NYU

Introduction to Robot Intelligence [Spring 2023]

Introduction to the class!

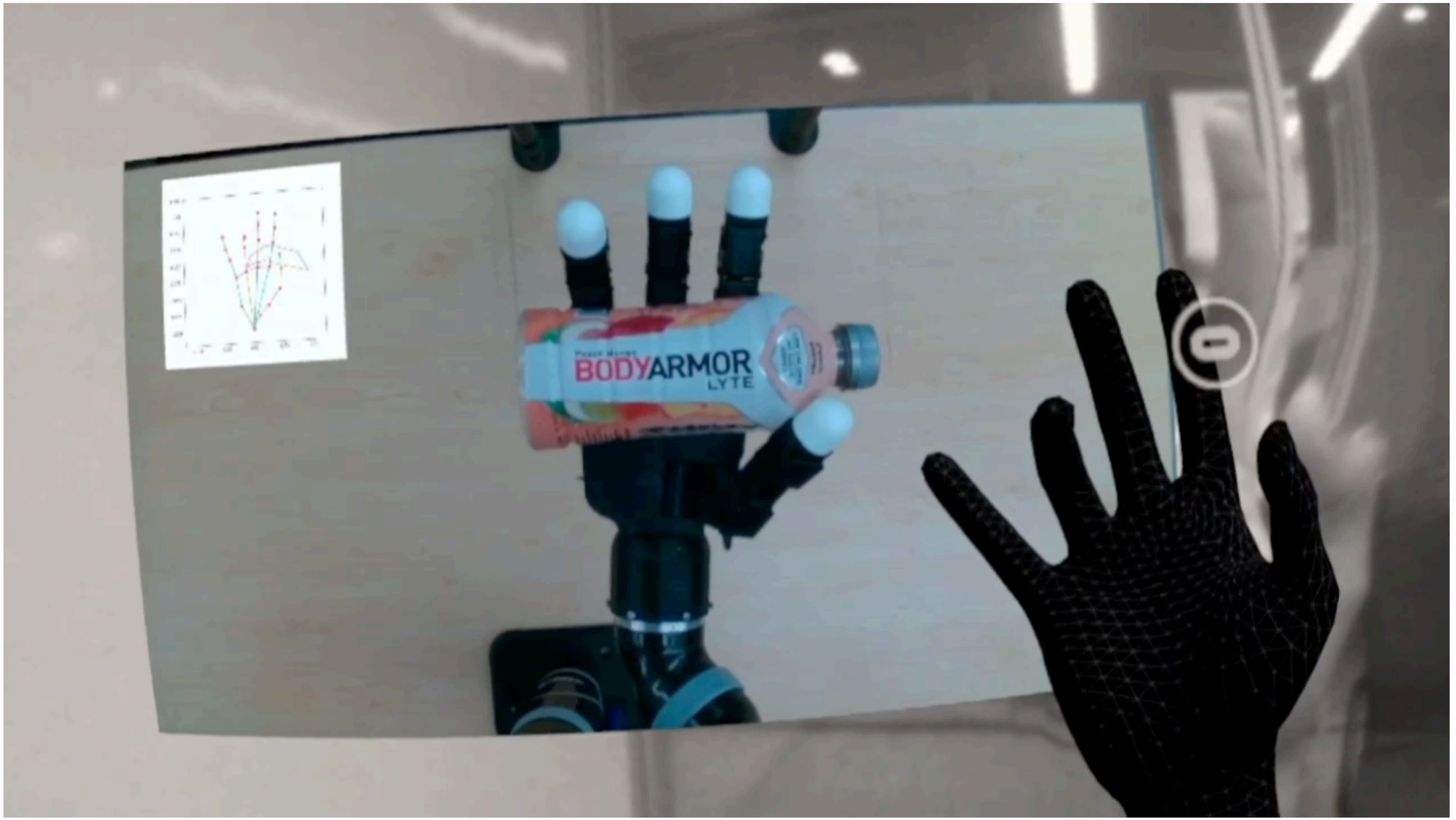
January 24, 2022

Lerrel Pinto

Robot Intelligence at NYU GRAIL

The Surprising Effectiveness of Representation Learning for Visual Imitation. By Pari*, Shafiullah*, Arunachalam, and Pinto. [RSS 2022]

Robot Intelligence at NYU GRAIL



"Holo-Dex: Teaching Dexterity with Immersive Mixed Reality". By Arunachalam, Güzey, Chintala and Pinto. [ICRA 2023]

