Overview

For your final project, you will design and implement a robotics solution. *This is your opportunity to experiment, think creatively, and demonstrate everything you've learned throughout the course.*

You have two project options:

1. **Default Project** – Imitation learning for the Square Assembly task.
2. **Open Project** – Propose and pursue your own original idea.

You may have a maximum of 2 team members per team for the default project and maximum of 3 for the open project.

Deliverables:

Final Report (written document)

- Problem Statement
- System Design / Methodology
- Evaluation Results
- Discussion and Reflections

Demo Video

- Duration: 2–3 minutes (compress it to under 100MB)
- Clearly demonstrate your solution in action

Source Code

- Well-documented and organized
- Includes a comprehensive **README**
- Fully **reproducible**

Project Webpage *(Optional – Extra Credit)*

- A clear, visually engaging summary of your project
  May include visuals, interactive elements, or additional context

Deadlines:

- **Project Proposal (for Open Project only): 5/23**
    - Your proposal is not being scored but will serve as a contract for how your final project will be graded
- **Final Project Deliverables: 6/9**

Grading (% out of total course grade):

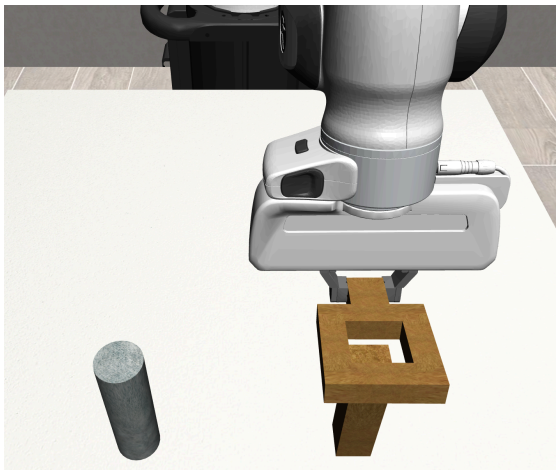
- Project Report: 8%
- Demo Video: 2%
- Source code: 2%
- Project website (extra credit) : 1%

GenAI Usage for Final Project *

- You are allowed to use any tool of your choice and build on existing repositories as long as you properly credit the source.
- However, you need to define your contribution clearly (i.e. what is the code/functionality you implement), and your grade is solely based on code you develop.

Option 1: Default Project — Robosuite Square Assembly Task

Objective: Implement an imitation algorithm to solve the Robosuite Square Assembly Task using demonstrations with low-dimensional state representation.



Project Expectations:

- Train a policy using supervised learning on provided demonstration data.
    - You can implement advanced versions of DMPs (so that it can handle orientation/rotation of the target and use multiple demos)
    - Or train a deep net policy of your choice
- Evaluate the learned behavior on the Square Assembly task
- Vary the number of demonstrations to use, and analyze the performance
- Discuss challenges, limitations, and potential improvements in the report

Option 2: Open Project - Your idea!

We encourage you to pursue an open project if you're interested in building something creative, ambitious, or personally meaningful. This is your chance to take everything you've learned and apply it to an idea you're passionate about.

Your project must include a robotics component, but beyond that, you're free to explore any tools, platforms, or topics that inspire you. Whether it's artistic, interactive, research-driven, or just something fun—go for it! Just make sure to get your idea approved by the instructor or TA.

Requirements:

Submit a short project proposal (1 page) that includes the following sections:

- **Project Goal -** What are you aiming to accomplish?
- **Approach**
  - Briefly describe your methodology
  - List the tools or frameworks you plan to use
  - Draw a diagram of your design (if you want)
- **Success Criteria**
  - How will you define and measure success?
  - What are your intended outcomes?
- **Feasibility**
  - Explain how the project is achievable within the given time frame.
  - What existing skills or techniques do you bring to the project?

Note: All proposals must be approved by the instructor or a TA by 5/23.

Example topics:

- **control a robosuite robot with text commands**
  Create a system that maps short text inputs (like “move left” or “grab cube”) to predefined actions in a Robosuite environment.
- **blend joystick input with robot autonomy in robosuite**
  Let the user steer the robot with a joystick while a basic policy handles another part, like adjusting grip or arm height.
- **train a robosuite robot with basic reinforcement learning**
  Use a simple RL algorithm (like PPO) to teach a simulated robot to complete a task such as opening a door, or nut assembly.
- **use gestures or voice to control a robosuite robot**
  Detect simple gestures (like a wave) or speech commands (like “stop” or “pick up”) and trigger corresponding actions in simulation.
- **design emotional robot arm motions in robosuite**
  Program expressive arm motions (e.g., fast/sharp for excited, slow/smooth for sad) and see if people can guess the emotion.
- **simulate gaze or head turns for social cues in robosuite**
  Make the robot orient its “head” or gripper toward objects or people to simulate attention and social behavior.
- **draw simple shapes with a simulated robot arm in robosuite**
  Make the robot trace out circles, letters, or basic patterns using position control in a 2D workspace.
- **make a robosuite robot move to the beat of music**
  Use beat detection to identify the tempo of a song, then sync the robot’s arm or gripper motion to the rhythm.

Or ANYTHING related to a robot that you think is cool to work on!!!! :)