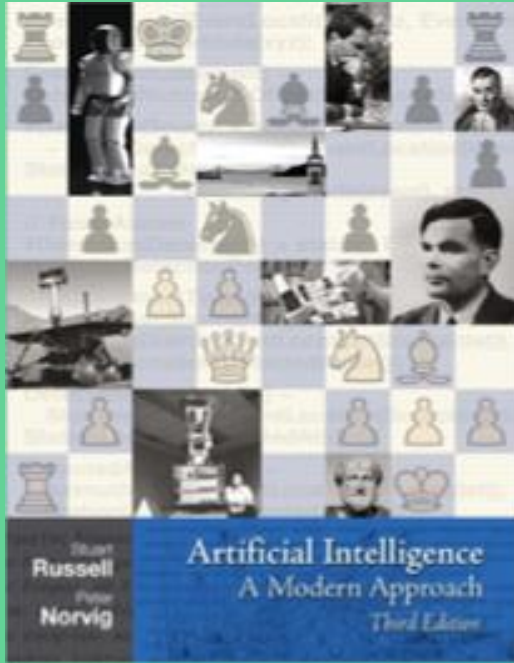# Syllabus
CMPSC 442: Artificial Intelligence, Fall 2022

Kaivan Kamali, Ph.D.
Mohammad Wasih

Outline

- Course information, slides 3-17
- COVID-19 Safety, slide 18
- Accessibility, slide 19
- Academic Integrity, slides 20-21
- Counseling services, slide 22
- Educational Equity, slide 23
- EECS Mentor program, slide 24

MAIN TEXT

- S. Russell and P. Norvig. *Artificial Intelligence: A Modern Approach (AIMA).* Prentice Hall, 2020, Fourth Edition.

Other readings are provided on Canvas

Class Meeting Times and Location

- **Times:** Morning Sections
  - Mon/Wed/Fri 10:10 am-11:00 am
  - Location: Chemistry Building 102
- **Times:** Afternoon Sections
  - Mon/Wed/Fri 12:20 pm-1:10 pm
  - Location: Osmond Lab 101

Contact Information

- Instructor
  - Morning session: Kaivan Kamali, kxk302@psu.edu
  - Afternoon session: Mohammad Wasih, mvw5820@psu.edu
  - Office Hours: On request, via Zoom
- TAs
  - Vipul Gupta, vkg5164@psu.edu
  - Berk Atil, bka5352@psu.edu
  - Ruihao Pan, rvp5555@psu.edu
- Graders: using gradescope, including **checking for code plagiarism along with instructor**
  - Conor Mathews (cbm5716@psu.edu)
  - Pranay Muthineni (ppm5244@psu.edu)
  - Waleed Khan (wak5122@psu.edu)

Text and Other Readings

- Norvig & Russell, Artificial Intelligence: A Modern Approach *(AIMA)*. Prentice Hall, 2020, Fourth Edition.
- Jurafsky & Martin, <u>Speech & Language Processing</u>, 3rd Ed. Draft PDF available online and through CANVAS
- Supplementary material on Canvas for some course modules
- Course Genealogy: materials drawn from Mitch Marcus, UPenn; Dragomir Radev, Yale; many others (see <u>AIMA</u> website)

Course Goals and Objectives

Students who do the work will learn

- Basic techniques for building intelligent computer systems
  - Search, (*games,*) constraint satisfaction, uncertainty and probability, Bayes Rule, Naïve Bayes, Hidden Markov Models
  - Introduction to fundamental concepts in machine learning: linear regression, linear regression classifier, perceptron learning rule
- In depth consideration of the role AI will play in our lives

Course Activities

- Six required homework assignments, plus one optional.
  - See the Canvas Grading FAQ
- Readings, video presentations on readings, classroom activities to enhance the readings including Q&A, group work, discussion
- Recitations
- A final class presentation on an AI topic by teams of 5-10 students
- Final exam

