

<https://mco.dev/IntroAI.pdf>

Intro to Artificial Intelligence

What a well informed person should know

Marc Cohen

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Logistics

- 2 sessions x 3 hours (Oct 30, Nov 6)
- Format: lectures, demos, and discussions
- Ten minute break every hour
- Toilets
 - Male: Ground Floor, 1st, 2nd and 5th Floors
 - Female: Ground Floor, 1st, 3rd, 4th, and 6th
- Videos: Welcome to City Lit, Safety at City Lit
- My email: Marc.Cohen@citylit.ac.uk (reach out any time)
- IT Support: ItHelpDesk@citylit.ac.uk

About Marc



I'm an American software engineer based in London. My mission is building tools, tutorials, and online courses to help make computing, mathematics, and data science more accessible and more inclusive.

I have an MEng degree in Computer Science from Cornell, a BA in Mathematics from Rutgers, and over 40 years of experience as a software developer and engineering manager at Bell Labs, Lucent Technologies, and Google.

Prerequisites

- **You are human (bots not allowed)**
- **You are curious about AI and want to learn more**
- **No technical knowledge required**
- **No programming required**
- **No maths required**

Goals

- **Understand what AI is and how it works**
- **Learn a little about the history of AI**
- **Gain a sense of what AI can do for you**
- **Appreciate some of the risks and pitfalls**
- **Be able to have an intelligent conversation about AI**

Non-Goals

- Deep dive into technology or maths
- Definitively answer profound ethical and societal questions
- Predict the future

Table of Contents

- A Personal Story
- Definitions
- AI History
- Mechanics
- What can AI do for you?
- Ethics
- The Future



Photo by Domenico Loia on [Unsplash](#)

A Personal Story

Part 1 - AI as a service

I've experienced a few changes

- **high level programming languages**
- **portable operating systems**
- **personal computers**
- **the internet and the world wide web**
- **search engines (esp. Google)**
- **mobile phones**
- **smart phones**
- **cloud computing**
- **the data science boom**
- **the AI revolution**

August 2016

Option 1 - Interactive Trivia Quiz Challenge Game

Inspired by [quizup](#) but a PWA rather than a native app and used as a way to illustrate backend design principles. We'll build this app in steps and highlight important lessons as they arise in the design process.

Requirements

- Usage flow
 - Visit site ([quizr.io](#))
 - Anonymous mode works out of the box
 - Ability to do quiz challenges with random other users but no user profile, no persistence of results, no leaderboard, no history
 - Establish a user profile
 - Challenge random or selected opponent to real time trivia challenge
 - Challenger selects subject, responder accepts or rejects (repeat until agreement)
 - Quiz conducted in real time using webRTC data (with optional video)
 - Results are persistent
 - Leaderboards maintained
 - Questions are accessed dynamically via network (caching is not particularly helpful because real time contents won't work while offline)
- Utilize an [open trivia question database](#)
- Implemented as a PWA
- Both a hosted service and an open source code example
- FE uses either react or Angular 2 (TBD)
- Use to illustrate state of the art back end capabilities

App Stages

1. FE - UI starts with anonymous mode only.
2. Add successive features by implementing an API (REST or gRPC). With each step, highlight options and considerations in choosing backend technology
 - a. sign in and user profile management

March 2023

**Wouldn't it be
cool to have a
free quiz game
for everyone
powered by AI?**

A Personal Story

Part 2 - AI as code completion

sentiment.ts

write_sql.go

parse_expenses.py

addresses.rb

```
1 #!/usr/bin/env ts-node
2
3 import { fetch } from "fetch-h2";
4
5 // Determine whether the sentiment of text is positive
6 // Use a web service
7 async function isPositive(text: string): Promise<boolean> {
8   const response = await fetch(`http://text-processing.com/api/sentiment/`, {
9     method: "POST",
10    body: `text=${text}`,
11    headers: {
12      "Content-Type": "application/x-www-form-urlencoded",
13    },
14  });
15  const json = await response.json();
16  return json.label === "pos";
17}
```

The logo consists of the word "quizaic" in a bold, sans-serif font. The letters are primarily white with a light blue shadow, except for the letter "i" which is red. The logo is set against a solid light blue rectangular background.

quizaic

(pronounced like **mosaic**)

Let's play!

The screenshot shows the Quizaic app interface. At the top, there is a navigation bar with the Quizaic logo and the text "AI Powered Infinitrivia". On the right side of the bar is a circular profile picture of a man wearing a green cap. Below the navigation bar is a vertical sidebar containing five menu items: "Home" (selected), "Browse", "Create", "Play", and "About". The main content area features a large blue banner with the "Quizaic" logo in white and red. Below the banner, the text "AI Powered Infinitrivia" is displayed in a large, bold, blue font. A detailed description follows: "Quizaic leverages the power of generative AI to create and play unlimited trivia quizzes and online surveys. Quizaic is a demonstration app to illustrate what's possible with the combination of Google Cloud services, Flutter, and Vertex AI. Quizaic is not an official Google product and should not be used for commercial purposes."

Quizaic

AI Powered Infinitrivia

AI Powered Infinitrivia

Quizaic leverages the power of generative AI to create and play unlimited trivia quizzes and online surveys. Quizaic is a demonstration app to illustrate what's possible with the combination of Google Cloud services, Flutter, and Vertex AI. Quizaic is not an official Google product and should not be used for commercial purposes.

Early Prompt

Generate a {num_questions} multiple choice quiz questions based on category {topic}.

Generate a {num_questions} multiple choice quiz questions **in Swedish** based on category {topic}.

Generate a {num_questions} multiple choice quiz questions based on category {topic} **in Swedish**.

Current Prompt

You are a trivia expert.
Generate a set of multiple choice quiz questions.

Category: {topic}

Quiz difficulty level: {difficulty}

Number of questions: {num_questions}

Number of responses per question: {num_answers}

Quiz language: {language}

RULES:

- Accuracy is critical.
- Each question must have exactly one correct response, selected from the responses array.
- Output should be limited to a json array of questions, each of which is an object containing quoted keys "question", "responses", and "correct".
- Don't return anything other than the json document.

