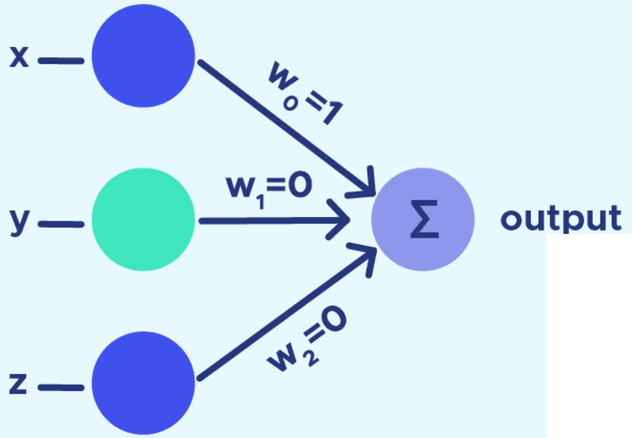
DeepRob

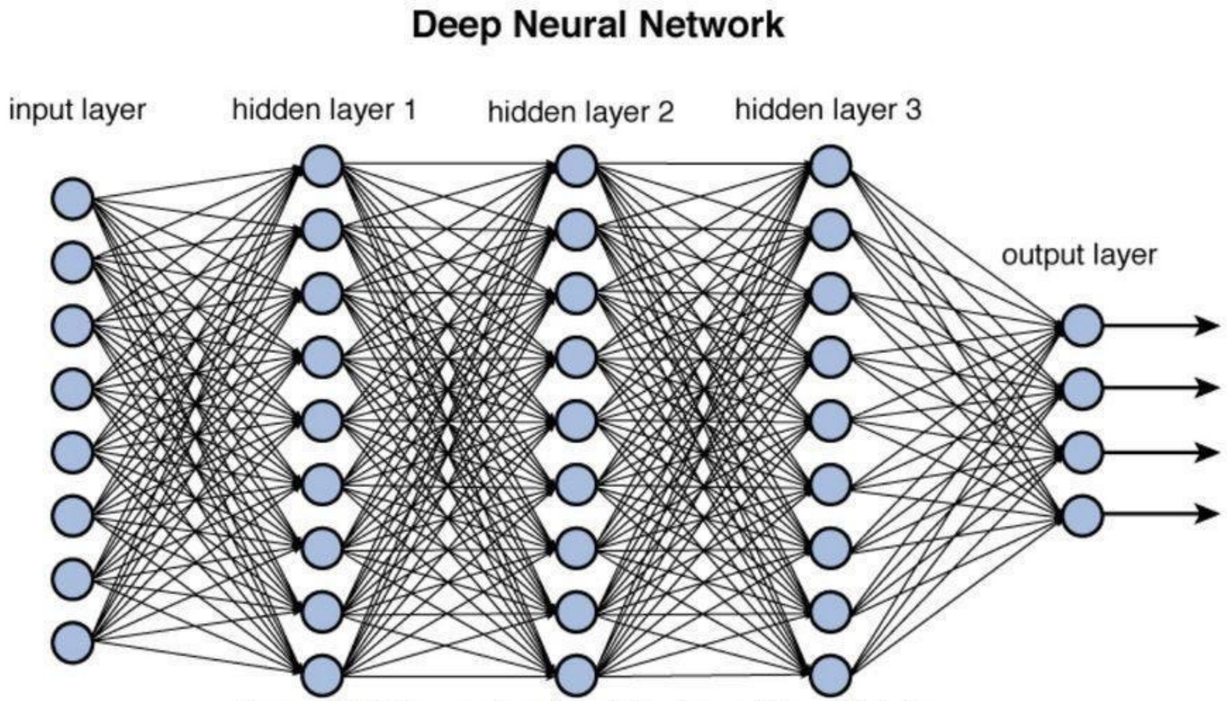
Discussion 1
Course Introduction
University of Michigan | Department of Robotics

Welcome!

Deep Learning for Robot Perception



What is Deep Learning?



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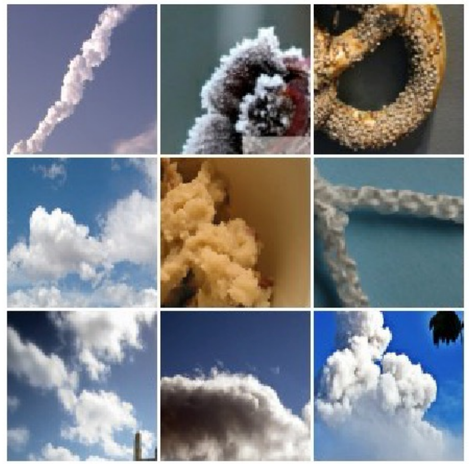

