CMPSC 311
Robotic Agents
Fall 2019

Syllabus

Course Instructor

Dr. Janyl Jumadinova
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Instructor’s Office Hours

- Monday, Wednesday: 10:00 am – 12:00 pm (15 minute time slots)
- Tuesday: 2:30 pm – 3:30 pm (10 minute time slots)
- Thursday: 1:15 pm - 2:15 pm (10 minute time slots)

To schedule a meeting with me during the office hours, please go to http://cs.allegheny.edu/sites/jjumadinova/schedule, click on the “schedule an appointment” link and select the desirable date and time. You can schedule an appointment outside of my office hours via course’s Slack channel or email.

Course Meeting Schedule

Lecture, Discussion and Group Work, Doane 106: Tuesday, Thursday, 9:30 am – 10:15 am
Laboratory Session, Doane 104/106: Wednesday, 2:30 pm – 4:20 pm

Textbooks

There is not a single required textbook for this class. Reading assignments from specific articles and open source books will be provided through a course website.

Academic Bulletin Course Description

A study of the design and implementation of autonomous software agents and robotic systems that cooperatively complete complex tasks. In addition to examining techniques for large-scale coordination and group-based decision-making, students learn how to apply the field’s technologies to address the challenges facing local and global communities. Participating in hands-on activities that often require teamwork, students develop and evaluate several multi-agent or multi-robot systems, while also reflecting on the civic issues surrounding the use of these systems. During a weekly laboratory session students use state-of-the-art technology to complete projects, reporting on their results through both written documents and oral presentations. Prerequisite: CMPSC 101. Distribution Requirements: CL, QR.
Course Objectives

Complex artificial intelligence problems often require sophisticated computer programs, or agents, that act autonomously on behalf of their users to interact and work together. This course will introduce students to the foundational principles behind agent-based and robotic systems and to the civic issues, public challenges, and opportunities in this field. Areas of discussion include, but are not limited to, robot navigation, perception, swarming, sensor fusion, electronic commerce, auctions, robotics in K-12 education, renewable energy, misuse of intelligent software and hardware, and various public issues utilizing agent/robotic systems as a solution.

The course will introduce students to the practice of agent-based and robotic systems while covering both the well-established and the cutting-edge areas of the discipline. The course also invites students to develop several multi-agent and multi-robot systems and to assess the correctness of their implementations. Moreover, the course will ask students to reflect on several public problems at local, national and international level that are or can be solved using agent-based or robotic technologies and to study social systems behind them. In addition to improving their teamwork skills, students will enhance their ability to write and speak about agent-based and robotic systems in a clear and concise fashion. Through civic engagement activities, students will also strengthen their skill of clearly communicating technical details to the general public.

Learning Objectives

At the completion of this course, a student must be comfortable with fundamental concepts and practical techniques in multi-agent and robotic systems and be aware of current public issues involving this area. When given a new agent-based problem, students should be able to select proper agent-based or robotic tools and implement a complete application that uses them to solve the stated problem. Students also must be able to develop a toolkit of agent-based concepts that they can use in the context of the solutions to real-world problems. Furthermore, students must be capable of identifying a public problem applicable to the field of study, and find and apply an appropriate solution using robotic and agent-based systems. Finally, students must be able to critically reflect on the civic engagement interactions and influences of any societal forces on the problem their civic action is addressing.

Community Engagement Component

A significant portion of the course asks the students to study and reflect on public problems related to the field of multi-agent and robotic systems. One of the problems studied in detail includes STEM, and computer science education in particular, in K-12 schools, and presents robotic systems as a part of a solution. This course will provide an opportunity for you to be a part of this solution in our local Meadville community. For some of the assignments you will be required to develop software and/or hardware to be presented to a group of students in the Crawford Central school district. The community engagement activities will involve giving in-class and/or after school demos/lessons to the Crawford Central students and developing hands-on activities for a robotics event open to all Crawford Central families.

Handed out on 27 August, 2019
Class Policies

Grading

The grade that a student receives in this class will be based on the following categories. All percentages are approximate and it is possible for the assigned percentages to be changed during the academic semester, if a need arises to do so.

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class Participation</td>
<td>10%</td>
</tr>
<tr>
<td>Assignments</td>
<td>45%</td>
</tr>
<tr>
<td>Exams</td>
<td>15%</td>
</tr>
<tr>
<td>Final Project</td>
<td>30%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

These grading categories are defined as follows:

- **Class Participation**: All students are required to actively participate during all of the class sessions. Your participation will take forms of completing class exercises (individually and in teams), answering questions about the required reading assignments, contributing to class discussions and asking constructive questions. You must also regularly participate in the discussions and polls on the Slack channels for this course.

- **Assignments**: There will be two types of assignments.
  - Laboratory assignments invite students to experiment with various tools and techniques for designing, implementing, evaluating, and documenting your multi-agent or robotic system. Additionally, you will be required to submit reflections on the civic learning components if relevant to the particular lab. To best ensure that students are ready to develop software after graduation, students will complete most of the lab assignments in teams. Many of the lab assignments in this course will expect students to give both a presentation and a demonstration of the system that they created.
  - Research paper presentations will allow students to survey the state-of-the-art research on the topic of multi-agent and multi-robot systems and public problems that this field tries to address. Students share findings from the readings with their colleagues in the course.

