ECE 57000: Artificial Intelligence Syllabus (Tentative)

Course Information

ECE 57000, Fall 2021 (in-person)
CRNs: 34846
MWF, 12:30pm-1:20pm ET
Location: **Matthews Hall 210**
3 Credit Hours
Prerequisites: Graduate standing, or ECE 302 and ECE 368 for undergraduates
Course website including tentative schedule, due dates, and important links:
https://www.davidinouye.com/course/ece57000-fall-2021/
Piazza for announcements and discussion (must signup ASAP):
https://piazza.com/purdue/fall2021/ece57000

Instructor

David I. Inouye
EE 332, 765-496-0238
dinouye@purdue.edu
Instructor office hours in EE 332: Mon 1:30-2:30pm (except Aug 23), Thurs 10-11am
Instructor's Webpage: https://www.davidinouye.com/

Teaching Assistants

Graduate TAs
Ziyu Gong, gong123@purdue.edu
Zeyu Zhou, zhou1059@purdue.edu

Undergraduate TAs
Preston Rahim, prahim@purdue.edu
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Ryan Honwad, rhonwad@purdue.edu

TA Office Hours
Monday-Friday, 4-6pm, Room: EE 132

Course Description

This course will provide a graduate-level introduction to artificial intelligence (AI) with a primary focus on unsupervised learning and probabilistic models. Topics will include clustering, mixture models, density estimation, representation learning, and deep generative models. The lecture content will focus on key concepts and intuitions. The course project will enable students to dive deeper into a topic of their choice.

Expectations / Prerequisites

This class is oriented towards first-year graduate students. The course will expect basic knowledge of linear algebra, probability distributions, random variables, and Python programming. I will briefly review some of these concepts, but if you are not familiar with these subjects, this may not be 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 Gradescope** 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

1. Basic understanding of unsupervised learning techniques, a subarea of AI. (lecture content and quizzes)
2. Deeper understanding of one specific area of interest in AI. (course project)
3. Basic research skills and hands-on experience using current toolkits. (assignments + course project)

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. Clustering
5. Dimensionality reduction
6. Density estimation
7. Deep generative models
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 >= 90%, B if >= 80%, C if >= 70%, D if >= 60%, and F otherwise (e.g., if you have >= 90% you are guaranteed an A). No final exam.

- 20% - Quizzes
- 20% - Programming assignments
- 60% - Course project
    - 10% - Checkpoints and peer reviews
    - 50% - Final project deliverables including presentation and participation

Quizzes
There will be 10-15 short quizzes throughout the semester. Most quizzes will focus on recent content but three of them will be review quizzes and can cover any material up to that point. All quizzes including review quizzes will be weighted equally.

Programming Assignments
There will be 5-8 programming assignments throughout the semester. The assignments are meant to reinforce the content and provide hands-on experience with the common tools of AI/ML. **All regrade requests must be submitted on Gradescope.** Regrade requests over email will not be accepted.

Course Project
The course project will require reading several recent AI/ML research papers and reimplementing one of these papers. The course project will be individual. No group projects. To ensure progress throughout the semester, you will be required to submit various project checkpoints and peer review other students' work. See course website for draft of course project instructions.

Missed or Late Work
Quizzes: Given that a 12-hour window will be given for quizzes, no late quiz submissions will be accepted. **Any late quizzes will receive a 0** (unless you have received written approval for a late exception from the instructor).

Assignments and course project materials are due **on or before 11:59pm ET (midnight)** on the day they are due unless otherwise specified.
- One day late: 80% of original score
- More than one day: 0%

For Peer Circuit (checkpoint, paper, and peer review submission), **you MUST notify a graduate TA over email 12 hours before the original due date if you want to submit late.** This ensures that we will be able to give you a late pass on Circuit. If you do not submit within 24 hours of the original due date, you will receive a 0 on the assignment (even if Circuit allows you to submit later than 24 hours).

Logistics and Technology Summary
- **Course material via course website**
  Slides, assignments, 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.

- **Quizzes and assignments via Gradescope**
  All quizzes and assignments will be turned in via Gradescope. Quizzes will be made available for a time window. Once started, however, the quiz will need to be finished in a short time period (probably 30s-1min per question). The quizzes will be open notes but no communication is allowed with other students during or after.

