

CGSC 3601-A Artificial Intelligence and Cognitive Science

Prerequisites: third-year standing and CGSC 2002 and (CGSC 1005 or COMP 1005). Restricted to students enrolled in B.Cog.Sc. Honours.

Tutorial A1:

- **Zoom Meeting ID:** T.B.A. **Passcode:** T.B.A.
- **Zoom URL:** T.B.A.

Tutorial A2:

- **Zoom Meeting ID:** T.B.A. **Passcode:** T.B.A.
- **Zoom URL:** T.B.A.

Instructor: Mary Kelly, Ph.D. (she/her; mary.kelly4@carleton.ca)

- **Office:** 2213 Dunton Tower; <https://carleton-ca.zoom.us/my/animus.lab>
- **Office Hours:** By appointment (**in person or online**)

Teaching Assistants: T.B.A.

- I. **Course description:** An overview of Artificial Intelligence (AI) techniques, such as problem solving by search, machine learning, probabilistic reasoning, neural networks, and natural language processing. By the end, you will be able to:
 - Describe various AI algorithms, including rationale for their design
 - Explain how to evaluate AI algorithms
 - Compare and contrast various AI approaches
 - Apply AI algorithms and techniques to solve problems and synthesize results
- II. **Brightspace:** Slides, recorded lectures, quizzes, exams, and assignments are posted here:
Home page: <https://brightspace.carleton.ca/d2l/home/287917>
- III. **Textbook:** No textbook is required for the course. Readings, slides, and recorded lectures will be provided through the course website. If you require a resource beyond the course materials, the following artificial intelligence textbook is free: <http://artint.info/2e/html/ArtInt2e.html> If you want a resource to help you through the neural network material in the course, I recommend Tariq Rashid's *Make Your Own Neural Network* which can be purchased in ebook (Kindle) or paperback formats: <https://www.amazon.com/Make-Your-Own-Neural-Network-ebook/dp/B01EER4Z4G>

IV. **Software:** All students taking CGSC 3601 are required to either own or have daily access to a computer (either Mac or PC; desktop or laptop) that they can both work on and install software on. This software includes but is not limited to the programming language Python and a number of Java applets. Netbooks, Chromebooks, and Smartphones are not suitable. The computer must be running either Windows or a Mac operating system. Wifi functionality on this computer is required; we also recommend at least 8GB of RAM and sufficient hard drive space.

V. **Evaluation:** The coursework consists of an online midterm and final exam, questions to be completed after each lecture, three online quizzes on readings, three assignments, and labs/tutorials. All course materials will be available through Brightspace.

<i>Evaluation</i>	<i>Value</i>	<i>Date</i>
Reading quizzes	12% (4% ea.)	Oct. 8, Nov. 14, Nov. 28, Dec. 6 (lowest grade dropped)
Midterm	28%	Oct. 29 - Nov. 1
Assignments	18% (6% ea.)	Oct. 29, Nov. 14, Dec. 6
Tutorials	10% (1.4% ea.)	Once per week on the Tuesday after next.
Questions	4% (0.25% ea.)	Available after each lecture, due in 1 week.
Final	28%	During final exam period.

VI. **Lectures:** In the interest of accommodating disabled, sick, immunocompromised, or COVID-cautious students, all lectures will be recorded and made available on Brightspace. In-person attendance is neither taken nor required.

VII. **Lecture questions:** Each lecture will have corresponding review or reflection question(s) worth, collectively, 4% of your final grade, due to be completed on Brightspace one week from the lecture at 11:59pm. Lecture questions are formative assessment. You have unlimited attempts to correct mistakes in the lecture questions until the deadline.

VIII. **Midterm and final exam:**

The midterm will cover content from the first portion of the course (up to and including week 5). The final exam will focus on the part of the class not covered by the midterm (week 6 onwards) but will also include some selected topics prior to the midterm. The midterm and the final will be based on:

- (1) slides and recorded lectures, which will be made available on Brightspace,
- (2) tutorial / lab topics.

Exams are **open book:** you may consult course materials while taking the exams.

IX. Tutorials / Labs

The tutorials are designed to provide hands on practice with concepts discussed in class. Tutorials are intended to be completable during the tutorial time allotted. You have **until midnight on the Tuesday after next** to submit your worksheet to your tutorial section's Brightspace page. Tutorials work sheets and materials will be made available online one week before the tutorial in which they are due. Some tutorials provide assignment time. Attendance is **not** taken and **not** mandatory.

X. Exam Deferral Policy

Both the midterm and final exam will be online, open on the Brightspace page for a period of several days with a time limit of 3 hours once started.

If you expect to miss the **midterm exam (to be completed any time from 2:35pm on Oct. 29th to 11:59pm on Nov. 1st)**, you must notify me as soon as possible.

Deferral of the **final** exam is only possible if the registrar office is notified and their protocol is followed.

