COM SCI 188

Intro to Robotics

Lecture 1

Yuchen Cui

Winter 2026

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Agenda

- Meet the Crew
- Logistics & Syllabus
- Course Policies

- What is a robot?
- Course Overview
- Q&A

Meet The Crew

Holden Grisset
TA Dis1A

Ashima Suvarna
TA Dis1B

Yuchen Cui
Instructor

Raayan Dhar
Lead LA

Alexis Lee
LA Dis1A

Yike Shi
LA Dis1B

Course Logistics

Class Schedule: TR 10-11:50am

Location: Boelter 2760

Discussion Sections (required):

- 1A: F 2 pm - 3:50 pm @ Haines Hall A2
- 1B: F 12 pm - 1:50 pm @ Haines Hall 118

Course Logistics

- **Instructor Office Hours:** Wed 3-4 pm or by appointment
- **TA office hours**: 2nd hour of discussion sessions

- Best to ask questions on Piazza!

Course Policy

Grading:

- Problem Sets (24% = 4x 6% each)
- Programming Assignments (24% = 3x 8% each)
- Midterm Exam (29%)
- Final Project (15% = demo 5% + report 10%)
- Discussion Section Participation & In-Class Quizzes (8%)

Course Policy

Attendance:

Discussion Section Participation & In-Class Quizzes (8%)

- Discussion sections are **required** and have check-offs.
- You are allowed to miss up to 2 lecture quizzes without penalty, please use them wisely! No additional absence will be granted without penalty.

Course Policy

Submitting assignments:

Upload assignments to Gradescope before deadline (11:59pm on the due date)

Late Policy: -10% × Max Score × Days Late

Start early!

Textbooks:

Modern Robotics: Mechanics, Planning, and Control

Kevin M. Lynch and Frank C. Park

Link: https://hades.mech.northwestern.edu/images/7/7f/MR.pdf

Probabilistic Robotics

Sebastian Thrun, Wolfram Burgard, and Dieter Fox

Link: https://docs.ufpr.br/~danielsantos/ProbabilisticRobotics.pdf

Prerequisites:

- Math:
  - Calculus (MATH 32A)
  - Linear Algebra (MATH 33A)
  - Probability (MATH 70, MATH 170x)
- Physics: Mechanics (Physics 1A)
- Coding: CS 35L & Proficiency in Python

Academic Integrity

As a student and member of the UCLA community, you are expected to demonstrate integrity in all of your academic endeavors. Accordingly, when accusations of academic dishonesty occur, The Office of Student Conduct reviews and adjudicates alleged violations. Academic dishonesty, includes all forms of academic misconduct or research misconduct, including, but not limited to, cheating, fabrication, plagiarism, multiple submissions, facilitating academic dishonesty, and unauthorized collaboration.

Academic Integrity

Problem sets and coding assignments are to be solved **individually**.

You will work in small teams for discussion session exercises, and the final project. You are expected to **contribute equally** to your team.

GenAI Policy

Use them as a convenient personal TA but not to replace you in learning!

GenAI Policy

The use of generative AI is prohibited in problem sets.

The use of generative AI is allowed in coding assignments but should be explicitly marked for each generated code block.

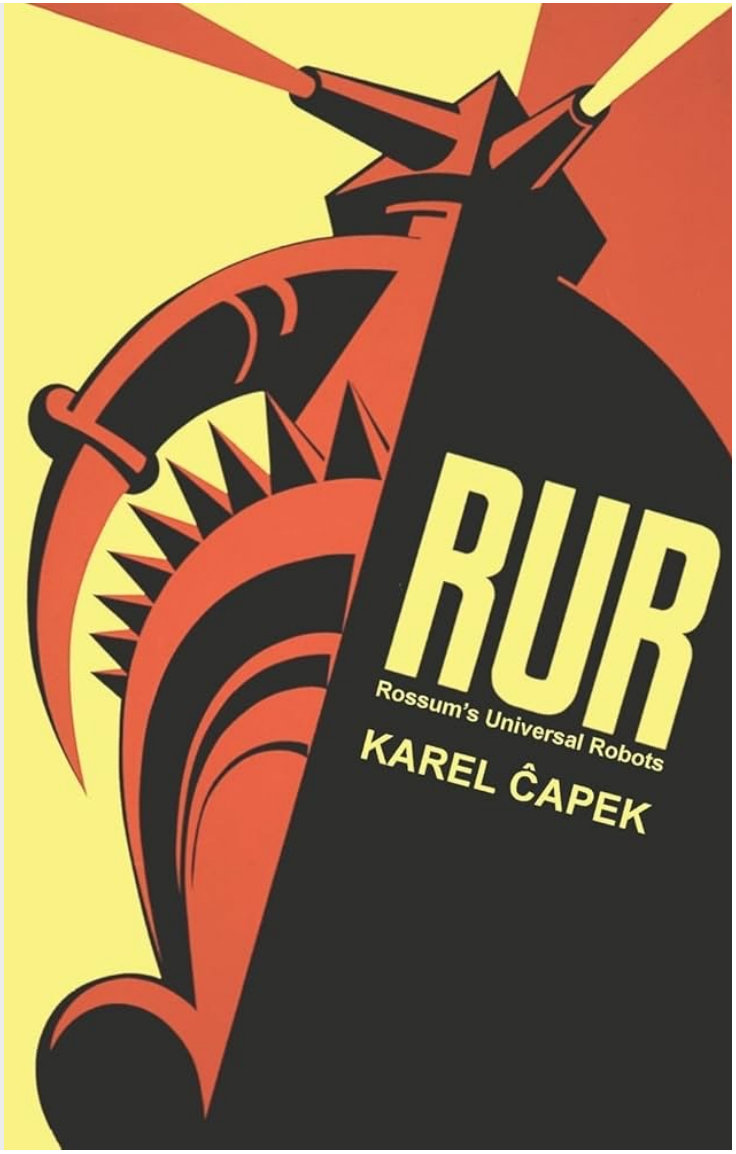
Join Gradescope

- Entry Code:ZJ32X2

What is a Robot?

