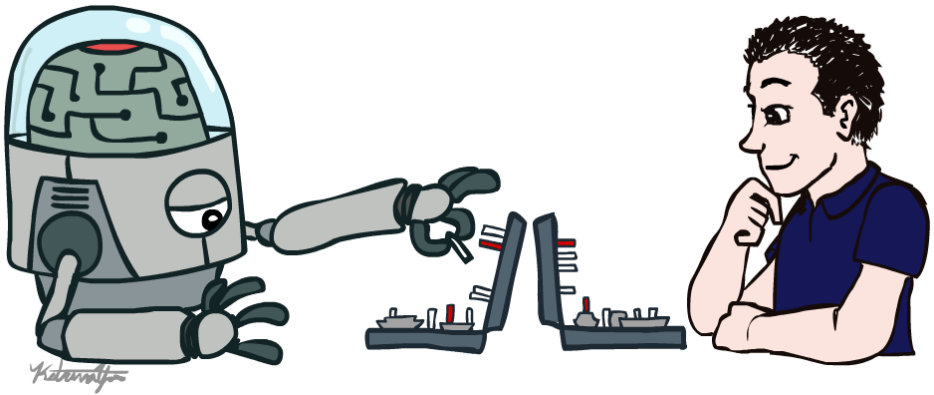
CS 188: Artificial Intelligence

Introduction



Instructors: Stuart Russell and Dawn Song

Course Staff

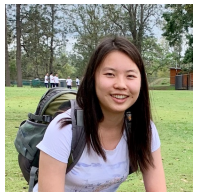
Professors

Dawn Song

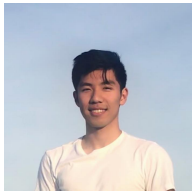
Stuart Russell

GSIs

Albert Yu



Angela Liu

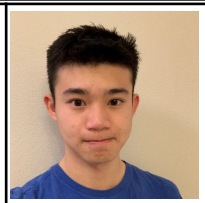


Carl Qi

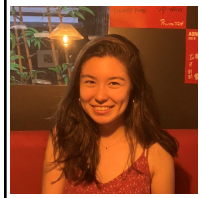
Daniel Filan

Dimitris Papadimitriou

Emma Tao



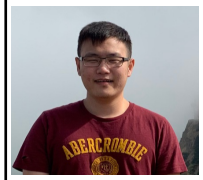
Jeffrey Tao



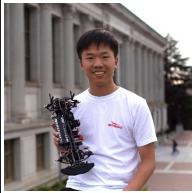
Jennifer Grannen

Jiaheng Zhang

Jocelyn Chen

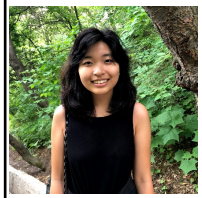


Jonathan Yang



Mesut Yang

Nikita Samarin

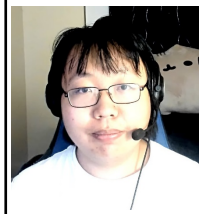


Regina Wang

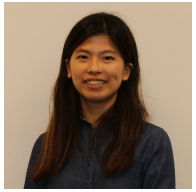
Robert Lin

Ryan Koh

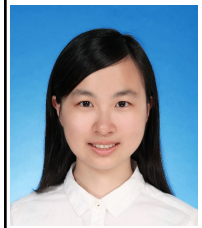
Saagar Sanghavi



Tiancheng Xie



Wendy Lin

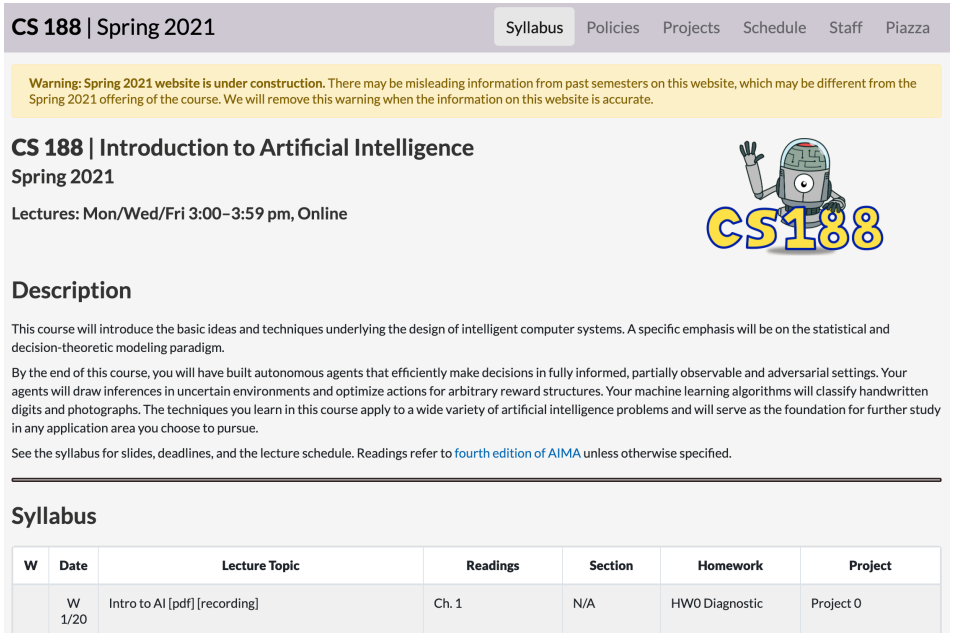


Xinyun Chen

Yanlai Yang

Course Information

http://inst.cs.berkeley.edu/~cs188



CS 188 | Spring 2021

Syllabus | Policies | Projects | Schedule | Staff | Piazza

Warning: Spring 2021 website is under construction. There may be misleading information from past semesters on this website, which may be different from the Spring 2021 offering of the course. We will remove this warning when the information on this website is accurate.