- **Course project and peer reviews via Circuit (https://purdue.peercircuit.org/)**
  Course project checkpoints, peer reviews, and final deliverables will be submitted to Circuit.
- **Grades on 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 free GPU acceleration and the necessary packages. You will need a free Google account to use Colab.

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) *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 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 will be required **(Nov 29, Dec 1, Dec 3, Dec 6, Dec 8, and Dec 10**) and could affect your final project grade. While not fully decided, it is likely that these will be **virtual presentations in Zoom breakout rooms** to accommodate the large number of project presentations and encourage active participation.

In the event a student is quarantined or isolated, the student should contact the instructor as soon as possible to discuss ways to maintain academic progress in the course. Please note that, according to Details for Students on Normal Operations for Fall 2021 announced on the Protect Purdue website, "individuals who test positive for COVID-19 are not guaranteed remote access to all course activities, materials, and assignments."

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.

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/section in the subject line of the email (e.g., ECE 57000 …). 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 research or conceptual questions** over assignment/debugging questions because assignment questions could be answered during the daily TA lab hours.

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 Quizzes

While taking a quiz, you should not communicate with anyone in the class in any way including but not limited to text messaging, phone calls, hand signals, or smoke signals. After the quiz, you cannot discuss or share **any** information about the quiz or quiz questions. Any sharing of quiz information will result in failure of the course.

Academic Integrity Policy for Programming 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 violation. Do not share code with anyone if they ask. You should refer them to the instructor if there are any extenuating circumstances.

Academic Integrity Policy for Course Project

Because each project should be unique, I will allow more freedom in collaborating or discussing the course project code. You can help each other debug or discuss the actual code. Both students will likely learn from this exercise. However, the student associated with the project should be the one actually writing all the code. Your project implementation should be your work. Additionally, no student should feel any obligation to help another student. **If you let others <u>view your code and help in any substantial way</u>, you must acknowledge their help in your term paper under an "Acknowledgements" section at the end of the term paper (e.g. "John Doe helped me debug my code.").** If there is any doubt, please discuss with me before engaging in that activity.

Plagiarism

Any sort of plagiarism is considered academic dishonesty. Do not copy anything from published papers unless you quote and cite it. <u>**For any idea that came from another source (even if it is not a direct quote), you must put a citation**</u>. <u>This includes when you summarize or critique a research paper.</u> You must use your own words to summarize the paper and add a citation to the paper. If there is any doubt, again, please ask before submitting. For more information please see https://owl.purdue.edu/owl/research_and_citation/using_research/avoiding_plagiarism/index.html

Classroom Guidance Regarding Protect Purdue

Any student who has substantial reason to believe that another person is threatening the safety of others by not complying with Protect Purdue protocols is encouraged to report the behavior to and discuss the next steps with their instructor. Students also have the option of reporting the behavior to the Office of the Student Rights and Responsibilities. See also Purdue University Bill of Student Rights and the Violent Behavior Policy under University Resources in Brightspace.

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 WellTrack.** Sign in and find information and tools at your fingertips, available to you at any time.

- **If you need support and information about options and resources**, please see the Office of the Dean of Students, http://www.purdue.edu/odos, for drop-in hours (M-F, 8 am- 5 pm).
- **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 office of the second floor of the Purdue University Student Health Center (PUSH) during business hours.

TaskHuman 1-on-1 Wellness Video Calls

TaskHuman offers private, real-time, on-demand, 1-on-1 video calls with wellness coaches covering over 800+ topics such as anxiety, mindfulness, reducing stress, clean eating, time management, in-home workouts, relationship tensions, financial issues, spiritual guidance and many more. You can access these wellness coaches from around the world 24/7. The College of Engineering has an exclusive agreement with TaskHuman which gives you **FREE and UNLIMITED** access to these resources. Over 3,200 calls have been made by College of Engineering students, staff, and faculty so far with an average satisfaction rating of 4.89/5.
Learn more here: https://engineering.purdue.edu/ECE/TaskHuman.
DOWNLOAD TASKHUMAN:
- Download the TaskHuman App directly from the App Store or Google Play Store
- Create an account
- Go to Setting and tap on "Check for Discounts"
- Insert your code: purdue63

Don't see a topic you want or have other questions? Contact Brooke Parks, Senior Lecturer in ECE, at brookeparks@purdue.edu.

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.