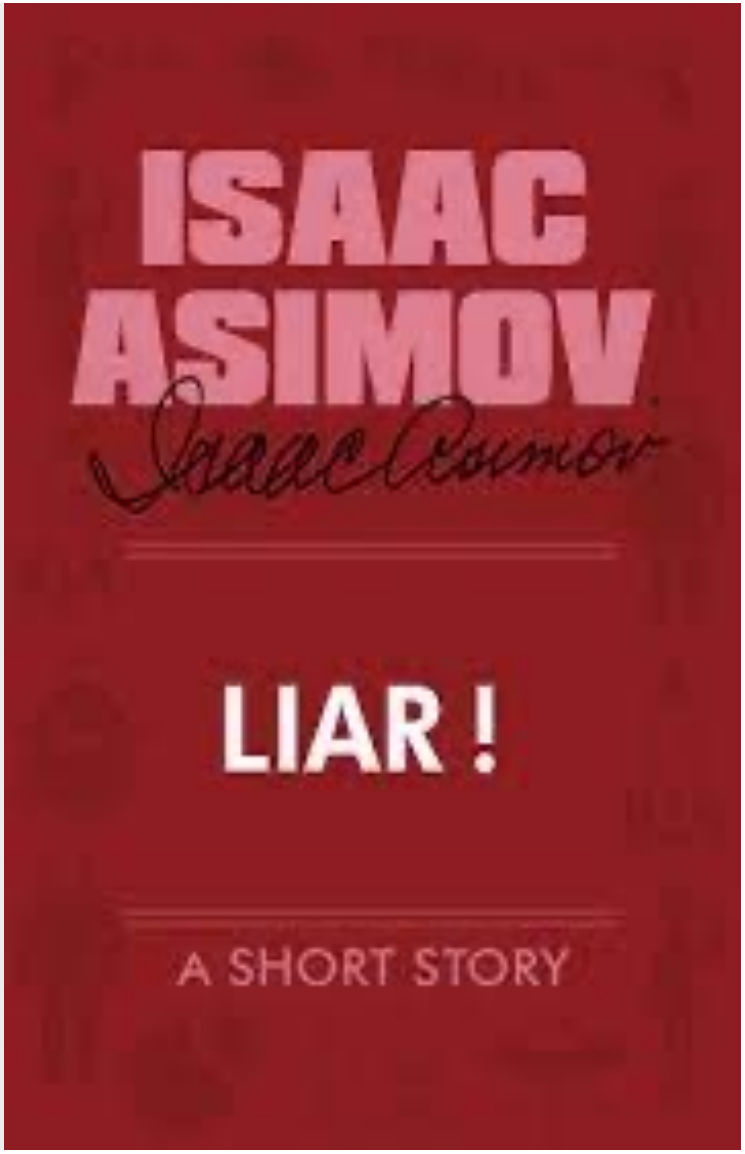
What is a Robot?

The modern term *robot* derives from the Czech word *robota* (“forced labor” or “serf”), used in Karel Čapek’s play *R.U.R.* (1920) – Rossum’s Universal Robots



What is a Robot?

The word *robotics* first appeared in Isaac Asimov's science-fiction story *Liar!* (1941), in which a robot is mistakenly given the ability to read minds.



What is a Robot?

Artificial Human

Programmable Machine

Autonomous Agent

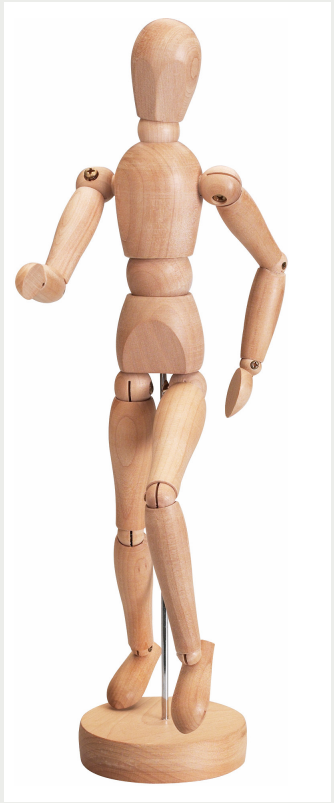

AUTOMATIC DOOR
AUTOMATIC DOOR
"PERKS"

"A robot is defined as intelligence embodied in an engineered construct, with the ability to process information, sense, plan and move within or substantially alter its working environment.

Here intelligence includes a broad class of methods that enable a robot to solve problems or to make contextually appropriate decisions and act upon them."

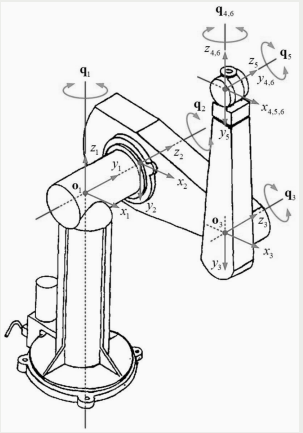
Sense + Plan + Act (autonomously)

National Science Foundation




AUTOMATIC DOOR
AUTOMATIC DOOR
"PERKS"

Robotics



Kinematics

The study of motion *without* considering forces or torques.

Dynamics

The study of motion considering the forces and torques that caused it.

Control

How to execute desired motion.

Perception

How to understand the world using sensors.

Planning

How to reach a goal.

Course Objectives

- Develop a foundational understanding of ***kinematics, dynamics, and control*** for modeling and managing robotic motion.
- Become familiar with ***sensors and perception algorithms*** to interpret environmental data for robotic decision-making.
- Understand principles of ***state estimation***, as well as ***task and motion planning***, to enable reliable and efficient robot behaviors.
- Explore basic ideas of ***AI in robotics***, including imitation learning and human–robot interaction, for advanced autonomous capabilities.
- Gain ***hands-on experience*** in simulation tools to design, test, and refine robotic systems in a virtual environment.
- Reflect on the ***ethical implications*** of robotics, fostering responsible development and deployment of robotic technologies

Course Schedule

- https://ucla-robot-intelligence-lab.github.io/cs188


Robosuite
Discussion Session 1
Install Robosuite

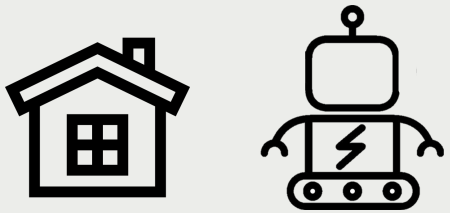
How to design a robot?