CS 188 | Introduction to Artificial Intelligence

Spring 2021

Lectures: Mon/Wed/Fri 3:00–3:59 pm, Online

CS188

Description

This course will introduce the basic ideas and techniques underlying the design of intelligent computer systems. A specific emphasis will be on the statistical and decision-theoretic modeling paradigm.

By the end of this course, you will have built autonomous agents that efficiently make decisions in fully informed, partially observable and adversarial settings. Your agents will draw inferences in uncertain environments and optimize actions for arbitrary reward structures. Your machine learning algorithms will classify handwritten digits and photographs. The techniques you learn in this course apply to a wide variety of artificial intelligence problems and will serve as the foundation for further study in any application area you choose to pursue.

See the syllabus for slides, deadlines, and the lecture schedule. Readings refer to fourth edition of AIMA unless otherwise specified.

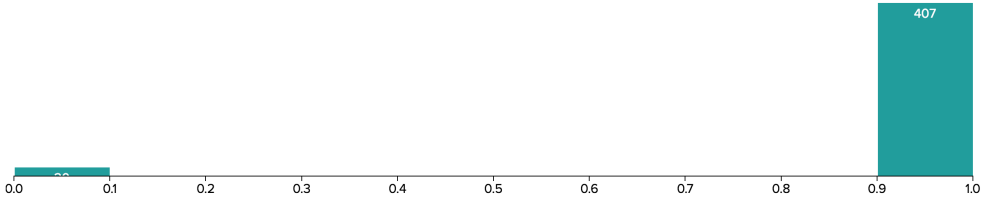
Syllabus

W	Date	Lecture Topic	Readings	Section	Homework	Project
	W 1/20	Intro to AI [pdf] [recording]	Ch. 1	N/A	HW0 Diagnostic	Project 0

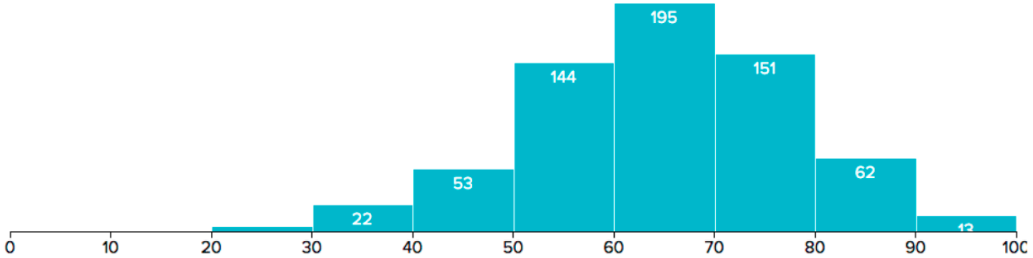
- Communication:
  - Announcements, questions on Piazza
  - Staff email: cs188@berkeley.edu
  - Office hours:
    - Stuart: Monday 9-10.30, Thursday 1-2
    - Dawn: Tuesday 4-5pm from March 15
  - Sections start next week
- Work:
  - Projects (25%), homework (10% + 10%)
    - **P0 (Python) due 1/22, HW0 (math) due 1/25**
  - Midterm (20%), final (35%)
  - Participation up to 1% extra (**be nice!**)
  - Fixed grading scale (85% A, 80% A-, etc.)

Some Historical Statistics

- Homework and projects: instruction (iterate/learn till you nailed it)



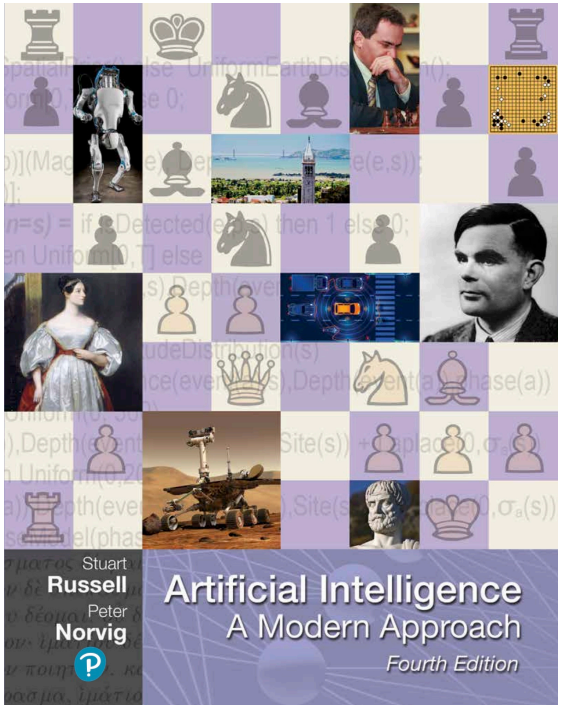
- Exams: assessment



Textbook

Russell & Norvig, AI: A Modern Approach, 4th Ed.