OUTPUT:

A Personal Story

Part 3 - AI as coding agent

Introducing vibe coding in Google AI Studio

Oct 26, 2025

3 min read

We're making it faster and more intuitive than ever to turn your vision into a working, AI-powered app with vibe coding in AI Studio.



Ammaar Reshi

Product and Design Lead,
Google AI Studio



Kat Kampf

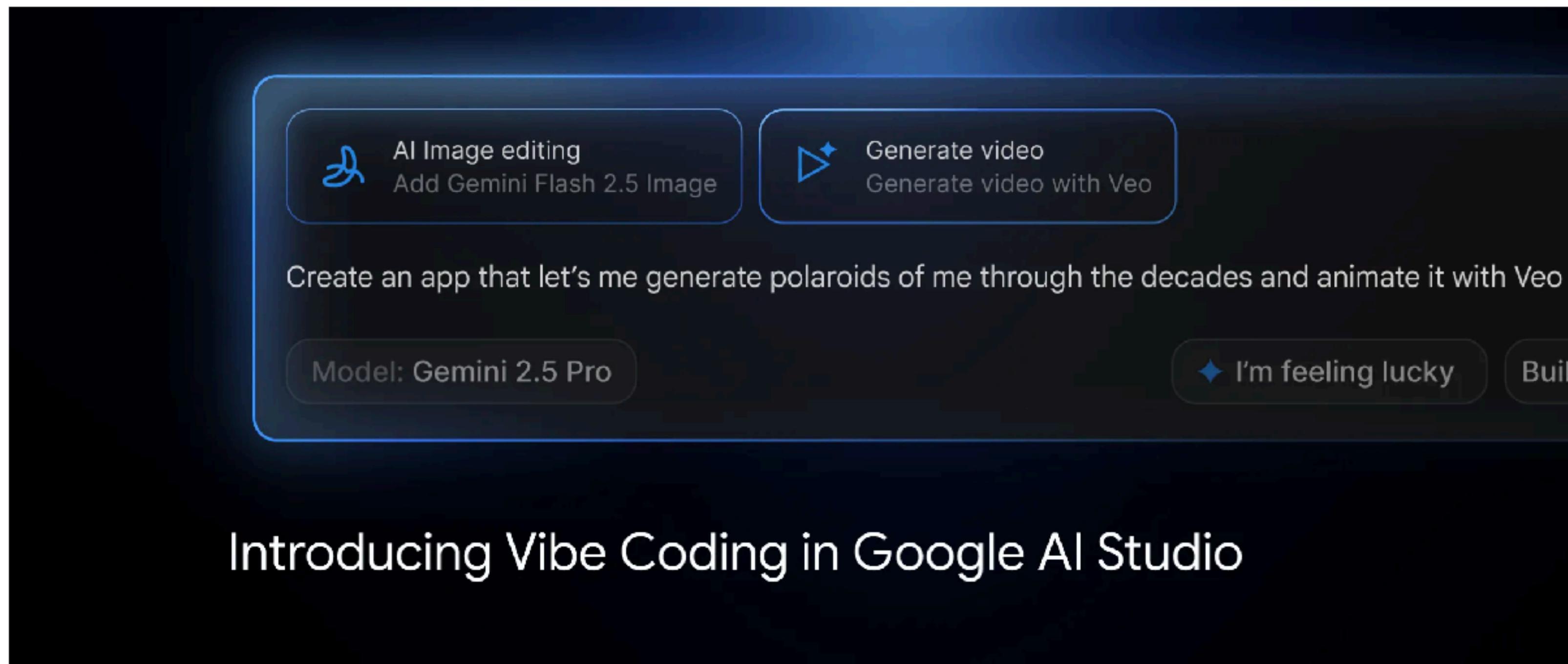
Product Manager, Google AI
Studio



Read AI-generated summary



Share



Google AI Studio

< Build

Start

Gallery

Your apps

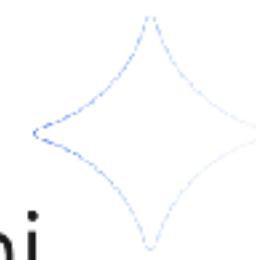
FAQ

Recently viewed

React Hello World

Zenith AI Meditation

React Hello World



Build your ideas with Gemini

Describe your idea

⚙️ Model: Gemini 2.5 Pro



👉 I'm feeling lucky

Build ←

Supercharge your apps with AI



Nano banana powered app

Add powerful photo editing to your app. Allow users to add objects, remove backgrounds, or change a photo's style just by typing.



Create conversational voice apps

Use the Gemini Live API to give your app a voice and make your own conversational experiences.



Animate images with Veo

Bring images to life with Veo 3. Let users upload a product photo and turn it into a dynamic video ad, or animate a character's portrait.



Use Google Search data

Connect your app to real-time Google Search results. Build an agent that can discuss current events, cite recent news, or fact-check information.



Use Google Maps data

Connect your app to real-time Google Maps data. Build an agent that can pull information about places, routes, or directions.



Generate images with a prompt

Generate high-quality images from a text prompt. Create blog post heroes, concept art, or unique assets in your application.



Gemini intelligence in your app

Embed Gemini in your app to complete all sorts of tasks - analyze content, make edits, and more.



AI powered chatbot

Add a context-aware chatbot to your app. Give your users a support agent that remembers the conversation, perfect for multi-step bookings or troubleshooting.

Google AI models may make mistakes, so double-check outputs.

➡️ Get API key

⚙️ Settings

marcacohen@gmail....

