



INFSCI 2440: Artificial Intelligence

[Current as of: 8/19/2020]

Fall 2020

Class time: Thursdays 11:05pm – 1:55pm
Location: FKART 125 (Social Distance Cap: 38)

Instructor:

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Graduate Student Assistants:

TA: Saeed Javadi

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Office hours: Tuesdays 3:00-6:00pm

Communication

- Sending email is the best means to talk to the instructor and the TA
 - Expect a 24-hour response time frame
- Attending virtual office hours is also a good way
 - Instructor's office hours: issues related to the course in general
 - TA's office hours: specific assignment related issues
- Submitting Muddiest Points
 - One stone for two-bird approach
 - A quick way to ask help on topics that confuse you
 - An easy way to earn participation points (up to 5% in final score)

Canvas URL: <http://canvas.pitt.edu>

I. Course Description:

With the focus on the machine intelligence technologies around processing, representing, modeling, and learning from large quantity of data in current web context, this course serves as a broad introduction to students the theories, algorithms and applications of modern Artificial Intelligence (AI). Taking a data science-oriented perspective, this course aims to help students to develop a broad theoretical knowledge and practical experience on AI. With the understanding that modern AI is

actually a discipline of theories and techniques around the idea of data driven model-based machine intelligence, this course consists of four broad modules: 1) representation of knowledge, 2) uncertainty-based modeling and reasoning, 3) improvements with machine learning, and 4) communication with natural language processing, all of which are necessary components for an intelligent agent to engage intelligently with other agents or people in real world. The goal of this course is to prepare students to work creatively and productively in current data-driven and intelligence-rich environment, and it is ideal for students who would like introductory exposure to techniques in modern AI.

Prerequisites: programming using python, discrete mathematics, probabilities and statistics

Course Goals

Upon finishing this course, the students should be able to

- engage academic discussions on AI both as a theoretical concept as well as a set of rapidly developing technologies
- design and develop certain AI technologies
- evaluate and adopt major AI technologies for real world problems

II. Canvas Information:

The Web-based teaching system for this course is Canvas, whose goal is to facilitate course-related communication as well as distribution of course materials and grades. You can access Canvas at <http://canvas.pitt.edu>. You must log in with your University Computer Account – this is the one that goes with your ‘pitt.edu’ e-mail address. Course-related e-mail will be sent to your Pitt e-mail account. If you do not read e-mail on your Pitt account, you are responsible for forwarding any e-mail received on your Pitt account to the e-mail address that you use. See <http://accounts.pitt.edu/> for information on managing your Pitt account and forwarding e-mail. If you have trouble logging in to Canvas, you may need to log in to the accounts website above to activate your Pitt e-mail account. Call 412-624-HELP with any problems relating to your account.

III. Recommended books and Readings

There is no required textbook for this class. However, various parts of the following books will be used in the class:

1. Russell and Norvig. Artificial Intelligence: A Modern Approach. 3rd Edition. In short AIMA. <http://aima.cs.berkeley.edu/>. Referred as “AIMA” subsequently.
2. Jurafsky and Martin. Speech and Language Processing. 3rd Edition. In short SLP. <https://web.stanford.edu/~jurafsky/slp3/>. Referred as “SLP” subsequently.

There will be about 3-4 required readings each week. These readings usually are from the textbooks. You are asked to read all these readings before the class each week starts.

Readings will generally be available online or via Canvas (if available in electronic format). Additional readings may be added as needed.

IV. Course Schedule Summary

Date	Unit and Readings	Assignment and Others
Aug. 20	1: Intelligent Agents and Course Overview Readings <ul style="list-style-type: none"> • AIMA Chapter 1 • AIMA Chapter 2 • AIMA Chapter 26 	<ul style="list-style-type: none"> • <i>Team Project Introduction</i>
Aug. 27	2: Agents for Problem Solving: Classical and Beyond Readings <ul style="list-style-type: none"> • AIMA Chapter 3 (except 3.4, 3.5.3) • AIMA Chapter 4 	<ul style="list-style-type: none"> • <i>Assignment 1 Out</i>
Sep. 3	3: Agents with Knowledge Base for Inference and Planning Readings: <ul style="list-style-type: none"> • AIMA Chapter 7.1-7.2, • AMIA Chapter 8 • AMIA Chapter 12 	
Sep. 10	4: Agents with Uncertain Knowledge 1 Readings: <ul style="list-style-type: none"> • AIMA Chapter 13.1-13.5, • AIMA Chapter 15.1-15.3 	<ul style="list-style-type: none"> • <i>Team Formation and Initial Proposal Deadline</i>
Sep. 17	5: Agents with Uncertain Knowledge 2: Readings: <ul style="list-style-type: none"> • AIMA Chapter 14.1-14.5 	<ul style="list-style-type: none"> • <i>Assignment 1 Due</i> • <i>Assignment 2 Out</i>
Sep. 24	6: Agents with Learning Capabilities 1: Basics and Neural Networks Readings: <ul style="list-style-type: none"> • AIMA Chapter 18.1-18.2, 18.4 • AIMA chapter 18.6, 18.8, 18.9 (could be nice read to know some basic methods) 	