(sorry!)



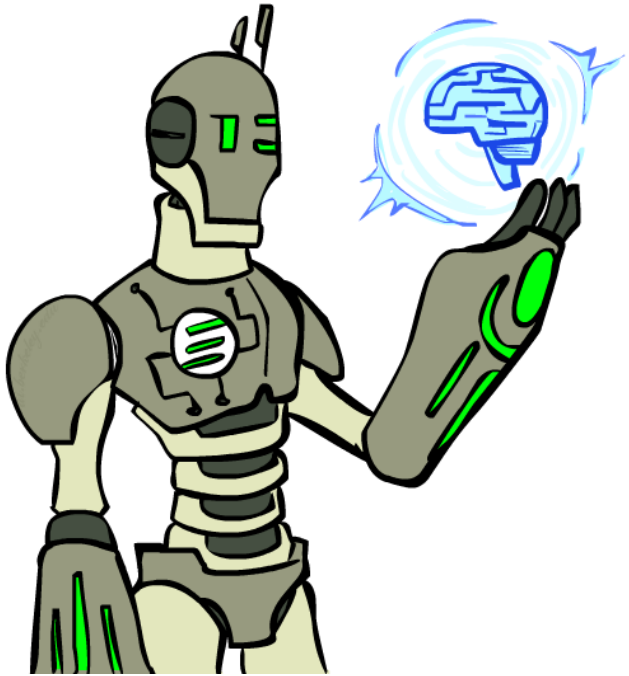
Policies (see website)

- For online lectures:
  - Camera on, mic off
  - Please do ask questions: “Hand Up” or write in Chat
  - Will occasionally split into multiple zoom rooms for collaborative problem-solving
- We (staff) are here to help
  - Please do observe academic integrity policies!
  - Please don’t exclude your fellow students!

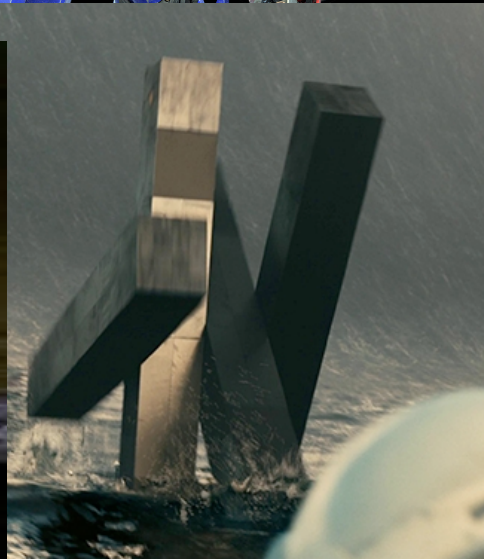
Today

- What is artificial intelligence?

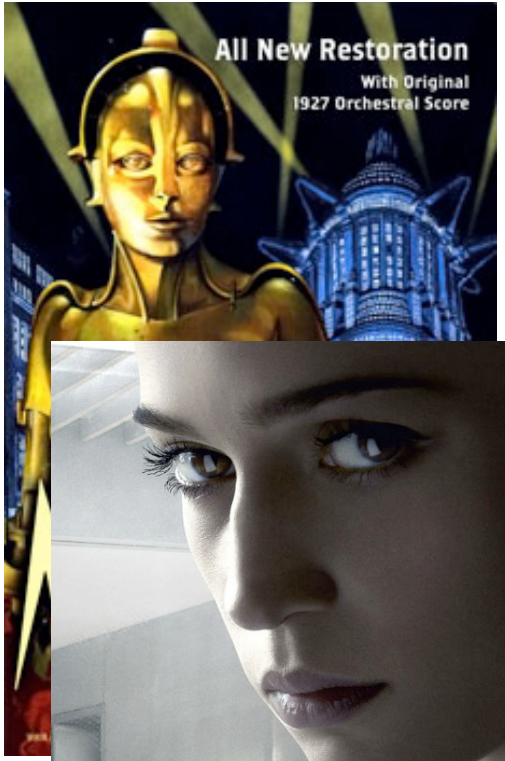
- Past: how did the ideas in AI come about?
- Present: what is the state of the art?
- Future: will robots take over the world?

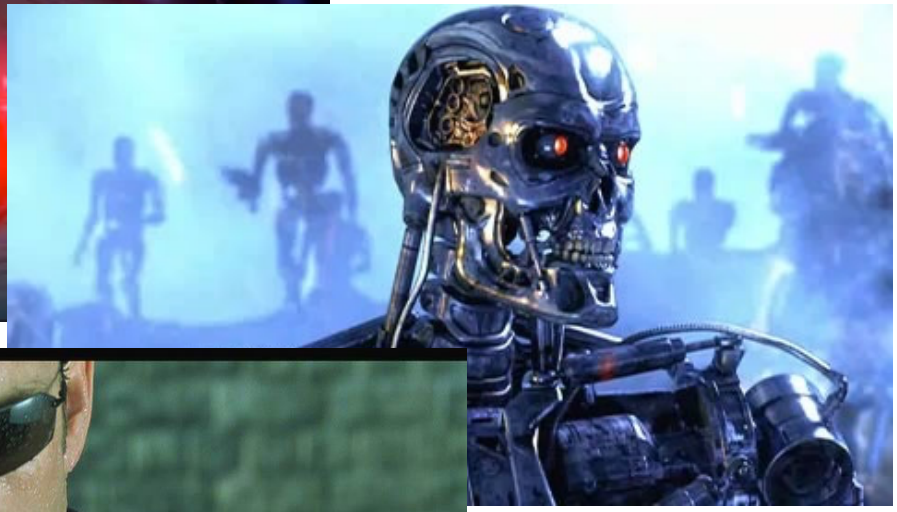


Movie AI



Movie AI






YESTERDAY DR. WILL CASTER WAS ONLY HUMAN
JOHNNY DEPP
REBECCA HALL
PAUL BETTANY
KATE MARA
CILLIAN MURPHY
AND MORGAN FREEMAN
TRANSCENDENCE
entertainmentfilms.co.uk