Definitions

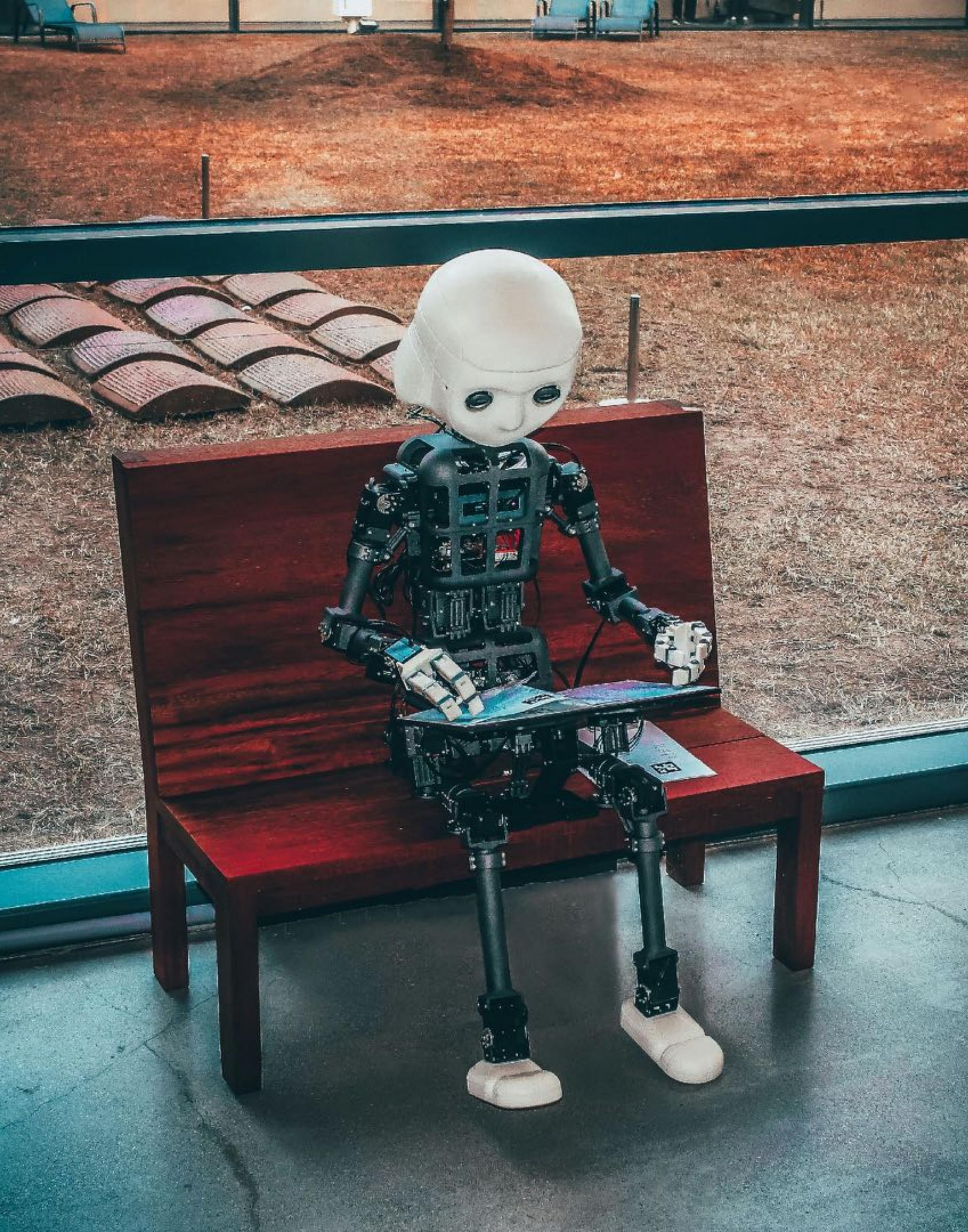
- **Artificial Intelligence**
- **Machine Learning**
- **Neural Network**
- **Deep Learning**
- **Generative AI**

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estis tute en mal~o²; elmeti
mal~on²; mal~o min kaptas
malgrasiĝintan vizaĝon de n
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krio². **mal~igi**. Senigi je ~o
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io sen~a.

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lia lingvoprojekto. **2** (anka
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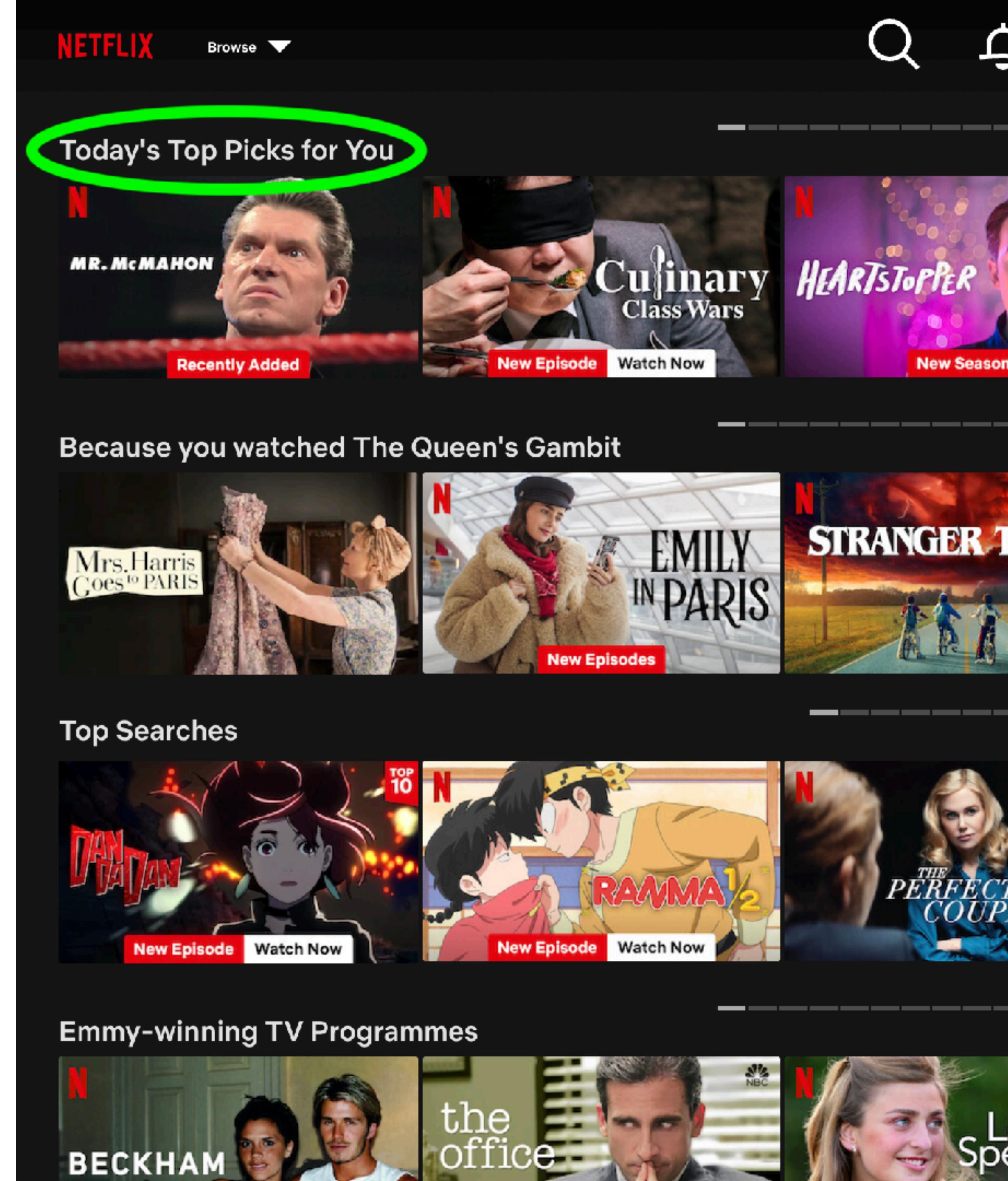
Definition: Artificial Intelligence

