COMP6721 Applied Artificial Intelligence

Lectures: On campus, Tue & Thu 18:30-21:00 **Room: SGW FG C080**
Instructor: Arash Azarfar **arash.azarfar@concordia.ca**
Office hours*:* Tue & Thu *17:15 – 18:15* **On-campus/Zoom TBA**

Coordinator: Dr. Mahdi Hosseini **Mahdi.hosseini@concordia.ca**

Calendar Course Description

The course covers heuristic and adversarial searches for concrete applications. It then discusses automated reasoning, advanced knowledge representation and dealing with uncertainty for Artificial Intelligence applications. Finally, it introduces autoencoders, recurrent neural networks and sequence to sequence models. A project is required. Students who have completed COMP 472 may not take this course for credit.

Objectives

The purpose of the course is to provide a broad technical introduction to the core concepts of Artificial Intelligence (AI). Topics include state-space search (uninformed and informed/heuristic search), adversarial search, Machine Learning (ML), Artificial Neural Networks (ANN), Deep Learning (DL), Computer Vision (CV) in DL, optimization algorithms in DL, and Natural Language Processing (NLP). *It is intended as an overview or first introduction to AI*, as there are dedicated courses covering ML, DL, CV, NLP, Intelligent Systems and other areas introduced here in more detail.

Prerequisite Knowledge

For the lab sessions, assignments, and course project, you must be familiar with general programming in *Python* (we will provide a brief introduction to Python as part of the first lab session). Several course topics require a solid grasp of mathematical foundations, in particular *probability theory* and *linear algebra*.

General Information

This course is scheduled to be on campus (in person), including lectures, labs, and Programmer-On-Duty (POD).

This course has two (2) lectures, two (2) lab sessions, and POD sessions per calendar week (summer semester). For each topic, lecture slides will be made available through the course Moodle web site. Additional activities and office hours will also be announced in-class and on Moodle.

Textbook

There is no single textbook that will be used for this course. For each lecture topic, required and recommended readings will be posted as part of the lecture information on Moodle. Generally, these readings will be available online or as an electronic resource through the Concordia Library.

Moodle Web Site

Amendments to this syllabus, if any, as well as other important information will be made available through the course's Moodle site. The Moodle site also provides additional reading material, as well as discussion forums for asking questions on lecture topics, the project, exams, etc. Note that you must be registered for the course to access the Moodle site (there is typically a one-day delay between registering and receiving Moodle access).

Evaluation

Your grade will be based on two individual assignments, as well as a team project (split into multiple submissions). Additionally, we will have a mid-term and a final exam. The distribution of these deliverables is as follows:

10% **Assignments (2x, individual work)**
20% **Midterm Exam (Written form)**
40% **Final Exam (Written form)**
30% **Course Project (teamwork, split into multiple submissions)**

There is no standard relationship between percentages and letter grades assigned for this course. In order to pass the course, you must receive at least 50% of the overall possible marks.

Please note that the course contains one midterm exam and will be taken during the midterm examination slots in written form. Should you fail to write the exam, there will be NO make-up session for retaking them.

Note: It is your responsibility to adhere to the ***university's code of conduct*** as detailed in the calendar. All students must read and sign the Expectations of Originality form and submit the signed copy with their assignments and project.

Academic Integrity

Violation of the Academic Code of Conduct in any form will be severely dealt with. This includes copying (even with modifications) of program segments. You must demonstrate independent thought through your submitted work. The Academic Code of Conduct of Concordia University is available at: https://www.concordia.ca/conduct/academic-integrity.html

It is expected that during class discussions, in the online forums and in your written assignments you will communicate constructively and respectfully. Sexist, racist, homophobic, ageist, and ablest expressions would not be tolerated.

Course Content and Schedule

We will cover the following topic(s) in each lecture week (note that the weekly schedule may be subject to change):

Session	Topic	Tentatively on	Note (Tentatively)
1	Introduction to AI: Overview & History	Thu, May11th	
2	State-Space Search: Uninformed & Heuristic Search	Tue, May 16th	
3	Adversarial Search: Mini-Max & Alpha-Beta Pruning	Thu, May 18th	
4	Introduction to Machine Learning (ML), Naïve Bayes Classifier	Tue, May 23rd	Assignment #1 is posted covering 1-6
5	ML: Decision Trees, Evaluation	Thu, May 25th	
6	ML: Unsupervised Learning	Tue, May 30th	
7	Introduction to Artificial Neural Networks (ANN)	Thu, June 1st	Mid-term (covering the first 6 sessions). Date TBD.
8	Deep Learning: Introduction	Tue, June 6th	
9	Deep Learning: Computer Vision & Optimization Algorithms	Thu, June 8th	Assignment #2 is posted covering 7-11

10	Introduction to Natural Language Processing (NLP)	Tue, June 13th	
11	NLP: Vector Space Model, Applications	Thu, June 15th	Project final submission deadline Saturday, 17th
12	Deep Leaning for NLP	Tue, June 20th	

There will not be time to cover all of these topics in depth. Other topics of interest to the class may also be included. A more detailed week-by-week breakdown, as well as additional information for each topic, will be available on the Moodle web site.