News AI

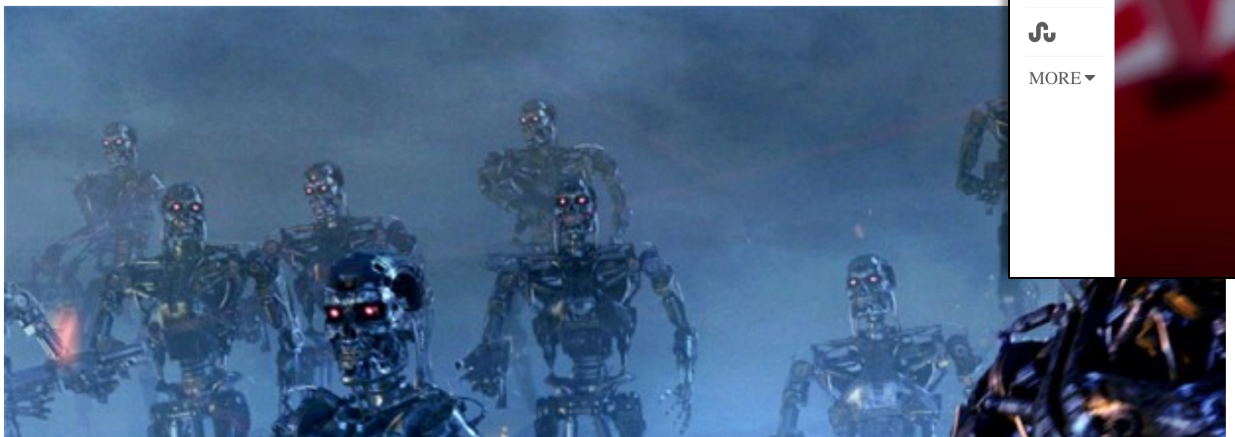
AI is the biggest risk we face as a civilisation, Elon Musk says

Billionaire burn: Musk says Zuckerberg's understanding of AI threat 'is limited'

HOME » FINANCE » FINANCE TOPICS » DAVOS

'Sociopathic' robots could overrun the human ra a generation

Computers should be trained to serve humans to reduce their th human race, says a leading expert on artificial intelligence



LIVESCIENCE NEWS TECH HEALTH PLANET EAR

Live Science › Tech

Lifelike 'Sophia' Robot Granted Citizenship to Saudi Arabia

By Mindy Weisberger, Senior Writer | October 30, 2017 03:39pm ET

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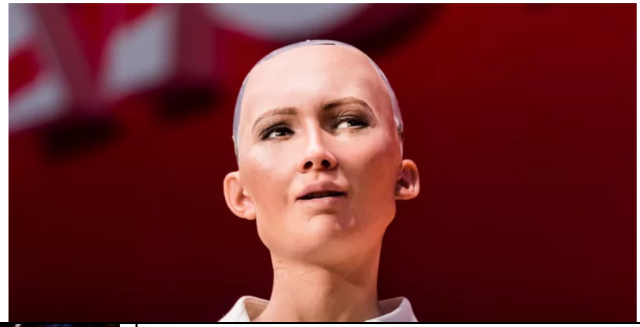
MORE



News AI

TECH • ARTIFICIAL INTELLIGENCE

United Kingdom Plans $1.3 Billion Intelligence Push

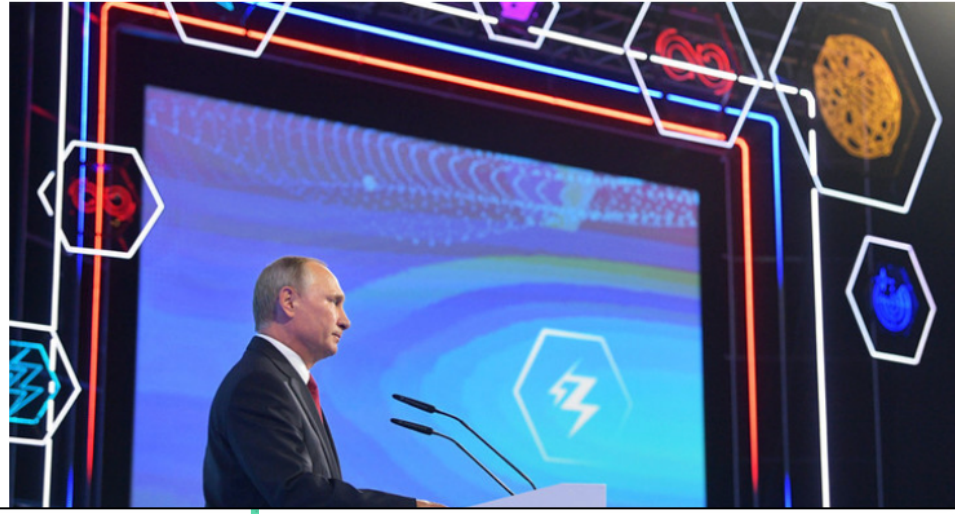
France to spend $1.8 billion on compete with U.S., China