Consideration #1

Tasks & Operating Environments

- Define specific tasks the robot will perform.
- Analyze working environments: indoor/outdoor, structured/unstructured, temperature, terrain, obstacles, etc.

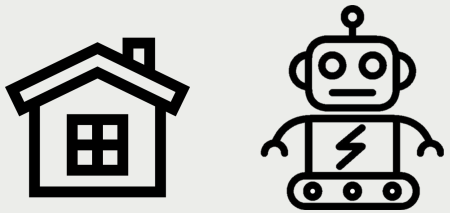
Consideration #2



Hardware Design

- **Mechanical Structure:** Chassis, joints, degrees of freedom.
- **Actuators:** Motors, servos, pneumatic or hydraulic systems.
- **Power System:** Battery type, power efficiency, backup options.

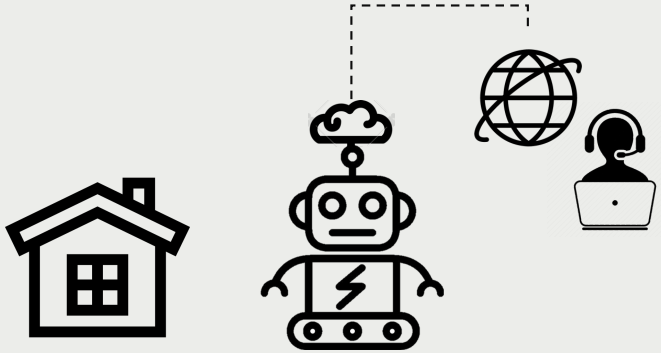
Consideration #3



Firmware & Embedded Systems

- **Computing Units:** Microcontrollers, onboard processors.
- **Sensor Integration:** Cameras, IMUs, LiDAR, GPS, force sensors.
- **Communication Interfaces:** Wired/wireless protocols (e.g., I2C, SPI, UART, CAN, Wi-Fi, Bluetooth).

Consideration #4

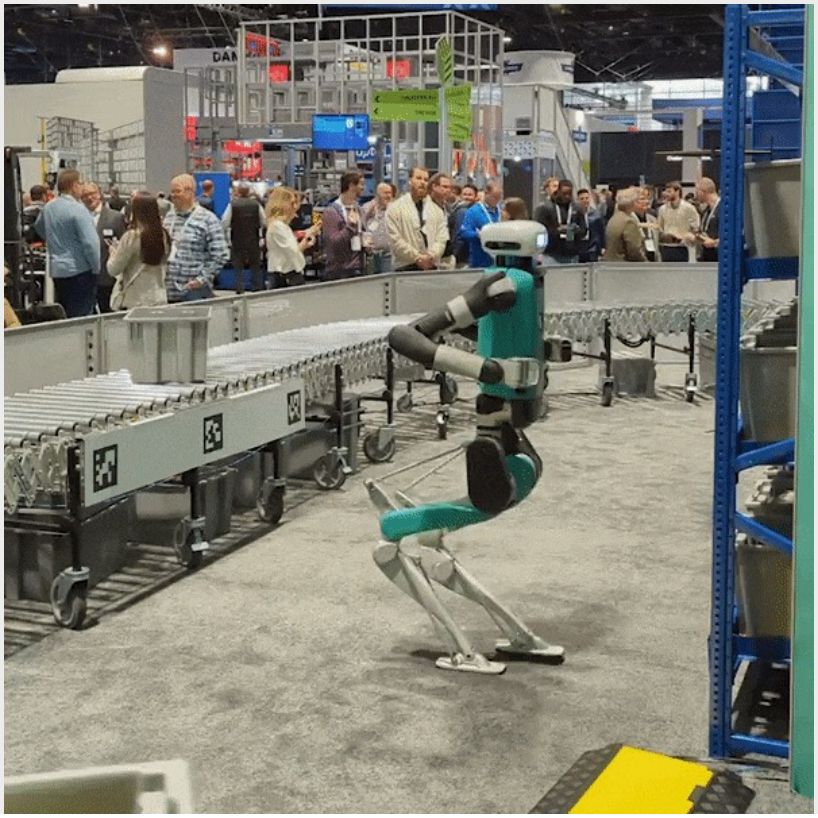


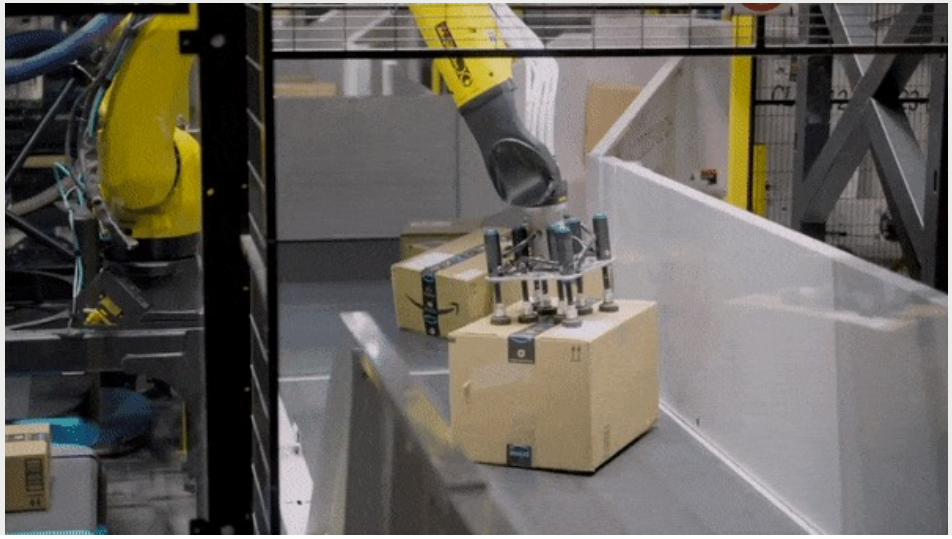
Software Architecture

- **Control Algorithms:** Motion planning, PID control, pathfinding.
- **Autonomy & Intelligence:** SLAM, AI/ML models, obstacle avoidance.
- **User Interface:** Remote control, dashboards, or autonomous modes.

