

IMSE 774 — Neural Networks

Fall 2026 Syllabus · 3 credits

Harun Pirim, PhD

August 25, 2026

Course Information

Course	IMSE 774 — Neural Networks (3 credits)
Term	Fall 2026
Meeting time	Tuesday & Thursday, 12:30–1:45 p.m.
Room	TBA
Course website	https://harunpirim.github.io/IMSE774-NeuralNetworks/
Learning management	Blackboard Ultra
Prerequisite	Graduate standing

Instructor

Name	Harun Pirim, PhD
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Office hours	TBA, or by appointment via email

Textbook

Simon J. D. Prince, *Understanding Deep Learning*, MIT Press, 2024.

The book is freely available from the author at <https://udlbook.github.io/udlbook/>, which also hosts the accompanying Python notebooks. Lecture notes on the course website follow the book's chapter structure and notation, so you can read the two side by side.

Supplementary references

- Michael Nielsen, *Neural Networks and Deep Learning* — <http://neuralnetworksanddeeplearning.com/>
- Goodfellow, Bengio & Courville, *Deep Learning*, MIT Press, 2016 — <https://www.deeplearningbook.org/>

- Recent papers distributed through Blackboard during the semester.
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Course Description

This course provides an in-depth exploration of neural networks, with a strong focus on deep learning. Students will learn fundamental concepts, including shallow and deep neural networks, optimization techniques, loss functions, and performance evaluation. The course covers key architectures such as Convolutional Neural Networks (CNNs), Transformers, Large Language Models (LLMs), Graph Neural Networks (GNNs), and generative models including Variational Autoencoders (VAEs), Generative Adversarial Networks (GANs), and diffusion models. Emphasis is placed on practical applications, with Python-based implementation, assignments, and a hands-on project aimed at solving real-world problems. Students will also engage in critical analysis of recent research in the field.

Course Objectives

Graduate students will be introduced to contemporary topics in neural networks, with a focus on deep learning. Both shallow and deep networks will be covered, including matrix notation, loss functions, model fitting, performance measurement, and regularization techniques. The course also explores convolutional networks, transformers and language models, graph neural networks, and modern generative models. Students will learn to distinguish different architectures designed for specific data types such as images, text, and graphs. Python code is provided for hands-on experience. Through assignments, a paper presentation, and a course project, students gain practical experience applying the architectures covered.

Learning Outcomes

By the end of this course, students will be able to:

1. Comprehend the fundamental concepts and architectures of neural networks.
 2. Model applications across different data types, including tabular, image, text, and graph data.
 3. Analyze and evaluate neural network models using appropriate performance measures.
 4. Design and apply a neural network project to solve a unique real-world problem.
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Assessment

Assignments (30%)

Roughly weekly assignments reinforce the concepts from lecture and apply them to datasets. Assignments are distributed as Jupyter notebooks and submitted through Blackboard, which is also where each assignment's due date is posted. The [Schedule](#) page carries only the exam and project milestones, so Blackboard is the authority on assignment deadlines.

Midterm Exam (20%)

An in-class, closed-book multiple-choice exam on **Thursday, October 22, 2026**, covering Chapters 1–7. No laptop or computer is required.

Paper Presentation (20%)

Each student presents a recent paper, discussing the novelty of its ideas and possible directions for future research. Presentations take place on **December 3, 8, and 10, 2026**. Paper selections must be approved by **Thursday, November 5, 2026**. A grading rubric will be posted on Blackboard.

Project (30%)

The project requires students to apply deep learning to a real-world problem. Students may work individually or in groups of at most two. The report is written in the format of a conference or journal paper. A detailed description and grading rubric will be posted on Blackboard.

Milestone	Due date
Project proposal (1–2 pages)	Thursday, October 8, 2026
Progress update	Thursday, November 12, 2026
Final report	Monday, December 14, 2026

Grade Breakdown

Course requirement	Percentage of grade
Assignments	30%
Midterm exam	20%
Presentation	20%
Project	30%
Total	100%

Letter grades follow a traditional 10-point scale: 90–100% = A, 80–89.99% = B, 70–79.99% = C, 60–69.99% = D, below 60% = F.

No make-up exams will be given for any reason except university-excused absences.

Important Dates

Date	Event
Tuesday, August 25	First day of class
Thursday, October 8	Project proposal due
Thursday, October 22	Midterm exam (in class)
Thursday, November 5	Presentation paper selection due
Friday, November 13	Last day to drop with a 'W' (NDSU deadline)
Thursday, November 12	Project progress update due
Thursday, November 26	No class — Thanksgiving
Dec 3, 8, 10	Student presentations
Thursday, December 10	Last class meeting
Monday, December 14	Final project report due

A full week-by-week schedule with topics and readings is on the [Schedule](#) page.

Course Policies

Attendance

According to [NDSU Policy 333](#), attendance in classes is expected. PointSolutions software will be used to record attendance; it opens at the beginning of class and closes at the end. No make-up assignments, tests, or project deadlines will be given for any reason except university-excused absences. See NDSU Policy 333 for faculty and student responsibilities related to attendance, including for university-sponsored activities. Veterans and student service members with special circumstances, or who are activated, are encouraged to notify the instructor as soon as possible and to provide activation orders.

Students with Special Needs

Any students with disabilities or other special needs who need accommodations in this course are invited to share these concerns or requests with the instructor and to contact the [Disability Services Office](#) as soon as possible.

FERPA

Your personally identifiable information and educational records as they relate to this course are subject to FERPA.

Academic Honesty

The academic community operates on the basis of honesty, integrity, and fair play. NDSU Policy 335: Code of Academic Responsibility and Conduct applies to cases in which cheating, plagiarism, or other academic misconduct have occurred in an instructional context. Students found guilty of academic misconduct are subject to penalties, up to and possibly including suspension and/or expulsion. Student academic misconduct records are maintained by the Office of Registration and Records. Informational resources about academic honesty for students and instructional staff can be found at <https://www.ndsu.edu/academichonesty>.

AI Usage Policy

AI tools (e.g., ChatGPT, code generators) may be used to support your learning by helping you understand concepts, explore ideas, or draft code. However, the work you submit must represent your own understanding and effort.

- **Critical review.** You are responsible for carefully reviewing, understanding, and — if needed — modifying any AI-generated content before including it in your work.
- **Acknowledgment.** If AI significantly contributes to your work, you must include a short statement explaining how you used it and to what extent.
- **Accuracy and responsibility.** You are accountable for checking the accuracy, quality, and relevance of AI-generated content. Blind reliance on AI is not acceptable and will not excuse mistakes.
- **Integrity.** All use of AI must follow academic integrity standards. Misuse — including plagiarism, misrepresentation, or other dishonest practices — will be treated as an academic integrity violation and may result in disciplinary action.

Use AI as a learning aid, not a shortcut. The goal is for you to build your own understanding and skills while using AI responsibly and transparently.

AI acknowledgment statement (include with submissions where applicable):

I acknowledge that I am responsible for the content of this submission. I used AI tools [describe briefly: e.g., “to debug code,” “to brainstorm ideas,” or “not at all”], and I have critically reviewed and verified all outputs to reflect my own understanding.

Software

All coursework uses Python. You will need:

- Python 3.11 or newer
- PyTorch, NumPy, Matplotlib, scikit-learn
- Jupyter (locally, or Google Colab in the browser)

Setup instructions are in the [repository README](#). Google Colab is acceptable for every assignment and requires no local installation.

i This syllabus is a guide to the course and may be adjusted as the semester progresses. Any changes will be announced in class and posted on the course website and Blackboard.