

COMP 472: Artificial Intelligence

Fall 2121 – Course Outline



1 General Information

Instructor:

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Office Hours: TBD
Class Time: Mondays & Wednesdays 10:15am–11:30pm
Class Room: MB 1.210 and online via Zoom <https://concordia-ca.zoom.us/j/leilakosseim>

Teaching Assistants:

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2 Course Description

Prerequisite: COMP 352 or COEN 352.

This course initially describes the scope and history of Artificial Intelligence. Then it covers heuristic search and game playing. Finally, it introduces the topics of machine learning, and natural language processing. 4 credits

Lectures: three hours per week.

Laboratory: two hours per week.

3 Course Materials

Recommended Book Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, 4th edition, Prentice Hall.

Web Page Many resources for the course will be available on Moodle, accessible through www.myconcordia.ca. This includes PDF slides, pre-recorded lectures, practice exercises and links to relevant outside material. Students should regularly consult the Moodle page for up-to-date information on the course.

4 Objectives

The objective of the course is to provide a broad technical introduction of the core concepts of Artificial Intelligence (AI). Topics include: state-space search (uninformed and informed/heuristic search), adversarial search, machine learning, natural language processing.

Graduate Attributes As part of either the Computer Science or Software Engineering program curriculum, the content of this course includes material and exercises related to the teaching and evaluation of graduate attributes. Graduate attributes are skills that have been identified by the Canadian Engineering Accreditation Board (CEAB) and the Canadian Information Processing Society (CIPS) as being central to the formation of Engineers, computer scientists and information technology professionals. As such, the accreditation criteria for the Software Engineering and Computer Science programs dictate that graduate attributes are taught and evaluated as part of the courses. The following is the list of graduate attributes covered in this course, along with a description of how these attributes are incorporated in the course.

1. **Knowledge-base** State space search (uninformed and informed/heuristic search, adversarial search), natural language processing and machine learning techniques.
2. **Use of Engineering Tools** Determine appropriate programming languages, software libraries and other resources to develop programs that put into practice the foundations of artificial intelligence as taught in the lectures.
3. **Individual and Team Work** Implementation of the projects in teams and individual exams.
4. **Communications Skills** Deliver projects as reports and/or oral presentations.

5 Grading

Mini-Project 1	15%	
Mini-Project 2	15%	
Mini-Project 3	15%	
2 in-person Midterms ¹	30%	(2×15%)
in-person Final Exam ¹	25%	
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	100%	

There will be 3 programming mini-projects, which can be done in teams of up to 3. The mini-projects must be programmed in Python, which will be introduced in the first weeks of the semester in the laboratories, and may involve the writing of a report or an oral presentation, as well as a demo of the work. All members of a team are required to attend the demo. The schedule of the demos will be posted on Moodle and will try as much as possible to accommodate the schedule of the students and the TAs.

¹In the event of extraordinary circumstances where in-person exams will not be possible, each missed exam will be replaced by a Moodle Quiz.

6 Tentative Schedule

Day	Topic	Video (time)	Chapter (4 th ed.)	Special Event
Part 1 – Intro to AI				
Wed Sept 8	Introduction to AI	1.1 (1:52)	1, 27	
Part 2 – Machine Learning				
Mon Sept 13	Introduction to Machine Learning	2.1 (1:04)	19.1–19.2	
Wed Sept 15	Naïve Bayes Classification	2.2 (1:37)	12.2–12.6	MP 1 given
Mon Sept 20	Application to Spam Filtering	2.3 (0:54)	23.1.1	
Wed Sept 22	Decision Trees	2.4 (1:26)	19.3	
Mon Sept 27	Evaluation Metrics	2.5 (1:18)	19.4	
Wed Sept 29	Unsupervised Learning	2.6 (0:40)		
Mon Oct 4	Perceptrons	2.7 (1:24)	19.6	
Wed Oct 6	Multi-Layered Neural Networks	2.8 (1:54)	21.1	
Mon Oct 11	Thanksgiving – No Class			
Wed Oct 13	Midterm 1			
Part 3 – Heuristic Search				
Mon Oct 18	State Space Representation & Uninformed Search	3.1 (0:37)	3.1–3.3	MP 1 due
		3.2 (1:10)	3.3	MP 2 given
Wed Oct 20	Informed Search	3.3 (0:43)	3.5	
Mon Oct 25	Hill-climbing, GBFS & A*	3.4 (0:37)	4.1.1	
		3.5 (0:50)	3.5.1–3.5.2	
Wed Oct 27	More on Heuristic Functions	3.6 (1:22)	3.5.2, 3.6	
Part 4 – Adversarial Search				
Mon Nov 1	Minimax	4.1 (1:18)	5.1–5.3	
Wed Nov 3	Alpha-Beta Pruning	4.2 (1:13)	5.2.3	
Mon Nov 8	Other Adversarial Search	4.3 (1:03)	5.4–5.5	MP 2 due MP 3 given
Wed Nov 10	Midterm 2			
Part 5 – Natural Language Processing				
Mon Nov 15	Introduction to NLP	5.1 (0:59)	23.5, 23.6	
Wed Nov 17	Bag-of-word Model	5.2 (0:37)	12.6.1	
Mon Nov 22	n-gram Models	5.3 (1:34)	23.1.2–23.1.4	
Wed Nov 24	Intro to Deep Learning	5.4 (0:44)	21.1, 21.2.3	
Mon Nov 29	Word Embeddings	5.5 (1:27)	24.1	
Wed Dec 1	Recurrent Neural Networks	5.6 (1:51)	21.6, 24.2	MP 3 due
Mon Dec 6				
Tue Dec 7 ²	Catch-Up and/or Review			

