Spring 2022

CS 441/541 Artificial Intelligence / Section: 001 / CRN: 60849/60873
Remote 6.40-8.30 PM M/W

Instructor: **Dr. Anthony D. Rhodes**, email: **arhodes@pdx.edu**

Office Hours: I will have office hours over Zoom throughout the term on Wednesdays 4.00-5.30 pm at the following link https://pdx.zoom.us/j/8099671228. If I am unable to meet at my regular office hours, I will post an alternative meeting time for that week on Canvas.

TA: **Hermann Nkouanga** (hermann@pdx.edu); office hours: **Tuesday 11:00am-12:00pm and Thursday 10:00- 11:00am** throughout the term at the following Zoom link: https://pdx.zoom.us/my/hermann.pdx

*Please read the following statement about attendance and the course logistics closely.

Note that our course is offered as "remote" for Spring 2022. As such, **all course lectures are posted to Canvas, and you can watch/rewatch them at your leisure**. Each week I will post the lecture/reading and assignment coverage for the current week. **Please refer to Canvas for all course assignments, course lecture slides, topic coverage schedule, etc**.

Each Wednesday from 6.40-8.50 pm I will host a Zoom a discussion/Q&A session (https://pdx.zoom.us/j/8099671228) where I will review the key topics from the lectures for the current week and answer any student questions. Attendance for these Zoom sessions is **optional**. I will not take attendance, nor will you be penalized for not attending the Zoom meetings.

Please note that I am not planning to provide comprehensive lectures during this time (please refer to the video lectures instead), however, I am happy to review material and provide any additional clarifications, guidance, etc. For this reason, please come prepared to ask questions if you choose to attend the Zoom sessions. I recommend viewing/skimming the reading material and lectures prior to attending the Zoom sessions when possible.

*If you are a person with a disability and require additional accommodations, please make an appointment with me as soon as possible to make arrangements.

Course Description: Introduction to the basic concepts and techniques of artificial intelligence, including the history of AI, philosophical issues, intelligence agents, classical search, non-classical search, adversarial games, reinforcement learning, etc.

Topic List (tentative):

(*) Conceptual Overview of AI/ML; History of AI
(*) Philosophical Issues
(*) Intelligent Agents (Ch. 2)

(*) Classical Search (Ch. 3)
(*) Non-Classical Search (Ch. 4)
(*) Adversarial Games (Ch. 5)
(*) Constraint Satisfaction (Ch. 6)
(*) Probabilistic Reasoning, Bayes Nets, Naïve Bayes, applications to NLP (Ch. 13-15)
(*) Genetic Algorithms
(*) Reinforcement Learning
(*) Decision Trees

Note: Our ML course will offer a (mostly) disjoint topic list from the above, including NNs, SVMs, classification systems, logistic regression, cluster analysis, sampling methods, applications, and more.

Prerequisites: Mth 261 (introduction to Linear Algebra); CS 202; high-level programming experience is strongly recommended; preferred prerequisite: Stat243/451 (intro to statistics/applied statistics).

Required Materials: (1) Main Textbook— *Artificial Intelligence: A Modern Approach* (3rd edition, 4th is also ok), Stuart Russell and Peter Norvig; ISBN: 0136042597.

(2) Supplemental Text – *Artificial Intelligence: A Guide for Thinking Humans*, Mitchell; Farrar, Straus and Giroux: 978-0374257835.

Expectations: Students are expected to intellectually engage with the course material. Please seek me out, our TA and other students if you have questions or if require additional help.

Recommendations for succeeding in this course:

(*) **When possible, please read/skim lecture notes & suggested readings prior to class**.

(*) **Please note that just like with a textbook, you should individually read through the lecture notes** (preferably both before and after lecture in order to fully absorb the material).

(*) Please **engage and work with other students**; you are encouraged to discuss course material and assignments (except for the midterm) as needed.

(*) When possible, **start assignments early** to give yourself adequate time to complete them by the due date; confer with me or other students with any questions/difficulties you encounter.

Course Requirements/Structure

Lecture Notes/Course Updates: Lecture notes, course assignments and general course updates will be posted to Canvas.

