CS 369: Introduction to Robotics

Prof. Thao Nguyen

Spring 2026

HAVERFORD
COLLEGE

Welcome!

- Please sign in & fill out a **notecard**

- Let me know if you can’t access **Piazza**

Outline for today

- Preliminaries

- Robots and their applications

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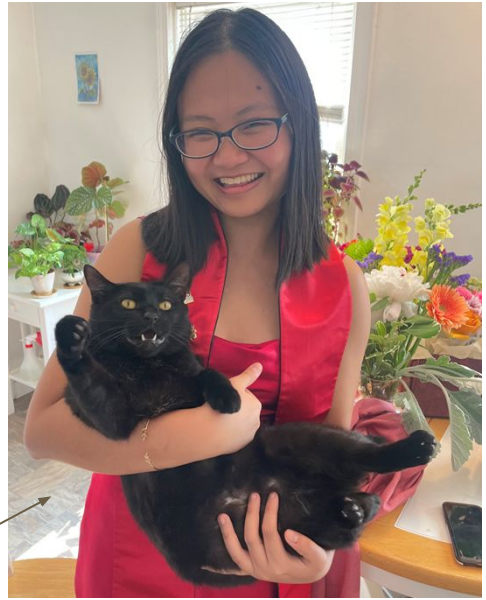
- Preliminaries

- Robots and their applications

Course staff

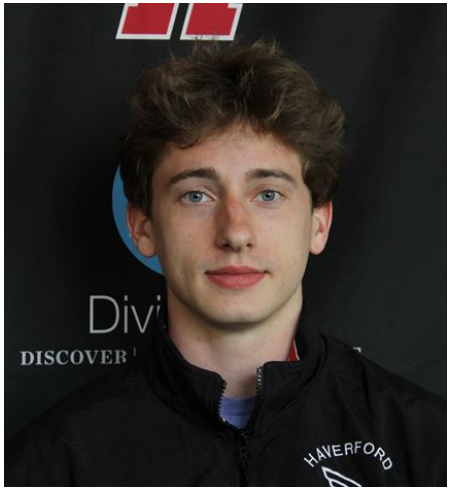
- **Instructor:** Thao Nguyen (she/her)
  - Call me Thao or Professor Nguyen
  - Research: Human-robot interaction and collaboration
  - Office hours: Tuesdays 2-4pm in KINSC L303



Milo

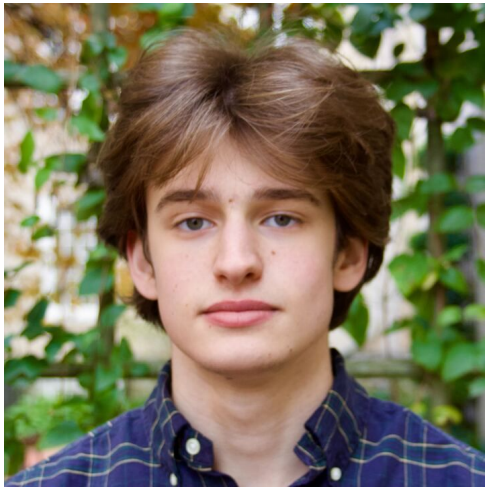
Course staff

- **Teaching Assistants:**



Owen Bluman

Zenas Boamah



Matt Feinstein

Course content

- **Robotics:** study and practice of the design, construction, operation, and application of robots

- There will be math, programming, and working with hardware

Course components

- Labs (7 total): 45%
- Final project: 25%
  - Includes an oral presentation and robot demonstration
- Research paper presentation: 15%
- Attendance & participation: 15%

Syllabus notes

(you are responsible for reading the entire syllabus on the course webpage)

- Lecture and lab attendance are mandatory
  - Please email me if you will be missing class
- Group work will be required for some labs
- Late work will not be accepted
- Piazza: should be used for all content/logistics questions
- Email: allow at least 24 hours for a response (48 during weekends)
- Lab grades will be posted on Moodle