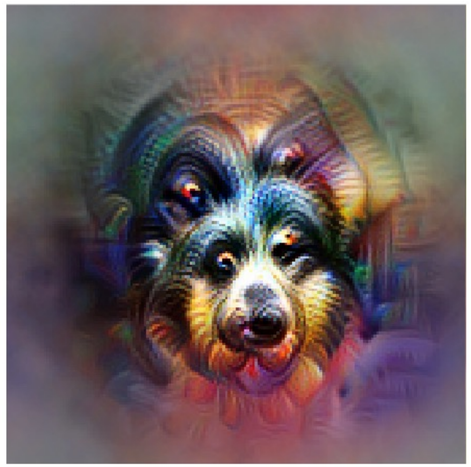

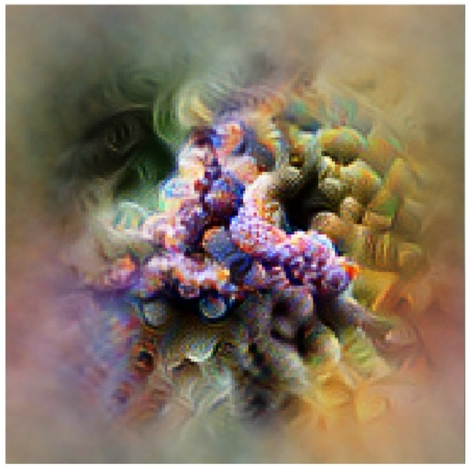

Baseball—or stripes?
mixed4a, Unit 6

Animal faces—or snouts?
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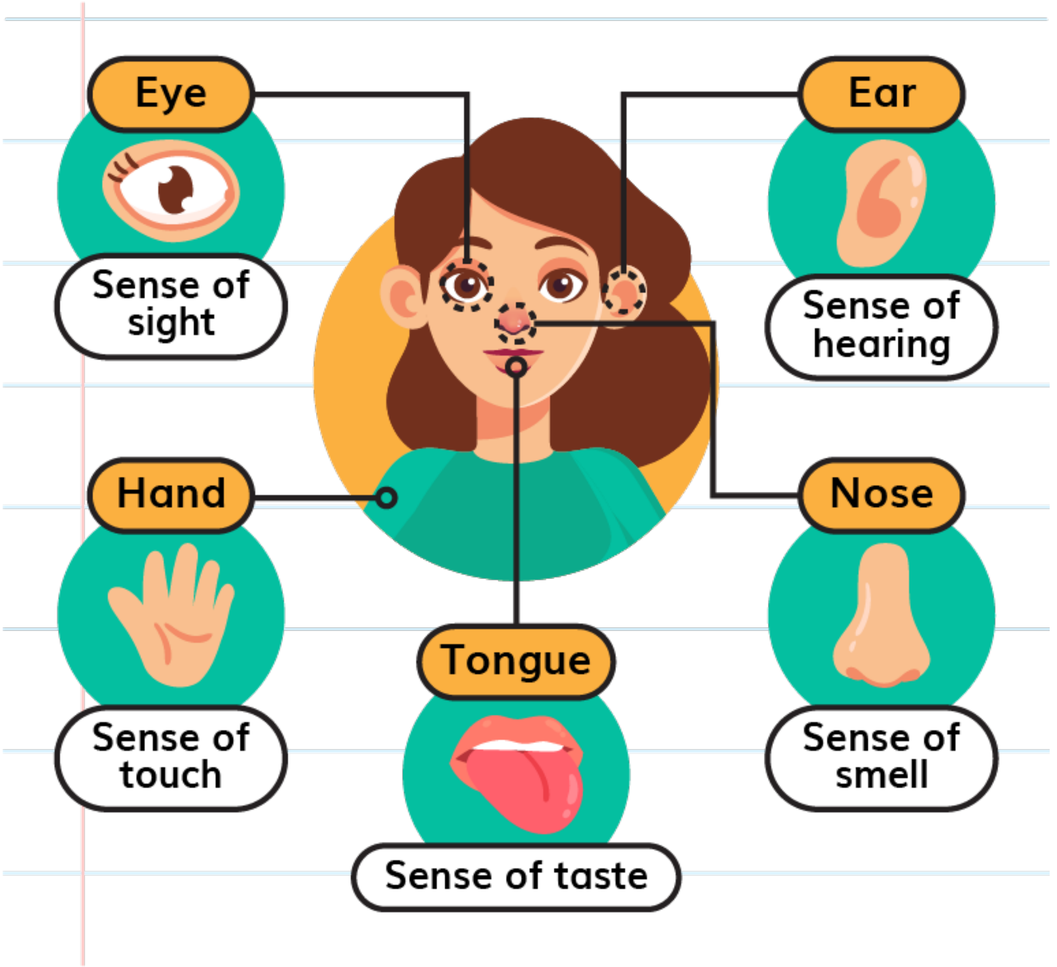
What is Deep Learning?

What is robot perception?

- “Understanding the environment through **sensory** information”



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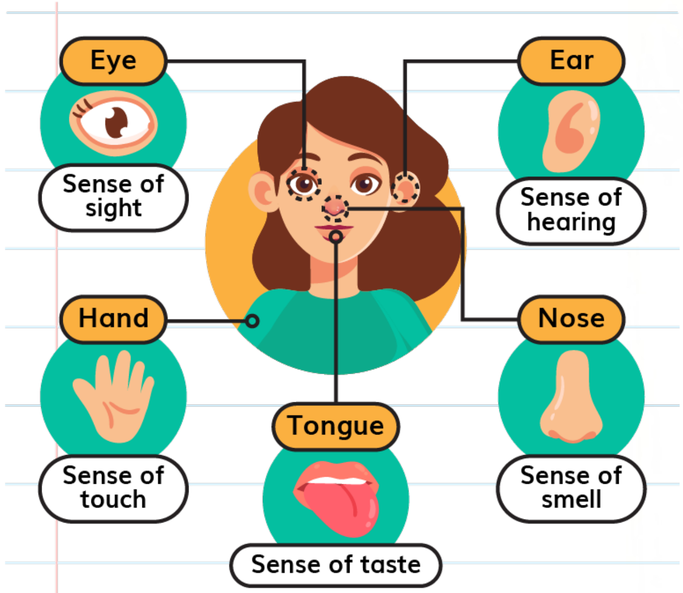
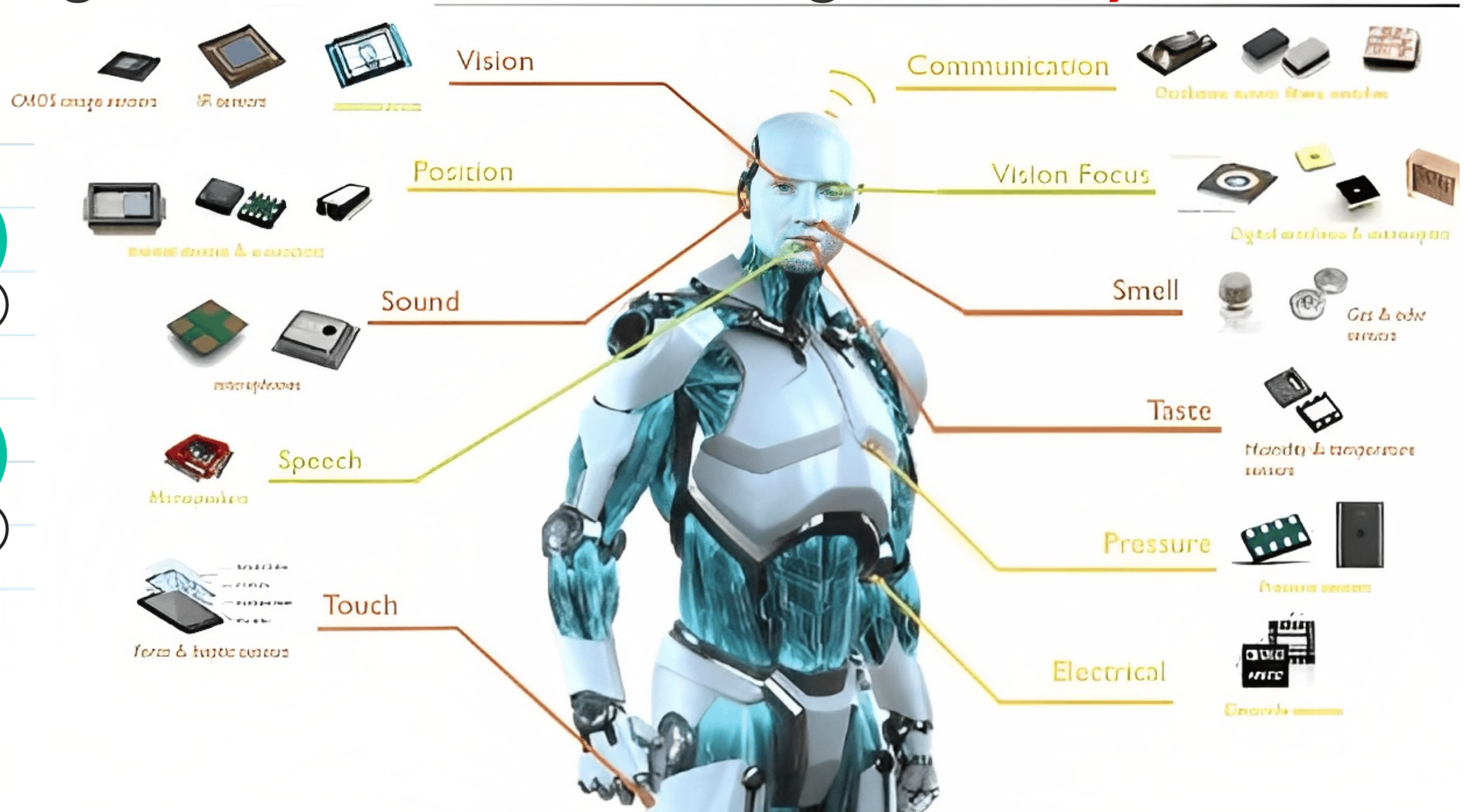




