

ECE 57000: Artificial Intelligence

Course Information

ECE 57000, Fall 2025

CRN(s): 34846 (002), 29583 (EPE), 27733 (004)

Instructional method: In-person (002), Online (EPE), Primarily Online (004)

3 Credit Hours

Prerequisite(s): Graduate standing, or ECE 302 and ECE 368 for undergraduates

Course website including tentative schedule, tentative due dates, and important links:

<https://www.davidinouye.com/course/ece57000-fall-2025/>

Piazza for all announcements and discussion. Please see Brightspace for link.

Course Description

This course will provide a graduate-level introduction to artificial intelligence (AI), which is broadly defined as any method that enables intelligent behavior in computers. Topics may include machine learning, probabilistic methods, representation learning, natural language processing, computer vision, and special topics. The course will cover technical concepts, intuitions, and algorithms and will include basic training in AI research.

Expectations / Prerequisites

While the official course prerequisite is ECE 368 and ECE 302, **this course will assume knowledge of some material from other required courses such as Linear Algebra (e.g., Math 265), Python programming (e.g., ECE 20875), and probability (e.g., ECE 302)**. In particular, the programming assignments will require significant Python programming knowledge. I will briefly review some of these concepts, but if you are not familiar with these subjects, this is not the right class for you; or, you will be expected to (re-)learn these concepts on your own.

I have posted a **prerequisite quiz on my website** to help you decide if you have the necessary background for this course or should consider taking at a future time. This quiz is entirely optional and will not count towards your grade in the class.

This syllabus is required reading and you will be required to know the policies outlined in this syllabus. Questions about the syllabus may appear on quizzes.

Learning Outcomes

A student who successfully fulfills the course requirements will have demonstrated:

1. The ability to write programs for artificial intelligence techniques.
2. The ability to modify or implement one current artificial intelligence research method.
3. The ability to write a report on a current artificial intelligence research topic.

Topics and Course Schedule (tentative)

The tentative course schedule will be posted on the course website. The topics and dates are tentative and subject to change. Any substantive changes will be announced on Piazza.

1. Introduction to artificial intelligence
2. Machine learning basics
3. Deep learning basics
4. Dimensionality reduction
5. Deep generative models (e.g., VAEs, Diffusion Models)
6. Sequence Models (e.g., RNNs, Transformers)
7. Markov decision processes
8. Special topics

Course Assessment and Grading

No +/- for grades; only letter grades A, B, C, D, or F. Letter grades will be assigned at the end of the semester. The instructor will determine the final grade cutoffs, but the cutoffs will be equal to or lower than the standard cutoffs. The standard cutoffs are A if $\geq 90\%$, B if $\geq 80\%$, C if $\geq 70\%$, D if $\geq 60\%$, and F otherwise (e.g., if you have $\geq 90\%$ you are guaranteed an A).

- 20% - Assignments (Drop lowest)
- 35% - Course Project
- 45% - Exams
 - 15% - Midterm 1
 - 15% - Midterm 2
 - 15% - Final exam

Assignments

There will be 5-15 assignments throughout the semester. The assignments may be diverse and could include programming assignments (e.g., implement a particular AI method), math assignments (e.g., derive an equation), or communication assignments (e.g., create a presentation on a topic related to lecture).

For certain assignments, submissions will be compared against one another and ranked within the class. Comparisons may be conducted either through manual review (e.g., peer evaluations) or automated methods (e.g., large language model-based comparisons using open-source tools). While the format is not yet finalized, the results may be displayed on a private leaderboard. To ensure fairness and privacy, **all submissions must remain anonymous and should not contain any personally identifiable information.** *Unless otherwise specified, the submission content (though not author identity) may be shown to other students in the class.*

Course Project

The course project will require reading several recent AI/ML research papers and reimplementing one of these papers. To ensure progress throughout the semester, you will be required to submit various project checkpoints and possibly peer review other students' work. More details will be released on the course website.

Exams

There will be two midterms and one final exam. They will be cumulative but will focus on the more recent content. I will allow you to bring a **single page (8 ½ x 11 inch, both sides) of handwritten notes** to the exams. No photocopy or printed notes. **You must put your name and PUID on your note sheet.** You will be required to turn in the note sheet but will be allowed to retrieve it later if you wish.

002 (in-person) and 004 (primarily online) – Exams will be in person. (Note that section 004 is a “primarily online” section that allows for exams to be required in person.)

EPE (Purdue Online) – Exams will use online proctoring for exams (e.g., Honorlock or similar).

Missed or Late Work

Assignments are due **on or before 11:59pm ET (midnight)** on the day they are due unless otherwise specified.

- One day late: 20% penalty (of the max score)
- **More than one day late: Grade of 0**

To accommodate for exceptional circumstances (e.g., sickness), I will drop your lowest assignment grade (including a 0 if you missed an assignment).