Participation

- Asking and answering questions in class (very important!)
- Actively participating in in-class activities (group work, exercises, polls)
- Collaborating with your lab group
- Asking and answering questions on Piazza
  - Avoid long blocks of code and giving away answers
  - Only **non-anonymous public posts** count toward participation grade
- Attending office hours and TA hours

Academic integrity

- All work you submit must be your own
- You may not read anyone else's code or let anyone else read your code
- Software for automatically generating code are not allowed
- When in doubt, please check with me

Academic accommodations

Haverford College is committed to providing equal access to students with a disability. If you have (or think you have) a learning difference or disability – including mental health, medical, or physical impairment - please contact the Office of Access and Disability Services (ADS) at **hc-ads@haverford.edu**. The Coordinator will confidentially discuss the process to establish reasonable accommodations.

Students who have already been approved to receive academic accommodations and want to use their accommodations in this course should share their verification letter with me and also make arrangements to meet with me as soon as possible to discuss their specific accommodations. Please note that accommodations are **not retroactive** and require advance notice to implement.

It is a state law in Pennsylvania that individuals must be given advance notice if they are to be recorded. Therefore, any student who has a disability-related need to audio record this class must first be approved for this accommodation from the Coordinator of Access and Disability Services and then must speak with me. Other class members will need to be aware that this class may be recorded.

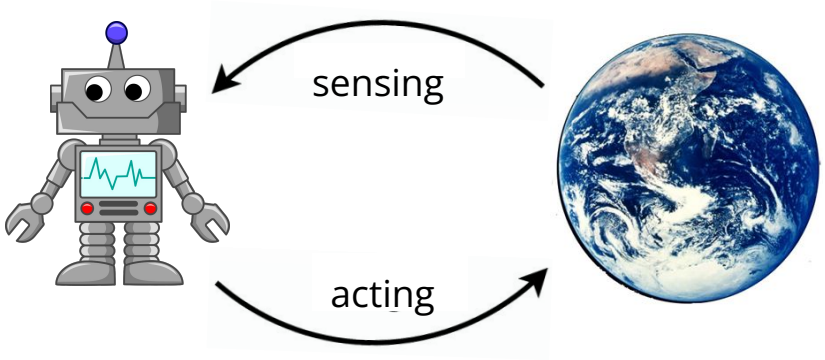
https://www.haverford.edu/access-and-disability-services/accommodations/receiving-accommodations