Course Staff

Instructor: Dr. Xiaoxiao Du [Sounds like “she-OW she-OW doo”]

- Email: xiaodu@umich.edu
- Office: 3257 FRB; or virtually

Instructor: Anthony Opipari

- Email: topipari@umich.edu

Advising Faculty: Prof. Chad Jenkins

- Email: ocj@umich.edu

Course Staff

GSI: Edmond Tong
ekjt@umich.edu

IA: Dalton Richardson
daltonri@umich.edu

IA: Yifu Lu
yifulu@umich.edu

Course Information

- **Lecture:** Tuesday & Thursday 3:00PM-4:30PM @G906 COOL

  Zoom link:

  https://umich.zoom.us/j/96524504025?pwd=R2pKWmVGVUExZCtBUGVWM2dONHFBQT09

  Meeting ID: 965 2450 4025

  Passcode: deeprob

- **Lab/Discussion:** Wednesdays 3:30PM-5:30PM @EECS 1311

DeepRob Grading

- Project 0 – 6%
- Project 1 – 12%
- Project 2 – 12%
- Project 3 – 12%
- Project 4 – 12%
- Final Project – 20%
- Participation/16 Pre-Lecture Quizzes – 16% (1% each)
- Student Lab Presentations – 10%

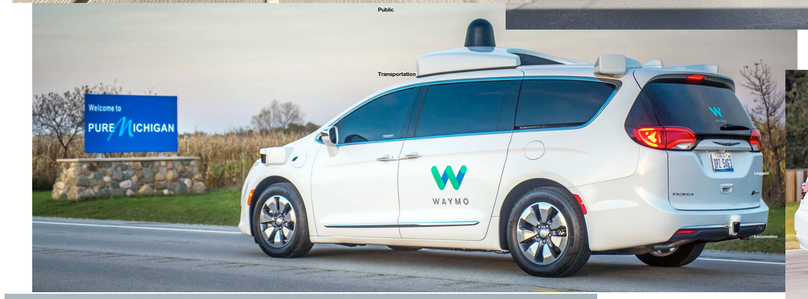
- A+ = 97.0 – 100
- A = 93.0 – 96.9
- A- = 90.0 – 92.9
- B+ = 87.0 – 89.9
- B = 83.0 – 86.9
- B- = 80.0 – 82.9
- C+ = 77.0 -- 79.9
- C = 73.0 – 76.9
- C- = 70.0 – 72.9
- D+ = 67.0 – 69.9
- D = 63.0 – 67.9
- D- = 60.0 – 62.9
- E = 0.0 – 59.9 (Not Passed)

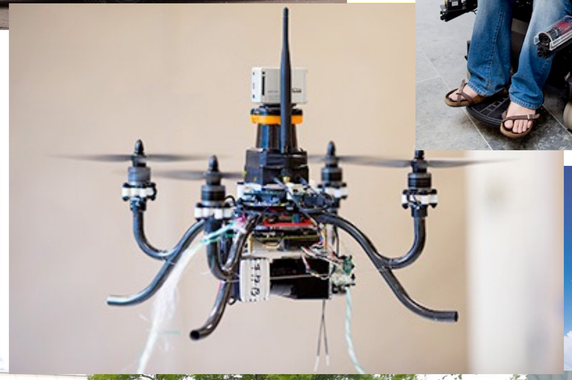
Course Content

- Linear Classifiers
- Training a neural network
- CNN/RNNs (convolutional and recurrent neural networks)
- Object detection
- Semantic scene understanding
- Deep learning datasets and data annotation
- Multi-modal perception
- Frontiers in DL
- And……
- We welcome your input!

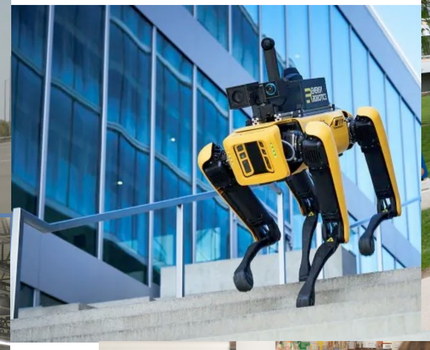
Course Resources

- Website (Everything!)
  - https://deeprob.org/w24/
- Canvas (assignments/major announcements)
- Piazza (Course staff help / minor announcements / team collaboration)
  - https://piazza.com/umich/winter2024/rob498011598012
- Zoom (Livestream Lectures)
  - https://umich.zoom.us/j/96524504025, passcode: deeprob
- Autograder (project grading)
  - https://autograder.io/web/course/258
- Pre-Lecture Quizzes (Gradescope)
- Student presentations – multi-modality perception!

