ENGR 3321: Introduction to Deep Learning for Robotics (CRN27199)
Fall, 2025

Class

Time: Monday & Wednesday, 1:00 PM – 2:15 PM
Location: Lewis Science Center 174
Course Materials: https://linzhanguca.github.io/deep_learning-2025

Instructor

Name: Lin Zhang
Office: LSC 110
Office Hour: Monday 10:00 AM – 12:00 PM *I may show up in LSCA 105.*
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Overview

Course Description

This course introduces the foundational concepts and common applications of artificial neural networks and deep learning. Students will be introduced to practical neural network architectures and techniques involved in the development of deep learning. This course provides lectures and labs for students to have a deeper inception and practice their skills. Students will work independently in each lab, but communications and discussions are highly encouraged. See **Course Contents** section for more details.

Prerequisites

No courses nor skills are required in advance. Though, **MATH1496 Calculus I** and **MATH3320 Linear Algebra** may make your journey easier. Experience with Python programming language can also be helpful.

Textbooks

No textbooks is required. The free text book: Deep Learning by Ian Goodfellow is a good reference.

Supplies

- A computer configured with Python and Jupyter Notebook is a must-have.
- A custom RC car and accessories for the final project will be provided for free.
- Students are welcome to request temporary possessing of laptop computers if needed.

Attendance Policy

- The instructor and the students are expected to appear in the classroom/lab in every class.
- If a student cannot show up on time, he/she needs to contact the instructor in advance.
- The instructor will notify the students with any changes of a class in advance.

Safety Requirement

No food nor drink will be allowed in the classroom.

Grading

A's are 90-100%, B's are 75-89%, C's are 60-74%, D's are 50-59%, F's are 0-49%. The final grade will be determined by following criteria.

Component	Percentage	Note
Attendance/Perfection*	1%	Attend every class on time, need a bit good luck.
Assignments	70%	Follow the rubric comes with each assignment.
Final Project	29%	Follow the rubric.
Total	100%	

* No excuse will be accepted unless serving on UCA athletic teams or ROTC.

Other Policies

The policies and procedures detailed in the UCA 2025-2026 the student handbook are also part of this syllabus. Please refer to the relevant policies for guidance.
https://uca.edu/student/files/2025/08/UCA-STUDENT-HANDBOOK-2025-2026.pdf

Title IX

UCA has long been committed to providing a fair and consistent process for students, faculty, and staff to report incidents of sexual harassment and sexual misconduct, and will continue to do so under these new Title IX rules. The new rules became effective on August 14, 2020. As always, members of the campus community who have experienced Title IX Sexual Harassment (including sexual harassment, sexual assault, dating violence, domestic violence, stalking, and the unauthorized distribution of sexual images or recordings) are encouraged to report these incidents to the Title IX Coordinator. For further information, please visit: https://uca.edu/titleix/.

The University encourages individuals to report alleged sexual crimes promptly to campus officials and the University of Central Arkansas Police Department. Individuals are strongly encouraged to submit reports promptly in order to preserve evidence for a potential legal or disciplinary proceeding. All complaints or reports of Title IX Sexual Harassment should be submitted to the Title IX Coordinator:

Jennifer Craun
Associate General Counsel and Title IX Coordinator
Wingo Hall, Suite 207
201 Donaghy Avenue Conway, Arkansas 72035
501-450-3247
Email: jcraun@uca.edu

Academic Integrity

The University of Central Arkansas affirms its commitment to academic integrity and expects all members of the university community to accept shared responsibility for maintaining academic integrity. Students in this course are subject to the provisions of the university's Academic Integrity Policy, approved by the Board of Trustees as Board Policy No. 709 on February 10, 2010, and published in the Student Handbook. Penalties for academic misconduct in this course may include a failing grade on an assignment, a failing grade in the course, or any other course-related sanction the instructor determines to be appropriate. Continued enrollment in this course affirms a student's acceptance of this university policy.

Generative AI

Use of Generative AI Tools in Engineering

The usage of generative AI (such as ChatGPT, Gemini, Claude, etc.) is highly encouraged in this course. You can use it for any assignments and projects, but you have to cite it properly.