Outline for today

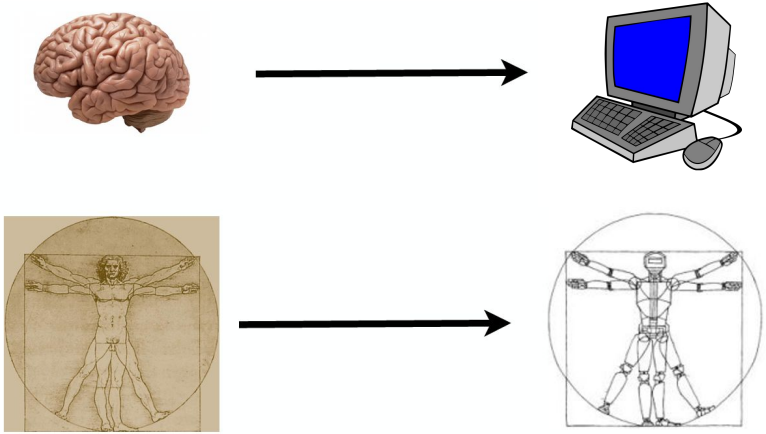
- Preliminaries

- Robots and their applications

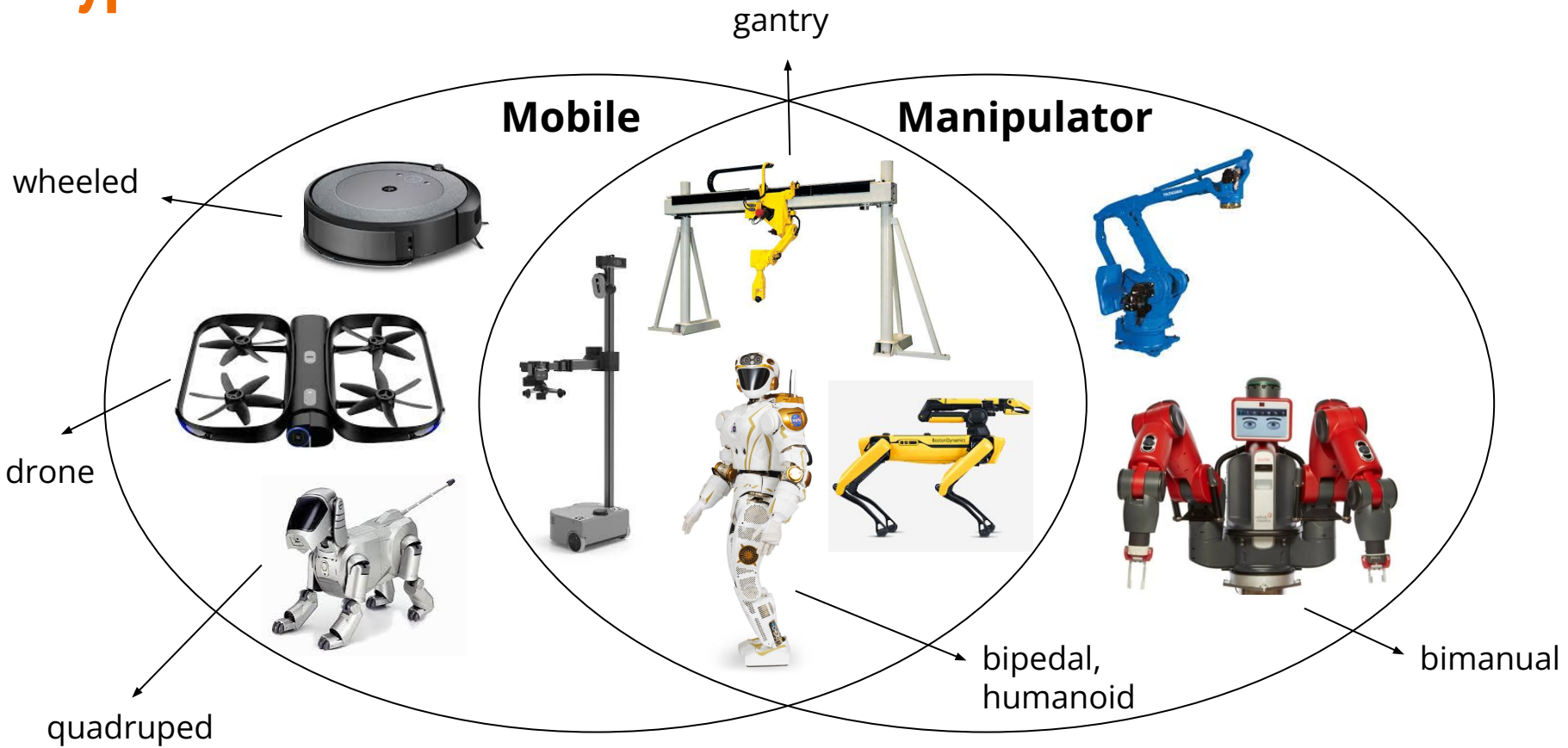
What is a robot?



- A robot is generally a machine that can sense, process, and perform physical actions in its environment, often autonomously
-



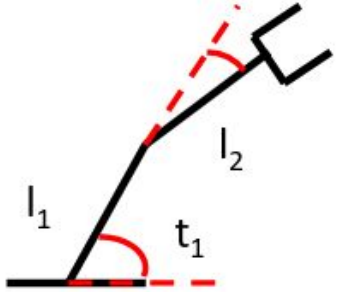
Types of robots



Robot applications

- Manufacturing & industry
- Agriculture
- Transportation
- Healthcare
- Exploration (e.g., space, underwater)
- Service & domestic
- Education & entertainment
- etc.