The creation of algorithms and systems capable of performing tasks that typically require human cognition, such as learning, reasoning, perception, decision-making, and natural language processing.



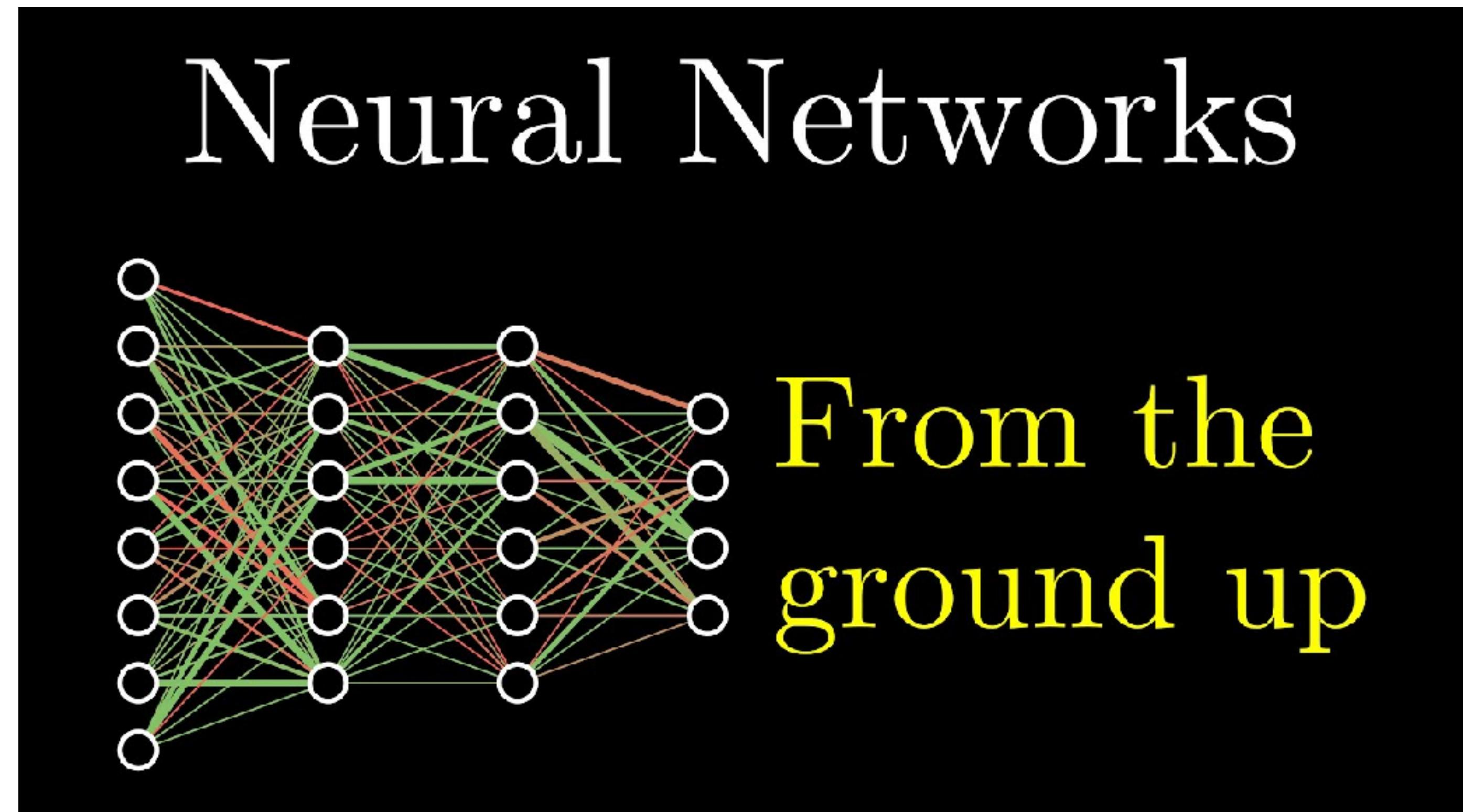
Definition: Machine Learning

The use and development of computer systems that are able to learn and adapt without following explicit instructions, by using algorithms and statistical models to analyze and draw inferences from patterns in data.



