

Course Syllabus of CSE 5522

Survey of Artificial Intelligence II: Advanced Topics

January 11, 2019

1 Course Information

Spring 2019, Tue/Thu, 3:55-5:15 PM, Dreese Lab 305

Instructor: Prof. Michael White, white.1240@osu.edu, <http://u.osu.edu/mwhite>

Office Hours: Oxley Hall 222B, M 2:30–3:30, F 10:30–11:30 (office hours subject to change)

TA: Akshay Mehra, mehra.42@buckeyemail.osu.edu, <https://www.linkedin.com/in/akshay-mehra/>

Office Hours: DL 586, MW 4:30–5:30

Course Description

Survey of advanced concepts, techniques, and applications of artificial intelligence, including knowledge representation, learning, natural language understanding, and vision.

Credits, Prerequisites

3 semester credits. Official prerequisite is 3521, 5521 or 630. Graduate students may take the class without having taken the prerequisite, although the instructor should be consulted to determine if this course is appropriate. Not open to students with credit for CSE 730.

Terms Offered, General Information, Exclusions, Cross-Listings, etc.

- Offered both Autumn and Spring Semesters.
- There are programming projects and prior programming experience is assumed.
- This course satisfies an Application Core requirement in the CSE MS program.
- This course is a core course in the undergraduate Cognitive Science minor. Information regarding the minor and its requirements may be found at <https://cog.osu.edu/academics/cognitive-science-undergraduate-minor>.
- Please note that this course will be taught at the level of an introductory graduate class, and students should be prepared to work significantly outside of class time. Undergraduates are welcome but should be prepared for a significantly higher workload than in Survey of Artificial Intelligence I.
- Please note that many of the examples in class will be working with python. You should be comfortable programming at least simple scripts in python.

2 Course Material

Objectives

- Master advanced AI concepts, theories, and terminology.
- Master computational techniques in typical AI subareas.
- Master knowledge representation and reasoning methods in AI.
- Be exposed to current research topics in AI.

Textbook

Artificial Intelligence, A Modern Approach by Russell and Norvig, third edition, Prentice Hall, 2009. Please use this edition, Prentice Hall, 2009. Please use this edition - previous editions do not have significant coverage of some of the topics.

Topics

- Probability theory review, probabilistic inference (Chapter 13)
- Bayesian Networks (Chapter 14)
- (Hidden) Markov Models (Chapter 15)
- Survey of Machine Learning (Chapter 18, 20)
 - Decision trees, Neural Networks, Support Vector Machines, Expectation Maximization
- Survey of AI Applications: AI Research at OSU
 - Computer Vision, Bioinformatics, Automatic Speech Recognition, Natural Language Processing, Machine Learning

Guest Lectures

There will be a number of guest lectures this semester that will outline some of the AI research pursued at OSU. You are responsible for material presented in these lectures. Treat the material in these lectures like any other part of the course. The guest lecture dates, Table 1, are subject to change based on the availability of the lecturers.

3 Grading Plan

Grades will be assigned using the standard OSU scale. This is the *approximate* weighting of the different components of this course:

- Homeworks: $4 \times 10\%$ each, drop lowest = 30%
- Midterm Exam: 20%
- Final Exam: 30%
- Project: 20%
 - Paper review: 5%
 - Project writeup: 15%
 - BONUS: selected by program committee and presented during final week: +2%
 - BONUS: selected as best paper by audience: +2%

Homeworks:

There will be four homework assignments, some written and some programming. You have two weeks for each one and they are due at 11:59 PM on the due date listed in Carmen (and Table 1). Late homeworks will be penalized 10 points for every day late, up to three days late. No submissions will be allowed after three days. All code must be runnable on the stdlinux unix system, even if you've developed it on other platforms. You are responsible for making sure that the code runs there. You may use the programming language of your choice.

