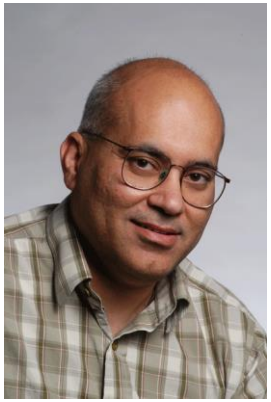
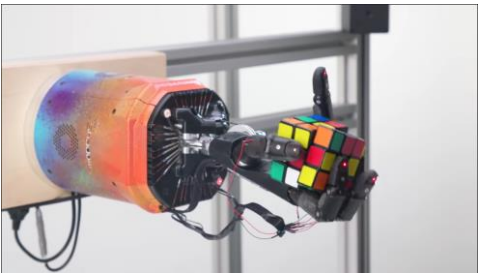
EE290-005: *Integrated Perception, Learning, and Control*

Yi Ma, Jitendra Malik, Claire Tomlin, and Shankar Sastry

Lecture One: Overview

- **A Course Overview** (20min, Yi Ma)
- **A Brief History and Future Vista in Robotics** (30min, Shankar Sastry)
- **An Overview of Perception and Action** (30min, Jitendra Malik)
- **A Viewpoint on Perception, Planning, and Control** (30min, Claire Tomlin)



Basic Information

Lecture Time: Wednesday 10:00am – 12:00pm

Lecture and Office Hours: https://berkeley.zoom.us/j/97126955125

EE290-006 Course Websites:

- **GitHub:** administrative information and resources
  https://pages.github.berkeley.edu/ee290-005/sp21-site/

- **Piazza:** announcements, Q&A, and team collaborations
  https://piazza.com/berkeley/spring2021/ee290005

A Related Course EE106B/206B: *Robotic Manipulation and Interaction*
https://ucb-ee106.github.io/106b-sp21site/

Course Requirements and Policy

Grading Policy: 2 Units (Participation) + 1 Unit (Project)

- Participation (2-unit):
  - ✓ 60% **prepare presentation** and lead discussion for a topic of choice
  - ✓ 20% **review papers** before class and participate in-class discussions
  - ✓ 20% **take notes** and summarize for a topic of choice (scribing)

- Course Project (1 additional unit):
  - ✓ 30% **a midterm project proposal** and 5-10min presentation
  - ✓ 70% a final 10-15min project presentation and report (conference paper style, e.g., the NeurIPS or IROS template.)

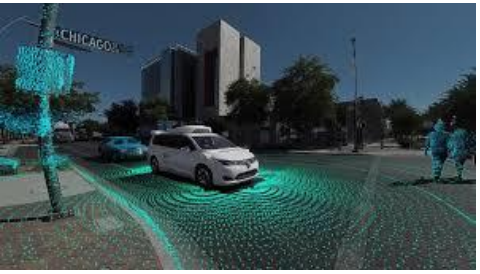
Presentation, scribing, and project will be done with **a team of 2-3 students**. Sign-up forms with be available soon.

Course Goals and Scope

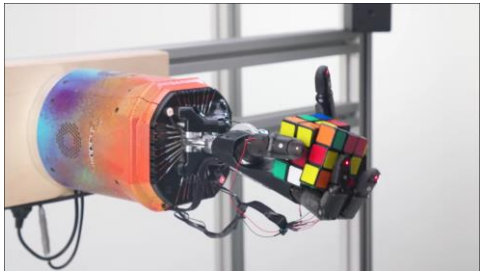
Goals: studies the integrated roles of perception, learning, and control in a closed-loop for autonomous robotic systems, under various levels of modeling uncertainty for the environment and of resource constraint for the agent.

Main Application Domains:

