

Deep Learning Project Description

Department of Computer Engineering

Deadline: December 16, 2025, 12:00 (during the course)

Individual Work – Printed Submission Only

Objective

This project aims to develop a deep understanding of a core topic in Deep Learning by combining:

- theoretical research,
- implementation and experimentation,
- performance benchmarking and comparison.

Students will investigate **modern advancements** in their assigned topic beyond what is covered in lectures, connecting the work to concepts from *Understanding Deep Learning (UDL)* by Simon J. D. Prince.

Project Topic Assignment

Your project topic is determined by the **last digit of your student number**:

Last Digit	Assigned Topic
0	Activation Functions (Comprehensive Study)
1	Optimization Algorithms (Comprehensive Study)
2	Architectures: KAN and other new architectures
3	Normalization Methods
4	Learning Rate Schedules & Warmup
5	Weight Initialization Strategies
6	Classification Loss Functions
7	Regularization & Data Augmentation
8	Training Efficiency Techniques
9	Model Evaluation & Calibration

Each topic must be treated as a **family-level study** (e.g., Topic 0 includes ReLU, Leaky ReLU, ELU, Swish, GELU, ReLU², etc. – not just one).

Deliverables (Printed Submission)

You must submit the following **as a printed, bound document**:

1. **Report** (8–12 pages, excluding appendices)
2. **Printed Code** (appendix)
3. **Printed Benchmarks & Logs** (appendix)

No digital submission, no video, and no group work.

Report Structure

The printed report must follow this structure:

1. Title Page (Name, Student Number, Topic)
2. Abstract (150–250 words)
3. Introduction & Motivation
4. Theoretical Background
5. Related Work (minimum 5 references)
6. Experimental Setup
 - datasets, models, hyperparameters, metrics
7. Results & Analysis
8. Discussion
9. Conclusion
10. Ethics Statement
11. References
12. Appendix A: Printed Code
13. Appendix B: Printed Benchmarks / Logs

Experiment Requirements

All projects must include:

- At least **2 models** and **2 datasets**
- At least **3 evaluation metrics** suitable to the topic
- At least **2 ablation studies**
- Training curves, tables, and analysis of results

Evaluation Rubric (100 points)

Category	Points	Description
Research Depth & Theory	20	Correctness, depth, modern coverage
Experimental Design	25	Fair comparisons, proper methodology, ablations
Analysis & Insight	25	Interpretation, understanding, critical thinking
Writing & Presentation	20	Clarity, structure, figures, readability
Printed Code & Logs	10	Completeness and reproducibility
Total	100	

Rules & Academic Integrity

- This is an **individual project**. Collaboration is not allowed.
- Use of AI tools (e.g., ChatGPT) is permitted only for **grammar/language polishing**.
- All code, results, and analysis must be your own.
- Suspected copied work will receive a zero and face academic procedure.

Checklist Before Submission

- Report printed and bound
- Code printed and included
- Benchmarks/logs printed and included
- Topic matches student number last digit
- Report length 8–12 pages (excluding appendices)