CGSC 5001 – Cognition and Artificial Cognitive Systems
DEPARTMENT OF COGNITIVE SCIENCE, CARLETON UNIVERSITY

Lecture time and dates:	Tuesdays 02:35pm – 5:25 pm, January 12, 2021 – April 12, 2021
Lecture location:	Online, please check the cuLearn course page for the Zoom link
Instructor:	Hamidreza Chinaei, PhD
Office:	Online, Check the course page
E-mail:	HamidrezaChinaei@cunet.carleton.ca (best way to reach me)
Office Hours:	Wednesdays, 2:00-3:00 or by appointment

Course Description and Learning Objectives

The topics of this course are at the intersection of i) Artificial Intelligence (AI), ii) speech and natural language processing, and iii) cognitive science. The course covers question answering dialogues, and in particular conversational AI, through reinforcement learning in the (partially observable) Markov decision processes, i.e., (PO)MDPs, as well as deep neural nets particularly sequence to sequence models. The course also will include unsupervised intent discovery through topic modeling. We will briefly introduce Bayesian models of human learning and inference, belief monitoring and update, as well as decision making and Bayesian theory of minds. Through a group course project, we will contribute to building a simple Artificial Cognitive System; each project group can select a task from data collection to building a small component of the system.

Textbook required

There is no textbook required for the course. There will be paper readings or supplementary readings, and these will be provided through the course web site.

Supplementary texts

There are several excellent and usually technical, artificial intelligence and natural language processing textbooks which provide supplementary information. Here is a sample list. However, your tests are mainly based on slides.

Speech and language processing, Dan Jurafsky and James H. Martin; (3rd ed. draft) (2019).
Available freely online:
https://web.stanford.edu/~jurafsky/slp3/
https://web.stanford.edu/~jurafsky/slp3/ed3book.pdf

Artificial Intelligence: Foundations of Computational Agents, David Poole, Alan Mackworth; Cambridge University Press (April 19, 2010).
Available freely online under a Creative Commons Attribution-Noncommercial-No Derivative Works 2.5 Canada License: **http://artint.info/html/ArtInt.html**

Artificial intelligence: a modern approach, Stuart Russell, Peter Norvig, Prentice Hall, 2010. Available under course reserves in the library.

Course modality: Online blended mode: mostly synchronous, the course discussions/presentations/lectures will be recorded based on our agreement in the first week. **Students are responsible to ensure they have proper internet connection before the term starts and their computer has a functioning webcam for the purpose of exams (webcams can be purchased online for roughly $20 for new ones).**

Course Web Page (cuLearn)

On this site you will find the course syllabus, slides, and any supplementary materials. Please note that the course slides are there for you to use and you are welcome and encouraged to do so, **but you are prohibited from sharing the slides.** My slides are my intellectual property, are Copyrighted and may not be shared or repurposed outside of this class. Sharing the slides either by electronic or non-electronic means is a violation of Copyright and I reserve the right to take action if you do so. For more information on Carleton's policy on Copyright infringement see: https://calendar.carleton.ca/copyrightcompliance/

Evaluation

The course evaluation will be based on a mixture of 1) a paper presentation 2) writing paper critiques (three of them) 3) class participation and discussions 4) one conceptual test based on presented slides, and 5) performing a group course project which includes progressive-reports and a presentation.

The weighting of the final grade is presented below.

Weighting of the final grade

Paper presentation	10%	Slides (3%) + presentation (7%)
Paper critiques (three of them)	15%	Each critique worth 5%. Thus, 3*5% = 15%
Class participation and discussions	15%	Participation: 10% grades: 1 grade for each attendance, max 10 grades **+2%** bonus if you attend all classes **+1%** bonus if you miss only one class Discussion: 5%
Test checkpoint	5%	Basic concepts (Mainly multiple choice based on presented slides)
Project	55%	Teamwork: ○ Project 35% ○ Progressive-Reports 10% ○ Presentation 10%

Paper presentation

Each student will present a paper from the pool of available papers related to the course topics (the list of the papers will be available in the course page). The student will be evaluated based on their presentations, slides, and answering the questions. The paper presentation grading will be based on students' evaluation and the instructor evaluation.

Paper critiques

Students will write **three** paper critiques for three papers presented by other students. The critique for the paper should be submitted **before** the presentation of the paper. The paper critique includes a summary of the paper, a summary of the contributions, the advantage and shortcomings of the paper, and some future directions especially about the course topics/projects or the student research.

Class participation and discussions
Students are expected to attend the classes to participate in class discussions and to evaluate students' presentation.

Test checkpoint
Half-way through the course, there will be a multiple-choice exam for the basic concept of the course slides.

Course project
In the early weeks of the classes, we will form students' groups of size 3 (+1 or -1). Each group will contribute in part of building a simple artificial cognitive computing system. Each part could include: i) data collection, ii) document retrieval, iii) dialogue, iv) question answering, v) recommendation system, etc.*
*The data collection task has to be finished in the early weeks of the class. If no groups prefer to do data collection, all groups will help in data collection. **The project is due on week-13. For data collection, it is due on week-7.**
The project has 6 progressive-reports: Starting from the first report (**week-3**) you will progressively build your report towards the final version (**week-13**). Every other week you will hand in the next version of your progressive report. Please see the lecture schedule for dates. The data collection team progressive report dates are from week-2 to week-7 (one report each week, excluding the reading week). That is, the data collection must be done by week-7.
The first five progressive reports weigh 1% and the final report weighs 5%.
The first report includes the name of each group member; the project title and description, and list of deliverables for the next progressive reports. In your following progressive reports, if needed, you may update the list of your deliverables/dates.
The groups will present their project in the last three weeks. The data collection will present in week-7 right after the test checkpoint.
The presentation grading is based on slides and thoroughness in presentation based on students' evaluations and the instructor evaluation.