Navigation

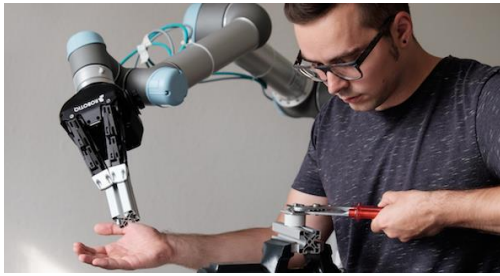


Manipulation



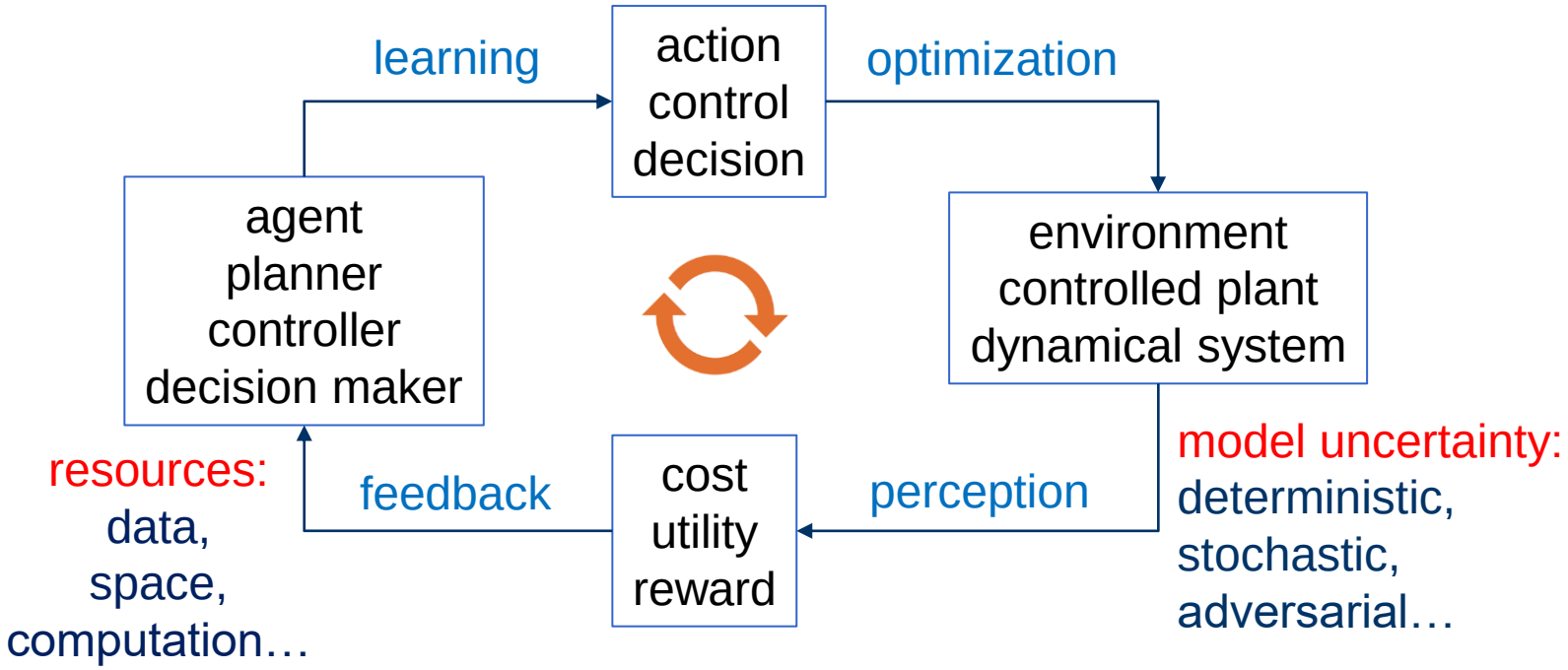
Locomotion

Human & Machine Interaction



A Basic Model

A Closed-Loop Autonomous System:



Tentative Schedule

Phase I: Technical Methods and Lectures by Instructors:

- January 20: Overview
- January 27: Perception for Manipulation and Navigation (Malik and Ma)
- February 3: Optimal Control and LQR (Tomlin)
- February 10: Kalman Filters and SLAM (Sastry)
- February 17: Reinforcement Learning (Ma and Sastry)

Tentative Schedule

Phase II: Paper Study and Presentation by Students:

- February 24 -- March 17: Student Paper Presentation
- March 24: Spring Recess
- March 31: (Midterm Project Proposal Presentation?)
- April 7 -- April 28: Student Paper Presentation
- May 12: Final Project Presentation

Suggestions for Presentation and Project

Paper Presentation:

- Problem formulation and assumptions (model uncertainty)
- Justification for the proposed method (other better alternatives?)
- Generalizability in the proposed solution (instance versus a class)
- Data and computational resource needed for the method (offline/online)

Course Project:

- Integration of multiple components
- Bridge simulation to physical-world systems
- Combine model-based and data-driven
- Out of the box applications or tasks

THANK YOU!

Questions, please?