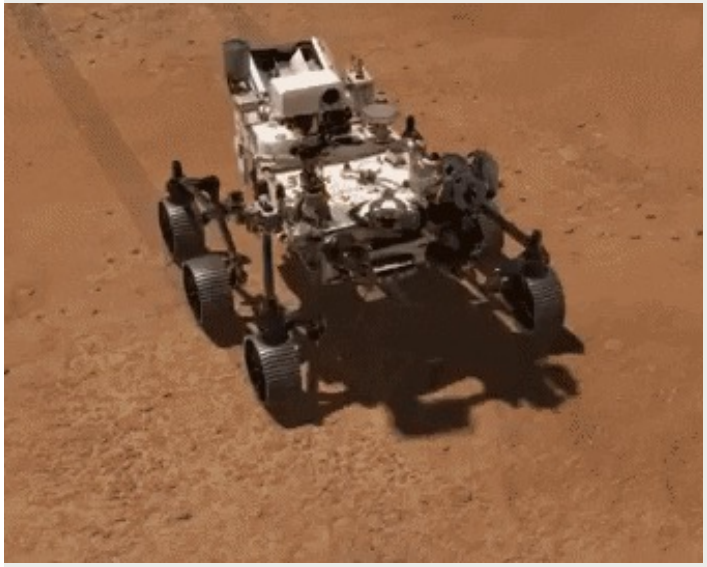
Where are we?

Logistics & Warehouse Robots



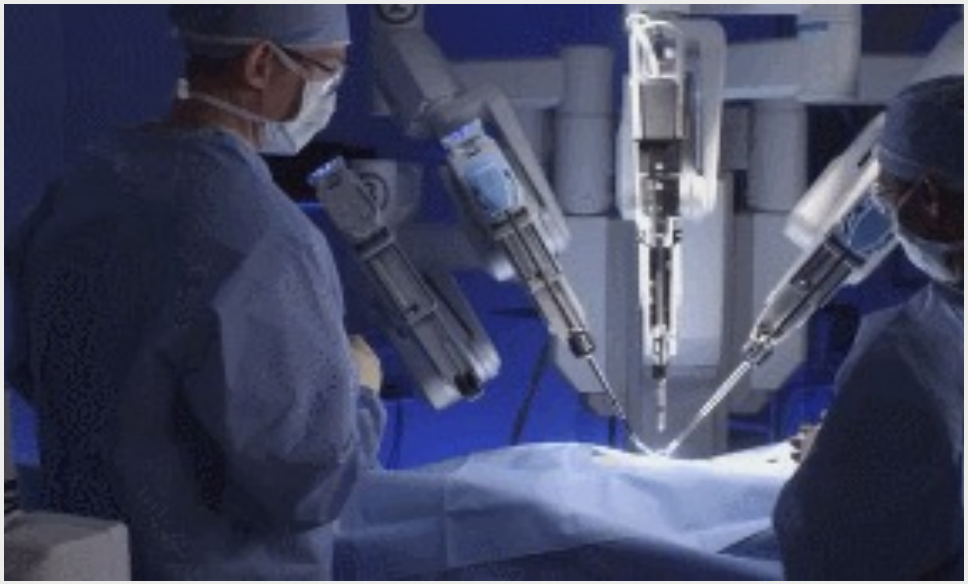


Space Robots



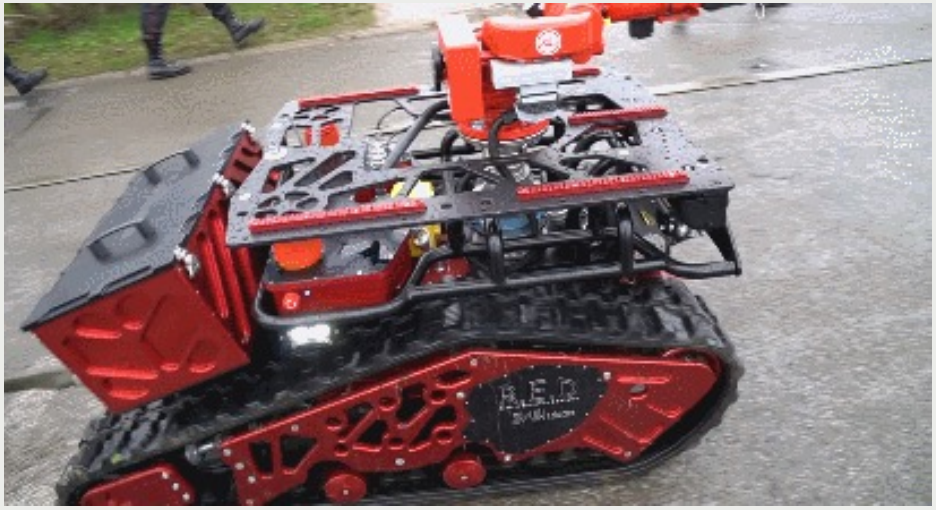
Deepsea Robots

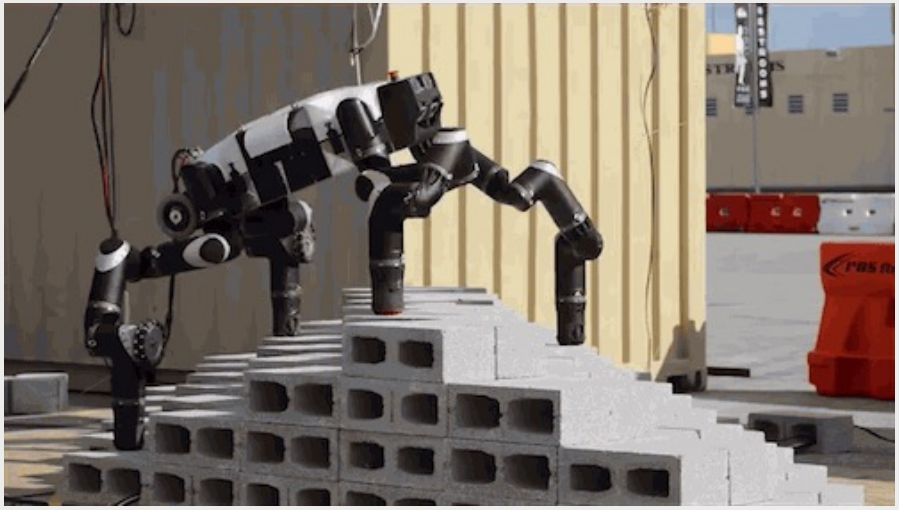
Healthcare & Medical Robots (?)