EU wants to invest £18b development

China's Got a Huge Art Intelligence Plan

'Whoever leads in AI will rule the world': Putin to Russian children on Knowledge Day

Published time: 1 Sep, 2017 14:08
Edited time: 1 Sep, 2017 14:40



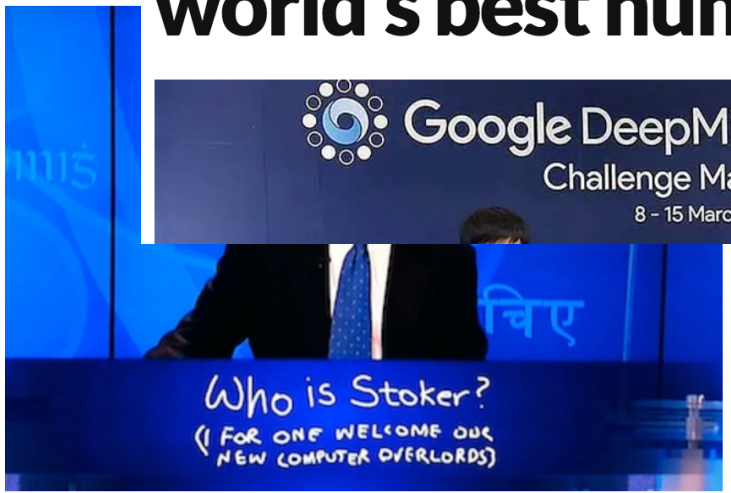
News AI

IBM's Watson Jeopardy Computer Shuts Down Humans in Final Game

DAILY NEWS 9 March 2016

Sili

'I'm in shock!' Ho world's best hum



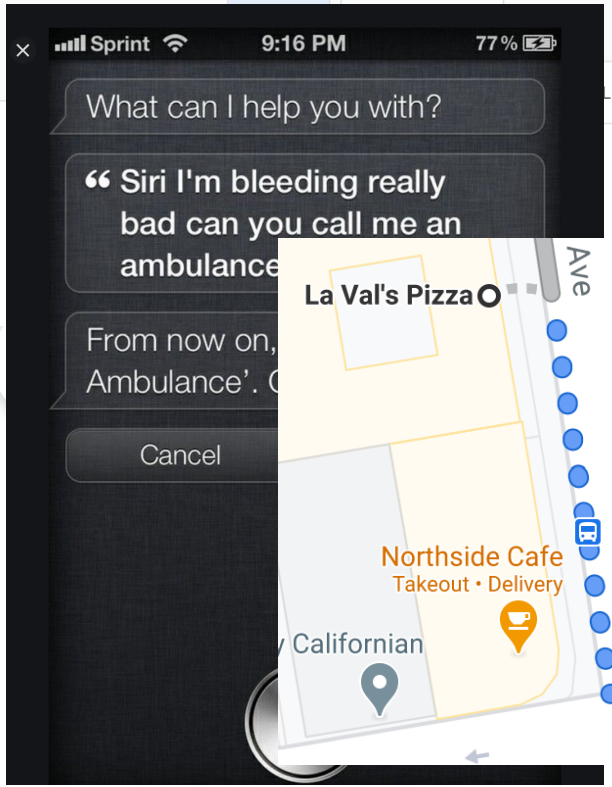
Blizzard will show off Google's Deepmind AI in StarCraft 2 later this week