Schedule Weeks 1-8

2022				Class Meetings		Homework		
mtg #	Date	Wk/Module	Day	Topic	Readings	Num.	Topic	Period (Days)
1	08-22	1	Mon	AI Intro; Python Intro	Syllabus	1	Python utilities	8/22-8/28 (7)
2	08-24		Wed	Python Basics	Tutorials & Doc			
3	08-26		Fri	Python Functions, etc.	Tutorials & Doc			
4	08-29	2	Mon	Python Classes, etc.	Tutorials & Doc	2	Uninf. Search	8/29-9/14 (17)
5	08-31		Wed	Intell. Agents	AIMA 2			
6	09-02		Fri	Intro to Search Algs	AIMA 3.1-3.3			
	09-05	3	Mon	Labor Day				
7	09-07		Wed	Uninformed Search	AIMA 3.3-3.4; A.1			
8	09-09		Fri	Heuristic Search	AIMA 3.5-3.6			
9	09-12	4	Mon	Search as Optimization	AIMA 4.1-4.2			
10	09-14		Wed	Search with Unknowns	AIMA 4.3-4.4			
11	09-16		Fri	Games & Minimax	AIMA 5.1-5.2.2	3	Informed Searc	9/16-10/4 (19)
12	09-19	5	Mon	Alpha-Beta Pruning	AIMA 5.2.3			
13	09-21		Wed	Stochastic Games	AIMA 5.3-5.5			
14	09-23		Fri	Constraint Satisfaction	AIMA 6.1-6.2			
15	09-26	6	Mon	CSP Search	AIMA 6.3-6.4			
16	09-28		Wed	Logical Agents	AIMA 7			
17	09-30		Fri	First Order Log (FOL)	AIMA 8			
18	10-03	7	Mon	FOL Inference	AIMA 9			
19	10-05		Wed	Quantifying Uncertainty	AIMA 12.1-12.4	4	Proposition. Lo	10/5-10/23 (19)
20	10-07		Fri	Probabilistic Agent; Baye	AIMA 12.7; 12.5			
21	10-10	8	Mon	Naive Bayes	AIMA 12.6			
22	10-12		Wed	NB for Spam; Smoothing	Module Rdgs			
23	10-14		Fri	Bayesian Networks	AIMA 13.1-13.2			

Schedule Weeks 9-15

2022				Class Meetings		Homework		
mtg #	Date	Wk/Module	Day	Topic	Readings	Num.	Topic	Period (Days)
24	10-17	9	Mon	Bayesian Inference	AIMA 13.3-13.5			
25	10-19		Wed	Markov Processes	AIMA 14.1-14.2			
26	10-21		Fri	Formalizing HMMs	AIMA 14.3; J&M 8			
27	10-24	10	Mon	HMM: Viterbi Decoding	AIMA 14.3; J&M	5	NB Classifier	10/24-11/10 (18)
28	10-26		Wed	Learning HMMs	AIMA 14.3; J&M 9			
29	10-28		Fri	Expectation Maximization	AIMA 20.3			
30	10-31	11	Mon	Decision Theoretic Agent	AIMA 16			
31	11-02		Wed	MDPs	AIMA 17.1-17.2			
32	11-04		Fri	Solving MDPs	AIMA 17.2-17.3			
33	11-07	12	Mon	Intro to ML	AIMA 19.1-19.5			
34	11-09		Wed	Regression; Perceptrons	AIMA 19.6			
35	11-11		Fri	Deep Learning	AIMA 19.6	6	HMM	11/11-12/01 (21)
36	11-14	13	Mon	Reinf. Learning	AIMA 22.1-22.4			
37	11-16		Wed	Reinf. Learning	AIMA 22.5-22.7			
38	11-18		Fri	NLP Intro	Module Rdgs	7	(Opt'l) Sudoku	11/18-12/06 (19)
NA	11-21		Mon	Thanksgiving				
NA	11-23		Wed	Thanksgiving				
NA	11-25		Fri	Thanksgiving				
39	11-28	14	Mon	Distributional Semantics	AIMA 24.1; Rdgs			
40	11-30		Wed	DNN Language Modeling	J&M 3, 9			
41	12-02		Fri	Student presentations				
42	12-05	15	Mon	Student presentations				
43	12-07		Wed	Student presentations				
44	12-09		Fri	Student presentations				

Homework

6 Required Programming Assignments, 1 Optional

- 7 days for Homework 1, DUE 08/28 at 11:59 pm
- 17-21 days for all other homework assignments
- Late homework gets **a zero** grade
  - Two homework assignments can be two days late
  - Save the late assignments for an emergency

All homework must be **YOUR OWN INDEPENDENT WORK**

- Homework is checked for plagiarism
- Do not copy code from the web, that is plagiarism

Course Grade

Standard:
- 55% Homework programming assignments
- 35% Final exam
- 10% Discussion and presentation

Schreyer Students Honors Option (Email me first week of class)
- 55% Homework programming assignments
- 30% Final exam
- 15% Honors Option