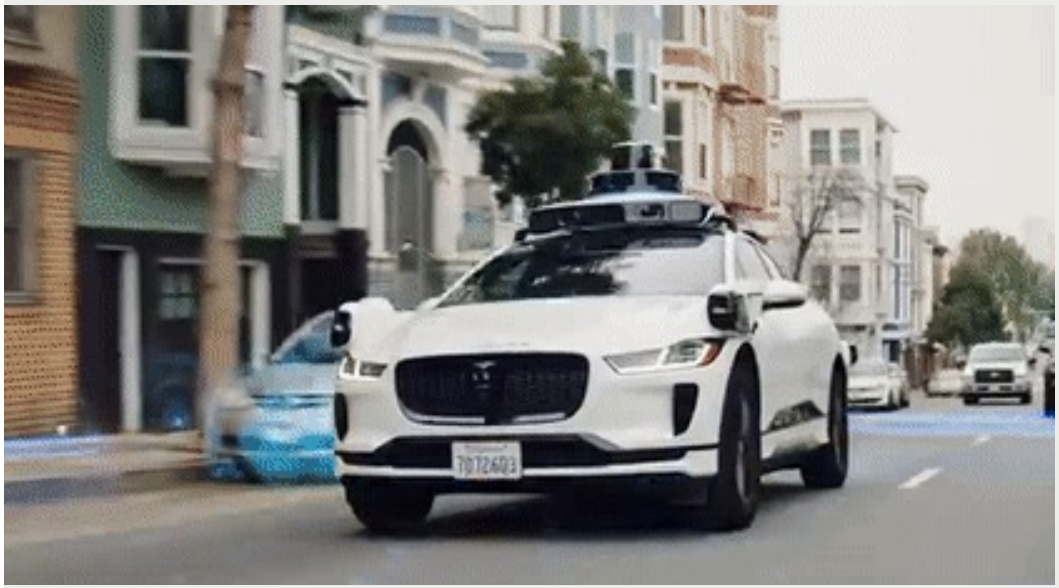
Agricultural Robots

Disaster Response Robots





Service & Hospitality Robots



Education, Entertainment & Companion Robots

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