Robot representation



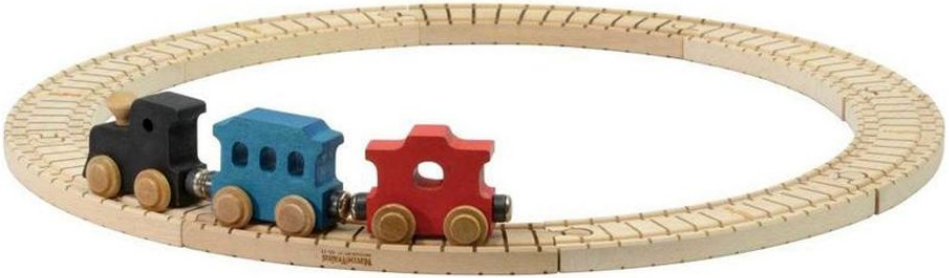
- Link: single rigid body
- Joints: connection between links, allow relative movement
- End effector: tool (gripper, welder, etc.) at the end of the arm

- **Robot configuration:** the physical arrangement of a robot's links and joints, defining its movement and workspace

Degrees of freedom

- Degrees of Freedom (DOF): the number of independent parameters that can fully define the configuration

- How many DOF does this have?



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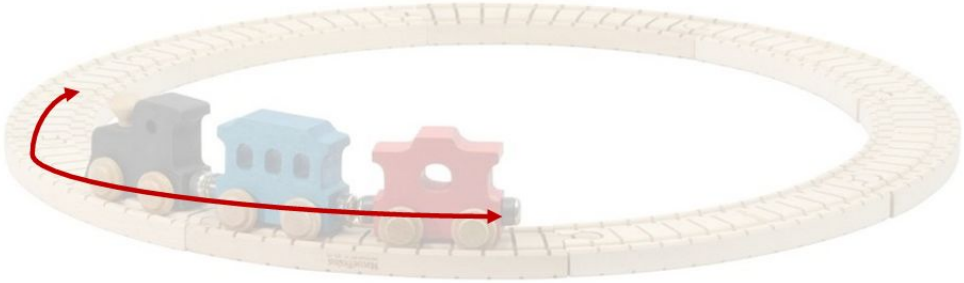
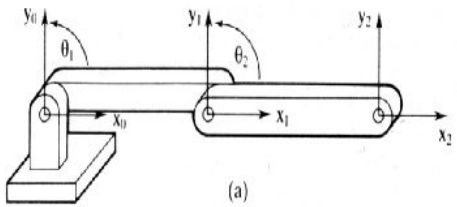


1 DOF

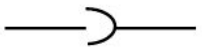
Types of joints



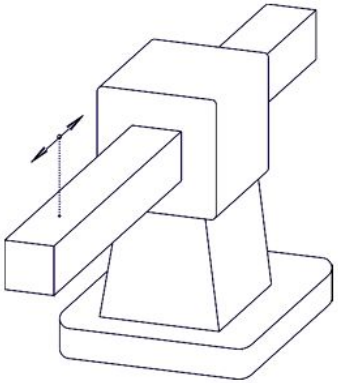
Revolute Joint

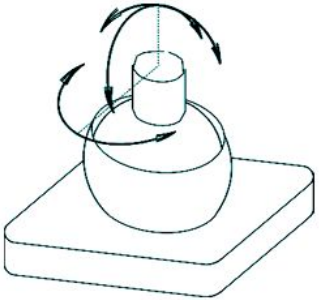
1 DOF (Variable - Θ)

Prismatic Joint

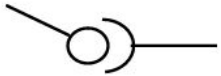


1 DOF (linear) (Variables - d)





Spherical Joint



3 DOF (Variables - Θ_1, Θ_2, Θ_3)

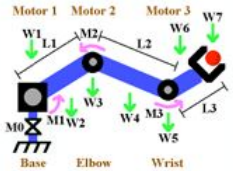
Robotics

High-level Reasoning

Discrete, abstract, symbolic.

$$PourTea:$$
$$Pre: HoldingKettle \wedge KettleFull$$
$$Effect: \neg KettleFull \wedge TeaPoured$$

Continuous, noisy, locally and partially observable, sensorimotor space.



Low-level Control

George Konidaris,
Brown University