a graphical representation (e.g., a flowchart).
2. **Video Demonstration Requirement**

    Record a **5-minute video** demonstrating:
    - How to run your code.
    - The functionality of your code.
    - Key outputs or results, including any visualizations.
    - A brief explanation of your model's performance and evaluation metrics.

PART 2: PROBLEM ANALYSIS

Answer the following questions based on your model's testing results and overall development process:

1. **Model Performance Analysis**
    - Based on the evaluation results (e.g., accuracy, loss, confusion matrix), identify and explain the strengths and weaknesses of your model. What factors contributed to these outcomes?
2. **Model Evaluation Metrics**
    - Describe the evaluation metrics you used to measure the model's performance. Why are these metrics suitable for the problem you are solving?
3. **Improvement Strategies**
    - Suggest at least two improvements to enhance your model's performance. Justify your suggestions based on the testing results and the problem domain.
4. **Real-World Applicability**
    - Discuss how well your model generalizes to unseen data and whether it is suitable for deployment in real-world scenarios. Provide reasoning based on your evaluation metrics.

EVALUATION CRITERIA

Part 1: Deep Learning Model Development (75 marks)

- Dataset Selection, Justification, and Complexity: **15 marks**
- Code Functionality: **30 marks**
- Code Quality and Readability: **15 marks**
- Model Design and Implementation: **20 marks**
- Data Preprocessing and Handling: **10 marks**
- Testing, Evaluation, and Visualization: **10 marks**
- Framework Description (Text or Flowchart): **10 marks**
- Innovation and Creativity (Optional): **5 marks**

Part 2: Problem Analysis (25 marks)

- Model Performance Analysis: **6 marks**
- Model Evaluation Metrics: **5 marks**
- Improvement Strategies: **5 marks**
- Real-World Applicability: **4 marks**
- **Video Demonstration**: **5 marks** (clarity, functionality demonstration, and explanation of results)

PLAGIARISM STATEMENT

I certify that this open book test is my own work, based on my personal study and/or research and that I have acknowledged all material and sources used in its preparation, whether they be books, articles, reports, lecture notes, and any other kind of document, electronic or personal communication. I also certify that this report has not previously been submitted for assessment in any other subject, except where specific permission has been granted from all unit coordinators involved, or at any other time in this unit, and that I have not copied in part or whole or otherwise plagiarized the work of other students and/or persons.

Name :

Date :

Signature :

-End of Specification-