Homework Assignments

There will be two (2) homework assignments. The first homework will cover the first six sessions of the class. The second homework will cover the next sessions. The posting date as well as the deadlines of submission will be announced on Moodle. There will be 24 hours of cut-off date for late submission but only 50% of the mark will be considered for grading.

Laboratory Assignments

There are 11 laboratory sessions and 11 assignments in total posted each week. They are discussed during the laboratory sessions. **Note that lab sessions are a mandatory part of the course and take place in-person**, but the submission of your solution is not required.

Lab Sessions

There will be four weekly lab groups, starting from the second week of the semester. Note that lab sessions are a mandatory part of the course and take place in-person. You must attend the lab section you are registered in.
The lab sessions generally cover the lecture material from the previous lecture as well as the posted assignments. It is a prerequisite before attending each lab that you study the lecture material, readings, assignments and work on the corresponding worksheet.

Course Project

As part of the course, you will work on an AI project related to the topics covered in the lectures. Complete guideline for course project will be announced in class and on Moodle. The project is a teamwork. Formation of the teams should be started in the first class and confirmed by the second class.

Program-On-Duty (POD) Sessions

There will be weekly POD sessions, starting in the second calendar week of the semester. It is highly encouraged to attend one of the designated POD sessions with the team of your course project and update the teaching assistant on your progress with your project. Note that POD sessions are mainly dedicated to consult with your TA on acquiring proper guidance in developing your course project. The POD sessions may take place in-person or online.

Email Inquiries

All inquiries related to the course (e.g. midterm exams, assignments, etc) must be communicated via email using the contact info below. Your email subject line must follow a prefixed topic of "[COMP6721: {your subject}]".

Lecturer	Arash Azarfar	[email: arash.azarfar@concordia.ca]
Lead TA	Soorena Salari	[email: soorena.salari@mail.concordia.ca]
Lead TA and Lab instructor	Denisha Thakkar	[email: denisha.thakkar@mail.concordia.ca]
TA and Lab instructor	Farzad Salajegheh	[email: farzad.salajegheh@concordia.ca]
TA and Lab instructor	Y A Joarder	[email: ya.joarder@concordia.ca]

Disclaimer

In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.

On Campus Resources

HEALTH SERVICES An on-campus health clinic and health promotion center with nurses and doctors. SGW 514-848-2424 ext. 3565 LOY 514-848-2424 ext. 3575	**COUNSELLING AND PSYCHOLOGICAL SERVICES** Counsellors (licensed mental health professionals) work with students to address their mental health and wellbeing needs. SGW 514-848-2424 ext. 3545 LOY 514 848-2424 ext. 3555
ACCESS CENTRE FOR STUDENTS WITH DISABILITIES Supports students with a variety of disability conditions (including temporary disabilities arising from illness or injury). Students receive academic support for their educational experience at Concordia. acsdinfo@concordia.ca 514-848-2424 ext. 3525	**SEXUAL ASSAULT RESOURCE CENTRE** Provides confidential and non-judgemental support and services to students, staff and faculty of all genders and orientations affected by sexual violence and/or harassment. Jennifer Drummond, Coordinator jennifer.drummond@concordia.ca sarc@concordia.ca 514-848-2424 ext. 3353
STUDENT SUCCESS CENTRE Support network from first-year to graduation.You'll find one-on-one tutors, study groups, workshops as well as learning and career advisors 514-848-2424, ext. 3921	**DEAN OF STUDENTS** Supports students to enhance their Concordia experience by engaging in student life outside the classroom. Terry Kyle, Manager deanofstudents.office@concordia.ca SGW 514-848-2424 ext. 3517 LOY 514-848-2424 ext. 4239
ABORIGINAL STUDENT RESOURCE CENTRE An on-campus resource for First Nations, Métis and Inuit students that helps them make the most of the many resources available at the university. Orenda Konwawennotion Boucher-Curotte, Coordinator orenda.boucher@concordia.ca 514-848-2424 ext. 7327	**INTERNATIONAL STUDENTS OFFICE** Supporting international students with immigration documents,health insurance,social events,and workshops. iso@concordia.ca 514-848-2424 ext. 3515
STUDENT ADVOCACY OFFICE Advocating for students facing charges under the Academic Code of Conduct or the Code of Rights and Responsibilities. studentadvocates@concordia.ca 514-848-2424, ext. 3992	**MULTI-FAITH & SPIRITUALITY CENTRE** Provides a home for all those wishing to celebrate the human spirit in the widest sense of the word, through programs, events and a quiet space for reflection. Ellie Hummel, Coordinator mfsc@concordia.ca 514-848-2424, ext. 3593
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