ECE 57000: Artificial Intelligence Syllabus (Tentative)

Course Information

ECE 57000, Spring 2020
CRNs: 34846 (002, in-person), 26476 (003, online), 25916 (EPE, online), 25917 (OXE, online)
MWF, 12:30pm-1:20pm ET
Location: **Lilly 1105*** or live via Zoom (Links on Brightspace)
3 Credit Hours
Course website including tentative schedule, due dates, and important links:
https://www.davidinouye.com/course/ece57000-fall-2020/
Piazza for announcements and discussion (must signup ASAP):
https://piazza.com/purdue/fall2020/ece57000inouyeall

*IMPORTANT: Room has changed as of Friday, 8/21 to Lilly 1105 to accommodate for all in-person students (Section 002, 34846) to attend in person. ☺ All other students may attend virtually via Zoom (see Brightspace for link). Also, lectures will be recorded for later viewing.

Instructor

David I. Inouye
EE 332, 765-496-0238
dinouye@purdue.edu
Online office hours via Zoom (link to be posted on Brightspace):
10-11am ET on Tuesday and 3:30-4:30pm ET on Wednesday
Instructor's Webpage: https://www.davidinouye.com/

Teaching Assistant

Ziyu Gong
gong123@purdue.edu
Online office hours via WebEx (link to be posted on Brightspace):
4-5pm ET on Monday and 9-10am ET on Thursday

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 (1.5 weeks)
3. Deep learning basics (1.5 weeks)
4. Clustering
5. Dimensionality reduction
6. Density estimation
7. Deep generative models (3 weeks)
8. Unsupervised language modeling

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). <u>No final exam.</u>

- 15% - Quizzes
- 15% - Programming assignments
- 70% - Course project
    - o 15% - Checkpoints and peer reviews
    - o 55% - Final project deliverables

Quizzes
There will be 5-20 short quizzes throughout the semester.

Programming Assignments

There will be 3-5 programming assignments throughout the semester. The assignments are meant to provide hands-on experience with the common tools of AI/ML and reinforce the content.

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

Assignments and course project materials are due **on or before 11:59am EDT (noon)** on the day they are due unless otherwise specified.

- One day late: 80% of original score
- More than one day: 0%

UPDATE (9/11/2020): If you want to submit late (for 80% of original score), **you MUST notify both the instructor and TA over email before the original due date.** 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).

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

Logistics and Technology

- **Course material via course website**
  Slides, assignments, and Jupyter notebooks will be posted on the course website.

- **Lectures in person and via Zoom**
  In-person lecture with recorded live Zoom session for every class (see note on first page).

- **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 and final deliverables will be submitted to Circuit and peer reviews will also be done in Circuit.

- **Grades and lecture videos via Brightspace**
  Brightspace will primarily be used to compile all grades but will also include the private links for Zoom and recorded lectures.

- **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 during COVID-19

Students will not be required to be in-person for any class but are expected to know all material covered in class (the class will be recorded). All recorded lectures and material will be posted online. If a student misses a class, **the student** is still responsible for knowing all missed content including announcements.

For one or two of the presentation periods **(Nov 16, Nov 18, Nov 20, Nov 30, Dec 2 and Dec 4)**, students may be required to attend **live** (either virtually over Zoom or in-person) to ask or answer questions related to project presentations. If there are any issues with this, please let the instructor know as soon as possible.

Students should stay home and contact the Protect Purdue Health Center (496-INFO) if they feel ill, have any symptoms associated with COVID-19, or suspect they have been exposed to the virus. In the current context of COVID-19, in-person attendance will not be a factor in the final grades, but the student still needs to inform the instructor of any conflict that can be anticipated and will affect the submission of an assignment or the ability to take an exam. Only the instructor can excuse a student from a course requirement or responsibility. When conflicts can be anticipated, such as for many University-sponsored activities and religious observations, the student should inform the instructor of the situation as far in advance as possible. For unanticipated or emergency conflict, when advance notification to an instructor is not possible, the student should contact the instructor as soon as possible by email. When the student is unable to make direct contact with the instructor and is unable to leave word with the instructor's department because of circumstances beyond the student's control, and in cases of bereavement, quarantine, or isolation, the student or

the student's representative should contact the Office of the Dean of Students via email or phone at 765-494-1747.

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 TA 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.**

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 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

The Protect Purdue Plan, which includes the Protect Purdue Pledge, is campus policy and as such all members of the Purdue community must comply with the required health and safety guidelines. Required behaviors in this class include: staying home and contacting the Protect Purdue Health Center (496-INFO) if you feel ill or know you have been exposed to the virus, properly wearing a mask in classrooms and campus building, at all times (e.g., mask covers nose and mouth, no eating/drinking in the classroom), disinfecting desk/workspace prior to and after use, maintaining appropriate social distancing with peers and instructors (including when entering/exiting classrooms), refraining from moving furniture, avoiding shared use of personal items, maintaining robust hygiene (e.g., handwashing, disposal of tissues) prior to, during and after class, and following all safety directions from the instructor.

Students who are not engaging in these behaviors (e.g., wearing a mask) will be offered the opportunity to comply. If non-compliance continues, possible results include instructors asking the student to leave class and instructors dismissing the whole class. Students who do not comply with the required health behaviors are violating the University Code of Conduct and will be reported to the Dean of Students Office with sanctions ranging from educational requirements to dismissal from the university.

Any student who has substantial reason to believe that another person in a campus room (e.g., classroom) is threatening the safety of others by not complying (e.g., not wearing a mask) may leave the room without consequence. The student is encouraged to report the behavior to and discuss 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.

Academic Guidance in the Event a Student is Quarantined/Isolated

If you become quarantined or isolated at any point in time during the semester, in addition to support from the Protect Purdue Health Center, you will also have access to an Academic Case Manager who can provide you academic support during this time. Your Academic Case Manager can be reached at acmq@purdue.edu and will provide you with general guidelines/resources around communicating with your instructors, be available for academic support, and offer suggestions for how to be successful when learning remotely. Importantly, if you find yourself too sick to progress

in the course, notify your academic case manager and notify me via email. We will make arrangements based on your particular situation. The Office of the Dean of Students (odos@purdue.edu) is also available to support you should this situation occur.

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.*

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 strives to make learning experiences as accessible as possible. 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 via email 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.

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.