

ECE 425/525: INTRODUCTION TO

DEEP LEARNING

AN ENGINEERING PERSPECTIVE

Revolutionizing AI through Artificial Neural Networks

Deep Learning is transforming artificial intelligence across domains like language understanding, speech/image recognition, machine translation and autonomous systems. Inspired by the brain's neural networks, deep learning has driven groundbreaking advances—earning a Turing Award (2018) and Nobel recognition (2024).

This course (ECE 425/525) offers a comprehensive introduction to deep neural networks from an engineering perspective. Students will start from the basics (perceptrons, loss functions, backpropagation) and advance to modern architectures like CNNs, RNNs, and Transformers.

Explore theory, dive into hands-on programming assignments with PyTorch, and learn to design, train and deploy deep learning systems with real-world applications in computer vision, NLP, biomedical engineering and beyond.

What you'll learn?

- Core principles of artificial neural networks and deep learning
- Optimization and training algorithms
- DL architectures: CNNs, RNNs, Transformers, etc.
- Efficient techniques using pruning, quantization, sparsity, and federated learning
- Real-world applications in multiple engineering disciplines
- Responsible AI design: fairness, interpretability, and security
- Practical implementation using PyTorch



THE UNIVERSITY OF ARIZONA
COLLEGE OF ENGINEERING

Electrical & Computer
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“Deep learning is changing everything—from how we recognize images to how machines understand language. In this course, we start with the basics of artificial neural networks and work our way up to advanced models like Transformers, which power modern LLM technologies such as ChatGPT. It’s hands-on, project-driven, and built to give students real skills they can use right away.”

— **Jyotikrishna Dass**, Assistant Professor of Electrical and Computer Engineering



Course outcomes

By the end of the course, you will be able to:

- Explain and apply deep learning concepts and architectures.
- Build, train, and evaluate neural networks.
- Use PyTorch to solve real engineering problems.
- Understand the ethical and performance trade-offs in deploying AI systems.

Who should enroll?

Ideal for **undergraduates and graduate students** in a wide range of engineering fields—including electrical, computer, software, systems, industrial, etc. No prior deep learning experience required—just programming basics and linear algebra.

For more information

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Contact your ECE academic advisor for assistance:

undergradadvisor@ece.arizona.edu

msgradadvisor@ece.arizona.edu

phdgradadvisor@ece.arizona.edu

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