W #	Tue Date	Tue Events	Tue	Thu	Thu Events	Thu Date	W #
1	8-Jan		Introduction, Logistics, Course Overview	Course Overview, Basic Probability		10-Jan	1
2	15-Jan		Basic Probability	Basic Probability		17-Jan	2
3	22-Jan		Bayesian Networks	Bayesian Networks	HW1 Due	24-Jan	3
4	29-Jan		Exact Inference	Approximate Inference	Group Declaration	31-Jan	4
5	5-Feb		Temporal Probability Models	Temporal Probability Models	HW2 Due	7-Feb	5
6	12-Feb		Decision Trees	Linear Regression and Classification		14-Feb	6
7	19-Feb		Artificial Neural Networks	Support Vector Machines	HW3 Due	21-Feb	7
8	26-Feb		Ensemble Learning	Midterm Exam		28-Feb	8
9	5-Mar	Project Proposal	Maximum Likelihood Estimation	Bayesian Parameter Estimation		7-Mar	9
10	12-Mar		Spring Break			14-Mar	10
11	19-Mar		EM Algorithm	Bioinformatics	HW4 Due	21-Mar	11
12	26-Mar		Bioinformatics	Natural Language Processing		28-Mar	12
13	2-Apr	Final Paper Due	Natural Language Processing	Computer Vision		4-Apr	13
14	9-Apr	Paper Review Due	Speech Recognition	Advanced Topic		11-Apr	14
15	16-Apr		3 Groups Project Presentation	3 Groups Project Presentation		18-Apr	15
16	23-Apr		Final Exam: Monday, Apr 29, 6:00–7:45pm			25-Apr	16

Table 1: Course Schedule.

Exams:

There will be one midterm exam and one final exam.

- Midterm: In-class on Thursday, February 28
- Final exam: Monday, April 29, 6:00–7:45pm
- **Makeup policy:** Check the final exam date for possible conflict with your other exams. If you know you won't be able to make a deadline or exam, please see me before you miss the deadline or exam. If you miss the midterm or final, you will have to provide extensive written documentation for your excuse.

Group project:

You will be expected to apply machine learning techniques to an “interesting” problem, as part of a group; you are encouraged to propose a project based on your interests, and submit a conference-style paper based on your experiments.

You should declare your group on Carmen by the end of week 4 (Jan 31st) of the semester. Preliminary proposals for projects are due in the 9th week (March 5th) of the semester. Revisions to the project proposal may be made based on feedback. You are encouraged to make an appointment with me sometime early on to discuss potential projects. You must work in teams of three or larger (larger groups = more substantial projects); exceptions to this rule need to be cleared with me and are not likely to be granted given the size of the class this term. Please note that the late policy for homeworks does not apply for project deadlines.

Each team will turn in a 4 page maximum conference-style paper (following a conference template that I will provide) by Tuesday April 2nd, 11:59pm. The paper will be distributed to (up to) five classmates, who will provide anonymous reviews for the paper. These reviews will be used by the program committee (the class) to decide the top six papers, which will be presented in the last two sessions of class. Papers that are selected and presented (and reflect the submitted paper) earn a 2% bonus on the final grade. The presentation that is selected “best paper” by the non participating students and instructor earns another 2% bonus.

4 Others

Announcements and Communication

I will put announcements onto the main page of the CSE 5522 Carmen website (carmen.osu.edu). Announcements of urgent matters will be mailed to your Name.#@osu.edu address. If you do not regularly read that account, make sure you forward it to

somewhere that does. I will also monitor discussions on the Carmen discussion groups and answer as appropriate, but students should feel free to use the forums to have group discussions as well. Fair game for the homework discussion site might be questions like “What did Dr. W. mean by ‘Give an example of foo’ ” or “How could I start approaching problem X?” but not “Can someone give me the answer for this question.” Use common sense, keeping in mind the Code of Student Conduct.

Statement on Academic Misconduct:

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term academic misconduct includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct (<http://studentlife.osu.edu/csc/>).

In particular, you should note that you are not allowed to, among other things, (a) knowingly provide or receive information during exams, (b) knowingly provide or receive assistance on homeworks unless I say it’s OK, and (c) submit plagiarized (copied but unacknowledged) work for credit. If I suspect that any violation occurs, I am required to report the violation to the Council on Academic Misconduct. COAM will determine the guilt or innocence and appropriate penalties if any.

Statement about Disability Services:

Students with disabilities (including mental health, chronic or temporary medical conditions) that have been certified by the Office of Student Life Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office of Student Life Disability Services is located in 098 Baker Hall, 113 W. 12th Avenue; telephone 614-292-3307, slds@osu.edu; <http://slds.osu.edu/>.