²Make-up day for October 11

7 Behavior

All individuals participating in courses are expected to be professional and constructive throughout the course, including in their communications. Concordia students are subject to the Code of Rights and Responsibilities which applies both when students are physically and virtually engaged in any University activity, including classes, seminars, meetings, etc. Students engaged in University activities must respect this Code when engaging with any members of the Concordia community, including faculty, staff, and students, whether such interactions are verbal or in writing, face to face or online/virtual. Failing to comply with the Code may result in charges and sanctions, as outlined in the Code.

8 IP

Content belonging to the instructor or the TAs shared in online courses, including, but not limited to, online lectures, course notes, and video recordings of classes remain the intellectual property of the faculty member and the TAs. It may not be distributed, published or broadcast, in whole or in part, without the express permission of the faculty member. Students are also forbidden to use their own means of recording any elements of an online class or lecture without express permission of the instructor. Any unauthorized sharing of course content may constitute a breach of the Academic Code of Conduct and/or the Code of Rights and Responsibilities. As specified in the Policy on Intellectual Property, the University does not claim any ownership of or interest in any student IP. All university members retain copyright over their work.

9 Extraordinary Circumstances

In the event of extraordinary circumstances and pursuant to the Academic Regulations, the University may modify the delivery, content, structure, forum, location and/or evaluation scheme. In the event of such extraordinary circumstances, students will be informed of the changes.

10 Ethical Behavior

Plagiarism The most common offense under the Academic Code of Conduct is plagiarism, which the Code defines as “the presentation of the work of another person as one’s own or without proper acknowledgement.” This includes material copied word for word from books, journals, Internet sites, professor’s course notes, etc. It refers to material that is paraphrased but closely resembles the original source. It also includes for example the work of a fellow student, an answer on a quiz, data for a lab report, a paper or assignment completed by another student. It might be a paper purchased from any source. Plagiarism does not refer to words alone – it can refer to copying images, graphs, tables and ideas. “Presentation” is not limited to written work. It includes oral presentations, computer assignments and artistic works. Finally, if you translate the work of another person into any other language and do not cite the source, this is also plagiarism.

In simple words Do not copy, paraphrase or translate anything from anywhere without saying where you obtained it.

Source The Academic Integrity Website: <http://www.concordia.ca/conduct/academic-integrity.html>

11 Use of third-party software & Web sites

If you are using third-party software and/or web site, see the guidelines and include a statement. Information and standard wording found at:

<http://www.concordia.ca/offices/ctl/concordia-university-educationaltechnology-guidelines-for-faculty-and-students.html>

12 Accessibility and student services

Accessibility The instructor and the TAs will strive to make learning experience as accessible and inclusive as possible. If you have accessibility needs that require academic accommodations, please meet with an advisor from the Access Centre for Students with Disabilities (ACSD) as soon as possible to set up an accommodation plan. <http://www.concordia.ca/students/accessibility>.

List of student services

1. [Access Centre for Students with Disabilities](#)
2. [Student Success Centre](#)
3. [Counselling and Psychological Services](#)
4. [Concordia Library Citation and Style Guides](#)
5. [Health Services](#)
6. [Financial Aid and Awards](#)
7. [Academic Integrity](#)
8. [Dean of Students Office](#)
9. [International Students Office](#)
10. [Student Hub](#)
11. [Sexual Assault Resource Centre](#)
12. [Aboriginal Student Resource Centre](#)