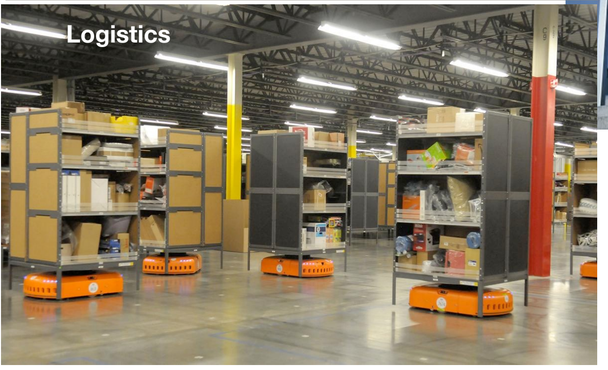


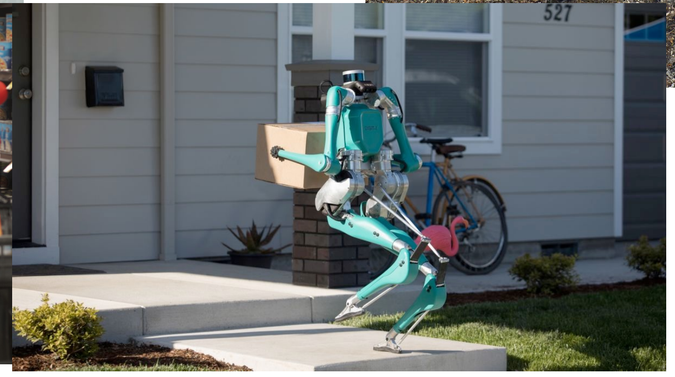


Delivery



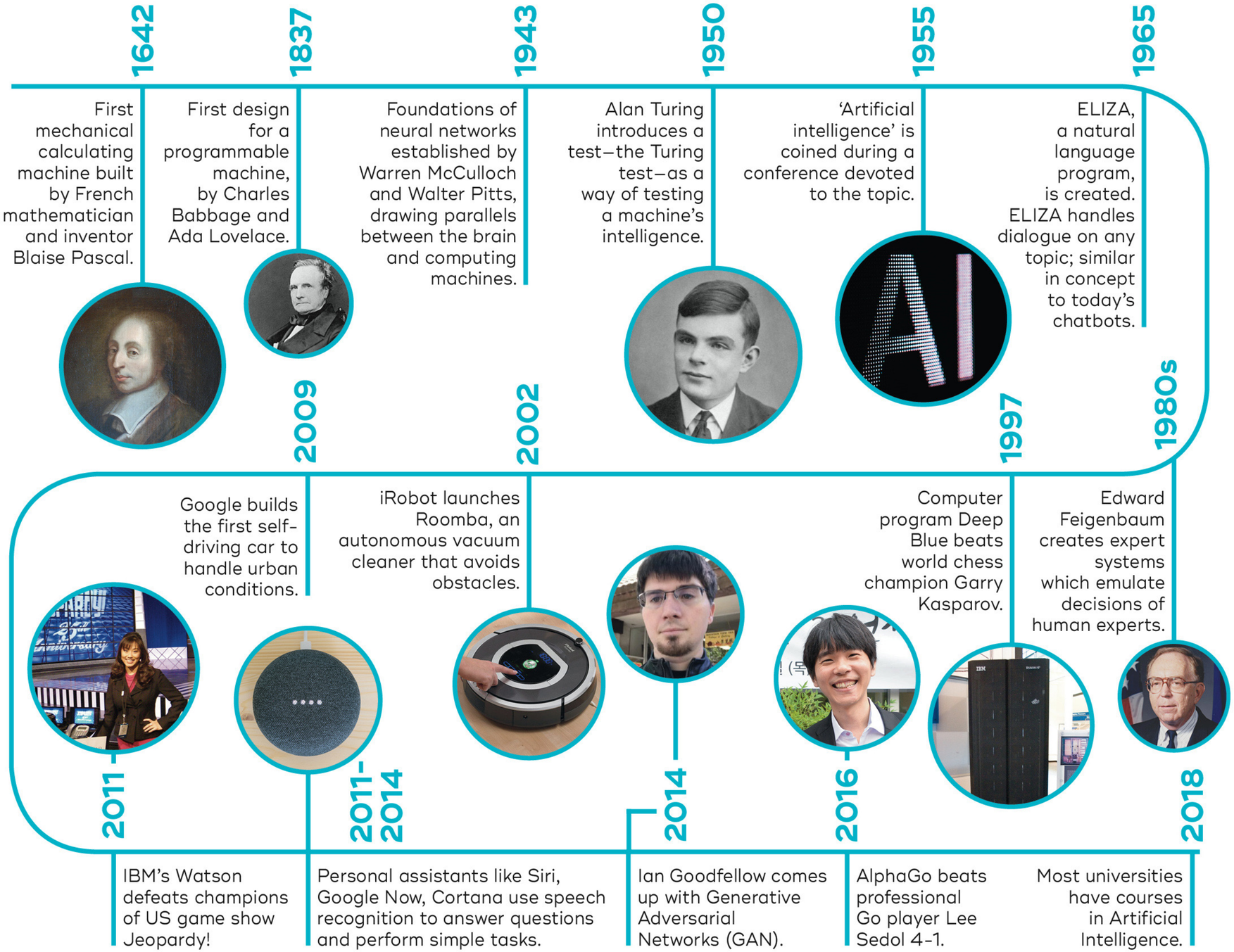
Logistics





DeepRob

How did we get started?



The rise of Robotics and AI

Fueled by advances in computing power and connectivity, the fields of robotics and artificial intelligence have grown rapidly

1921
The term **robot** is first used by Czech writer Karel Capek

1939
Elektro, a humanoid robot, debuts at the World's Fair, smoking cigarettes and blowing up balloons

1941
Isaac Asimov formulates the **Three Laws of Robotics:**

- **A robot may not injure a human being** or, through inaction, allow a human being to be harmed
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William Grey Walter creates **the first autonomous robot with complex behavior**

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Alan Turing publishes paper about the possibility of machines that think, develops idea known as the **Turing's Test.**

It tests a machine's ability to "think" by answering a series of questions. **In essence, the tester must think the machine's answers are coming from a human**

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GM installs Unimate robot to lift and stack hot pieces of metal

1968
Mobile robot "Shakey" is introduced. It's controlled by a computer the size of a room

1972
Stanford researcher develops PARRY, designed to simulate a paranoid schizophrenic.

1974
Intel produces its second-generation 8080 general-purpose chips

1979
SCARA, an articulated robot arm, is developed for assembly lines

1984
Doug Lenat and his team start **Cyc**, to codify millions of pieces knowledge that compose human common sense

1984
The RB5X, developed by General Robotics Corp., includes software enabling it to learn from its environment

1985
Jaron Lanier's VPL Research, Inc., sells first VR glasses and gloves; Lanier coins the phrase **virtual reality**

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1988 Nope, I'm human.