Homework Advice

DEFINE YOUR OWN UNIT TESTS, INCLUDING EDGE CASES
- Homework examples ARE NOT UNIT TESTS
- Homework examples are to **clarify** the problem

APPEARANCES CAN BE DECEPTIVE
- Always return the **right data type**, not what looks like the right data type
- Always return the **right data structure**

EFFICIENCY COUNTS   TOWARDS THE HOMEWORK GRADE
- Inefficient code gets penalized
- Do not loop through the same data multiple times
- Use efficient data structures from standard python libraries
  - E.g., comprehension; dictionaries; deque

Homework Grading

Homework is graded by an autograder hosted on Gradescope
- **Do not submit w/ import errors, syntax errors**
- Homework that does not import will NOT be graded in a timely way
- Homeworks that does not import **might not be graded at all**

To be graded, homework must produce a correct or partly correct answer

Request regrading **only through Canvas email!**
DO NOT EMAIL ME ABOUT HOMEWORK OUTSIDE OF CANVAS

Drop Rates

- 2016: 16 out of 66 = 26.7%
- 2017: 20 out of 70 = 28.6%
- 2018: 27 out of 89 = 30.3%
- 2019 section 1: 17 out of 85 = 20.0% - 22.7%
- 2019 section 2: 20 out of 88 = 22.7%

WHY?
- Homework assignments are challenging
- This course **DOES NOT TEACH CODING SKILLS**

Do Not Ask Me How Much Time to Spend on Homework

Ask yourself
- Are you comfortable programming with the following?
  - Loops
  - Recursion
  - Queue operations: push, pop, . . .
  - Efficient, easy to access structures: sorted arrays, associative arrays
  - Object oriented programming
- Can you break a problem down into simpler problems
- Define unit tests and edge cases
- Can you (learn to) work smart?

DO NOT START TO CODE THE SOLUTION BEFORE YOU UNDERSTAND THE PROBLEM

Time Spent on Homework does not Correlate with Grade

Grade x Hours, Sec 2, HW 4
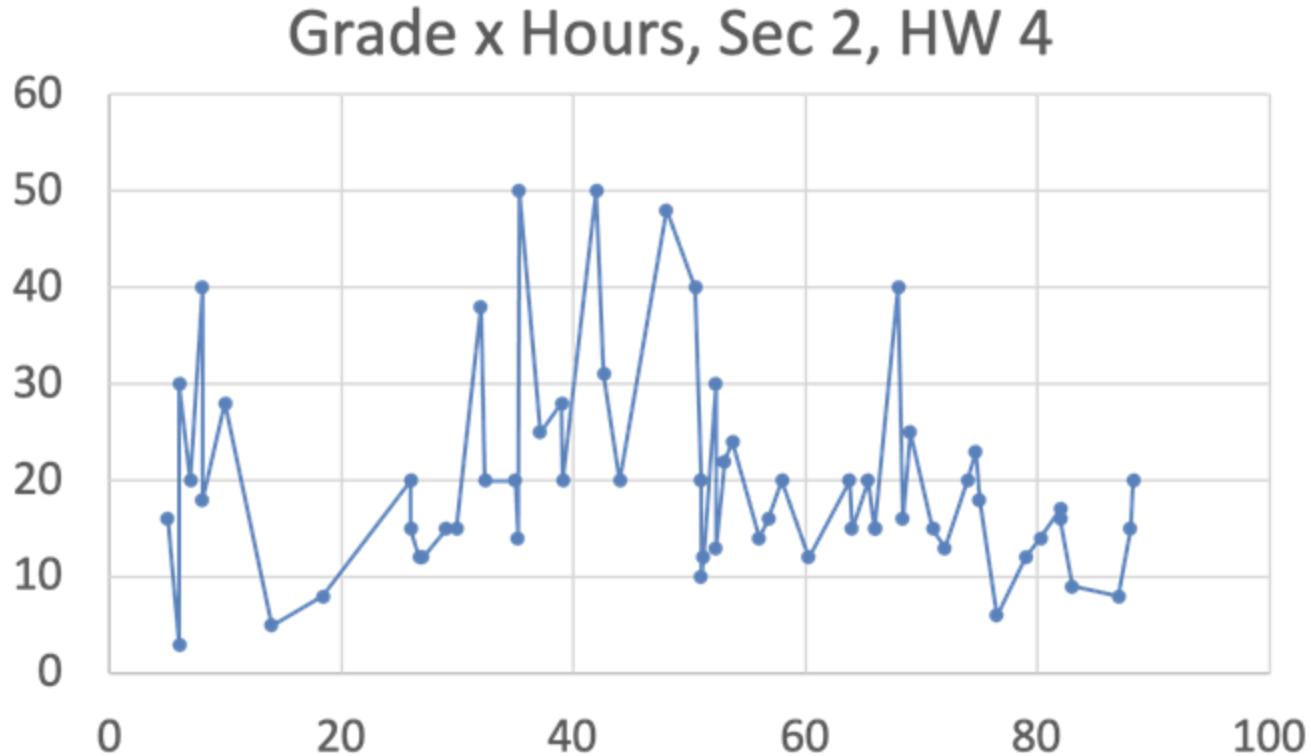
Accessibility