Homework: Assigned via Canvas. There will be **two required written homework assignments**. A subset of the problems from each homework assignment will graded, based on standard completeness and correctness criteria. **Please turn in homework via email to our TA by the assigned due date. If possible, please type your homework assignments. If you are unable to type them, please scan and email a neat and legible assignment.**

The homework assignments present you with an opportunity to gauge and improve your mastery of the course material, prior to taking the course exams. If you have questions regarding any of the exercises feel free to either ask me or to confer with your TA or fellow students. Group work is permitted and even in some cases favored, although ultimately each student must submit their own homework assignment. **No late homework will be accepted**.

Midterm: There will be **one midterm** occurring (tentatively) during <u>week 6</u> of the term. At the time of the midterm I will post the exam on Canvas. You will have 24 hours to submit an electronic version of your exam solutions (scanned or typed is fine). Please submit the midterm to our TA via email.

Individual Programming Assignments: Instructions will be given for **three required take-home, individual programming assignments**. You may use any standard high-level language with which you are comfortable (e.g. C, Python, Matlab, R, Java, etc.); due dates for programming assignments will occur around 4-6 week and 7-8 week.

(*) In total there are **5 required HW/programming assignments**. In total you will either complete:

2 hw + 3 programming

(Group) Final Programming Project: In small groups (3-5 people, no smaller please), you will pursue an AI-related research project (with a reasonable breadth and depth) in an intermediate to advanced topic that extends beyond the bounds of the core topics formally covered in lecture. Together, you and your group members will submit a short write-up of your project, including, importantly, code and cogent data results. During finals week (over two sessions) your group will give a short 10-15 minute presentation summarizing your work.

I will present more detailed instructions for the final project as the term progresses. All group members must substantially participate in the project and presentation; all components of the project will contribute to your grade, including the presentation. **You will turn-in your written project materials the day that you present your work**.

The topic chosen should relate in some basic way to AI theory and methods; you are welcome to use our text (or another text) as a reference for your material; you are also welcome (and even encouraged) to use a current research paper for inspiration. Please note that I do not expect you to develop a ground-breaking project over the course of the term; instead, I want to see you work as a team and to practice self-study to learn an intermediate-advanced topic. Attempts to recreate (or approximately recreate) a published result – or to use research as a methodological inspiration – is acceptable/encouraged.

Prior to the end of week 8, you must run your topic by me for approval (either in person or over email is fine) – no exceptions, please.

I want to keep the topic choice flexible so that you can pursue an area of interest, but here are some suggested areas: Computer vision (classification, etc.), medical applications (e.g. disease detection),

adversarial games, NLP, computational creativity (e.g. music, art), Bayesian inference, reinforcement learning.

(Graduate Assignment) Research Paper Analysis: Each graduate student will individually read a current, published (arXiv posting is OK) research paper (of their choosing, no less than 6 pages in length) in an AI-related field. You will write a short (**3 pgs., double-space, stapled 12 pt. font**) summary/analysis conveying the main ideas of the paper in your own words. The primary purpose in your summary/analysis is to successfully communicate that you have both read and (essentially) understood the main ideas of the paper. Please also include any follow-up questions you would care to ask the author, if given the opportunity; point out anything that wasn't entirely clear to you in the exposition of the paper; suggest ways to potentially improve upon or extend this research – are there any pertinent questions/ideas the authors have yet to explore? **(tentative due date: Friday, 6/3)**

AI Ethics Essay Response: During the term you will read (at your leisure) the supplemental text: *Artificial Intelligence: A Guide for Thinking Humans* (FYI: no quiz, hw or exam questions will be on this text). By the end of the term every student will write a summary/reflection essay for this text. You will submit, in-class, a **3-4 page (typed, double-space, stapled, 12 pt. font) paper.**

The paper is intended to be a reflective essay roughly organized as follows: the first half (1) of the paper should, in your own words, serve as a summary of some (certainly not all) of what you take to be the essential ideas articulated in the text; the second half (2) of your essay should be more reflective in nature and provide something of a personal commentary on the text – i.e. you should remark on what topics were of personal interest to you, what you found to be enlightening, novel, surprising, useful, etc.. In addition, please also do not hesitate to express opinions contrary to that of the author's own theses and claims. However, be advised that the essay should not be *polemical* in nature/tone per se. Please also refrain from making excessively vague, speculative, anecdotal and/or subjective claims or comments; a well-reasoned, and thoughtful response is strongly encouraged instead. **(tentative due date: Friday, 6/3)**

*Note that I reserve the right to alter the dates of the course assignments in order to better serve the particular pacing of the class. Do not expect to be able to make-up exams (except in the case of special circumstances).