Exams: **Any missed exam will receive a 0** (unless you have received prior approval from the instructor for exceptional circumstances).

DRC Accommodations

If you would like to use your DRC accommodations, you must send me your official DRC letter. **All exams requiring accommodations (such as extra time) should be scheduled with DRC testing ASAP. For other accommodations, please email me directly to discuss and we can find a good solution.**

Logistics and Technology Summary

- **Course material via course website**
Slides, Jupyter notebooks, and links will be posted on the course website.
- **Discussion via Piazza**
Any questions should be posted on Piazza rather than emailing TA or instructor so that students can help each other, and everyone can benefit from the questions and answers.
- **Grades on Gradescope or Brightspace**
Projects and exams will be graded on Gradescope. Assignments may be on Gradescope or the grades just uploaded to Brightspace. Brightspace will primarily be used to compile all grades.
- **Computing / GPU resources via Google Colab (<https://colab.research.google.com/>)**
All programming assignments will be designed to execute on Google Colab, which includes GPU acceleration and the necessary packages. You will need a Google account to use Colab.

Learning Resources

Google Colab Pro

Google Colab Pro (\$10 per month, \$40 for semester) is required for parts of this course. (However, see notes below about how to possibly use free Colab.)

While the free version of Google Colab may be enough for the assignments, we cannot guarantee the availability of the free version, especially GPU resources. Therefore, if you would like to save money, I would suggest using Colab free and avoid using the GPU runtime on Colab until you are done debugging your code. If you run into compute issues, you can then buy \$10 of compute units as needed instead of the Colab Pro monthly subscription.

You are also free to use your own Python notebook environment for completing the assignments, but the TAs will only support the Colab environment. The TAs will not be able to help with your Python environment setup.

Large Language Model (LLM) Access (Optional)

In the class, I will expect the **wise and effective use** of LLMs (ChatGPT, Gemini, Claude, Grok) for certain assignments. Most LLMs have a free version tier that you can use. *There are also sometimes student deals (e.g., Google has sometimes offered free Gemini Advanced subscriptions to students).* Additionally, Purdue hosts some open-source LLMs (see <https://www.rcac.purdue.edu/knowledge/genaistudio>, which is available to all students). **While not required, I would recommend using the Pro versions of these LLMs if you are doing more than a few queries.**

Textbooks

No required textbook. We will not follow any particular textbook but related reading will be posted if appropriate. Below are a few supplemental textbooks that may be useful.

(Optional) Dive into Deep Learning by Aston Zhang, Zack C. Lipton, Mu Li, Alex J. Smola. Available for free online at <https://d2l.ai/>. – A nice interactive book that has code examples in PyTorch for every chapter. The book covers many of the topics we will introduce along with specific applications.

(Optional) Deep Learning by Ian Goodfellow, Yoshua Bengio, and Aaron Courville, 2016. Available for free online at <http://www.deeplearningbook.org> or physical copy available on Amazon. - Part I is a good introduction to core concepts that covers the fundamental mathematical, computational, and machine learning concepts useful for the rest of this class.

(Optional) Machine Learning: A Probabilistic Perspective by Kevin P. Murphy, 2012. Available online via Purdue's library system: <https://ebookcentral.proquest.com/lib/purdue/detail.action?docID=3339490>. – This is a good reference book and some chapters may help supplement the lectures. Chapter 2 on probability may be a useful reference.

(Optional) Python Data Science Handbook by Jake VanderPlas, 2016. Available for reading online at <https://jakevdp.github.io/PythonDataScienceHandbook/>. - This could be a useful book for some of the Python tools used in this course.

Attendance Policy

Students in the in-person section are expected to attend all class periods in person per Purdue's academic regulations. **If a student misses a class, the student is still responsible for knowing all missed content including any announcements.**

For the project presentation class periods, attendance (via Zoom) will be required (**Dec 1, Dec 3, Dec 5, Dec 8, Dec 10, Dec 12**) and could affect your final project grade. These will be **virtual presentations in Zoom breakout rooms** to accommodate the large number of project presentations and encourage active participation. If you are an online student and cannot make these times because of work or other constraints, please let the instructor know.

Communication Policies

All students are expected to sign up for the Piazza class the first day of class or earlier and regularly check for announcements. Piazza will be used for all announcements and class discussions. Please post any questions to Piazza instead of emailing me or the TAs unless the issue is confidential in nature. This should help you receive answers faster. Additionally, you can post anonymously if you feel uncomfortable posting with your name. If you email the instructor or TA with a question, we will likely ask you to re-ask the question on Piazza if appropriate. We hope to reply to unanswered questions within 1-2 business days (9am-5pm, Mon-Fri). *Note this means that you may not receive an answer on Piazza on the day the assignment is due so I would encourage you to start early and ask early.*

I will be available via email during normal business hours (9am-5pm, Mon-Fri), and try to respond as soon as possible (generally within 1-2 business days). When emailing me, please place the course number in the

subject line of the email. This will help me locate and respond to your emails quickly. **Please use Piazza for asking questions whenever possible so that others can benefit from your questions.**

Instructor Office Hours

I will expect that you have been attending lectures regularly and reviewing the notes before asking questions in office hours. Additionally, I will expect that you have put some effort into understanding the material. **I will give preference to conceptual questions** over assignment/debugging questions because assignment questions could be answered by the TAs.