Accessibility Statement: Penn State welcomes students with disabilities into the University's educational programs. Every Penn State campus has an office for students with disabilities. The Student Disability Resources Web site provides contact information for every Penn State campus. For further information, please visit the Student Disability Resources Web site.

In order to receive consideration for reasonable accommodations, you must contact the appropriate disability services office at the campus where you are officially enrolled participate in an intake interview, and provide documentation. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with an accommodation letter. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. You must follow this process for every semester that you request accommodations.

Academic Integrity

- Academic Integrity Statement: The University defines academic integrity as the pursuit of scholarly activity in an open, honest and responsible manner. All students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts (refer to Senate Policy 49-20). **Dishonesty of any kind will not be tolerated in this course**. Dishonesty includes, but is not limited to, cheating, plagiarizing, fabricating information or citations, facilitating acts of academic dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with the academic work of other students. Students who are found to be dishonest will receive academic sanctions and will be reported to the University's Office of Student Conduct for possible further disciplinary sanctions (refer to Senate Policy G-9).
- Academic integrity will issues will be handled per the CSE department policies.
- Students are responsible to become familiar with these policies!

Code Plagiarism is an Academic Integrity Offense

- All code you submit for homework must be code you wrote, and must not copy any lines from other code.
- You may design your code by using pseudo code from the text or TAs, and filling out the details on your own.
- You can ask for help from TAs, but TAs will not write code for you. TAs can look at your code and give you tips.
- DO NOT SHOW YOUR CODE TO OTHER STUDENTS IN SOCIAL MEDIA INCLUDING CANVAS.
- Violations of this policy will result in at least a 0 on the assignment/project, up to reductions in the course grade. Any serious violation will result in an automatic failure in the course.

Counseling and Psychological Services

- Many students at Penn State face personal challenges or have psychological needs that may interfere with their academic progress, social development, or emotional wellbeing. The university offers a variety of confidential services to help you through difficult times, including individual and group counseling, crisis intervention, consultations, online chats, and mental health screenings. These services are provided by staff who welcome all students and embrace a philosophy respectful of clients' cultural and religious backgrounds, and sensitive to differences in race, ability, gender identity and sexual orientation.
- Counseling and Psychological Services at University Park (CAPS) (http://studentaffairs.psu.edu/counseling/): 814-863-0395
- Counseling and Psychological Services at Commonwealth Campuses (https://senate.psu.edu/faculty/counseling-services-at-commonwealth-campuses/)
- Penn State Crisis Line (24 hours/7 days/week): 877-229-6400
- Crisis Text Line (24 hours/7 days/week): Text LIONS to 741741

Educational Equity

Penn State takes great pride to foster a diverse and inclusive environment for students, faculty, and staff. Acts of intolerance, discrimination, or harassment due to age, ancestry, color, disability, gender, gender identity, national origin, race, religious belief, sexual orientation, or veteran status are not tolerated and can be reported through Educational Equity via the Report Bias webpage (http://equity.psu.edu/reportbias/).

EECS Mentor Collective Program

- The **Peer Mentor Program** connects 1st/2nd year students majoring (or intending to major) in EE, CS, Comp Eng or DS with a peer mentor. Participants can sign up for a mentor in their major to help guide them based on the mentor's experiences.
- The **Career Mentor Program**
  - Connects 3rd/4th yr EECS students with **alumni mentors**.
  - You are also encouraged to sign up as a mentor for the Peer Mentor Program.
  - Both opportunities look great on resumes and LinkedIn profiles

Sign up here

Contact: Tammy Falls, alumni and events coordinator, at 814-863-8143 or tjf13@psu.edu