CIS*6160 Multiagent Systems

Fall 2019
Section(s): C01

School of Computer Science
Credit Weight: 0.50
Version 1.00 - August 23, 2019

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1 Course Details

1.1 Calendar Description

Intelligent systems consisting of multiple autonomous and interacting subsystems with emphasis on distributed reasoning and decision making. Deductive reasoning agents, practical reasoning agents, probabilistic reasoning agents, reactive and hybrid agents, negotiation and agreement, cooperation and coordination, multiagent search, distributed MDP, game theory, and modal logics.

1.2 Course Description

This course studies intelligent computational systems consisting of multiple autonomous and interacting subsystems called agents. Both cooperative and competitive agent systems will be considered.

Study on competitive agents will be founded on game theory. Topics covered include Nash equilibrium, negotiation mechanism design, auctions, and negotiation. For cooperative agents, we study multiagent probabilistic reasoning, distributed constraint satisfaction, and distributed constraint optimization. Probabilistic reasoning will be founded on Bayesian probability theory with focus on Bayesian networks as the agent level representation. Constraint reasoning will focus on constraint networks as the agent level representation.

The undergraduate background of students on the following subjects are assumed: Artificial Intelligence, Discrete Mathematics, Probability and Statistics, Algorithm Analysis, Distributed Systems, and intermediate level of Java programming with hands-on experience in programming distributed systems.

1.3 Timetable

Lectures: Wed., 2:30PM - 05:20PM, REYN, Room 1101

Semester start date: 2019/09/05;   Semester end date: 2019/12/13

The 1st lecture is on Sept 11 and that week is referred to as Week 1.   Subsequent weeks will be referred to as Week 2, Week 3, and so on.

Assignment A1 will be distributed on Week 3 and will be due on Week 5.

Assignment A2 will be distributed on Week 6 and will be due on Week 9.

Project will be distributed on Week 5, the Project Proposal will be due on Week 7, the Project Report will be due on Week 12, and the Project presentation will be on Week 13.

1.4 Final Exam

The student performance will be evaluated by two assignments and one project.   See Section 6 Assessments for details.
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2 Instructional Support

2.1 Instructional Support Team

Instructor:	Yang Xiang Professor
Email:	yxiang@uoguelph.ca
Telephone:	+1-519-824-4120 x52824
Office:	REY 3320
Office Hours:	See the section on Consultation After Lectures.

2.2 Consultation After Lectures

This course has no Teaching Assistant.   Please direct all your questions and requests to the Instructor.   The Instructor can be reached in the following ways:

1. After lectures: Stay in the lecture room after the lecture, and your questions will be answered.
2. By emails: Email your questions to   **yxiang@uoguelph.ca**.   They will normally be answered within 24 hours. Please do not email your questions to other addresses, such as by replying to assignment marking reports emailed to you.

If your question is not answered within 24 hours, it is most likely that it was sent to the wrong address, and it never reached the Instructor. Please check your mailing and ensure to send it to the above email address.

3. By appointment: Make a meeting request either after lecture or by email. If by email, please suggest at least two alternative time slots.

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3 Learning Resources

3.1 Recommended Resources

References (Readings)
The following are the main references from which the lectures are based on. Additional references will be given for the course project.

1. J. Eichberger, Game Theory for Economists, Academic Press, 1993.
2. S.P.H. Heap and Y. Varoufakis, Game Theory: A Critical Introduction, Routledge, 1995.
3. K. Leyton-Brown and Y. Shoham, Essentials of Game Theory, Morgan \& Claypool, 2008.
4. K. Leyton-Brown and Y. Shoham, Multiagent Systems: Algorithmic, Game-Theoretic, and Logical Foundations, Cambridge University Press, 2009.
5. J.S. Rosenschein and G. Zlotkin, Rules of Encounter, MIT Press, 1994.
6. G. Weiss, Multiagent Systems (2nd Edition), MIT Press, 2013.
7. M. Wooldridge, An Introduction to Multiagent Systems (2nd Edition), John Wiley & Sons, 2009.
8. Y. Xiang, Probabilistic Reasoning in Multiagent Systems: A Graphical Models Approach, Cambridge University Press, 2002.
9. M. Yokoo, Distributed Constraint Satisfaction, Springer, 2001.

3.2 Additional Resources

Course Websites (Website)
http://www.cis.uoguelph.ca/~yxiang/6160/6160f19.html
The main course website is located at the above URL. The following resources are contained at the site:

1. Course outline
2. Lecture notes will be posted after the lecture, typically the same day.
3. News for the course
4. Resources for assignments
5. Assignment Submission Procedure

An additional course website is located at **CourseLink**.   It is used for the following functions:

1. Distribution of assignment and project descriptions.
2. Submission of assignments and project components.
3. Distribution of answers to assignment questions.

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4 Learning Outcomes

1. Understand relations between multiagent systems and subjects such as software engineering, distributed systems, mobile computing, game theory, social sciences, etc.
2. Analyze multiagent interaction through the normal form of games and equilibrium
3. Understand multiagent negotiation, mechanism design, and desirable properties of mechanisms
4. Understand multiagent negotiation by auctions
5. Analyze multiagent negotiation in task-oriented domains
6. Understand multiagent probabilistic reasoning framework and applications
7. Understand how to perform multiagent probabilistic inference by multiply sectioned Bayesian networks
8. Understand multiagent constraint satisfaction and optimization framework and applications
9. Understand how to perform multiagent constraint inference with distributed constraint networks

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5 Teaching and Learning Activities

The course includes the following teaching and learning activities:

1. Fundamental concepts, theories, methodologies, and algorithms are discussed and analyzed through lectures.
2. The theories, methodologies, and algorithms are practiced through lecture examples and short-answer questions given in assignments.
3. Mutiagent encounters are implemented in Java through programming questions given in assignments.
4. A major project that involves understanding and implementing a non-trivial multiagent system is conducted towards the end of the course.

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6 Assessments

6.1 Marking Schemes & Distributions

Student performance will be evaluated by two assignments (A1, 15%; A2, 15%), and a project consisting of a written proposal (10%), a written report (35%), and a demonstration/oral presentation (25%).

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7 University Statements

7.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

7.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Graduate Calendar - Grounds for Academic Consideration
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions
https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml

7.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml

Graduate Calendar - Registration Changes
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml

Associate Diploma Calendar - Dropping Courses
https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml

7.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

7.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance and not later than the 40th Class Day.

For Guelph students, information can be found on the SAS website
https://www.uoguelph.ca/sas

For Ridgetown students, information can be found on the Ridgetown SAS website
https://www.ridgetownc.com/services/accessibilityservices.cfm

7.6 Academic Integrity

The University of Guelph is committed to upholding the highest standards of academic integrity, and it is the responsibility of all members of the University community-faculty, staff, and students-to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff, and students have the responsibility of supporting an environment that encourages academic integrity. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

Undergraduate Calendar - Academic Misconduct
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

Graduate Calendar - Academic Misconduct
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml

7.7 Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

7.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars
https://www.uoguelph.ca/academics/calendars

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