- **Exams**: The exams will cover all of the material in its associated module. The date for each exam will be announced at least one week in advance of the scheduled date, tentatively three exams are planned. Unless prior arrangements are made with the instructor, all students will be expected to take the exams on the scheduled dates.

- **Final Project**: This project will present students with an opportunity to design and implement a correct and carefully evaluated multi-agent and/or a multi-robot system for some chosen application. The chosen application and the proposed solution should identify and address a public problem. Completion of the final project will require you to apply all of the knowledge and skills that you have acquired during the course of the semester.

Handed out on 27 August, 2019
Assignment Submission

All assignments will have a stated due date and are to be turned in electronically on that due date; all assignments must have headers with your name, date and the Honor Code pledge of the student(s) completing the work. You must follow proper procedures for submitting your completed programs in order for them to be graded. You will be given instructions on how to do that with your first programming assignment.

Late assignments will be accepted for up to one week past the assigned due date with a 15% penalty. All of the late assignments must be submitted at the beginning of the session that is scheduled one week after the due date. Unless special arrangements are made with the course instructor, no assignments will be accepted after the late deadline. For any assignment completed in a group, students must also turn in a one-page retrospective that describes each group member’s contribution to the submitted deliverables and the dynamics of their team work.

Attendance

It is mandatory for all students to attend all of the class, practical, and laboratory sessions. If you will not be able to attend a session, then please see me in advance of your absence to describe your situation. In case you missed a class because of an emergency, please notify me as soon as possible. Students who miss more than six unexcused sessions will have their final grade in the course reduced by one letter grade. Frequent or prolonged absences due to illness should be documented by the student’s doctor, the Health Center, the Dean of Students’ Office, or the office of Student Disability Services. If you need to miss class due to a religious observance, please speak to me in advance to make appropriate arrangements.

Use of Laboratory Facilities

To ensure that your software development experience in this course closely mirrors real-world practice, you are invited to use your own laptop during class and laboratory sessions. The course instructor and the department’s systems administrator have invested a considerable amount of time to develop a container-based approach to support the completion of all of the assignments and projects on any laptop that satisfies minimal requirements. The department has a few laptops that students are allowed to check out during normal business hours for a limited time use. Also, Alden 103, open daily for student work, features desktop machines with an Ubuntu operating systems, and Alden 101 has several desktop machines that are open for student use outside of class sessions. Finally, computers in Doane 106, can be used during class and lab sessions and open lab times.

Class Preparation

In order to minimize confusion and maximize learning, students must invest time to prepare for the class discussions, lectures, and practical and laboratory sessions. During the class periods, the course instructor will often pose questions that could require group discussion, the creation of a program or an experiment, or a group presentation. In order to help students remain organized and effectively prepare for classes, the course instructor will maintain a class schedule with reading assignments and presentation slides.
Seeking Assistance

Students who are struggling to understand the knowledge and skills developed in a class or a laboratory session are encouraged to seek assistance from the course instructor. Students who need the course instructor’s assistance should schedule a meeting through her Web site.

A Note on extenuating circumstances

If you should find yourself in difficult circumstances that significantly interfere with your ability to prepare for this class and to complete assignments, please inform me immediately so that we can work something out together! Do not wait until the last day of class to ask for exceptions to what is stated in this syllabus. In such a situation, you may also find it helpful to contact one of the available resources on campus:

The Maytum Learning Commons, Library/Academic Commons, 814-332-2898
You may request an individual tutor through Learning Commons:
http://sites.allegheny.edu/learningcommons/tutoring/
Allegheny College Counseling Center, Reis Hall, 814-332-4368
Winslow Health Center, Schultz Hall, 814-332-4355
Allegheny College Chaplain, Reis Hall, 814-332-2800

Special Needs and Disability:

Students with disabilities who believe they may need accommodations in this class are encouraged to contact Disability Services at (814) 332-2898. Disability Services is part of the Learning Commons and is located in Pelletier Library. Please do this as soon as possible to ensure that approved accommodations are implemented in a timely fashion.

Honor Code:

All students enrolled at Allegheny College are bound by the Honor Code. It is expected that your behaviour will reflect that commitment. To this end, we expect that you will adhere to the following Department Policy:

Department of Computer Science Honor Code Policy

It is recognized that an important part of the learning process in any course, and particularly in computer science, derives from thoughtful discussions with teachers, student assistants, and fellow students. Such dialogue is encouraged. However, it is necessary to distinguish carefully between the student who discusses the principles underlying a problem with others, and the student who produces assignments that are identical to, or merely variations on, someone else’s work. It will therefore be understood that all assignments submitted to faculty of the Department of Computer Science are to be the original work of the student submitting the assignment, and should be signed in accordance with the provisions of the Honor Code. Appropriate action will be taken when assignments give evidence that they were derived from the work of others.

You are encouraged to periodically review the specifics of the Honor Code as stated in the College Catalogue and The Compass.

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