Human-Centered Robotics

CSCI 473/573, Spring 2020
Coolbaugh Hall 219, Mon/Wed 7:30 AM – 8:45 AM

Class Website: http://inside.mines.edu/~hzhang/Courses/CSCI473-573/

Instructor: Dr. Hao Zhang, Computer Science Dept.
Office: BB 250
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Email: hzhang@mines.edu
URL: http://inside.mines.edu/~hzhang
Office Hours: 1:30-2:30 PM Fridays or by appointment (send email)

Teaching Assistant: Qingzhao Zhu
Location: Alamode Lab (BB 136)
Email: zhuqingzhao@mymail.mines.edu
Office Hours: TBD on Thursdays or by appointment (send email)

Course Description:
This course focuses on the new field of Human-Centered Robotics (HCR), bridging together research and application of methodology from robotics, human-machine interaction, and cognitive psychology. This course covers basic concepts and computational models of 3D sensing, robot learning and cognition to perceive humans, understand human behaviors, and decision making and planning in response to humans or environment events.

Prerequisites:
CSCI 262 and Math 201: As a Computer Science robotics course, understanding of fundamental concepts of computer science (e.g., data structures) and experience of programming in C++ or Python in Linux is necessary. Mathematical maturity is also needed to understand the computational models. In this course, the instructor will not teach programming and will assume sufficient math knowledge.

Required Textbook:
None. The history of human-centered robotics is short. The course is project-based and research-oriented, generally focusing on the cutting-edge concepts and techniques from recent research papers. Due to this reason, many texts, pictures, and slides we use in the lecture are collected by the instructor from a wide variety of online sources. Major references will be provided.

Schedule and Assignments:
All materials (lecture, schedule and assignments) will be available on the course website. If you miss a lecture, it will be your responsibility to check the course website (make sure you refresh the webpage).

Class Communication:

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Assignments will be submitted to Canvas. You will also check your grades on Canvas. If you want to chat with the instructor, please stop by my office during the office hours. Or if the office hours do not work for you, send an email to the instructor to schedule a meeting, or simply talk with the instructor before or after the classes.

**Evaluation:**

Grading will be 100% based on projects (Project 1: 20%, Project 2: 35%, and Final Project 45%). Students in CSCI 473 will be given the same projects, as those taking CSCI 573. However, the quality and/or quantity of the work expected is higher for CSCI 573 than for CSCI 473, and thus will be graded more strictly. Additional problems will also be provided to CSCI 573 students to solve in projects.

Final grades will be determined by overall average as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90 – 100</td>
</tr>
<tr>
<td>B+</td>
<td>85 – 89.9</td>
</tr>
<tr>
<td>B</td>
<td>80 – 84.9</td>
</tr>
<tr>
<td>C+</td>
<td>75 – 79.9</td>
</tr>
<tr>
<td>C</td>
<td>70 – 74.9</td>
</tr>
<tr>
<td>D</td>
<td>60 – 69.9</td>
</tr>
<tr>
<td>F</td>
<td>0 – 59.9</td>
</tr>
</tbody>
</table>

Decisions on borderline grades will be based upon class attendance and participation. The instructor considers borderline as ~0.75 point (at most 1 point).

**Class Policies:**

- **Class attendance:** Class attendance will be taken. Decisions on borderline grades will be based upon exceptional class attendance and participation, as deemed merited by the course instructor. Of course, if you have a good reason to miss class (e.g., you are sick, or you need to present a paper at a research conference, or you have a job interview, etc.), then it is not a problem. Please don’t come to class if you think you have a contagious illness. We will work with you to help keep you posted on class activities and material covered. In any case, it is your responsibility to catch up (or keep up) with all course material and announcements covered in class.

- **Class participation:** Please participate in class discussions. The course is so much more interesting that way! Again, decisions on borderline grades will be based upon exceptional class participation, as deemed merited by the course instructor.

- **Project assignments:** Projects write-ups will be posted on the course website, along with the due dates. All projects will involve programming; using C++ or Python in Linux is required (you will learn why we have this requirement in the course).

- **Due dates and Late Assignments:** All assignments are due at the date and time stated. *The individual Project 1 and Project 2 have a four-day late submission period (i.e., grace period with late penalty) for each deliverable, and late submission will lose 25% points per day for that specific deliverable.* The team-based Final project does NOT have a late submission period, and any deliverable submitted five (5) minutes past the due time will receive a grade of zero.
• **Exams:** There will be no exams 😊.

