UM CSE 598: Action and Perception

Schedule

Prof. Stella Yu, Stanley Hsieh, Yixing Wang, Drew Scheffer MW 10:30-12, TH 6:30-8:30, Fall 2025

Prerequisites: Basic knowledge of machine learning, computer vision, and robotics.

Designation: This course counts toward breadth *or* depth in CSE, *not both*. You must choose one.

Background: The era of general robotics and intelligent humanoids has arrived! Breakthroughs in computer vision, robotics, and reinforcement learning are rapidly advancing the field of embodied AI. Yet, despite these achievements, most current systems remain narrow in scope – highly specialized, task-specific, and dependent on curated datasets and handcrafted supervision. In contrast, biological agents acquire perception and motor coordination from raw sensory experience, learning through continuous interaction with their environment without explicit instruction. This course invites students to rethink machine intelligence by critically examining the foundations and frontiers of data-driven models for perceptual-motor learning in robotics.

Scope: This graduate-level course includes lectures, homework assignments, and lab sessions on advanced methods in computer vision and robotics that enable autonomous behavior. Topics may include embodied planning, navigation, locomotion, manipulation, learning in simulation and transfer to the real world, as well as self-supervised, interactive, and multimodal sensorimotor learning. Homework assignments are related to, but not necessarily closely tied to, the lectures; rather, they are designed to provide hands-on experience and practical skills that complement the lecture content.

In addition, this course includes required 2-hour weekly lab sessions focused on robot learning in simulation. Topics may include creating simulated world environments, designing a virtual robot or incorporating the model of an actual robot, training the robot agent, and benchmarking and analyzing its behavior. Time permitting, we will also explore how to transfer and adapt learned perceptual-motor policies to the real world. These lab sessions form a parallel track to the lectures/homework and follow their own structure and timeline.

Requirements: This graduate-level course assumes prior proficiency in core machine learning and computer vision concepts; it does **not** cover foundational material. You are expected to independently acquire any background knowledge needed to engage with the research papers discussed in class. Instead, the course focuses on broadening your perspective, deepening conceptual understanding, and critically evaluating modern approaches. In-person attendance, active participation in lectures and labs, and the timely submission of homework and lab assignments are all required.

Sign-Up: To request a registration override, please complete this sign-up form.

Homework must be submitted via Gradescope, linked through your Canvas page.

- Submissions are accepted with full credit decreasing linearly to zero over 5 days, at the rate of 1 point per hour, from 120 points on the due date to 0 point 120 hours after the due date.

- Homework will be graded promptly to provide timely feedback. Regrade requests are only accepted through Gradescope within 1 week of grades being released.

Grading:

1. 56% Homework (lowest 1 dropped)
2. 22% In-class mini-quizzes (one per lecture; lowest 6 dropped)
3. 20% Lab sessions (lowest 3 dropped)
4. 02% Class feedback

Piazza Guidelines:

- We use Piazza for discussions on conceptual and technical questions among classmates. There is no anonymity. Please be respectful to your classmates.
- Please post your questions, answers, and comments in dedicated folders.
- Please check Piazza for already posted questions before posting a new one. Unnecessarily clogging up Piazza makes the platform less usable for everybody.
- Please use Piazza for all communications, private or public, as much as possible. Others will benefit from answers and discussions on public questions.
- Piazza is moderated by the teaching staff.

Email Policy:

- Please email syu-eecs598@umich.edu only if you are unable to use Piazza's private channel. Emails sent to individual instructor(s) or GSI(s) **will not receive a response**.
- This centralized communication ensures that your concerns are addressed promptly and consistently by the course staff.

Academic Integrity:

- While you are encouraged to discuss homework and lab assignments with other students, your programming work must be completed individually. You must also write up your solution on your own. You may not search for solutions online or copy from a friend. You can discuss problems but never share code. Cite any sources and inspirations.
- Please observe the Michigan Engineering Honor Code. The College of Engineering takes honor code violations seriously, and penalties are severe. Make sure that you clearly understand what constitutes a violation of the Engineering Honor Code.

Accommodations: We aim to provide an inclusive learning environment for all.

- To request disability-related academic accommodations, visit Services for Students with Disabilities sometime during the first three weeks of classes.
- Please feel free to reach out to the teaching staff if you encounter scheduling conflicts or learning barriers. We welcome feedback at any time during the course.

Support:

The Counseling and Psychological Services Center provides support for a variety of issues including mental health and stress.