Robot Intelligence at NYU GRAIL

Watch and Match: Supercharging Imitation with Regularized Optimal Transport. By Haldar, Mathur, Yarats and Pinto. [CoRL 2022]

Your TA / Tutorial Instructor

Ulyana Piterbarg

(she/her/hers)

About

- PhD student @ NYU CILVR advised by Prof. Pinto and Prof. Rob Fergus
- Research Interests: imitation learning, continual learning, multimodality, differentiable simulation, structured representations, and intuitive physics

Contact

- up2021@cims.nyu.edu

Course Overview

Goals of the class

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- Traditional robotics classes: Kinematics, Dynamics, Control, Mechanism Design, Signal Processing, …
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- This class: Lies somewhere in the intersection of these fields.
- Although targeted towards robotics, ideas taught in this class are valid for many sequential decision making problems — game playing, advertising, recommendation systems, stock trading, etc…

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General

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- Communication: https://campuswire.com/p/GF1B80F4C (password: do not share)

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- Attendance: In-person only!
- Office hours: 2 hrs a week. Please see the class website or calendar for details.

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Interactions

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- Questions during lecture:
    - I will try to pause every 15-20 mins to take questions.
    - You are **highly encouraged** to interrupt!

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    - You are **highly encouraged** to interrupt!
- Questions after lecture:
    - CampusWire: comment on the lecture note. (Anonymous feature is enabled)
    - Office hours

Course Overview

Grading

- HWs - 90%:
    - HW1 is out
    - HW2 will be out soon
    - Discussion with other students is NOT OK.
- Discussions in class or campuswire - 10%

Course Overview

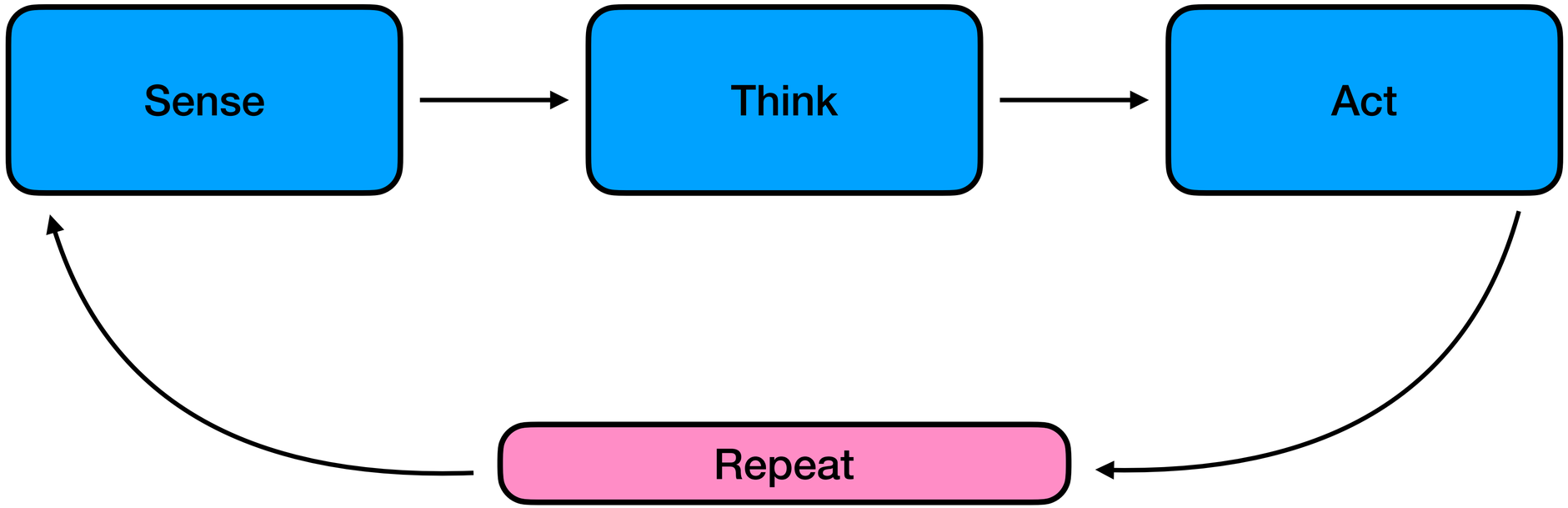
Key differences from previous year's offering

- Removal of project / hands on robotics component.
- Tutorial lectures to cover implementation.
- No discussion of HWs with other students.
- Change of focus from virtual to in-person lectures.