• **Grading corrections:** Bring any assignment grading correction requests to the instructor within 1 week of receiving the grade, or before the end of the semester, whichever comes first. After that, your grade will not be adjusted. If you find any mistake in grading, please let the instructor know. Your grade will not be lowered.

• **Using computers/phones in class:** Please be respectful of your colleagues in class, by turning off your phones and using your computers only for taking notes or keeping up with the material covered in class. Checking your email, working on other non-class related materials, web-surfing, etc., are not appropriate activities for class time. Be a good citizen, and practice courteous cell phone and computer etiquette!

• **Learning Environment:** Fundamentally, I expect and require respect in this course for yourself, your classmates, and your instructor and TAs.
  o Respect for yourself includes taking care of yourself physically and mentally and advocating for an environment that facilitates learning for you.
  o Respect for your classmates includes recognizing and appreciating the diversity of backgrounds and experiences of your classmates and making it your interest to foster a learning environment for everyone; all are welcome.
  o Respect for your instructors (as well as your classmates) includes not participating in disruptive or distracting behavior: talking, playing games, or web surfing during lecture, for instance, make it difficult for others to focus on the reason we are all here.
  o Respect must be mutual to be effective; we (your instructors) and your TAs will be held to the same standards of respect.

Please let your instructor know if you become aware of an issue with the classroom (or out-of-classroom) environment with regards to these policies.

• **Disability Accommodations:** website [http://disabilities.mines.edu](http://disabilities.mines.edu) outlines the university's disability services. Any student requiring accommodations must request Student Disability Services deliver each professor a Confidential Letter of Required Accommodations to ensure accommodations are met. Any student requiring accommodations, please contact the instructor via email or schedule an individual meeting to coordinate accommodations.

• **Collaboration Policy:** Discussing ideas is encouraged. You may help each other with your strategy for how to solve the projects. You are expected to note significant collaborations by giving the name of your student collaborators on the project material you turn in. However, except if specifically allowed by the instructor, copying from any outside sources (e.g., fellow students, Internet, etc.) on any material to be graded is not permitted, and will be considered cheating. **Cheating will be dealt with harshly,** and will result in failure of the assignment and/or failure of the class.

• **All Mines and CS Department’s policies will be strictly followed (see next page).**
Diversity and Inclusion: At Colorado School of Mines, we understand that a diverse and inclusive learning environment inspires creativity and innovation, which are essential to the engineering process. We also know that in order to address current and emerging national and global challenges, it is important to learn with and from people who have different backgrounds, thoughts, and experiences. Our students represent every state in the nation and more than 90 countries around the world, and we continue to make progress in the areas of diversity and inclusion by providing Diversity and Inclusion programs and services to support these efforts.

Disability Support Services: The Colorado School of Mines is committed to ensuring the full participation of all students in its programs, including students with disabilities. If you anticipate or experience any barriers to learning in this course, please feel welcome to discuss your concerns with me. Students with disabilities may also wish to contact Disability Support Services (DSS) to discuss options to removing barriers in this course, including how to register and request official accommodations. Please visit their website for contact and additional information. If you have already been approved for accommodations through DSS, please meet with me at your earliest convenience so we can discuss your needs in this course.

Accessibility within Canvas: Read the Accessibility Statement from Canvas to see how the learning management system at the Colorado School of Mines is committed to providing a system that is usable by everyone. The Canvas platform was built using the most modern HTML and CSS technologies, and is committed to W3C’s Web Accessibility Initiative and Section 508 guidelines.

Discrimination, Harassment, and Title IX: All learning opportunities at Mines, including this course, require a safe environment for everyone to be productive and able to share and learn without fear of discrimination or harassment. Mines’ core values of respect, diversity, compassion, and collaboration will be honored in this course, and the standards in this class are the same as those expected in any professional work environment. (More information can be found here.) Discrimination or harassment of any type will not be tolerated. As a participant in this course, we expect you to respect your instructor and your classmates. As your instructor, it is my responsibility to foster a learning environment that supports diversity of thoughts, perspectives and experiences, and honors your identities. To help accomplish this: (1) Course rosters are provided to the instructor with the student’s legal name. I will honor your request to address you by a preferred name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. (2) If something is said or done in this course (by anyone, including myself) that made you or others feel uncomfortable, or if your performance in the course is being impacted by your experiences outside of the course, please report it to me (if you are comfortable doing so), to the Wellness Center/Counseling, and to Speak Up (an anonymous option). In this course, we will cultivate a community that supports survivors, prevents interpersonal violence, and promotes a harassment free environment. Title IX and Colorado State law protects individuals from discrimination based on sex and gender in educational programs and activities. Mines takes this obligation seriously and is committed to providing a campus community free from gender and sex-based discrimination. Discrimination, including sexual harassment, sexual violence, dating violence, domestic violence, and stalking, is prohibited and will not be tolerated within the Mines campus community. If these issues have affected you or someone you know, you can access the appropriate resources here: http://www.mines.edu/title-ix/. You can also contact the Mines Title IX Coordinator, Camille Torres, at 303.384.2124 or titlexi@mines.edu for more information. It’s on us, all of the Mines community, to engineer a culture of respect.