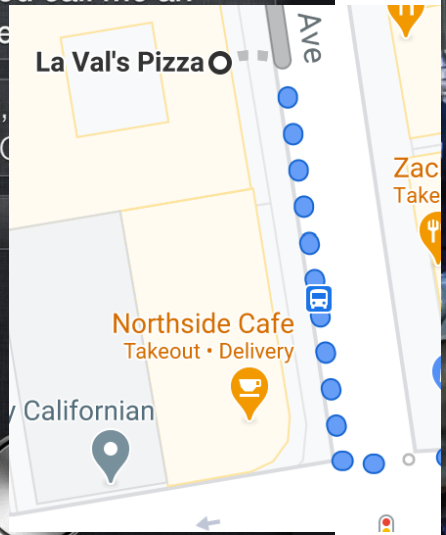
By Andy Chalk 4 hours ago

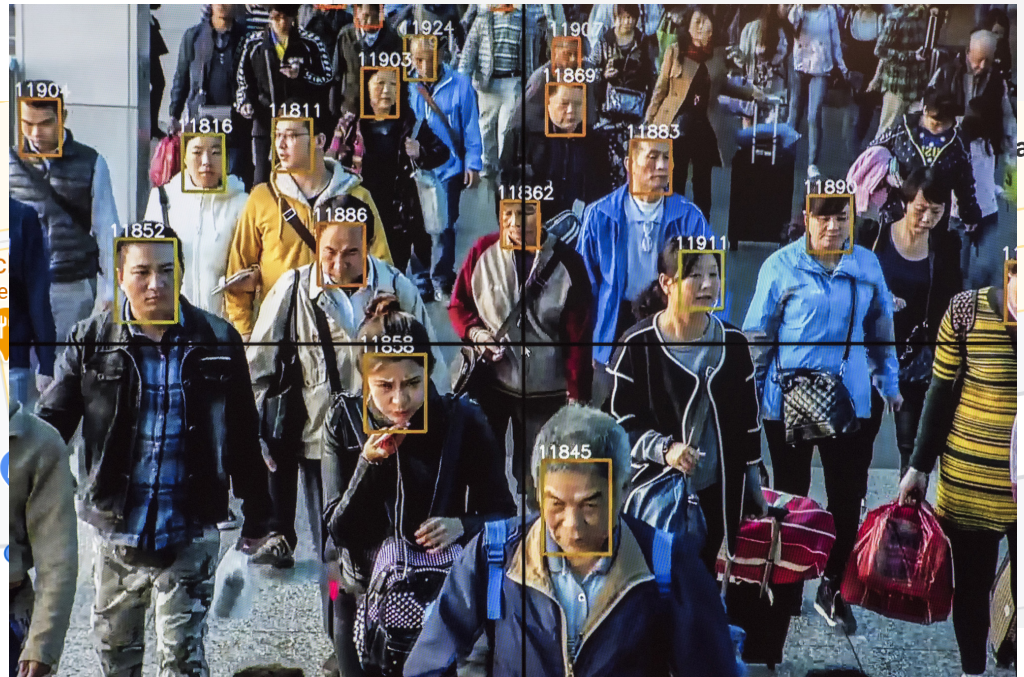
Google and Blizzard launched the artificial intelligence project in 2016.

COMMENTS

Real AI







Google Translate

SPANISH

CHINESE (TRADITIONAL)

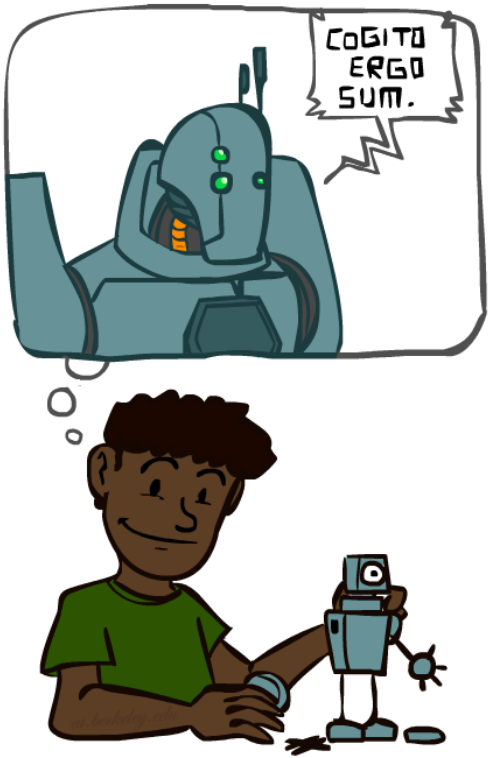
ENGLISH

FRENCH


TUG
CAUTION
MAY CONTAIN
CHEMOTHERAPY DRUG
CAUTION
MAY CONTAIN
CHEMOTHERAPY DRUG


Boston Dynamics

A (Short) History of AI

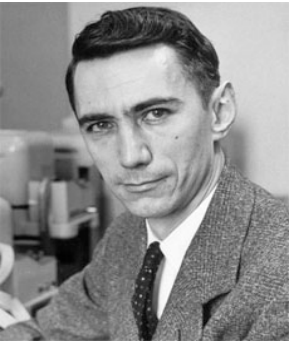


Demo: HISTORY – MT1950.wmv

A short prehistory of AI

- Prehistory:
  - **Philosophy** (reasoning, planning, learning, science, automation)
  - Aristotle: For if every instrument could accomplish its own work, obeying or anticipating the will of others . . . if, in like manner, the shuttle would weave and the plectrum touch the lyre without a hand to guide them, chief workmen would not want servants, nor masters slaves
  - **Psychology** (learning, cognitive models)
  - **Linguistics** (grammars, formal representation of meaning)
- Near miss (1842):
  - Babbage design for universal machine
  - Lovelace: “a thinking machine” for “all subjects in the universe.”

AI's official birth: Dartmouth, 1956

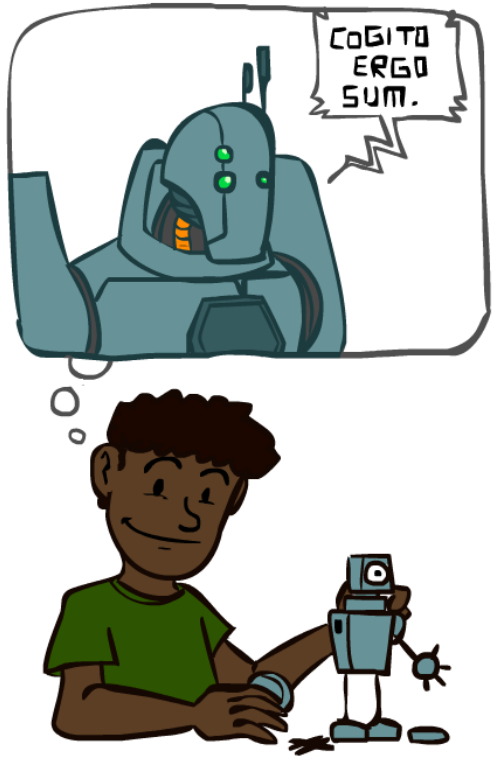


"An attempt will be made to find how to make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves. ***We think that a significant advance can be made if we work on it together for a summer."***