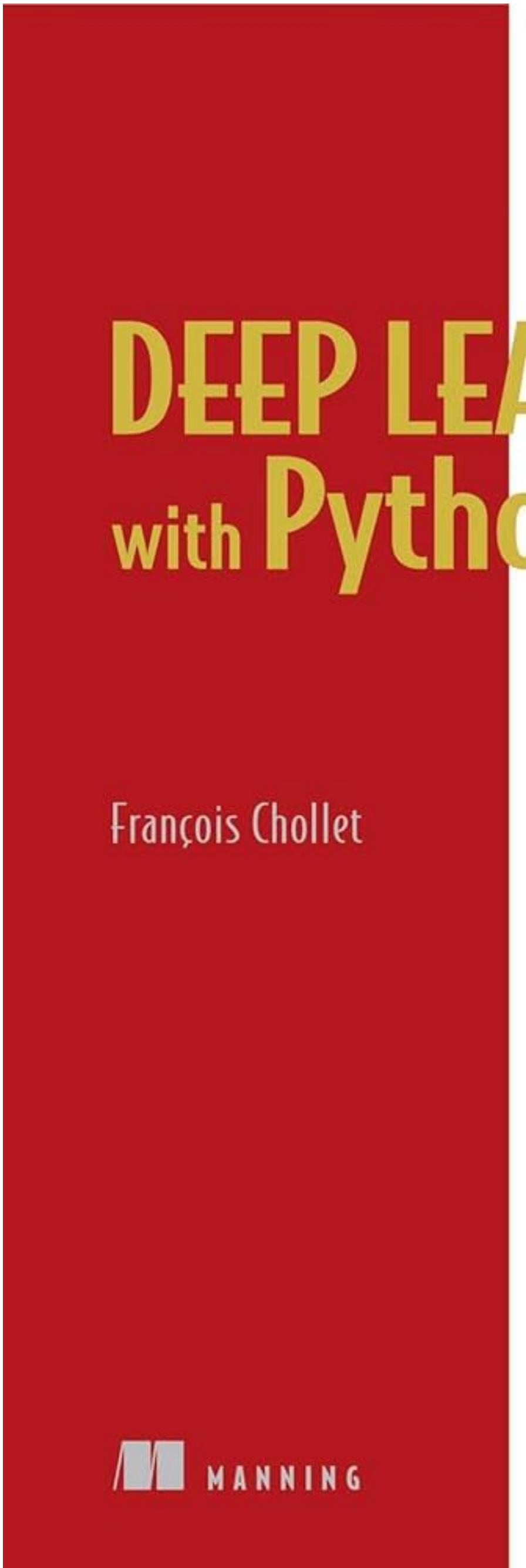
Definition: Neural Networks

A machine learning (ML) technique that uses a network of interconnected layers of nodes to process data in a way that bears some resemblance to the human brain.



Definition: Deep Learning

A type of machine learning that uses multi-layer neural networks to train computers to process data and make human-like decisions. Deep learning systems learn from large amounts of data, including images, text, audio, and video to recognize patterns, make predictions, and automate tasks.



Definition: Generative AI

Deep-learning models
that can generate high-
quality text, images,
video, and other
content based on the
data they were trained
on.



**Artificial
Intelligence**

**Machine
Learning**

**Neural
Networks**

**Deep
Learning**

**Generative
AI**

Artificial Intelligence

Machine Learning

Deep Learning

1950's

1960's

1970's

1980's

1990's

2000's

2010's



AI History

How did we get here?

- Founders
- Timeline



Ada Lovelace

Ada Lovelace (1815–1852) worked with Charles Babbage on his design for the Analytical Engine, a mechanical general-purpose computer that was never built. In her famous notes, she described how such a machine could manipulate symbols according to rules — not just numbers — and even envisioned it creating music or art. This foresight is often seen as a conceptual precursor to artificial intelligence, since she recognized the potential for machines to process abstract patterns beyond calculation.



