

# Deep Learning

## Final Project Instructions

### Objective

The objective of this final project is to provide students with hands-on experience in implementing and experimenting with deep learning architectures by re-implementing a chosen architecture from a list of research papers. Students will gain practical knowledge in understanding, implementing, and experimenting with state-of-the-art deep learning models.

### Task Description

#### Paper Selection

Each group of students (pairs) will select one paper from the list of provided research papers. The selected paper should describe a deep learning architecture along with its application in a specific task (e.g., image classification, natural language processing, etc.).

#### Project Presentation

Students are required to thoroughly understand the chosen architecture and its application. They will prepare a presentation explaining the architecture, its components, and the task it aims to solve. The presentation should cover the key aspects of the chosen architecture, the implementation process, **experimental results**, and insights gained.

The presentation will be presented at the last lecture of the semester, each group will have 15 mins to present and 2 mins to answer questions. The presentation should cover:

- Overview of the architecture.
- Key components and modules.
- Training methodology.
- Application domain and task.
- Experimental results.
- Comparison to performance metrics reported in the paper.

## Implementation

Students will re-implement the chosen architecture using PyTorch. The implementation should closely follow the details provided in the paper. Students should write clean, well-documented code to facilitate understanding and reproducibility.

## Experimentation

After successfully implementing the architecture, students will conduct experiments to explore various aspects of the model. This includes:

- Baseline Evaluation: Evaluate the performance of the implemented architecture on a relevant dataset following the evaluation protocol described in the paper.
- Variations and Improvements: Experiment with different variations of the architecture (e.g., changing hyperparameters, modifying layers/modules, adding regularization techniques) and analyze their impact on performance.
- Comparative Analysis: Compare the performance of the original architecture with the variations and improvements proposed. Students should provide insights into which modifications led to performance improvement or degradation.

## Documentation & Report

Students are required to document their work comprehensively. This includes:

- Detailed explanation of the implementation, including code comments.
- Experimental setup, including datasets used, hyperparameters, and evaluation metrics.
- Results and analysis of experiments conducted.
- Discussion on insights gained, challenges faced, and lessons learned.
- Suggestions for further improvements or research directions based on their findings.

## Evaluation Criteria

- Understanding: Clarity in understanding the chosen architecture and its components.
- Implementation Quality: Accuracy and completeness of the implementation.
- Experimental Design: Thoughtfulness in designing and conducting experiments.
- Analysis and Interpretation: Depth of analysis and interpretation of experimental results.

- Documentation and Presentation: Quality of documentation, report, and presentation delivery.

## **Important Dates**

25/01/2025 - Project Presentation.

01/02/2025 - Experimentation & Report Submission.

## **Additional Notes**

- Students are encouraged to seek guidance from the instructor or teaching assistant throughout the project.
- Projects are submitted in pairs.
- Plagiarism will not be tolerated, and any instances will be dealt with according to the course's academic integrity policy. The use of LLMs for consultation is allowed.
- Any deviations from the provided guidelines should be discussed with the instructor beforehand.
- Students in Miluim do not have a deadline for submitting the reports, though they are encouraged to present in class on the architecture presentation date. Contact the instructor for updating your submission and presentation status beforehand.