CSE 591 (Spring 2019): Human-Aware Robotics

M W 6:00–7:15 PM BYAC190

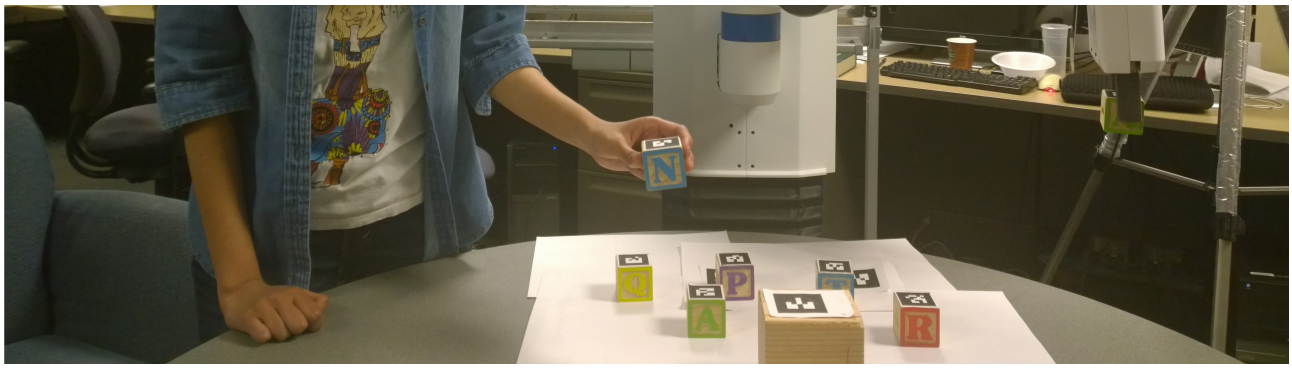
Instructor: Yu ("Tony") Zhang

Email: yzhan442@asu.edu

URL: www.public.asu.edu/~yzhan442

Course website:

http://www.public.asu.edu/~yzhan442/teaching/CSE591S19-HAR



Warning: ***This class is research-oriented and hence involves lots of self-learning and exploration.***

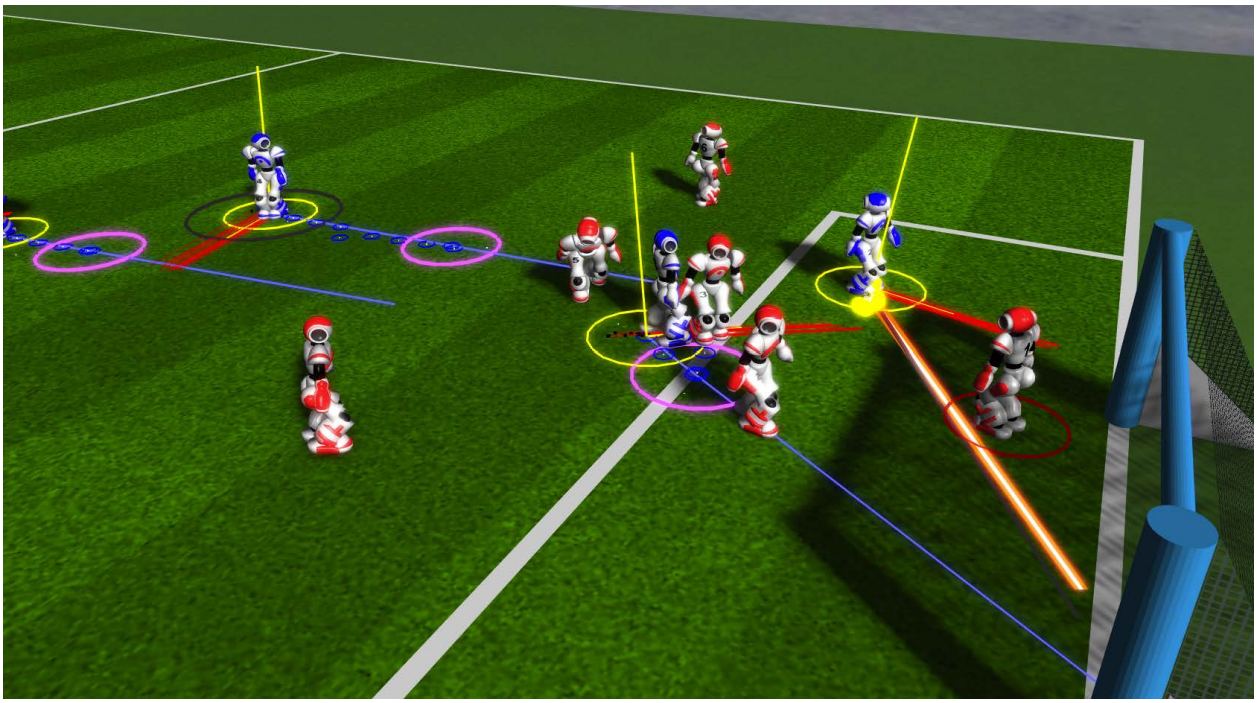
1. Course Description:

Despite the tremendous progress in the field of robotics made during the last decade, we are still experiencing robots' curious ambivalence to humans. At the same time, an increasing number of applications demand that humans and robots work together. Although a few of these applications can be handled through 'tele-operation', technologies that act in concert with the humans in a teaming relationship with increasing levels of autonomy are desirable. For such robots to be useful, it is important for them to be human-aware and behave in a nonintrusive fashion. In this class, we will cover several broad areas in human-aware robotics and discuss the state-of-the-art approaches in each of these areas. This is a graduate level seminar course in which we will introduce the development of recent approaches in AI and Robotics, with a focus on their applications to human-aware robotics.

In this class, we will study human-aware robotics via the lens of Robot Soccer and many more robotic applications. For robot soccer, in contrast to traditional games, you will also be participating in the game! You and your robots work together as a team! you will learn to develop your robot soccer teammate and compete with other teams. You will learn the fundamentals underlying technologies for human-awareness, which is the central piece to many emerging topics such as explainable AI, human-robot interaction, and human-robot teaming.

The setting that we use is similar to the FIFA game. However, you will only be able to control one agent! Hence, it is important to make agents that really collaborate with you.

The platform to use is the RoboCup simulation platform.



2. Course Information:

Broad Areas Covered:

1. Modeling of Humans
2. Human-Aware Decision Making
3. Human-Robot Communication
4. Human Factor Analysis

A broad spectrum of AI and robotics topics will be covered, including but not limited to goal and intent recognition, human-aware planning, reward modeling via inverse reinforcement learning, collaborative decision making, explanation generation, human-robot communication, etc.

Lecture:
M & W 6:00–7:15 PM BYAC190

Instructor: Yu ("Tony") Zhang Email: yzhan442@asu.edu

Instructor Office Hours:
M & W 4:45PM–5:45PM BYENG 594

Grader: Akshay Sharma Email: ashar204@asu.edu

Remarks on Electronic Communication: For questions regarding class issues, email me or post it on class piazza (preferred). Before sending an email please follow the excellent advice http://www.wikihow.com/Email-a-Professor. For questions about class materials (e.g., homework, projects and etc.), see the respective sections below.

3. Textbooks Information (all recommended):

Artificial Intelligence - A Modern Approach
Stuart Russell & Peter Norvig

Probabilistic Robotics
Sebastian Thrun, Wolfram Burgard & Dieter Fox

Reinforcement learning: an introduction
Richard S. Sutton & Andrew G. Barto

Introduction to Autonomous Mobile Robots
Roland Siegwart, Illah Reza Nourbakhsh & Davide Scaramuzza

4. Resources:

Course website:
http://www.public.asu.edu/~yzhan442/teaching/CSE591S19-HAR/ (to be available soon)

Schedule (will be active soon and updated incrementally):
http://www.public.asu.edu/~yzhan442/teaching/CSE591S19-HAR/schedule.html

On-line discussions and polls (Piazza):
http://piazza.com/asu/spring2019/cse591HAR/home
To sign up:
http://piazza.com/asu/spring2019/cse591HAR

5. Exams:

There will only be one final exam for the class:

Final: In class, open books and notes.

Makeup exams will be given only for medical reasons or other personal emergencies. You must submit **VERIFIABLE** documentation with your petition for a makeup exam.