The first HelpMate service robot begins work at Danbury Hospital

How are you feeling today?

I have had enough of this.

1956 IBM 305, the first hard disk drive **5MB**

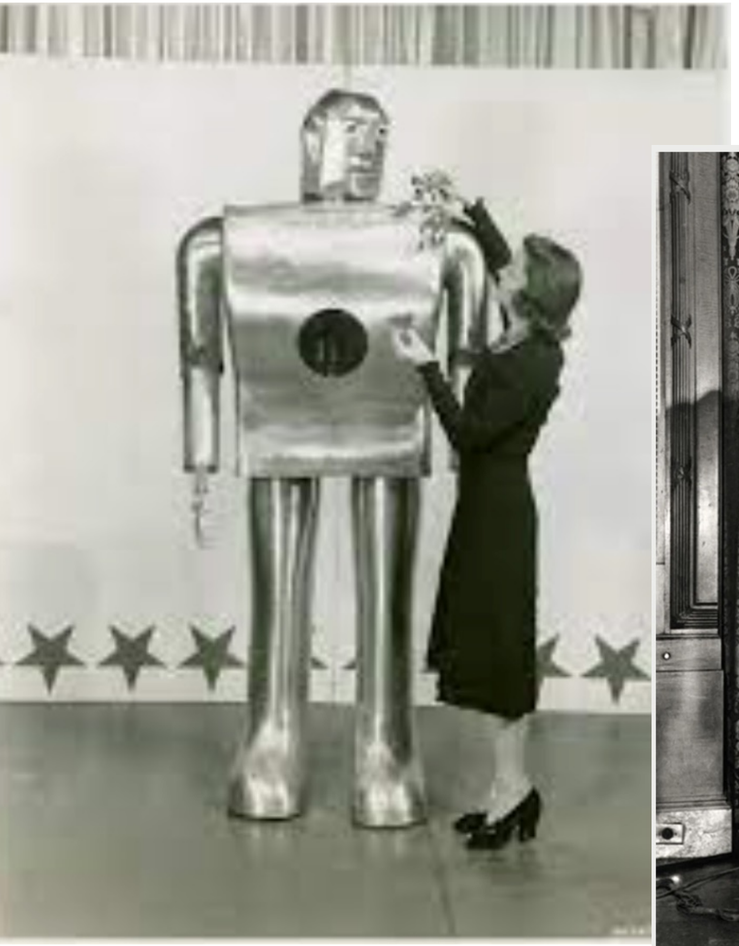
1970 IBM 1330 **100MB** per pack

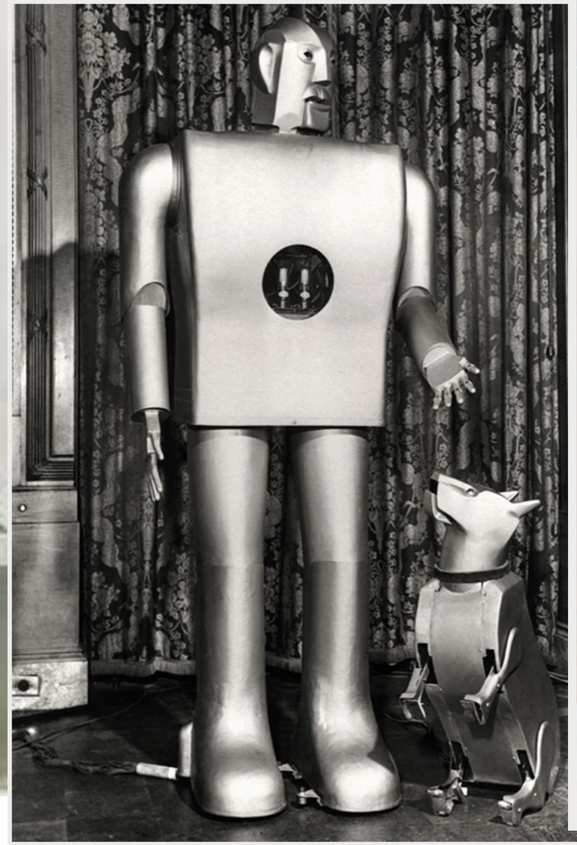
1985 IBM 0665, a 5.25" disk with **20-40MB**

Minimize and maximize
Shrinking disk sizes and exponentially growing capacity help fuel robotics and AI