Questions?

What is a robot?

What is a robot?



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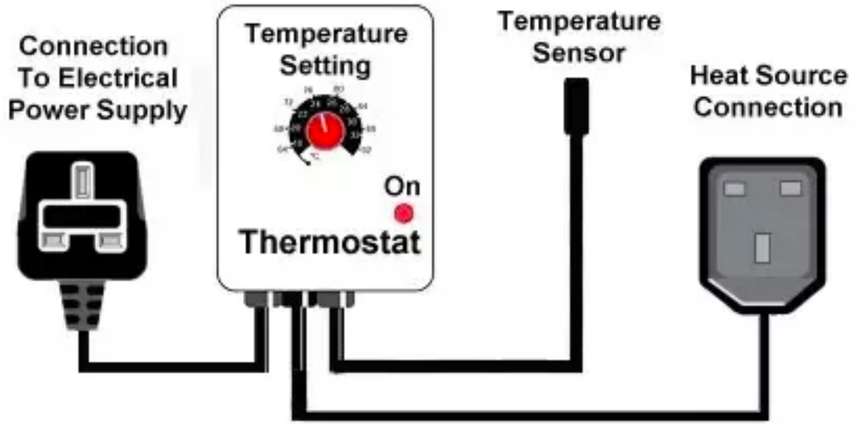
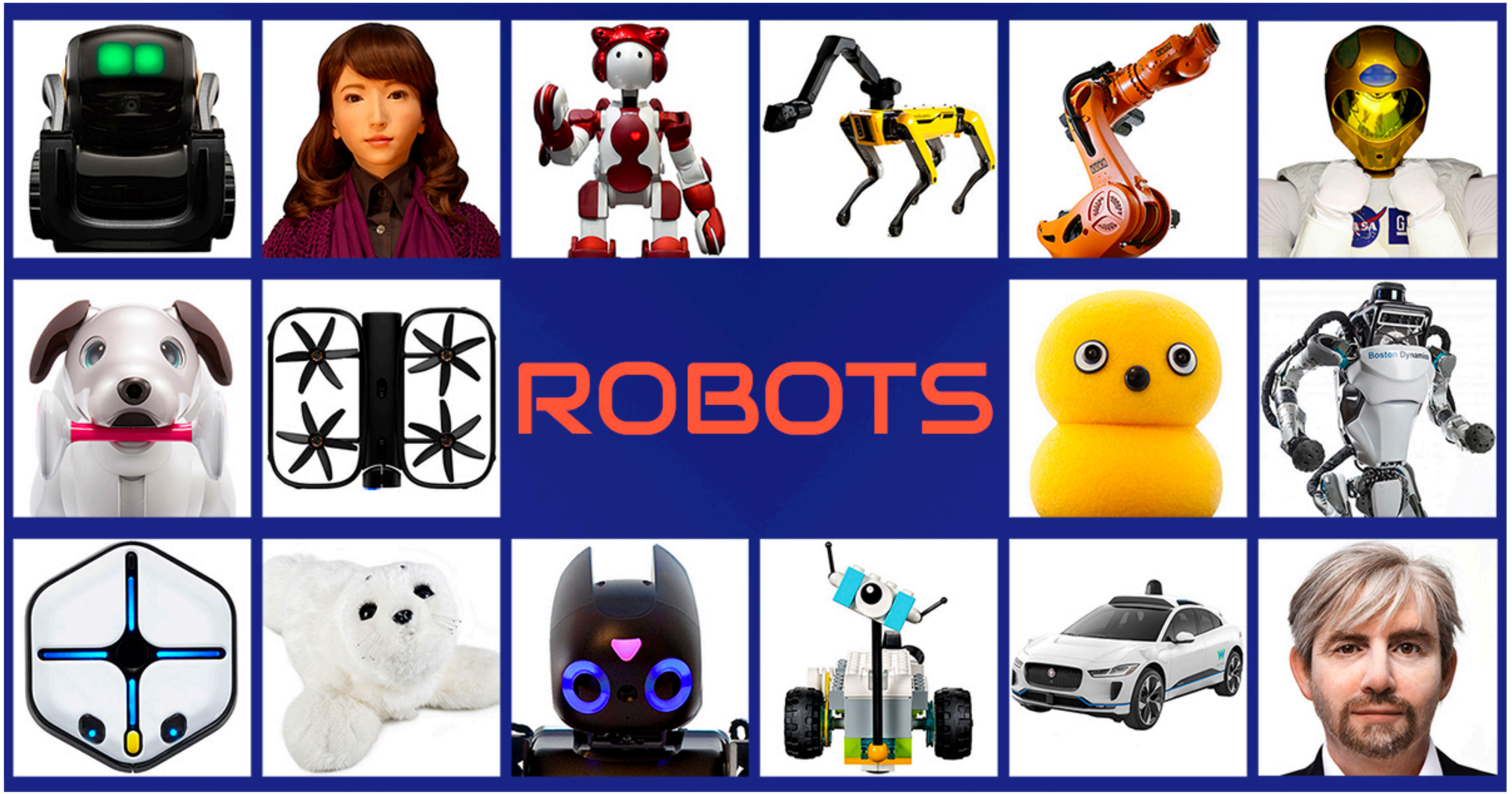
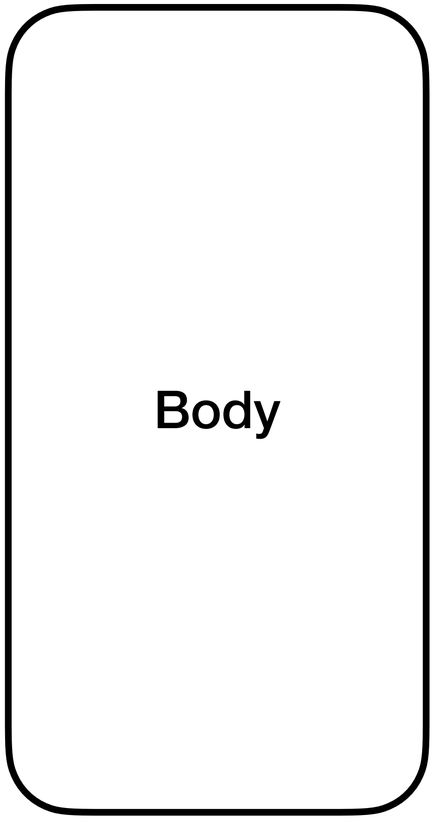