6. Individual projects:

- C++ based project that is composed of several parts, based on our soccer simulator (to be provided). ***Ubuntu Linux is required.***
- These are ***individual*** projects. ***Plagiarism will be checked; do NOT bet on your luck.*** Your code will be compared among all those who have ever submitted the programming project plus online resources. Detection of copied or isomorphic code will be automatically performed.
- **If cheating is detected, that projection assignment score will be zero AND you will get 10% off your final grade AND you will be reported. Read also the plagiarism section below.**

7. Team project:

An applied project that tests how you can apply the knowledge that you learned to improve your soccer team. This will be extended from your individual projects. There is a ***project proposal phase*** where you must propose what your plan is for the team project to improve your robotic teammates and obtain approval before starting the team project. The team project also has a ***presentation & final competition*** phase (details will be announced). **A final**

project report with your code must be submitted. 1-2 student (small team) per project.

8. Paper discussion:

- Every time when a paper reading assignment is due, you must **provide a writeup** of your thoughts/comments/questions about the paper ***and*** share your thoughts among the class **during the discussion phase**. **The writeup is to be submitted on Piazza at least 24 hours before the discussion phase.**
- **You must also read others' writeups and provide your comments (online or during the discussion phase)**
- Papers will be provided

9. Participation:

- **1 extra for the end-of-semester survey.**
- ***Contributing to both on-line and in-class discussions***! This should be an activity throughout the semester.
- Correcting your instructor in class!
- Helping others figure out fallacies in their line of thought when attempting to solve a problem.
- Giving hints to your classmates, but **not** the answer.

10. Grading:

Individual projects & homework	25%
Team project	35%
Final Exam	15%
Attendance, discussion and participation	25% (including online)
End of the semester survey	1%
Total	101%

Final grades will be determined as follows*:

A+	[98-101]
A	[93-98)
A-	[90-93)
B+	[85-90)
B	[80-85)
B-	[75-80)
C+	[70-75)
C	[65-70)

D [60-65)

E [0-60)

* The instructor reserves the rights to curve if necessary.

11. Grading Questions:

If you believe that there is a mistake in grading, you must inform the grader and instructor **within 2 business days** when the graded work was returned to you.

12. Grading Questions:

I take very seriously class evaluations and feedback. During the semester, **I will be posting surveys on Piazza** for feedback on both the course organization and the course content. I will appreciate it if you respond to these surveys. Ideally, the changes I implement will help you better succeed in the course.

Finally, it is **extremely important** that you respond to the final anonymous survey solicited by the university at the end of the school year. The overall feedback helps me make changes for the next year. The survey is often released 1-2 weeks before the final at: https://fultonapps.asu.edu/eval/

13. Academic Dishonesty:

- Your work for this course must be the result of your own individual effort. Having said that, you are allowed to discuss problems with your classmates, the grader or me, but you must not blatantly copy others' or online solutions.
- Copying (or slightly changing) solutions from online sources, other books or your friends is **easily detectable**.
- **If copying or plagiarism is detected, then a zero grade will be applied to the respective assignment & your final grade will be penalized, and a formal report will be filed!**
- Do not forget that if you can find an answer online, so can we! Actually, the automatic plagiarism-checking system will have many different versions of solutions to check against your answers for copying.

14. Disability Accommodations:

Suitable accommodations will be made for students having disabilities and students should notify the instructor as early as possible if they will require same. Such students must be

registered with the Disability Resource Center and provide documentation to that effect.

15. Sexual Discrimination:

Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at https://sexualviolenceprevention.asu.edu/faqs.

As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, https://eoss.asu.edu/counseling, is available if you wish discuss any concerns confidentially and privately.

More info about prior offerings:

Check out student projects from the previous offerings here:

http://www.public.asu.edu/~yzhan442/teaching/CSE591-HAR/student-projects-cse591-fall16.html
(One of the student projects led to a 2017 Microsoft Imagine Cup US Final Team!)

Disclaimer:

Some of the information above is tentative and ***subject to change***.

Comments about the course from students in previous offerings:

"*This was a subject of really high interest for me, the intend being to take understand the world of robotics and gain enough knowledge to do projects and progress in this field. So I was able to base my projects on these and have achieved parts of what I aimed for.*"

"*The course gave a high-level overview of an ongoing research field, covering an array of topics. This breadth can often help students to find interesting areas of research.*
The projects for the class inspired free thinking and concrete formulation of a proposed idea."

"*The most important factor about this course was the vast topic that was covered and how different phases in the courses were connected to make us under human robot interactions better.*"