E-mail Protocol and Guidelines

I will respond to emails within 24-48 hours (excluding weekends and holidays). E-mail is best reserved for simple questions - if you have questions that require more than a yes/no type answer, the best forum for answering them is during class or in person during group or individual office hours.

Communication guidelines: Please write e-mails **clearly** using complete words, sentences and punctuation. Address your emails appropriately by using the **names and titles you have asked to use when addressing your TA and professor**. At the end of your mail mention the **course** (we are teaching more than one course) and your **student ID**.

Lecture Schedule (tentative)

Please note that dates for topics are approximate. The readings will be updated in the course page starting from the first week of classes.

	Topic	Readings, dues, and comments (if any)
Week 1 Jan 12	Welcome and introduction reinforcement learning	
Week 2 Jan 19	RL cont'd, dialog	**Bayesian theory of mind**
Week 3 Jan 26	Dialog cont'd, Conversational AI	**project progressive-report (v1)**
Week 4 Feb 02	Intent discovery through topic modeling	
Week 5 Feb 09	Question answering	**project progressive-report (v2)**
Reading Week (Feb 15-19)		
Week 6 Feb 23	Deep neural nets	
Week 7 Mar 02	**Test1** checkpoint (coverage: Week 1 – Week 6)	**project progressive-report (v3)**
Week 8 Mar 09	Deep neural nets	
Week 9 Mar 16	DNNs, cont'd: Sequence to sequence models	**project progressive-report (v4)**
Week 10 Mar 23	Recommendation systems	
Week 11 Mar 30	Project presentations	**project progressive-report (v5)**
Week 12 April 06	Project presentations	
Week 13 April 13		**final project and final progressive-report due April 14**

Regulations and Information Common to all Cognitive Science Courses

REQUESTS FOR ACADEMIC ACCOMMODATION

You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

Pregnancy obligation: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see the Student Guide

Religious obligation: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see the Student Guide

Academic Accommodations for Students with Disabilities: The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (if applicable).

PETITIONS TO DEFER

Students unable to complete a final term paper or write a final examination because of illness or other circumstances beyond their control or whose performance on an examination has been impaired by such circumstances may apply within five working days to the Registrar's Office for permission to extend a term paper deadline or to write a deferred examination. The request must be fully and specifically supported by a medical certificate or other relevant documentation. Only deferral petitions submitted to the Registrar's Office will be considered.

WITHDRAWALS

The last day to withdraw from a Fall 2019 course, without academic penalty, is December 6, 2019.

The last day to withdraw from a Fall course with a full fee adjustment (financial withdrawal) is September 30. Withdrawals after this date will create no financial change to term fees but will result in a grade(s) of WDN appearing on your official transcript.

OFFICIAL FINAL EXAMINATION PERIOD

Fall 2019 courses: December 9-21 (may include evenings & Saturdays or Sundays). **For more information on the important dates and deadlines of the academic year, consult the Carleton 2019-2020 Calendar.**

PLAGIARISM

The University Senate defines plagiarism as "*presenting, whether intentional or not, the ideas, expression of ideas or work of others as one's own.*" This can include:

- 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;
- submitting a take-home examination, essay, laboratory report or other assignment written, in whole or in part, by someone else;
- using ideas or direct, verbatim quotations, or paraphrased material, concepts, or ideas without appropriate acknowledgment in any academic assignment;
- using another's data or research findings;
- failing to acknowledge sources through the use of proper citations when using another's works and/or failing to use quotation marks;
- handing in "*substantially the same piece of work for academic credit more than once without prior written permission of the course instructor in which the submission occurs.*"

Plagiarism is a serious offence, which cannot be resolved directly with the course's instructor. The Associate Deans of the Faculty conduct 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 range from a mark of zero for the plagiarized work to a final grade of "F" for the course, and even suspension from all studies or expulsion from the University.

GRADING SYSTEM

Letter grades assigned in this course will have the following percentage equivalents:

A+ = 90-100	B = 73-76	C - = 60-62
A = 85-89	B - = 70-72	D+ = 57-59
A - = 80-84	C+ = 67-69	D = 53-56
B+ = 77-79	C = 63-66	D - = 50-52

F Failure. No academic credit

ABS Absent from the final examination

DEF Official deferral (see "Petitions to Defer")

FND "Failed, no Deferral" – assigned when the student is absent from the final exam and has failed the course on the basis of inadequate term work as specified in the course outline.

Standing in a course is determined by the course instructor, subject to the approval of the Chair and Faculty Dean.

ICS RESOURCES (613-520-2600, phone ext. 2522)

Department of Cognitive Science (2522)	2221 DT
(Dunton Tower) Registrar's Office (3500)	300 Tory
Student Academic and Career Development Services (7850)	302 Tory
Paul Menton Centre (6608)	501 University Centre
Writing Tutorial Service (1125)	4th fl Library
Learning Support Services (1125)	4th fl Library

Academic Advising

Visit the Cognitive Science Undergraduate Office, DT 2221 to discuss your program. Advisors can answer questions concerning:

- Course selection and meeting program requirements
- Your audit and transfer credits
- Gaining access to courses that are closed
- Information concerning prerequisites and preclusions
- Course equivalencies and substitutions
- Information about whether to pursue the (Honours Project Course) or the Thesis stream and CGPA requirements
- Community Practicum Course
- Concentrations
- Exchanges and course selection

DEPARTMENTAL DROP BOX POLICY – Located outside 2202A DT

Mail received prior to 8:30am will be date stamped with yesterday's date. Mail received before 8:30am on Monday's will be date stamped with the previous Friday's date. Please include your name, student number, course code and instructor's name. If any of this information is missing it may delay getting your paper to your instructor.