- **Technical Reports and Projects**: When using AI-generated text or design suggestions in your reports or presentations, cite the tool used, e.g.,:
  OpenAI, "ChatGPT Response to How do I cite chatgpt's response following IEEE's standards?," ChatGPT, [Online]. Available: https://chatgpt.com/share/007f83e5-4426-41ae-88c6-c53343228e44. Accessed on: Aug. 19, 2024.
- **Code and Algorithms**: If AI contributed to a code snippet or algorithm in your work, include a comment noting the usage.
- **Acknowledgment in Design or Research**: When AI plays a role in idea generation or refining your designs, include an acknowledgment in your report or project documentation explaining how it was used.

Ethical Use of Generative AI in Engineering

You can access generative AI anytime and anywhere. When using such tools in an engineering context, follow these ethical guidelines:

- **Transparency in AI Assistance**: Clearly disclose when and how AI contributed to your projects, reports, or problem-solving processes. Whether generating design ideas, writing code, or clarifying concepts, it's important to attribute AI's role honestly.
- **Academic Integrity and Learning**: Ensure your work reflects your understanding and effort. AI can assist with problem-solving, but it's crucial that you develop and demonstrate the core engineering skills you're learning in this course.
- **Safety and Accuracy in Technical Work**: AI-generated outputs are not always reliable, especially when it comes to technical calculations, design parameters, or safety-critical applications. Verify all AI-generated content against trusted engineering sources or industry standards.
- **Bias and Ethical Engineering Design**: AI models can introduce biases into design or problem-solving suggestions. It's important to critically evaluate these outputs, particularly in engineering applications that impact diverse populations or involve ethical considerations.
- **Respecting University and Industry Standards**: Adhere to both academic guidelines and professional engineering standards when using AI. Unauthorized or unacknowledged use of AI in technical reports, design projects, or exams can result in academic penalties.

Building Emergency Plan

An Emergency Procedures Summary (EPS) for the building in which this class is held will be discussed during the first week of this course. EPS and Building Emergency Plan (BEP) documents for most buildings on campus are available at https://uca.edu/go/bep-library. Every student should be familiar with emergency procedures for any campus building in which he/she spends time for classes or other purposes.

Disabilities

The University of Central Arkansas adheres to the requirements of the Americans with Disabilities Act. If you need an accommodation under this Act due to a disability, please contact the Office of Accessibility Resources and Services (OARS), (501)450-3613.

Course Evaluation

The Student Course Experience Survey is a crucial element in helping faculty achieve excellence in the classroom and the institution in demonstrating that students are gaining knowledge. Students may complete surveys for the courses they are taking starting on **Monday, December 1st, through Sunday, December 14th** after finals week. Please use Feedback Hub for the online evaluation.

Course Contents

Please refer to the following for a tentative course plan. The actual contents will be subject to changes due to the progress of the course. Note:

- **All assignments due on Wednesdays at 2:30 PM**
- **All assignments are individual works**
- **The final project needs teamwork.**

Module 1 - Neural Network Fundamentals

Introduce the basic concepts of neural networks. Students are expected to build a deep neural network from scratch.

- **Assignment 1:** Linear Model. **Due date:** Wednesday, 09/03.
- **Assignment 2:** Logistic Regression. **Due date:** Wednesday, 09/17.
- **Assignment 3:** Multi-Layer Perceptron. **Due date:** Wednesday, 10/01.
- **Assignment 4:** PyTorch Getting Started. **Due date:** Wednesday, 10/08.

Module 2 - More Neural Networks

More interesting neural network architectures and related techniques will be introduced.

- **Assignment 5:** Convolutional Neural Network. **Due date:** Wednesday, 10/22.
- **Assignment 6:** Object Detection. **Due date:** Wednesday, 10/29.
- **Assignment 7:** Transfer Learning. **Due date:** Wednesday, 11/05.

Module 3 - Deep Learning Powered Self-Driving

Students will develop and test deep learning models on a self-driving robot.

- **Final Project:** Autonomous Karting. **Due date:** **Monday, 12/08 @ 11:00 AM**.