Objectives

Researchers and developers continue to pursue increasingly sophisticated roles for autonomous systems. Whether they are working within networked systems as software agents or embedded in robots and unmanned vehicles, what makes these systems valuable is their intelligent, active, and adaptive nature. (Bradshaw et al., 2012)

The goal of this course is to study the important role of human-centered design and teamwork in developing human-agent-robot teams. The course examines software agent architectures, algorithms from artificial intelligence that can enable agents to behave in an intelligent manner, and several approaches to the creation and deployment of human-agent-robot teams.

Specific Learning Outcomes:
Upon completion of this course, it is anticipated that the student will be able to:

• Analyze the structure and abilities of software agents
  - Identify the performance measure, environment, actuators, and sensors of an agent
  - Determine an appropriate agent architecture (table lookup, simple reflex, goal-based, or utility-based) for a particular problem domain
  - Describe the evaluation and utility function(s) used by an agent
  - Recommend a performance measure for an agent
  - Describe the properties of the environment in which an agent works

• Understand models of teamwork and coactivity
  - Design a coactive human-agent-robot team model for a particular domain problem

• Engage critically and reflectively in a discussion of approaches to the creation and deployment of human-agent-robot teams
  - Describe how a computational agent most efficiently learns
  - Design a test for a complex distributed system of a human-automation team
  - Identify the requirements for robots to understand human communication
  - Explain the relationship of autonomy to overall performance
  - Place human, agent, and robot team members on a spectrum of social behavior and design an instance of a behavior-desire-intention model
  - Identify an appropriate balance between autonomy and interdependence in a human-agent-robot team

Prerequisites
Graduate standing or permission of the instructor.

Expected Work
This will be an interactive class, and students are expected to participate fully in class discussions and activities.

Weekly readings will be assigned. Students will submit written reflections on each of these before class and will contribute summaries, critiques, and observations after the class meeting.
Some of the class activities may involve experiments with applications of various AI algorithms. These will range from running applications and making observations to extending existing applications; assignments will be appropriate to each student’s background.

Students will complete a group or individual project during the course of the term. The format and content will be determined by the student in consultation with the instructor and can range from a software project to a comprehensive written report. A conference-style presentation on the project will be made to the class at the end of the term.

Written assignments are expected to reflect scholarly technical writing. *Writing for Computer Science* by Justin Zobel provides guidance on appropriate writing style.

*Students are responsible for all the material in the assigned readings, whether or not it is covered in class, and for all material presented in class, whether or not it is in the assigned readings.*

**Exams**

Brief quizzes on the assigned readings at the beginning of each class.

**Text and Required Materials**

- Access to LMU Library resources, especially IEEEExplore and the ACM Digital Library.

**Recommended References**


**Additional References**


Grading
The final grade for this class will be weighted as follows:

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<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Reading quizzes</td>
<td>15%</td>
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<tr>
<td>Reflections and posted discussions</td>
<td>25%</td>
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<tr>
<td>Project</td>
<td>40%</td>
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<td>Project Proposal</td>
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<td>Project Draft</td>
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<td>Project Report</td>
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<tr>
<td>Project Presentation</td>
<td>5%</td>
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<tr>
<td>Participation</td>
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Students will upload a reflection of the week’s reading the evening before the reading is discussed in class. Students will be graded on the quality of the content and the presentation of the reflections and on a brief quiz on the reading at the beginning of class. Each student is expected to actively engage in discussions of the assigned readings at each class meeting. This will require studying the assigned reading and one other related reference of the student’s choice. The additional reference can be an additional article or a piece of software that implements and demonstrates some aspect of the evening’s topic. Following the discussion, students will post a summary of their group’s work and follow up with at least two meaningful critiques or observations related to the discussion. These postings will be graded. Refer to Teaching Philosophy and Course Policies for criteria used to measure effective class participation.

Each student will complete a comprehensive course project after consulting with the instructor on the project topic. Team projects will be entertained, with the understanding that the resulting work will reflect the effort of N people, where N is the number of people on the team. This can entail an implementation of a human-agent-robot team or a human-agent-agent team that reflects the approaches discussed in class. Students interested in this approach should consider using the Jade framework. An alternate version of the project would be an in-depth case study of an existing human-agent-robot team to which the student has access and which can be discussed and possibly demonstrated in an open environment. A third project choice would be to complete a scholarly technical paper on some aspect of human-agent-robot teamwork; the paper would include a review of related literature and a synthesis of existing work or the detailed design of a human-agent-robot team to work on a particular domain problem.

Assignments (proposal, draft, report, presentation) related to the project will be graded. Late work will only be accepted by prior arrangement.

Refer to the Teaching Philosophy and Course Policies handout for additional information.
Office Hours/Contact Points

*Office Hours:* Tuesday, 5:20-6:20 p.m.
  Wednesday, 10 a.m. - 4 p.m.
  *And by appointment.*

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