John McCarthy and Claude Shannon
Dartmouth Workshop Proposal

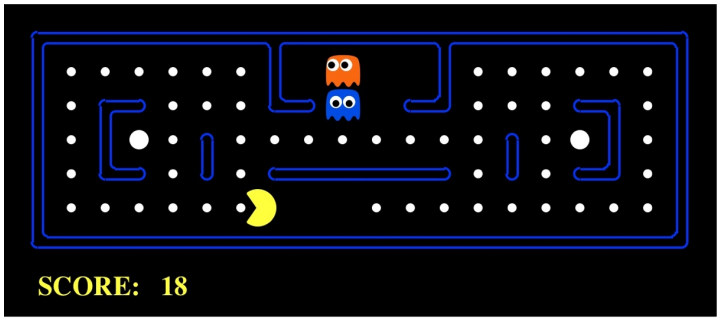
A (Short) History of AI

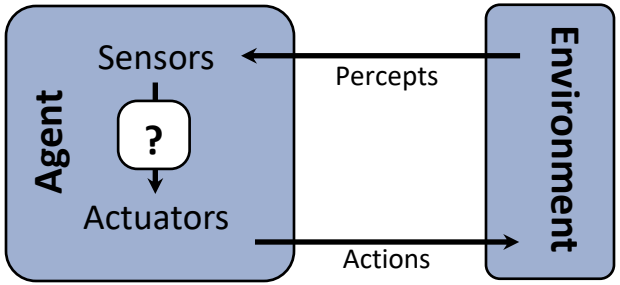
- 1940-1950: Early days
  - 1943: McCulloch & Pitts: Boolean circuit model of brain
  - 1950: Turing's “Computing Machinery and Intelligence”
- 1950—70: Excitement: Look, Ma, no hands!
  - 1950s: Early AI programs: chess, checkers (RL), theorem proving
  - 1956: Dartmouth meeting: “Artificial Intelligence” adopted
  - 1965: Robinson's complete algorithm for logical reasoning
- 1970—90: Knowledge-based approaches
  - 1969—79: Early development of knowledge-based systems
  - 1980—88: Expert systems industry booms
  - 1988—93: Expert systems industry busts: “AI Winter”
- 1990— 2012: Statistical approaches + subfield expertise
  - Resurgence of probability, focus on uncertainty
  - General increase in technical depth
  - Agents and learning systems… “AI Spring”?
- 2012— ___: Excitement: Look, Ma, no hands again?
  - Big data, big compute, deep learning
  - AI used in many industries



AI as Designing Rational Agents

- An **agent** is an entity that *perceives* and *acts*.
- A **rational agent** selects actions that maximize its expected **utility**.
- Characteristics of the **sensors, actuators, and environment** dictate techniques for selecting rational actions
- **This course** is about:
  - General AI techniques for many problem types
  - Learning to choose and apply the technique appropriate for each problem

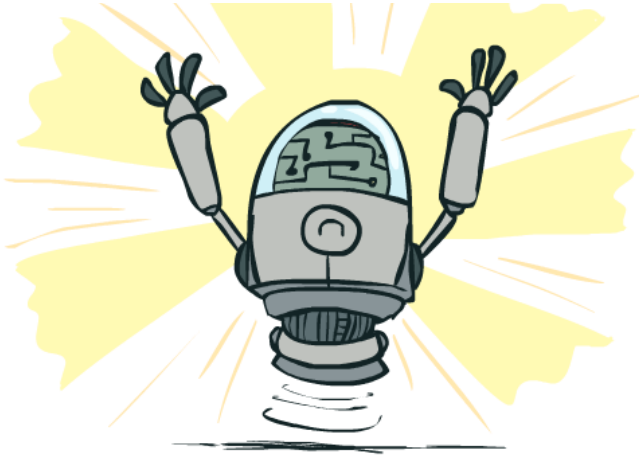




What Can AI Do?

Quiz: Which of the following can be done at present?

- ✓ Play a decent game of table tennis?
- ✓ Play a decent game of Jeopardy?
- ✓ Drive safely along a curving mountain road?
- ✗ Drive safely along Telegraph Avenue?
- ✓ Buy a week's worth of groceries on the web?
- ✗ Buy a week's worth of groceries at Berkeley Bowl?
- ? Discover and prove a new mathematical theorem?
- ✗ Converse successfully with another person for an hour?
- ? Perform a surgical operation?
- ✓ Translate spoken Chinese into spoken English in real time?
- ? Fold the laundry and put away the dishes?
- ✗ Write an intentionally funny story?



Unintentionally Funny Stories

Once upon a tir
and a vain crow
in his tree, hold
mouth. He not
piece of cheese
swallowed the
the crow. The

Janelle Shane
@JanelleCShane

Follow

Tried retraining the neural net on just "what do you get when you cross a X with a X?" jokes. Results did not improve. And for some reason, bungees are its favorite thing.