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Oct. 1	7: Agents with Learning Capabilities 2: Statistical methods Readings: • AIMA Chapter 20	
Oct. 8	8: Agents with Learning Capabilities 3: NN methods Readings: • SLP Chapter 7 (Neural Nets and Neural Language Models): 7.5, • SLP Chapter 9 (Sequence Processing with Recurrent Networks), • SLP Chapter 10 (Encoder-Decoder Models, Attention, and Contextual Embeddings): 10.1-10.3,	<ul style="list-style-type: none"> • Assignment 2 Due • <i>Assignment 3 Out</i>
Oct. 15	9. Agents with Learning Capabilities 4: Ensemble and Reinforcement Learning Readings: • AMIA chapter 18.10 • AIMA chapter 21	<ul style="list-style-type: none"> • <i>Project Initial Presentation (Online)</i>
Oct. 22	10: Agents with Language Capabilities 1: Basics Readings: • SLP Chapters 2 (Regular Expression, Text Normalization, and Edit Distance), • SLP Chapter 3 (Language Modeling with N-Grams)	<ul style="list-style-type: none"> • Assignment 4 Out
Oct. 29	TA Assignment feedbacks	<ul style="list-style-type: none"> • Assignment 3 Due
Nov. 5	11. Agents with Language Capabilities 2: Extraction (NER, Summarization) Readings: • SLP Chapter 18 (Information Extraction), • SLP Chapter 20 (Semantic Role Labeling)	
Nov. 12	13. Agents with Language Capabilities 3: Transformation (MT, Simplification) Readings: • SLP Chapter 11 (Machine Translation) • SLP Chapter 25 (Question Answering)	
Nov. 19	14. Agents in Human Society: Present and Future	<ul style="list-style-type: none"> • Assignment 4 Due

	<p>Readings:</p> <ul style="list-style-type: none"> • AIMA Chapter 27 • Henry Kissinger How the Enlightenment Ends. The Atlantics, June 2018. https://www.theatlantic.com/magazine/archive/2018/06/henry-kissinger-ai-could-mean-the-end-of-human-history/559124/ • Pew Research Center, December, 2018, “Artificial Intelligence and the Future of Humans” https://www.pewresearch.org/internet/2018/12/10/artificial-intelligence-and-the-future-of-humans/ • 	
Nov. 26	Thanksgiving (no class)	
Dec. 3	15. Team Project Final Presentation	

V. Assessment

Participation 10%

Class attendance is required for success in this course, as material will be covered in class that is not included in the readings. Participation is based on active participation to each week’s “readings” before the class and “my muddiest points” after the class. The “readings” is planned to complete on an online reading system, which will be stated in detail in the class. This reading task should be completed before 11:59pm of the Tuesday before the class. As described below, 10 participations are required as part of your final grade, each of which counts for .5 participation point.

Your muddiest points should be posted into the blog you created in blogger.com for this course. Just list any questions regarding the issues covered during the class. Again, 10 responses to the muddiest points are required as part of your final grade, each of which counts .5 participation point.

If you must miss a class, please notify the instructor, and make arrangement to obtain course notes and handouts. Makeup exams will not be offered except under extreme circumstances.

Assignment 36%

There are total four assignments, each of which will count 9% in the final course score. The deadline of submitting each assignment is before 11:59pm of the due date. That is, you should submit the assignment before leaving for this class. Each 24-hours delay will have 40% deduction of the maximal score. No submission later than 2 days will be accepted except in the case of emergencies and personal disasters.