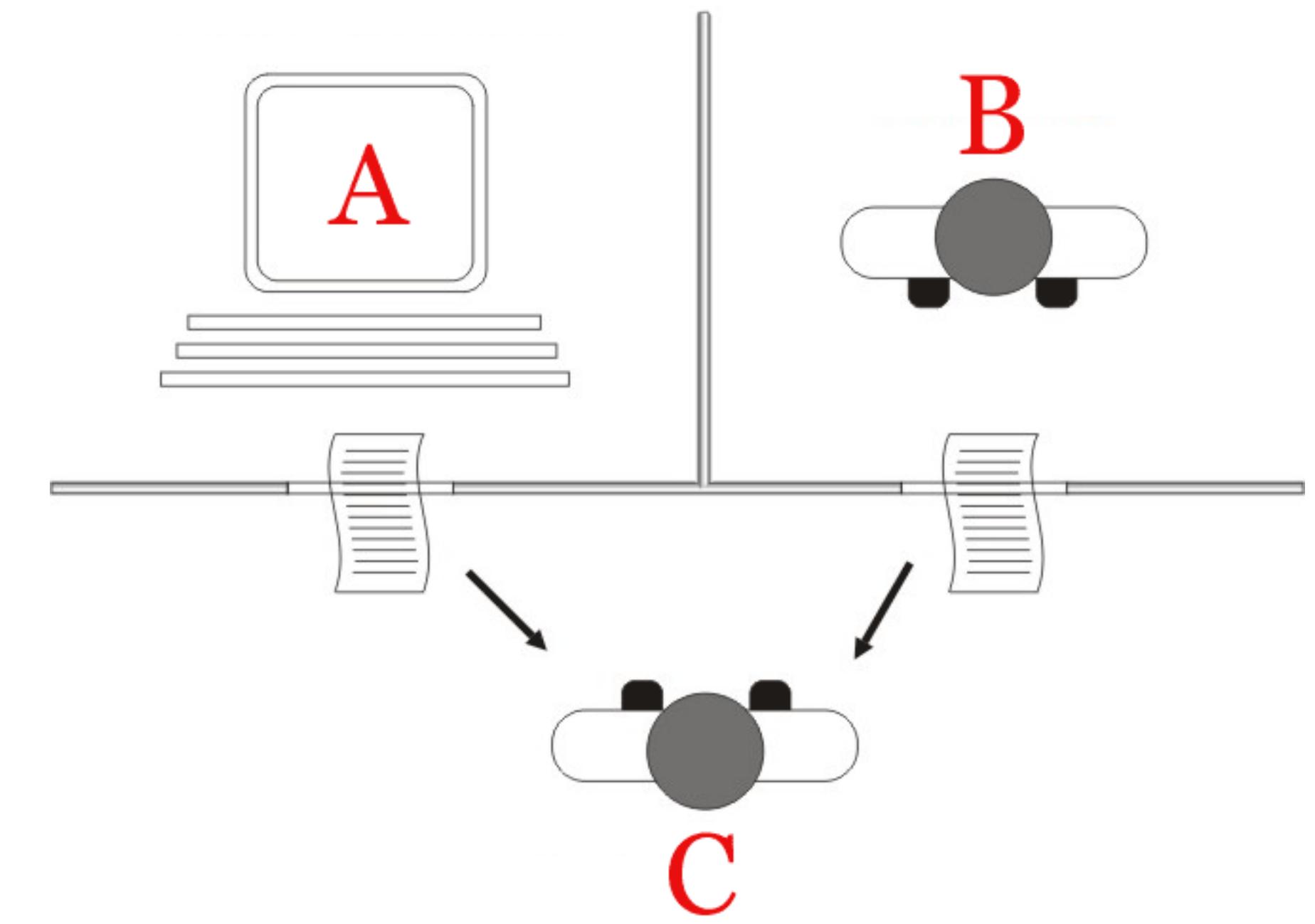
Alan Turing

Alan Turing (1912–1954) laid the theoretical foundations of computer science with his concept of the “universal machine,” showing that a single device could simulate any other computational process. In his 1950 paper “*Computing Machinery and Intelligence*,” he proposed the Imitation Game (now called the Turing Test) as a way to consider machine intelligence. His ideas established core questions about whether and how machines could think, making him one of the intellectual founders of artificial intelligence.



The Turing Test (1950)

If a machine could carry on a conversation that was indistinguishable from a conversation with a human being, then it was reasonable to say that the machine was "thinking". This was the first serious proposal about how humanity might achieve artificial intelligence.



By Juan Alberto Sánchez Margallo - File:Test_de_Turing.jpg, CC BY 2.5

How Did You Do On The AI Art Turing Test?

...

NOV 20, 2024



Share

...

Last month, I challenged 11,000 people to classify fifty pictures as either human art or AI-generated images.

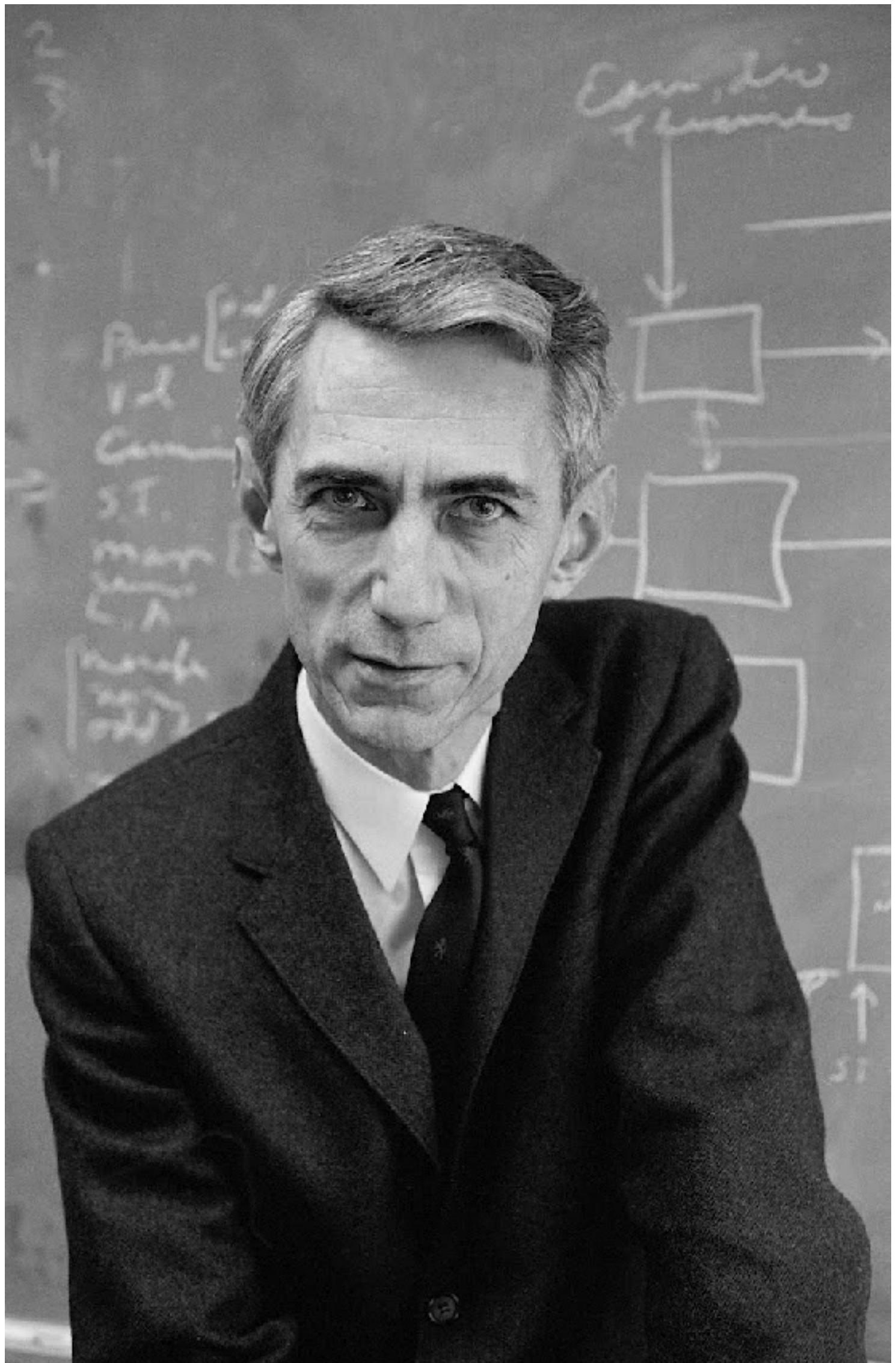
I originally planned five human and five AI pictures in each of four styles: Renaissance, 19th Century, Abstract/Modern, and Digital, for a total of forty. After receiving many exceptionally good submissions from local AI artists, I fudged a little and made it fifty. The final set included paintings by Domenichino, Gauguin, Basquiat, and others, plus a host of digital artists and AI hobbyists.