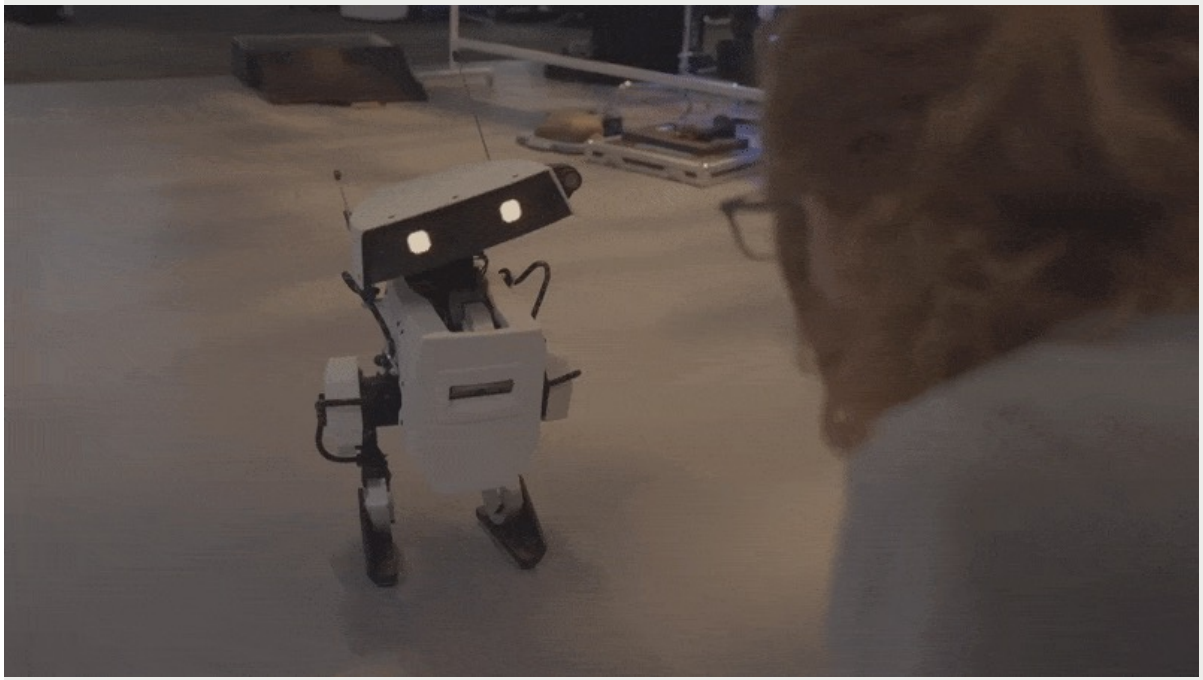
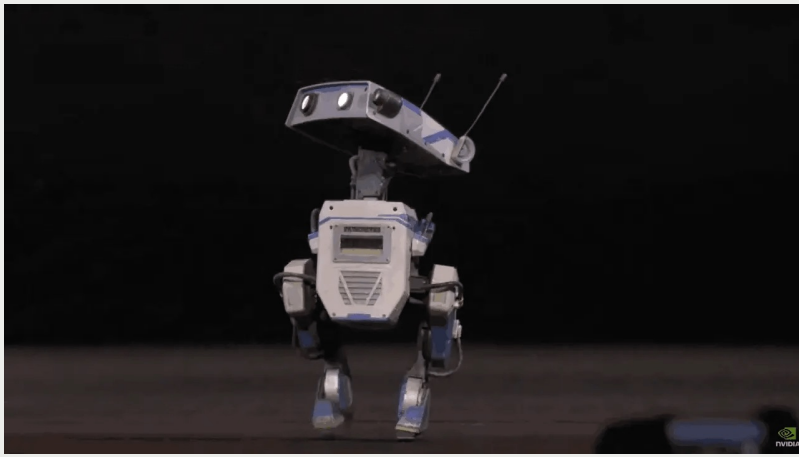
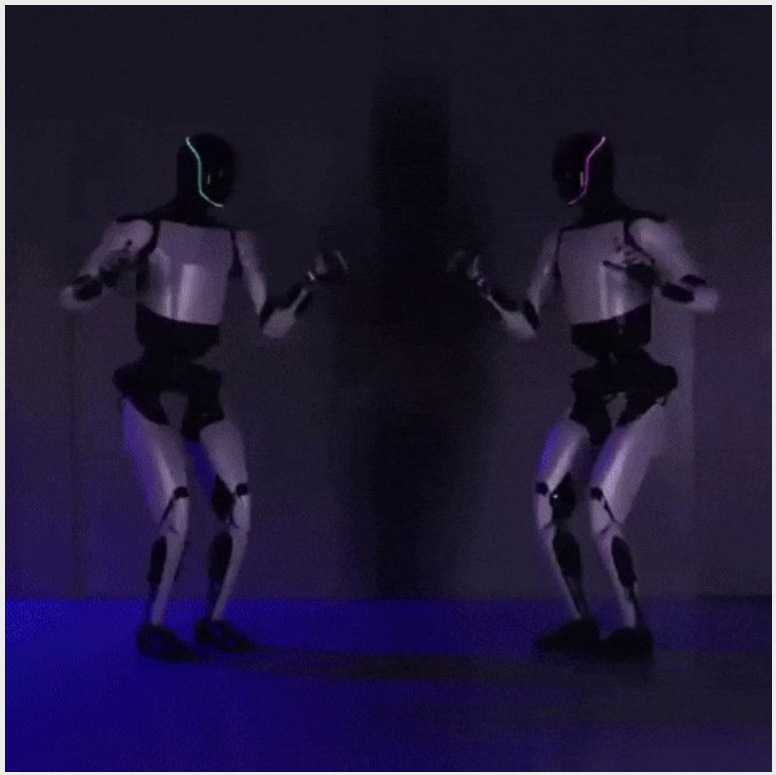
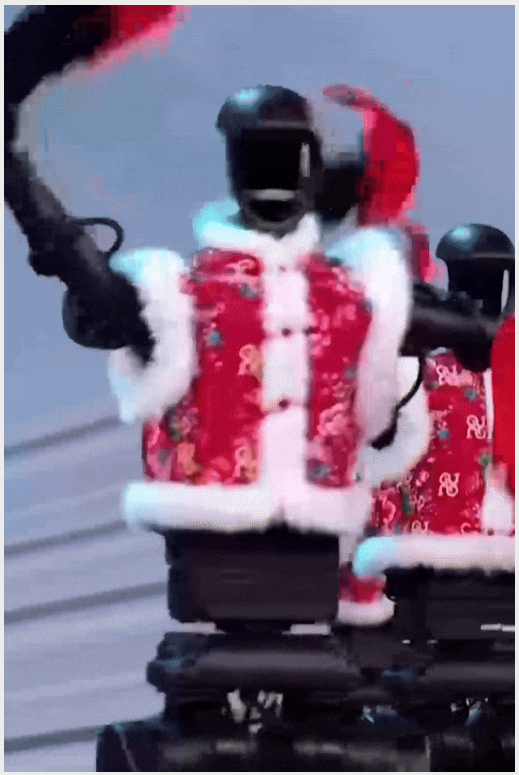
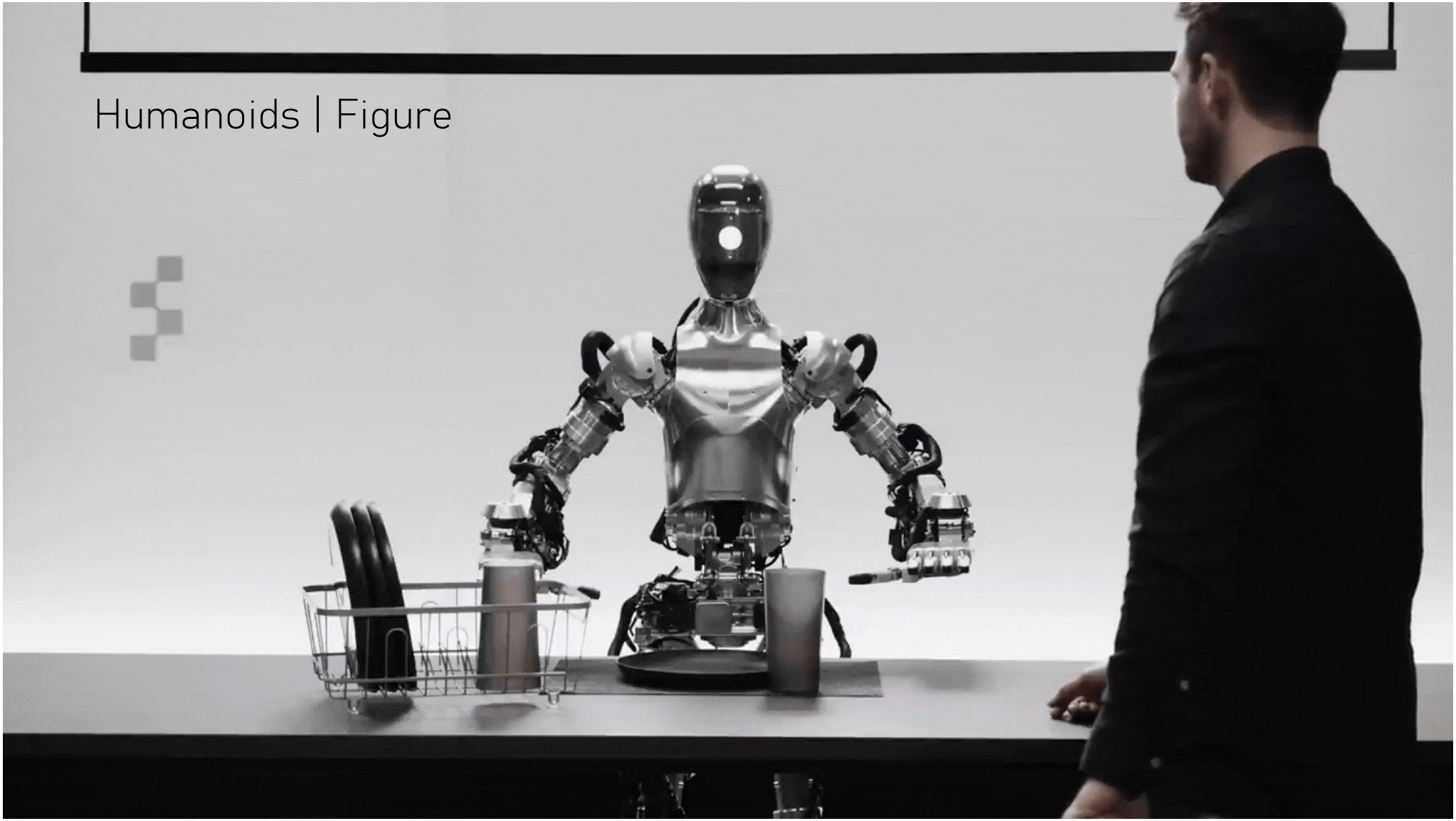