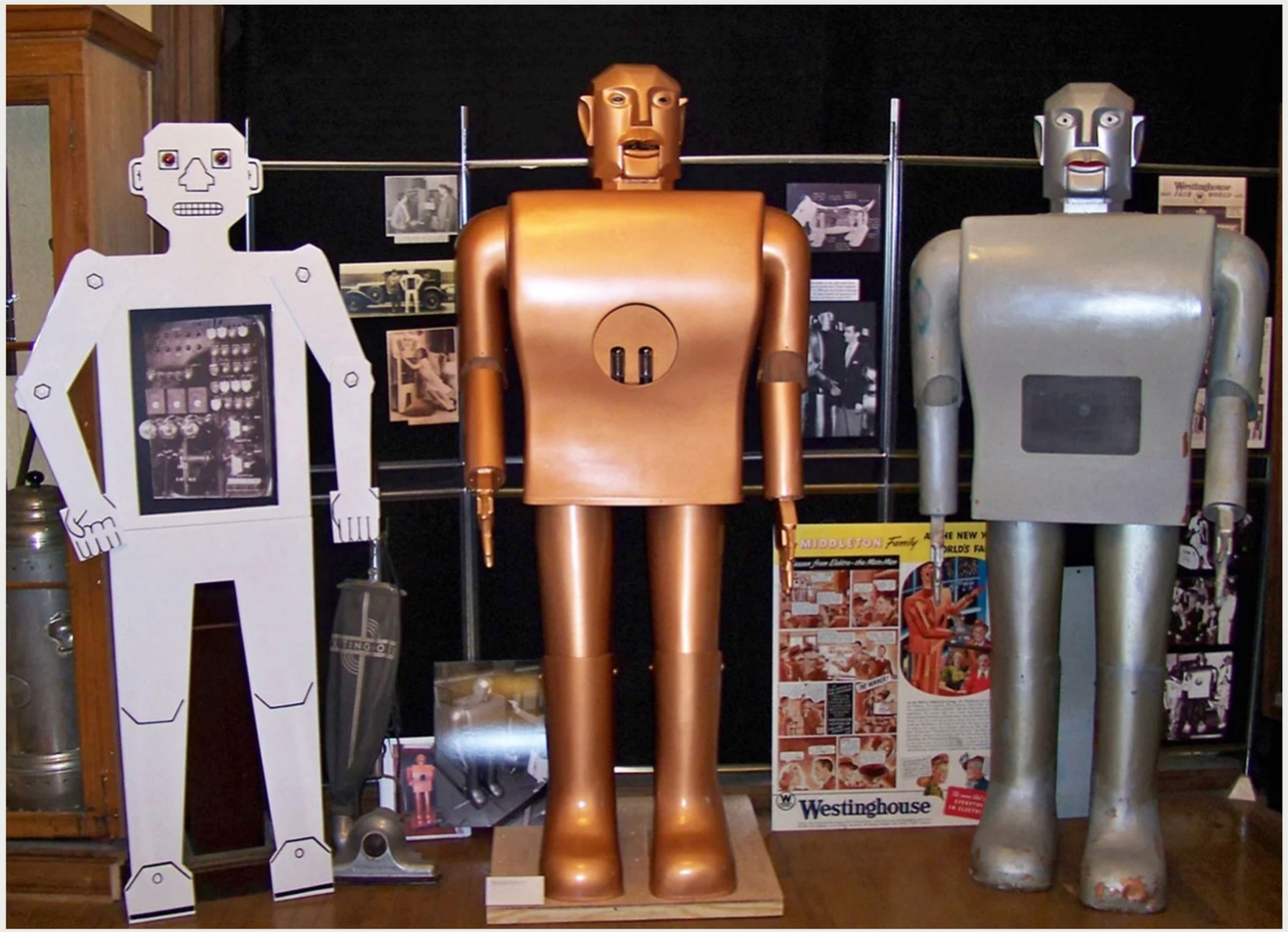
Source: D. Erickson, PWC

Elektro, 1939





Robot's Best Friend: Westinghouse introduced Sparko the dog as a companion for Elektro. PHOTO: BETTMANN/GETTY IMAGES



Robot Family: Herbert Televox (left) was Westinghouse's first human-form robot. The more famous member of the Westinghouse robot family was Elektro; a copy is shown in the middle, while the original is on the right. PHOTO: MANSFIELD MEMORIAL MUSEUM

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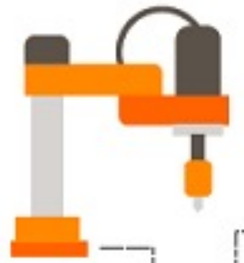

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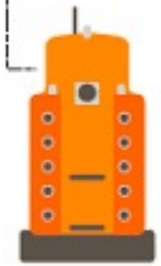

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nature

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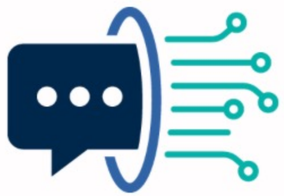
nature > news feature > article

NEWS FEATURE | 25 July 2023

ChatGPT broke the Turing test — the race is on for new ways to assess AI

Large language models mimic human chatter, but scientists disagree on their ability to reason.

https://genai.umich.edu



U-M GPT

Where we are now…

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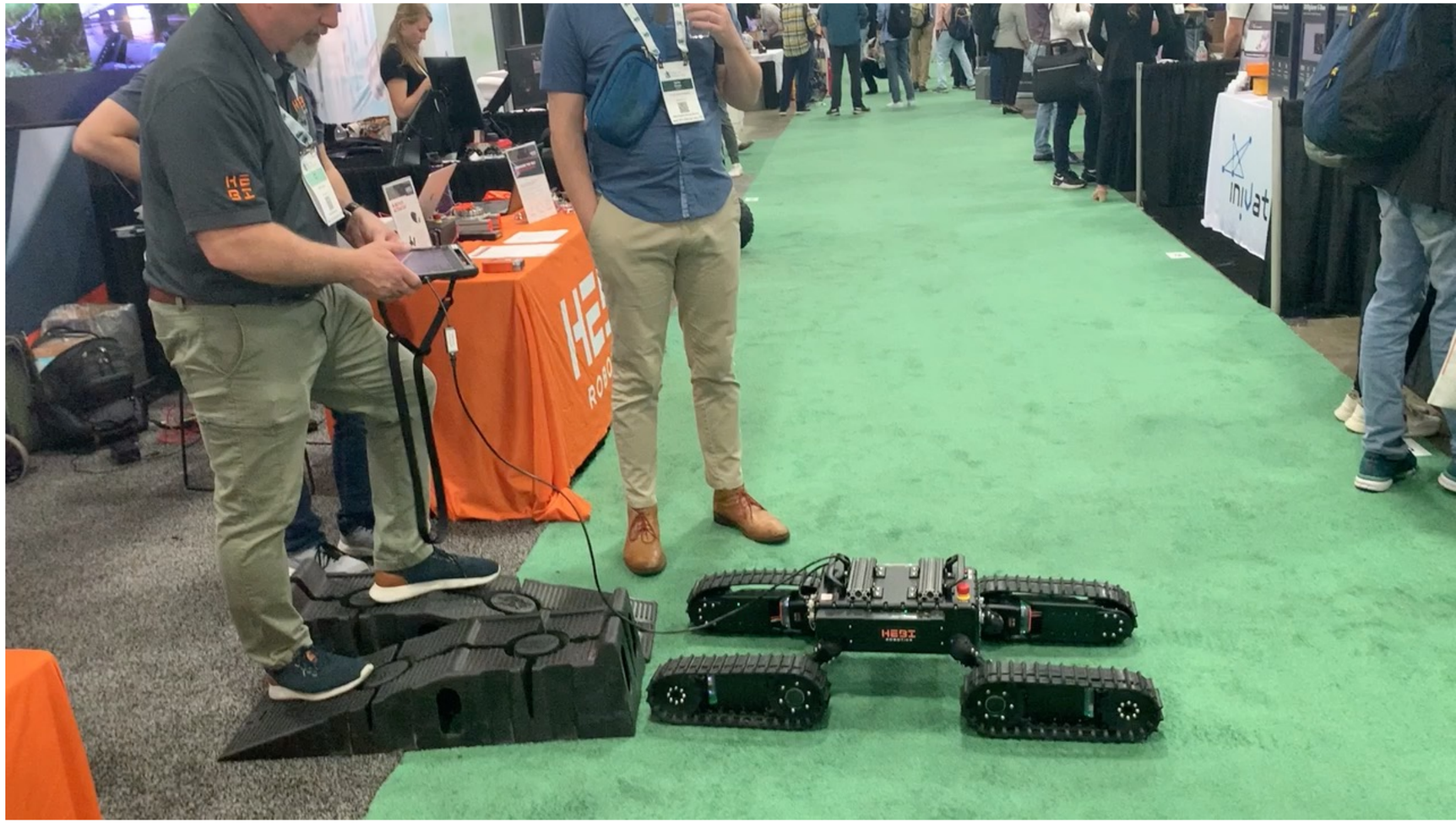