Types of robots



Source: robots.ieee.org

What is a robot made of?



Components of a robot ‘body’:

- Links, joints, structural material

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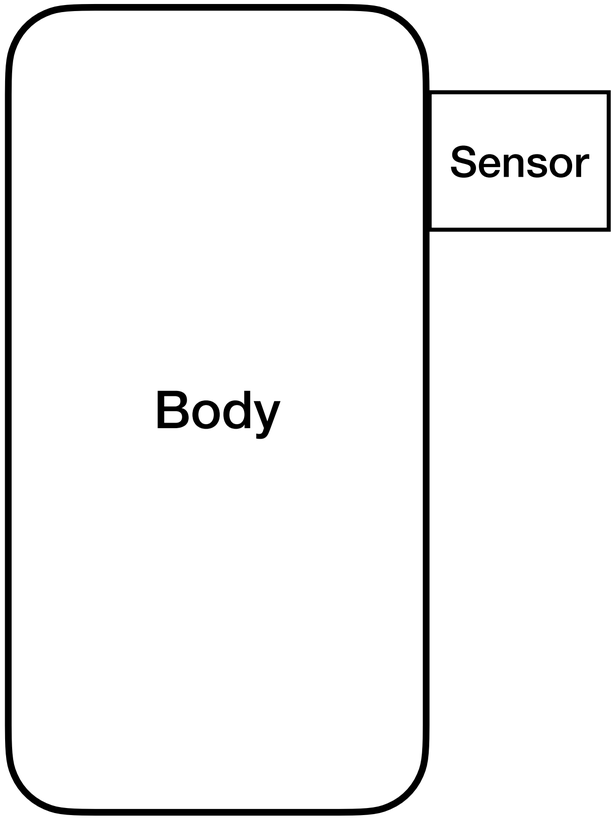

Components of a robot ‘body’:

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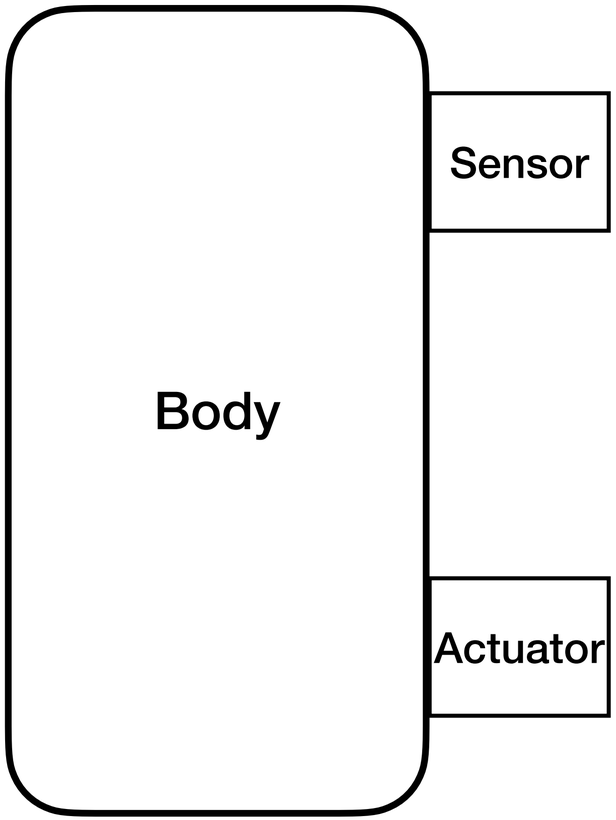

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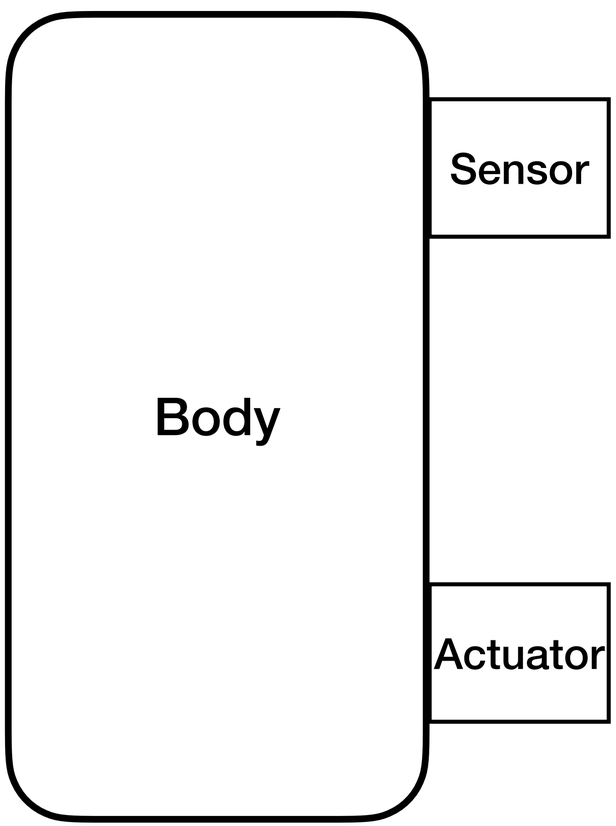