Grading Standards
Your grade will be approximately weighed in the following way:

Written Homework 20% **(2 total assignments)**
Midterm 20%
Individual Programming Assignments (**3 total assignments**) 30%
Ethics Essay Response 10%
Final Group Programming Project 20%
(Graduate Assignment) Research Paper Analysis: (Will constitute 1/3 of final project grade for grad students)

PSU LEARNING CENTER

https://www.pdx.edu/tutoring/

PSU PUBLIC SAFETY OFFICE
https://www.pdx.edu/cpso/campus-public-safety

PSU DRC

PSU values diversity and inclusion; we are committed to fostering mutual respect and full participation for all students. My goal is to create a learning environment that is equitable, useable, inclusive, and welcoming. If any aspects of instruction or course design result in barriers to your inclusion or learning, please notify me. The Disability Resource Center (DRC) provides reasonable accommodations for students who encounter barriers in the learning environment.

If you have, or think you may have, a disability that may affect your work in this class and feel you need accommodations, contact the Disability Resource Center to schedule an appointment and initiate a conversation about reasonable accommodations. The DRC is located in 116 Smith Memorial Student Union, 503-725-4150, drc@pdx.edu, https://www.pdx.edu/drc.

If you already have accommodations, please contact me to make sure that I have received a faculty notification letter and discuss your accommodations.

Students who need accommodations for tests and quizzes are expected to schedule their tests to overlap with the time the class is taking the test.

Please be aware that the accessible tables or chairs in the room should remain available for students who find that standard classroom seating is not useable.

For information about emergency preparedness, please go to the Fire and Life Safety webpage(https://www.pdx.edu/environmental-health-safety/fire-and-life-safety) for information.

Classroom Requirements for All Students and Faculty Due to Covid-19

The University has established rules and policies to make the return to the classroom as safe as possible. It is required for everyone to follow all the Return to Campus rules and policies. To participate in this class, PSU requires students to comply with the following.

Masks Required at all Times in Classroom

- [Wear a mask or face covering indoors](#) at all times. Your mask or face covering must be properly worn (fully covering nose and mouth and tight fitting). Mesh masks, face shields, or face covering that incorporates a valve designed to facilitate easy exhalation are not acceptable. **Because a mask must be worn in the classroom, there should be no eating or drinking in the classroom.** If you have a medical condition or a disability that prevents you from wearing a mask or cloth face covering, you must obtain an accommodation from the [Disability Resource Center (DRC)](#) to be exempt from this requirement.
- CDC, State, and County guidance does not limit class size for in-person instruction or require physical distancing.

Vaccination

- Be vaccinated against COVID-19 and complete the [COVID-19 vaccination attestation](#) form. Those students with medical or nonmedical exemptions or who will not be on campus at all must complete the process described on "COVID-19 Vaccine Exemption Request Form" to establish those exemptions.

Health Check, Illness, Exposure or Positive Test for COVID-19

- Complete the [required self-check for COVID-19 symptoms before coming to campus each day.](#)
- If you are feeling sick or have been exposed to COVID-19, do not come to campus. Call SHAC to discuss your symptoms and situation (503.725.2800). They will advise you on testing, quarantine, and when you can return to campus.
- If you test positive for COVID-19, [report your result to SHAC](#) and do not come to campus. SHAC will advise you on quarantine, notification of close contacts and when you can return to campus.
- Please notify me, (i.e. your instructor), should you need to miss a class period for any of these reasons so that we can discuss strategies to support your learning during this time.
- If I become ill or need to quarantine during the term, either I or the department chair will notify you via PSU email about my absence and how course instruction will continue.

Failure to Comply with Any of these Rules
As the instructor of this course, the University has given me the authority to require your compliance with these policies. If you do not comply with these requirements, I may ask you to leave the classroom or I may need to cancel the class session entirely.

In addition, failure to comply with these requirements may result in a referral to the Office of the Dean of Student Life to consider charges under PSU's Code of Conduct. A student found to have violated a university rule (or rules) through the due process of student conduct might face disciplinary and educational sanctions (or consequences). For a complete list of sanctions, see Section 14 of the Student Code of Conduct & Responsibility

Guidance May Change
Please note that the University rules, policies, and guidance may change at any time at the direction of the CDC, State, or County requirements. Please review the University's main COVID-19 Response webpage and look for emails from the University on these topics.