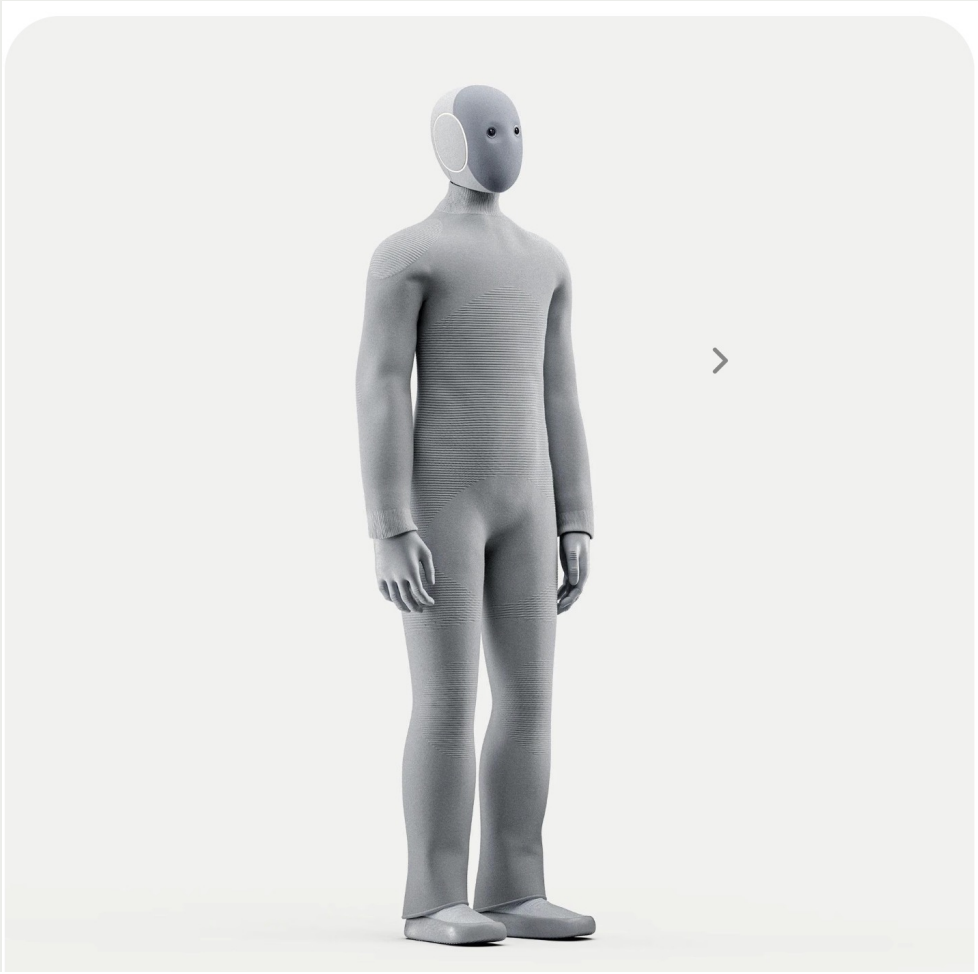
Humanoids | Tesla Optimus & Unitree H1






Humanoids | Figure

Humanoids | 1x Neo



NEO
Home Robot

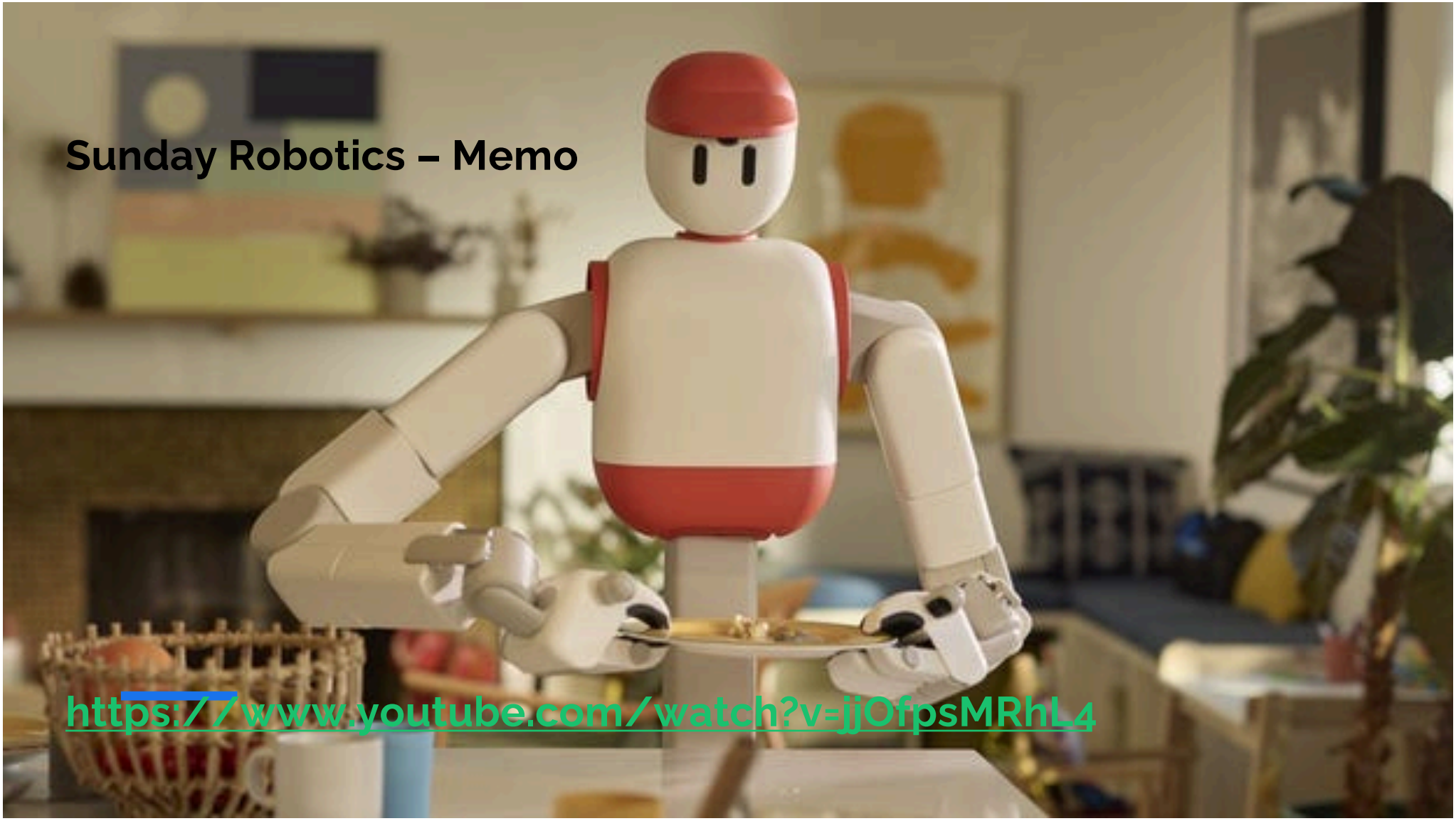
Product | FAQ

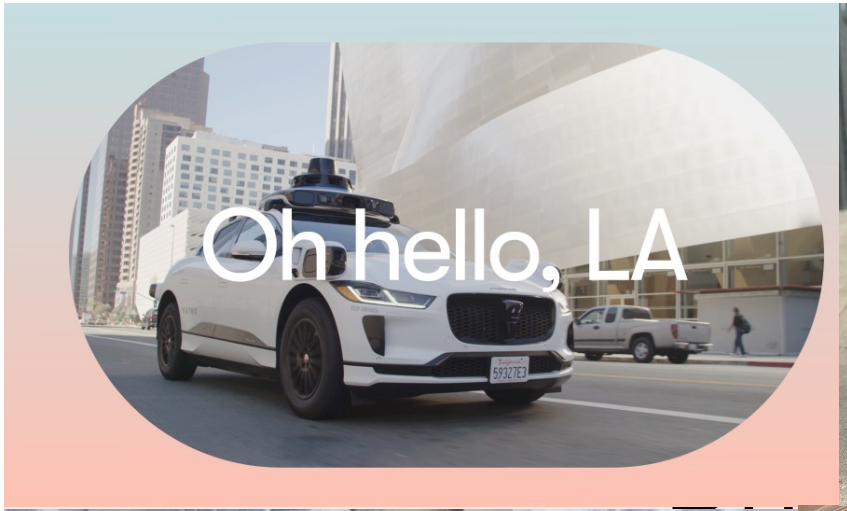
Standard — $499/mo Subscription
- Monthly Subscription
- Starter Productivity Package
- Standard Delivery

Early Access — $20,000 Ownership
- Ownership with 3-Year Warranty
- Premium Support
- Priority Delivery

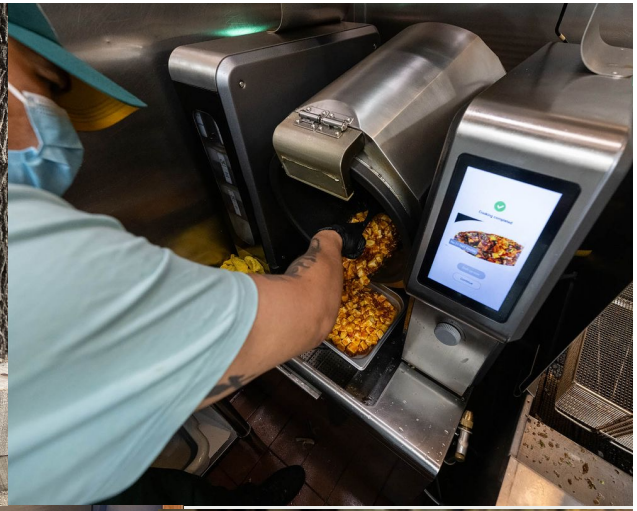
$200 Deposit Due Today
Fully Refundable
US Deliveries start 2026

Order Now


Sunday Robotics – Memo
https://www.youtube.com/watch?v=jjOfpsMRhL4


Oh hello, LA


coco




jamba
By Blendid

What is hard?

Moravec's paradox

*"it is comparatively **easy** to make computers exhibit adult level performance on **intelligence tests** or **playing checkers**, and **difficult** or impossible to give them the **skills of a one-year-old** when it comes to **perception** and **mobility**"*

Chelsea Finn Explains Moravec's paradox: https://www.youtube.com/watch?v=raHM3k-uR0E


That's it for today!
Questions?