Course Project:Deeplearning Competition on Kaggle

Overview

In this course project, you will participate in a data science competition hosted on the [kaggle](#) platform. Your goal is to develop and optimize predictive models to achieve high performance in one of these competitions:

- [CSIRO - Image2Biomass Prediction](#)
- [Plant Seedlings Classification | Kaggle](#)
- [HMS - Harmful Brain Activity Classification](#)

Beyond achieving good results, you will also analyze and compare different methodological approaches, produce a detailed written report, and defend your work through an oral presentation.

Objectives

- Develop proficiency in designing and implementing deep learning architectures, such as Convolutional Neural Networks (CNNs), Multilayer Perceptrons (MLPs) or other architectures.
- Apply advanced training techniques and optimization algorithms to improve model performance.
- Critically evaluate different model architectures and training strategies.
- Effectively communicate the engineering process, insights, and results.

Project Components & Grading

Your final grade will be based on three components:

1. **Submission Score (30%)**
   - Based on your final ranking on the competition leaderboard.
   - The platform will provide a specific metric to evaluate model performance.
   - Your score will correspond to your standing at the competition deadline.
2. **Technical Report (40%)**
   - Length: Approximately 10-15 pages (excluding appendices).
   - The report should be professional, clear, and well-structured.
3. **Report Structure and Guidelines:**
   - **Introduction & Problem Understanding**
     - Clearly define the problem and objectives.
     - Identify challenges related to model architecture and training.
   - **Model Architecture Design**
     - Describe the design of at least three different deep learning architectures (e.g., various CNN and MLP configurations).
     - Discuss the rationale behind each design, including expected advantages and potential drawbacks.
   - **Training Optimization Strategies**

- - Detail the training algorithms and optimization techniques employed (e.g., learning rate schedules, gradient-based optimizers, regularization methods).
    - Explain how these strategies were selected and their impact on model performance.
  - **Model Evaluation & Validation**
    - Describe the validation framework used to assess model performance.
    - Discuss any cross-validation techniques or performance metrics applied.
  - **Results & Analysis**
    - Present the performance outcomes of each model architecture and training strategy.
    - Analyze the results, highlighting what worked well and areas for improvement.
  - **Conclusion & Lessons Learned**
    - Summarize key insights, challenges encountered, and lessons for future projects.
4. **Report Assessment Criteria:**
   - Clarity, organization, and coherence of writing.
   - Depth of analysis in model design and training optimization.
   - Justification for chosen architectures and training methods.
   - Quality of evaluation and critical reflection on results.
5. **Oral Defense (30%)**
   - You will present your work in a 15-20 minute session (10-15 minutes for the presentation and 5-10 minutes for Q&A).
6. **Presentation Guidelines:**
   - **Content & Structure**
     - Provide a clear overview of the problem, methodologies, and results.
     - Use visuals (e.g., model diagrams, performance charts) to illustrate key points.
   - **Technical Depth & Understanding**
     - Demonstrate a thorough understanding of the design choices and training strategies.
     - Be prepared to discuss the strengths and weaknesses of each approach.
   - **Responses to Questions**
     - Effectively address questions regarding your methodologies, optimization techniques, and potential improvements.

Project Timeline

- The project will take place between 17/12 and 17/01.

Academic Integrity

- Include a bibliography with your report.
- Teams should consist of 2 to 4 students maximum.