Course Project:Deeplearning Competition on Kaggle

Overview

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

- Digit Recognizer | Kaggle
- Plant Seedlings Classification | Kaggle
- House Prices - Advanced Regression Techniques | Kaggle

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.