XI. Assignments

There are three written assignments that involve the application of AI techniques . **All assignments are due by 11:59pm** on the specified date. Please avoid putting the assignment off until the last minute – this does not work well with AI assignments as they require exploration of the concepts, use of AI software, etc.

Late policy: Assignments will be accepted late if an extension has been requested **before** the deadline for submitting the assignment. If an extension has been granted, the assignment must be handed in before the assignments are graded and returned, otherwise the assignment will be graded as a zero.

Collaboration policy: You may collaborate on the assignments with **one other person**—if you do, you must clearly indicate the name of the person you worked with on the assignment you pass in (and in that case, your assignments can be the same). Group collaboration on the assignments with more than 2 people is not permitted—this will be strictly enforced.

Citation policy: If you use any external sources, like papers or Stack Exchange, ***please cite these sources***. In general, if you are not sure, please check with us. Please see the notice on academic integrity towards the end of the syllabus (e.g., “A student found in violation of academic integrity standards may be awarded penalties which range from a reprimand to receiving a grade of F in the course or even being expelled from the program or University”).

XII. Reading quizzes

There will be 4 brief online quizzes on the assigned readings which will be research papers illustrating the application of AI techniques – you are **only** required to write any **3** of the **4** scheduled quizzes and each is worth 4%. If you write all 4 quizzes, the lowest quiz grade will be dropped.

All quizzes are due by 11:59pm on the specified date.

What happens if I miss a quiz? Make-up quizzes will not be available—if you miss a quiz because of a documented reason, you will either be provided with an extension or its weight will be added to the final.

XIII. Email: We, the professor and TAs, will try to respond to e-mails within 48 hours (excluding weekends and holidays).

XIV. Course Schedule: *This schedule is to be regarded as tentative.*

Sept. 5	Lecture	Introduction
Sept. 9/10	No tutorial.	
Sept. 10	Lecture	AI Art
Sept. 12	Lecture	Intelligence as Search
Sept. 16/17	<i>Tutorial</i>	<i>Search</i>
Sept. 17	Lecture	Informed Search
Sept. 19	Lecture	Search with Costs
Sept. 23/24	<i>Tutorial</i>	<i>Python Practice</i>
Sept. 24	Lecture	Games as Search
Sept. 26	Lecture	Expert Systems and ACT-R; Quiz 1 opens
Sept. 30/Oct. 1	<i>Tutorial</i>	<i>ACT-R and Production Systems</i>
Oct. 1	Lecture	Traditional Robotics; Assn 1 posted
Oct. 3	Lecture	Embodied Robotics & Bayesian Probability
Oct. 7/8	<i>Tutorial</i>	<i>Assignment 1 work period</i>
Oct. 8	Lecture	Bayesian networks; Quiz 1 closes
Oct. 10	Lecture	Naïve Bayes Classifiers
Oct. 14	Thanksgiving	No tutorial.

Oct. 15	<i>Tutorial</i>	<i>Assignment 1 work period</i>
Oct. 15	Lecture	Supervised Machine Learning
Oct. 17	Lecture	Statistics for Machine Learning
Oct. 21-25	Fall break	No tutorial. No lecture.
Oct. 28/29	<i>Tutorial</i>	<i>Weka & machine learning; Assn 2 posted</i>
Oct. 29	Midterm	No lecture ; Online midterm opens; Assn 1 due
Oct. 31	Lecture	Perceptrons; online midterm closes Nov. 1st
Nov. 4/5	<i>Tutorial</i>	<i>Assignment 2 work period</i>
Nov. 5	Lecture	Perceptrons and Learning; Quiz 2 opens
Nov. 7	Lecture	Hopfield Networks
Nov. 11/12	<i>Tutorial</i>	<i>Perceptrons</i>
Nov. 12	Lecture	Multi-layer neural networks
Nov. 14	Lecture	Neural network design; Quiz 2 closes; Assn 2 due
Nov. 15		Last day for academic withdrawal
Nov. 18/19	<i>Tutorial</i>	<i>Hopfield Networks; Assn 3 posted</i>
Nov. 19	Lecture	Structural NLP; Quiz 3 opens
Nov. 21	Lecture	Statistical NLP
Nov. 25/26	<i>Tutorial</i>	<i>Assignment 3 work period</i>
Nov. 26	Lecture	Latent Semantic Analysis & GPT
Nov. 28	Lecture	Reinforcement Learning; Quiz 3 closes; Quiz 4 opens
Dec. 2/3	<i>Tutorial</i>	<i>Q-Learning</i>
Dec. 3	Lecture	Q-Learning
Dec. 5	Lecture	Final Exam Review
Dec. 6	Monday schedule	No tutorial; Assn 3 due; Quiz 4 closes
Dec. 9-21	Final Exam	During final exam period

XV. Copyright: Classroom teaching and learning activities, including lectures, discussions, presentations, etc., by both instructors and students, are copyright protected and remain the intellectual property of their respective author(s). All course materials, including presentations, outlines, and other materials, are also protected by copyright and remain the intellectual property of their respective author(s).