One of these two pretty hillsides is by one of history's greatest artists. The other is soulless AI slop. Can you tell which is which?

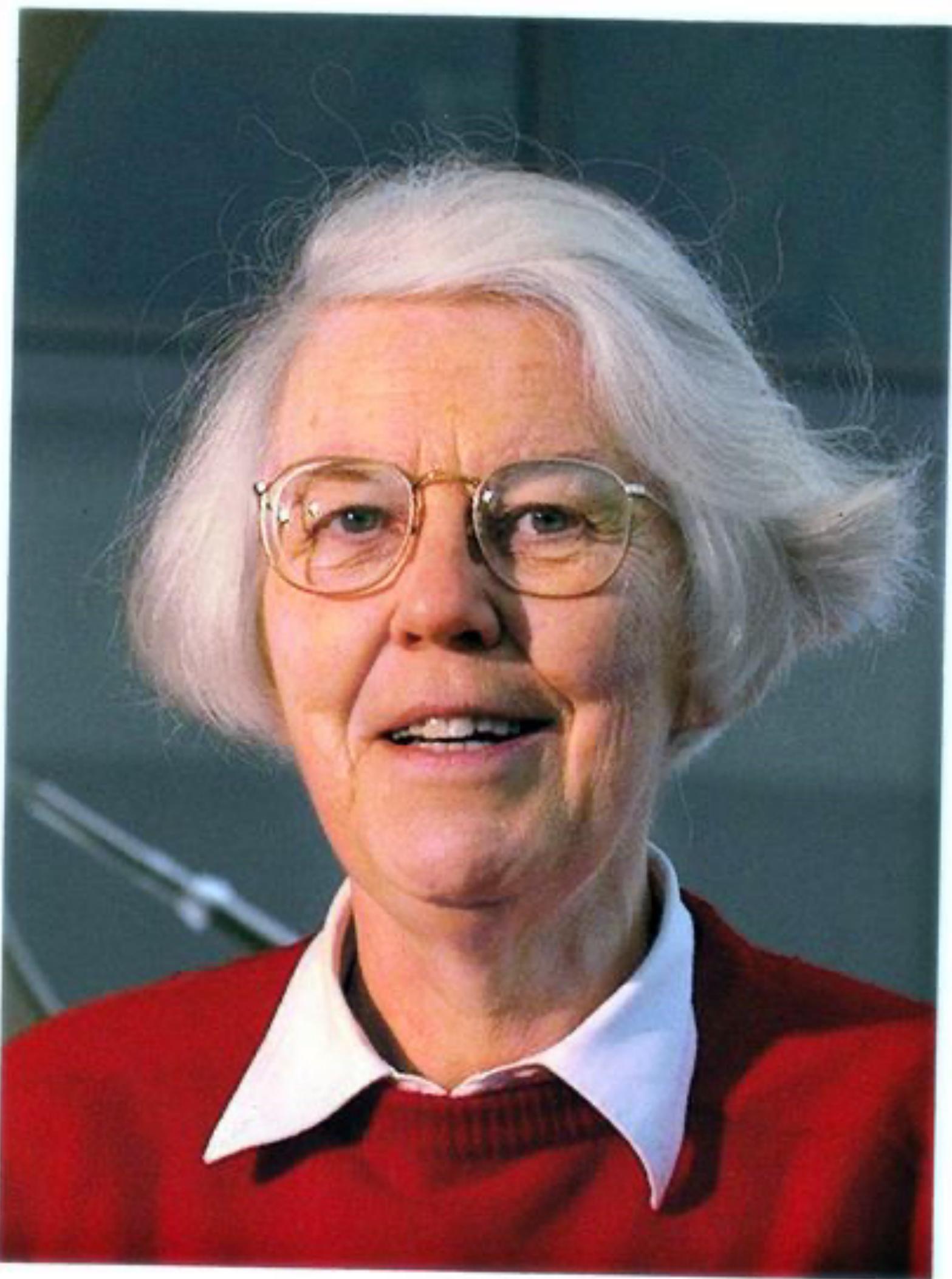
Claude Shannon

Claude Shannon (1916–2001), often called the “father of information theory,” laid the groundwork for modern digital communication and data processing. His 1948 paper defined concepts like *bits* and *entropy*, enabling the mathematical treatment of information and uncertainty. While not an AI researcher per se, his theories on communication and symbolic processing directly influenced early artificial intelligence, machine learning, and pattern recognition.



Karen Spärck Jones

Karen Spärck Jones (1935–2007) was a pioneering computer scientist in natural language processing and information retrieval. She introduced the concept of *inverse document frequency (IDF)*, which, combined with term frequency, became the foundation of modern search engines. Her work made it possible for computers to rank documents by relevance, a breakthrough that continues to underpin AI-driven search and text analysis today.



Geoffrey Hinton

Geoffrey Hinton (b. 1947) is widely known as the “godfather of deep learning” for his pioneering work on artificial neural networks. He helped popularize the backpropagation algorithm in the 1980s and later co-developed deep belief networks, showing how multiple layers of representations could be learned. His group’s success with *AlexNet* in the 2012 ImageNet competition demonstrated the power of deep learning, sparking today’s revolution in computer vision, natural language processing, and generative AI.



Demis Hassabis

Demis Hassabis (b. 1976) is the co-founder and CEO of DeepMind, a leading AI research company acquired by Google in 2014. Trained as both a neuroscientist and computer scientist, he pushed for biologically inspired approaches to AI, leading to breakthroughs such as **AlphaGo**, the first system to defeat a world champion in Go, and **AlphaFold**, which solved the decades-old protein folding problem. His leadership has made DeepMind central to advancing deep reinforcement learning and AI for scientific discovery.