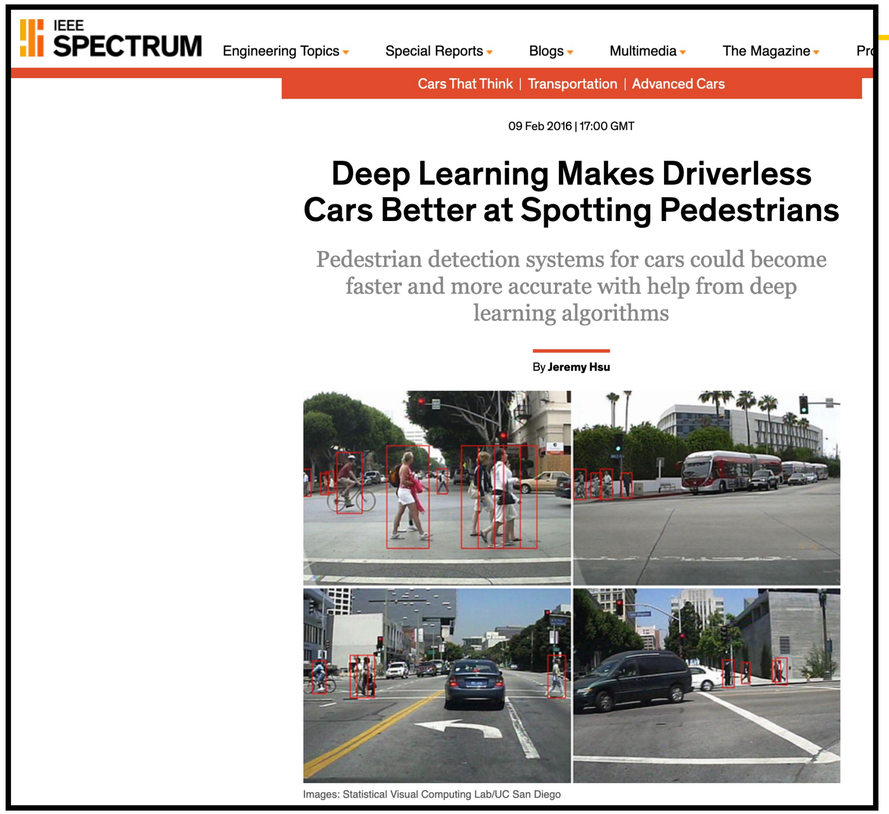
Where we are now..

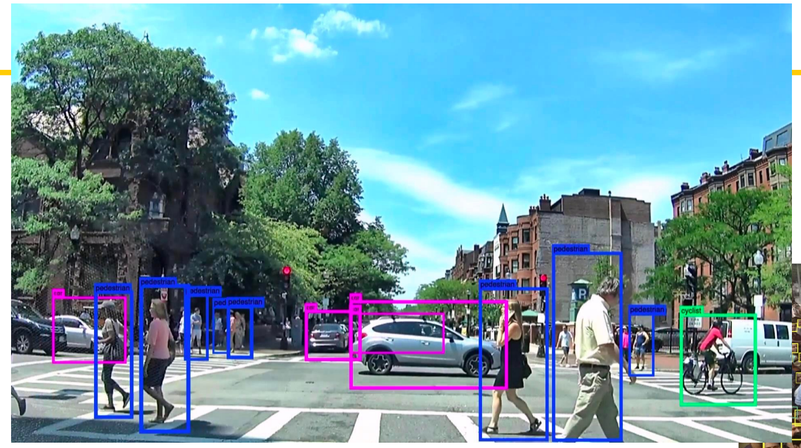
Deep Learning

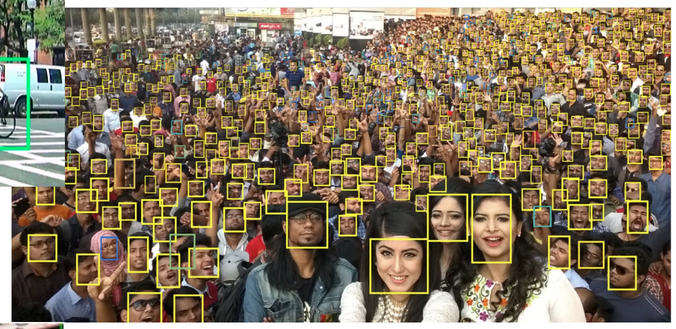
Second wave AI:

Data-driven

“Learn from lots of data”







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2011

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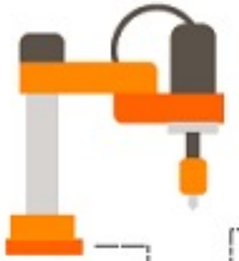

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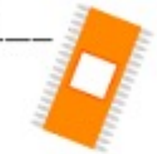

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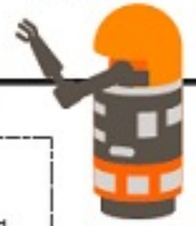

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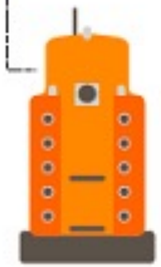