Students registered in the course may take notes and make copies of course materials for their own educational use only. Students are not permitted to reproduce or distribute lecture notes and course materials publicly for commercial or non-commercial purposes without express written consent from the copyright holder(s).

XVI. Addressing Human Rights Concerns: The University and all members of the University community share responsibility for ensuring that the University’s educational, work and living environments are free from discrimination and harassment. Should you have concerns about harassment or discrimination relating to your age, ancestry, citizenship, colour, creed (religion), disability, ethnic origin, family status, gender expression, gender identity, marital status, place of origin, race, sex (including pregnancy), or sexual orientation, please contact the Department of Equity and Inclusive Communities at equity@carleton.ca.

XVII. Grades: In accordance with the Carleton University Undergraduate Calendar (p. 34), the letter grades assigned in course will have the following percentage equivalents:

A+ = 90-100	B+ = 77-79	C+ = 67-69	D+ = 57-59
A = 85-89	B = 73-76	C = 63-66	D = 53-56
A- = 80-84	B- = 70-72	C- = 60-62	D- = 50-52
F = Below 50	WDN = Withdrawn from the course		DEF = Deferred

Standing in a course is determined by the course instructor subject to the approval of the Faculty Dean. This means that grades submitted by the instructor may be subject to revision. No grades are final until they have been approved by the Dean

XVIII. Plagiarism: The University Academic Integrity Policy defines plagiarism as “presenting, whether intentionally or not, the ideas, expression of ideas or work of others as one’s own.” This includes reproducing or paraphrasing portions of someone else’s published or unpublished material, regardless of the source, and presenting these as one’s own without proper citation or reference to the original source. Examples of sources from which the ideas, expressions of ideas or works of others may be drawn from include but are not limited to: books, articles, papers, literary

compositions and phrases, performance compositions, chemical compounds, artworks, laboratory reports, research results, calculations and the results of calculations, diagrams, constructions, computer reports, computer code/software, material on the internet and/or conversations.

Plagiarism is a serious offence that cannot be resolved directly by the course's instructor. The Associate Dean of the Faculty conducts a rigorous investigation, including an interview with the student, when an instructor suspects a piece of work has been plagiarized. Penalties are not trivial. They can include a final grade of "F" for the course.

Examples of plagiarism include, but are not limited to:

- any submission prepared in whole or in part, by someone else, including the unauthorized use of generative AI tools (e.g., ChatGPT);
- using ideas or direct, verbatim quotations, paraphrased material, algorithms, formulae, scientific or mathematical concepts, or ideas without appropriate acknowledgment in any academic assignment;
- using another's data or research findings without appropriate acknowledgement;
- submitting a computer program developed in whole or in part by someone else, with or without modifications, as one's own; and
- failing to acknowledge sources through the use of proper citations when using another's work and/or failing to use quotations marks.

XIX. Statement on Student Mental Health: As a University student you may experience a range of mental health challenges that significantly impact your academic success and overall well-being. If you need help, please speak to someone. There are numerous resources available both on- and off-campus to support you. Here is a list that may be helpful:

- a. Emergency Resources (on and off campus):** <https://carleton.ca/health/emergency-numbers/>
- b. Carleton Resources:**
 - i. Mental Health and Wellbeing: <https://carleton.ca/wellness/>
 - ii. Health & Counselling Services: <https://carleton.ca/health/>
 - iii. Paul Menton Centre: <https://carleton.ca/pmc/>
 - iv. Academic Advising Centre (AAC): <https://carleton.ca/academicadvising/>
 - v. Centre for Student Academic Support (CSAS): <https://carleton.ca/csas/> •
 - vi. Equity & Inclusivity Communities: <https://carleton.ca/equity/>
- c. Off Campus Resources:**
 - i. Distress Centre of Ottawa and Region: (613) 238-3311 or TEXT: 343-306-5550, <https://www.dcottawa.on.ca/>
 - ii. Mental Health Crisis Service: (613) 722-6914, 1-866-996-0991, <http://www.crisisline.ca/>

- iii. Empower Me: 1-844-741-6389, <https://students.carleton.ca/services/empower-me-counselling-services/>
- iv. Good2Talk: 1-866-925-5454, <https://good2talk.ca/>
- v. The Walk-In Counselling Clinic: <https://walkincounselling.com>

XX. Academic Accommodations: Carleton is committed to providing academic accessibility for all individuals. You may need special arrangements to meet your academic obligations during the term. The accommodation request processes, including information about the Academic Consideration Policy for Students in Medical and Other Extenuating Circumstances, are outlined on the Academic Accommodations website: <https://students.carleton.ca/course-outline/>

XXI. Important Information:

- Students must always retain a hard copy of all work that is submitted.
- For us to respond to your emails, we need to see your full name, CU ID, and the email must be written from your valid CARLETON address. Therefore, in order to respond to your inquiries, please send all email from your Carleton CMail account. If you do not have or have yet to activate this account, you may wish to do so by visiting <http://carleton.ca/ccs/students/>