Exam 24%

The exact format of the exam is undecided yet. If we ever go back to face to face format, the exam will be conducted in classroom that lasts for 100 minutes, and covers all the topics taught in the weeks before the exam date. Common exam questions include short calculation, short discussions, and long discussion questions.

However, if we stay remote teaching all the time, the exam will be in the format of writing an essay regarding the topics taught in the course.

Term Project 30%

Please see section VI for detail description of term project.

Course Grading Scale:

The final grade depends on the percentage of points you have earned, and the definition of letter grades is:

- $90 \leq A- < 93$, $93 \leq A < 98$, $98 \leq A+ \leq 100$
- $80 \leq B- < 83$, $83 \leq B < 88$, $88 \leq B+ < 90$
- $70 \leq C- < 73$, $73 \leq C < 78$, $78 \leq C+ < 80$
- $60 \leq D < 70$,
- $F < 60$

VI. Term Projects

Introduction:

The term project is designed for students to integrate and extend knowledge acquired throughout the course and to apply that knowledge to solve a real problem of substantial scope. Students are required to work in groups of 3 people. Experience suggests that successful teams require expertise in design, implementation, and project management.

The task is to identify a real-world problem or a standard task in AI and its related domain, either design your own or implement an existing model, technology or tool to resolve the identified problem or complete the standard task. The model/technology/tool should be in the area of knowledge representation, statistical modeling, machine learning or NLP, which are the main topics covered by this course. Relevant online APIs, tools or open source software can be used as part of the solution. Each team propose their project, and the instructor will revise and make suggestions to the project.

A dataset might be needed for completing the project. Existing datasets are preferred for the advantage of saving the time. If the team wants to collect data themselves, do talk to the instructor.

Milestones for the project:

Introduction of term project:	Unit 1
Team formation deadline:	Unit 4
Project Initial Presentation	Unit 9

VII. Course Policies

Ground rules for class discussion

On-class interaction and discussion will be an important means of learning in this course, therefore, it is important that we work together to create a constructive environment by observing these rules:

- You should participate in the discussion of ideas.
- You should respect diverse points of view.
- You should be aware of the diverse backgrounds of peers.
- You may not belittle or personally criticize another individual for holding a point of view different than your own
- Your use of language should be respectful of other individuals or groups

Plagiarism

It is expected that the work you submit in this course will be your own. While collaboration is allowed for the course project, it should be approved in advance and the nature of each contribution should be specified in the project proposal and the final submission.

The following statement is taken from *The Teaching Assistant Experience: A Handbook for Teaching Assistants and Teaching Fellows at the University of Pittsburgh* (A.P. Haley and J.M. Nicoll, eds.)]

Plagiarism means submitting work as your own that is someone else's. For example, copying material from a book or other source without acknowledging that the works or ideas are someone else's and not your own is plagiarism. If you copy an author's words exactly, treat the passage as a direct quotation and supply the appropriate citation. If you use someone else's ideas, even if you paraphrase the wording, appropriate credit should be given. You have committed plagiarism if you purchase a term paper or submit a paper as your own that you did not write¹.

Plagiarism is a violation of the University of Pittsburgh's standards on academic honesty, and violations of this policy are taken seriously. **From the *Guidelines on Academic Integrity: Student and Faculty Obligations and Hearing Procedures* (effective September, 1995):**

A student has an obligation to exhibit honesty, and to respect the ethical standards of the historical profession in carrying out his or her academic assignments. Without limiting the application of this principle, a student may be found to have violated this obligation if he or she:

- Presents as one's own, for academic evaluation, the ideas, representations, or words of another person or persons without customary and proper acknowledgment of sources.

¹ B. G. Davis, *Tools for Teaching* (San Francisco: Jossey-Bass, 1993), 300.

- Submits the work of another person in a manner which represents the work to be one's own. [Quotation ellipsed.]²

Special Needs

Students with disabilities who require special accommodations or other classroom modifications should notify the instructor and the University's Office of Disability Resources & Services (DRS) no later than the 2nd week of the term. Students may be asked to provide documentation of their disability to determine the appropriateness of the request. DRS is located in 216 William Pitt Union and can be contacted at 648-7890 (Voice), 624-3346(Fax), and 383-7355(TTY). Students who must miss an exam or class due to religious observances must notify the instructor ahead of time and make alternative arrangements.

² University of Pittsburgh, *Guidelines on Academic Integrity: Student and Faculty Obligations and Hearing Procedures* (Pittsburgh: University of Pittsburgh, 1995), 7-8.