TA Lab Hours

To be reasonably fair to all students, the TAs plan to use an office hour queue system. The TA will answer **1 main question or code issue for up to 10 minutes** (but if your 1 question can be answered faster, they will move on before 10 minutes). You can rejoin the queue and they will circle back around when they are able.

Academic Integrity

Any cheating or academic dishonesty will be penalized with a failing grade in the course. All acts of cheating or dishonesty will be reported to the Dean of Students.

Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information may be submitted anonymously, the more information that is submitted provides the greatest opportunity for the university to investigate the concern. Please see [Purdue's student guide for academic integrity](#) for more information. When in doubt, please discuss with the instructor. It is far better to discuss difficult circumstances with the instructor, than to be dishonest.

Academic Integrity Policy for Assignments

For programming assignments, feel free to talk with other classmates about the assignments. However, do not view, share, or copy code in any way (even just looking at someone's screen or writing on a whiteboard). **Only talk, no code.** Neither should you talk in such detail that you would both write the same programs. I reserve the right to run code similarity checks on all submitted code to find instances of academic dishonesty. Also, **sharing your code** with other students is also an academic integrity violation. Do not share code with anyone if they ask. You should refer them to the instructor if there are any extenuating circumstances.

AI and Large Language Models (LLM, e.g., ChatGPT, Gemini, Claude, GitHub Co-Pilot) Policy

AI-based tools can significantly enhance or significantly degrade your learning. The goal should be to deeply understand the material while also allowing for the efficiency and personalized help that AI tools can provide.

For assignments and the course project, you may use any AI tool including ChatGPT and GitHub Co-Pilot. Indeed, I expect you to use these tools in most cases. However, I would strongly warn you to carefully and critically evaluate any output of AI-based tools. In code, they can introduce subtle but critical bugs. In writing, they often produce false information (especially free versions). *And in both cases the LLM acts very confident.* **Thus, always carefully check any code and double check any original source material before whenever feasible.**

Because you are expected to deeply understand the course material, **exams will include questions related to lecture and assignments (both programming and conceptual). No calculators or LLMs will be allowed on exams.** Thus, you need to understand programming and concepts well enough to do problems by hand.

Nondiscrimination Statement

Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life. Purdue's nondiscrimination policy [can be found here](#).

Accessibility and Accommodations

Purdue University is committed to making learning experiences accessible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247.

Mental Health Statement

If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, try [Therapy Assistance Online \(TAO\)](#), a web and app-based mental health resource available courtesy of Purdue Counseling and Psychological Services (CAPS). TAO is available to all students at any time by creating an account on the [TAO Connect website](#), or downloading the app from the App Store or Google Play. It offers free, confidential well-being resources through a self-guided program informed by psychotherapy research and strategies that may aid in overcoming anxiety, depression and other concerns. It provides accessible and effective resources including short videos, brief exercises, and self-reflection tools.

If you need support and information about options and resources, please contact or see the [Office of the Dean of Students](#). Call 765-494-1747. Hours of operation are M-F, 8 a.m.- 5 p.m.

If you find yourself struggling to find a healthy balance between academics, social life, stress, etc., sign up for free one-on-one virtual or in-person sessions in West Lafayette with a [Purdue Wellness Coach at RecWell](#). Student coaches can help you navigate through barriers and challenges toward your goals throughout the semester. Sign up is free and can be done on BoilerConnect. Students in Indianapolis will find support services curated on the [Vice Provost for Student Life website](#).

If you're struggling and need mental health services: Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact [Counseling and Psychological Services \(CAPS\)](#) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS offices in [West Lafayette](#) or [Indianapolis](#).

Basic Needs Security

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact the Dean of Students for support. There is no appointment needed and Student Support Services is available to serve students 8 a.m.-5 p.m. Monday through Friday. Considering the significant disruptions caused by the current global crisis as it related to COVID-19, students may submit requests for emergency assistance from the [Critical Needs Fund](#)

Emergency Statement

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. Relevant changes to this course will be posted onto the course website or can be obtained by contacting the instructors or TAs via email or phone. You are expected to read your @purdue.edu email on a frequent basis.

Disclaimer

This syllabus is tentative and is subject to change. See course website for course schedule including due dates; the course schedule is also subject to change. Any substantive changes will be announced in class and on Piazza.