CARE @ Mines: If you feel overwhelmed, anxious, depressed, distressed, mentally or physically unhealthy, or concerned about your wellbeing overall, there are resources both on- and off-campus available to you. If you need assistance, please ask for help from a trusted faculty or staff member, fellow student, or any of the resources below. As a community of care, we can help one another get through difficult times. If you need help, reach out. If you are concerned for another student, offer assistance and/or ask for help on their behalf. Students seeking resources for themselves or others should visit care.mines.edu. Additional suggestions for referrals for support, depending on comfort level and needs include: (1) CARE at Mines: for various resources and options, or to submit an online “CARE report” about someone you’re concerned about, or email care@mines.edu. (2) CASA for academic advising, tutoring, academic support, and academic workshops. (3) Counseling Center (303-273-3377) to make an appointment or for online resources for students on the website. Located in the Wellness Center 2nd floor. Located at 1770 Elm St. (photo below). (4) Health Center (303-273-3381) for an appointment, located in the Wellness Center 1st floor. (5) Colorado Crisis Services - For crisis support 24 hrs/7 days, either by phone, text, or in person, Colorado Crisis Services is a great confidential resource, available to anyone. Also call 1-844-493-8255, or text “TALK” to 38255. Walk-in location addresses are posted on the website. (6) Food and/or Housing - Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact the Dean of Students for support. Furthermore, please notify your professor if you are comfortable in doing so. This will enable your professor to provide resources that may be available. All of these options are available for free for students. The Counseling Center, Health Center, and Colorado Crisis Services are confidential resources. The Counseling Center will also make referrals to off-campus counselors, if preferred. In an emergency, you should call 911, and they will dispatch a Mines or Golden PD officer to assist.

Absence Policy: The Student Absences webpage outlines CSM's policy regarding student absences. It contains information and documents to obtain excused absences. All absences that are not documented as excused absences are considered unexcused absences. Faculty members may deny the student the opportunity to make up some or all of the work missed due to unexcused absence(s). However, the faculty members do have the discretion to grant a student permission to make up any missed academic work for an unexcused absence. The faculty member may consider the student's class performance, as well as their attendance, in the decision. In the case of an absence, the student is responsible for determining what work was missed and for putting forth a good faith effort to review the material on their own.

Policy on Academic Integrity/Misconduct: The Colorado School of Mines affirms the principle that all individuals associated with the Mines academic community have a responsibility for establishing, maintaining and fostering an understanding and appreciation for academic integrity. In broad terms, this implies protecting the environment of mutual trust within which scholarly exchange occurs, supporting the ability of the faculty to fairly and effectively evaluate every student’s academic achievements, and giving credence to the university’s educational mission, its scholarly objectives and the substance of the degrees it awards. The protection of academic integrity requires there to be clear and consistent standards, as well as confrontation and sanctions when individuals violate those standards. The Colorado School of Mines desires an environment free of any and all forms of academic misconduct and expects students to act with integrity at all times. Academic misconduct is the intentional act of fraud, in which an individual seeks to claim credit for the work and efforts of others without authorization, or uses unauthorized materials or fabricated information in any academic exercise. Student Academic Misconduct arises when a student violates the principle of academic integrity. Such behavior erodes mutual trust, distorts the fair evaluation of academic achievements, violates the ethical code of behavior upon which education and scholarship rest, and undermines the credibility of the university. Because of the serious institutional and individual ramifications, student misconduct arising from violations of academic integrity is not tolerated at Mines. If a student is found to have engaged in such misconduct sanctions such as change of a grade, loss of institutional privileges, or academic suspension or dismissal may be imposed. The complete policy can be found in the Mines’ Policy Library.