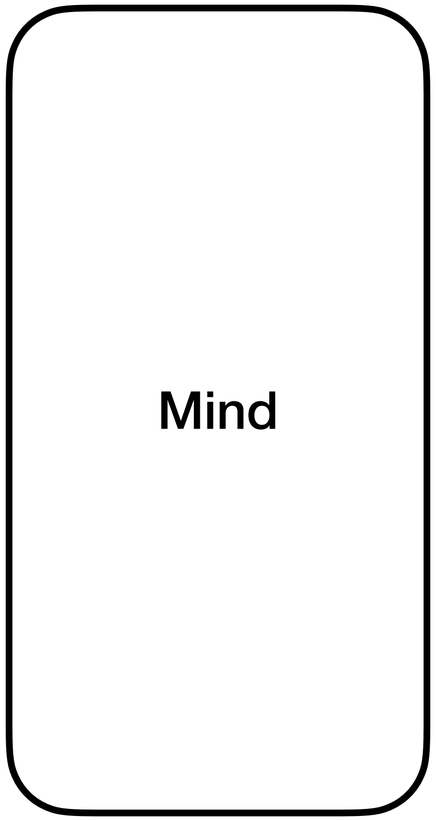

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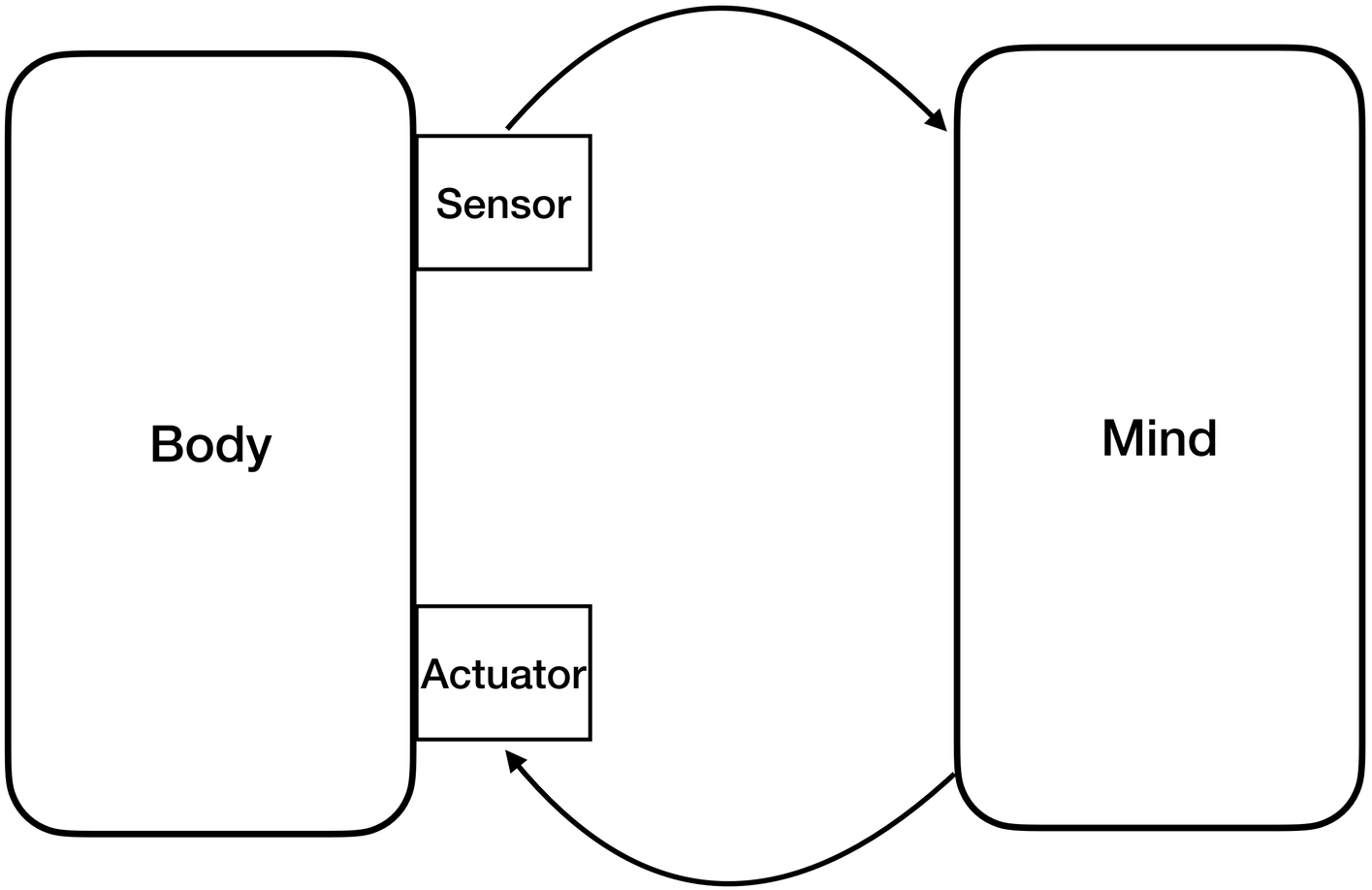

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What is intelligence?

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Intelligence: The ability to perceive or infer information, and to retain it as knowledge to be applied towards adaptive behaviors within an environment or context.

Artificial Intelligence: Intelligence demonstrated by machines.

Source: wikipedia.

What is AI?

Good Old Fashioned AI
(GOFAI)

- Intelligence from computation on models of the world

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Machine Learning (ML)

- Intelligence from internalizing patterns in data

Syllabus

https://nyu-robot-learning.github.io/robot-intel-class-sp23/syllabus

This Class

- Practical understanding of Robotic Intelligence
- Focus on foundational ideas that are components of state-of-the-art methods
- Math — Only as much as to understand concepts.
- More breadth, less depth.
    - Want to go into more depth on a particular topic?

Questions?