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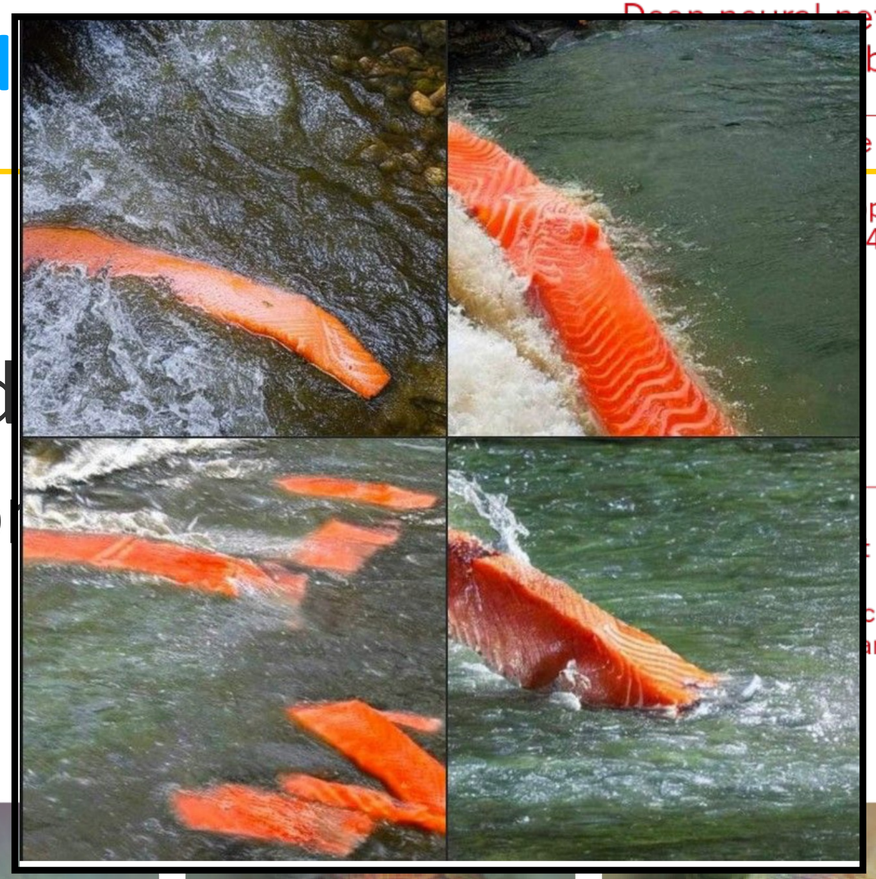
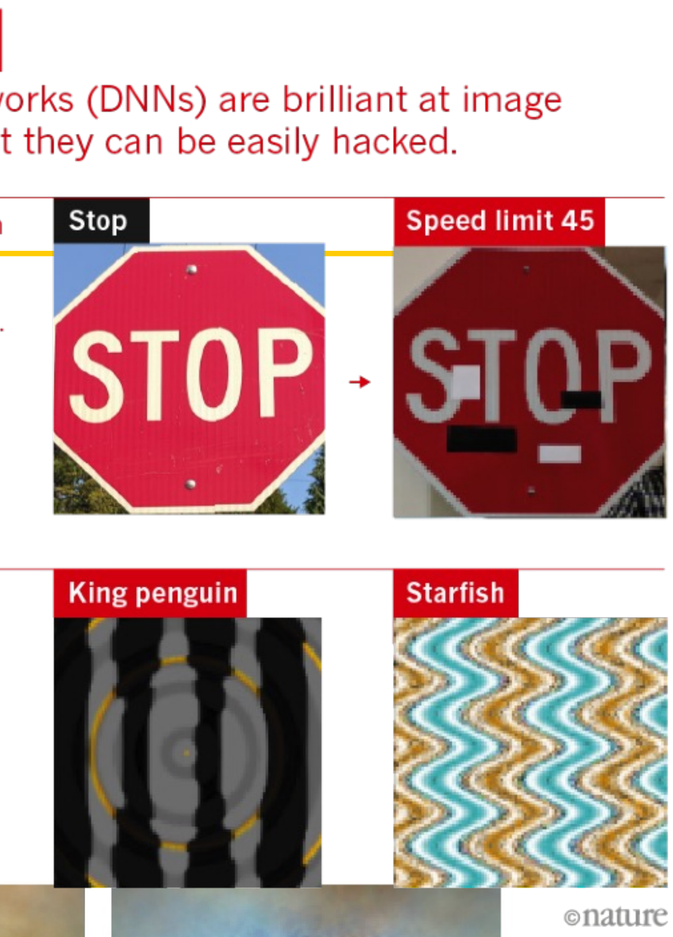
DEEPROB

Some Issu

- “Easy to fool”
- Large volume of d
- Limited annotatio
- Ethics
- …





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mixed4a, Unit 6

Animal faces—or snouts?
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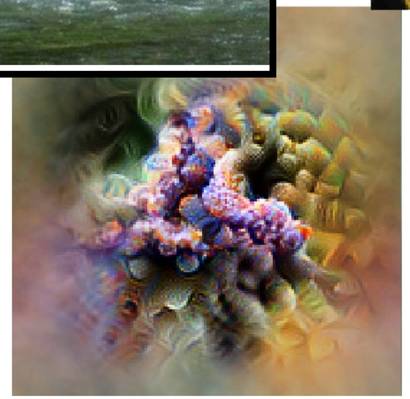

Clouds—or fluffiness?
mixed4a, Unit 453

Buildings—or sky?
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Other Robotics and AI courses

First wave AI: Model-based

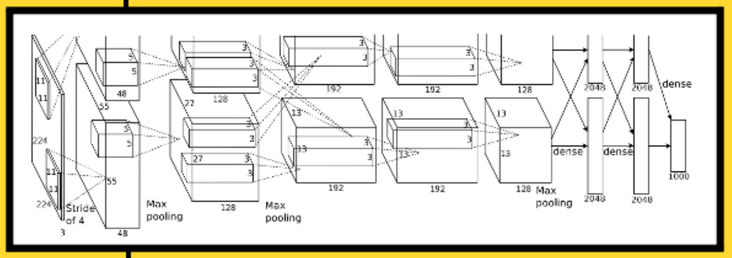
"Think through the entire problem"

1956

DeepRob is a step into modern robot learning

Second wave AI: Data-driven

"Learn from lots of data"



2011

Research for future AI

Third wave AI: Explainable

"Combine first and second wave AI to generate explanations"

??

20??

Time

DeepRob

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