What do you get when you cross a dog and a vampire?

A bungee

What do you get when you cross a cow with a rhino?

A bungee with a dog

What do you get when you cross a street and a cow?

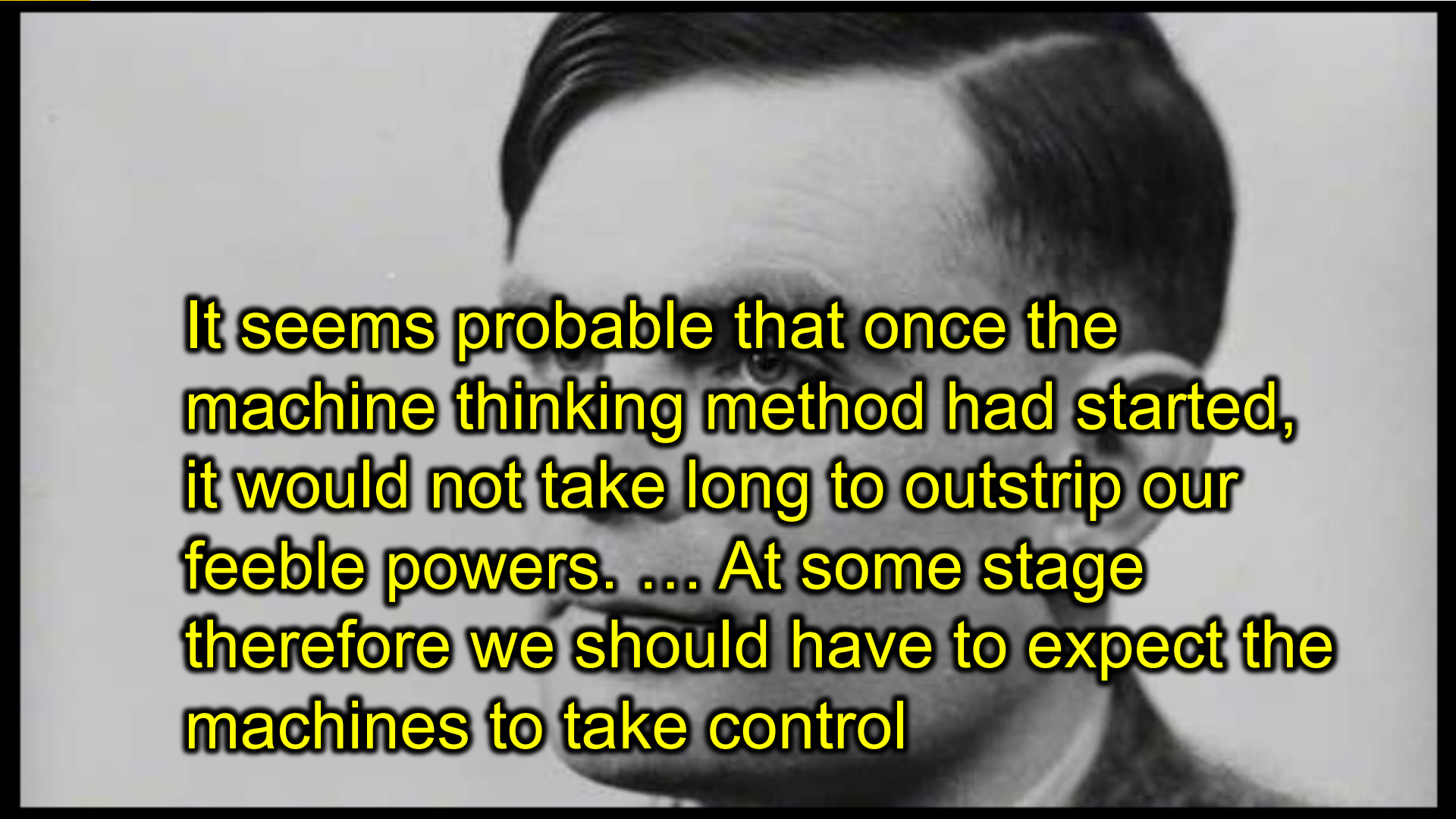
A bungee with a bungee and a rhino

What do you get when you cross a pig with a cow with a party?

Because the engineers with a dog

Future

- We are doing AI…
  - To create intelligent systems
    - The more intelligent, the better
  - To gain a better understanding of human intelligence
  - To magnify those benefits that flow from it
    - E.g., net present value of human-level AI ≥ $13,500T
    - Might help us avoid war and ecological catastrophes, achieve immortality and expand throughout the universe
- What if we succeed?


It seems probable that once the machine thinking method had started, it would not take long to outstrip our feeble powers. … At some stage therefore we should have to expect the machines to take control

What's bad about better AI?

- AI that is incredibly good at achieving something other than what we really want
- AI, economics, statistics, operations research, control theory all assume utility to be ***fixed, known, and exogenously specified***
  - ~~Machines are intelligent to the extent that their actions can be expected to achieve their objectives~~
  - Machines are ***beneficial*** to the extent that ***their*** actions can be expected to achieve ***our*** objectives

A new model for AI

1. The machine's only objective is to maximize the realization of human preferences
2. The robot is initially uncertain about what those preferences are
3. Human behavior provides evidence about human preferences

The standard model of AI is a special case, where the human can exactly and correctly program the objective into the machine