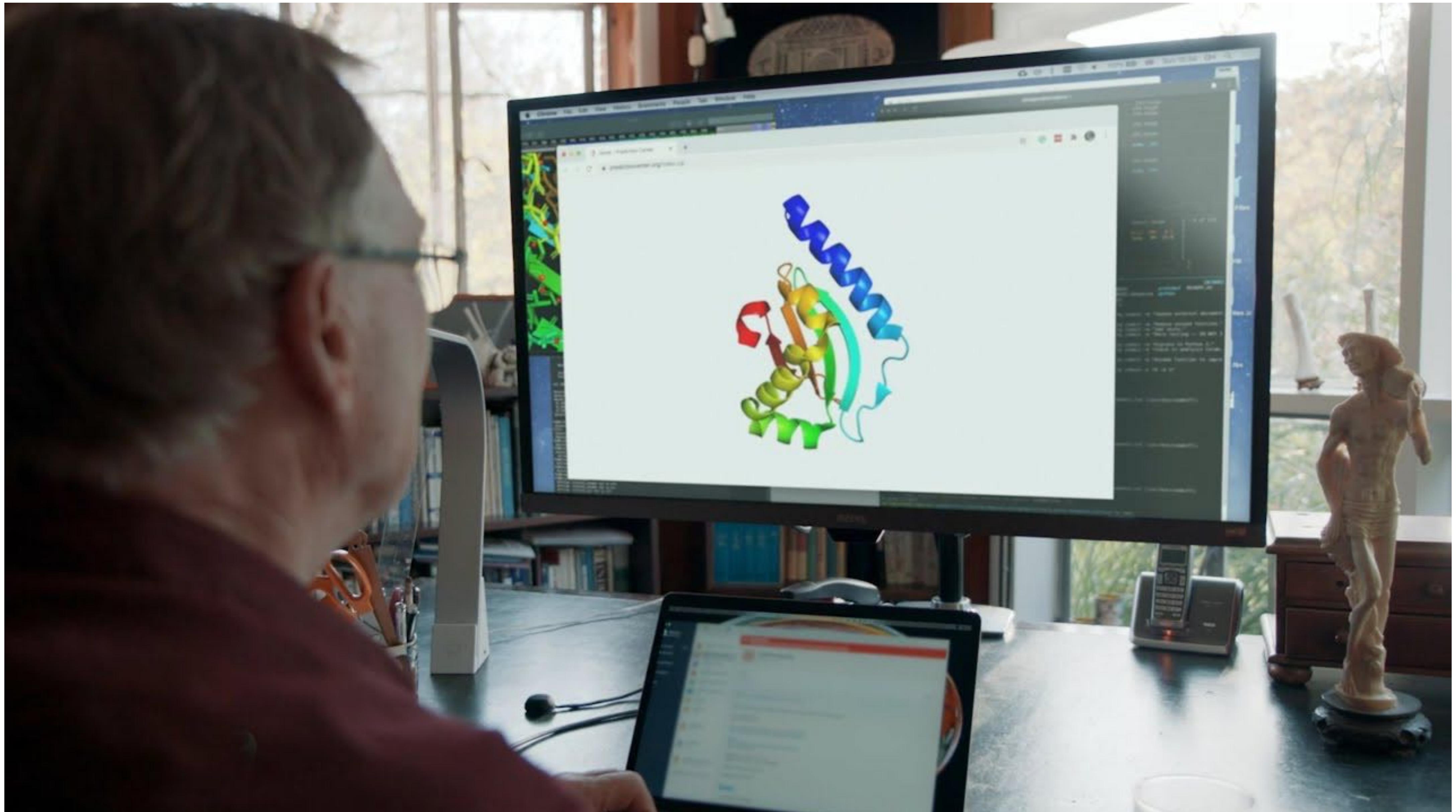


AlphaGo



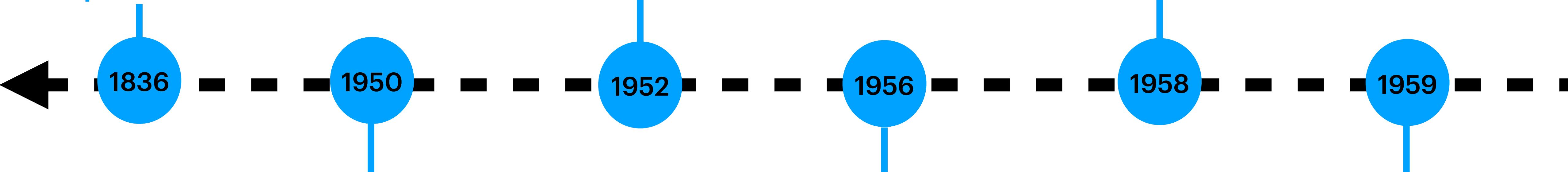
0:00 - 2:00

AlphaFold



AI Development Timeline

Charles Babbage & Ada Lovelace design the Analytical Engine, an early mechanical general-purpose computer.



Alan Turing publishes "Computing Machinery and Intelligence," introducing the Turing Test.

Arthur Samuel developed a program to play checkers, which is the first to ever learn the game independently.

John McCarthy, Marvin Minsky, Nathaniel Rochester, and Claude Shannon organize the Dartmouth Conference, coining the term "Artificial Intelligence."

John McCarthy created LISP, the first programming language for AI research, which is still in popular use to this day.

Arthur Samuel created the term "machine learning" in a speech about teaching machines to play chess better than the humans who programmed them.

AI Development Timeline

Edward Feigenbaum and Joshua Lederberg created the first “expert system” to replicate the decision-making abilities of human experts.

1965

1965

Joseph Weizenbaum created the first “chatterbot” (later shortened to chatbot), ELIZA, a mock psychotherapist, that used natural language processing (NLP) to converse with humans.

The first AI winter begins as funding and interest decline due to unmet expectations.

1972

1974

Marvin Minsky and Seymour Papert publish Perceptrons, highlighting limitations in neural networks.

1980

David Rumelhart, Geoffrey Hinton, and Ronald Williams publish the backpropagation algorithm, revitalizing neural networks.

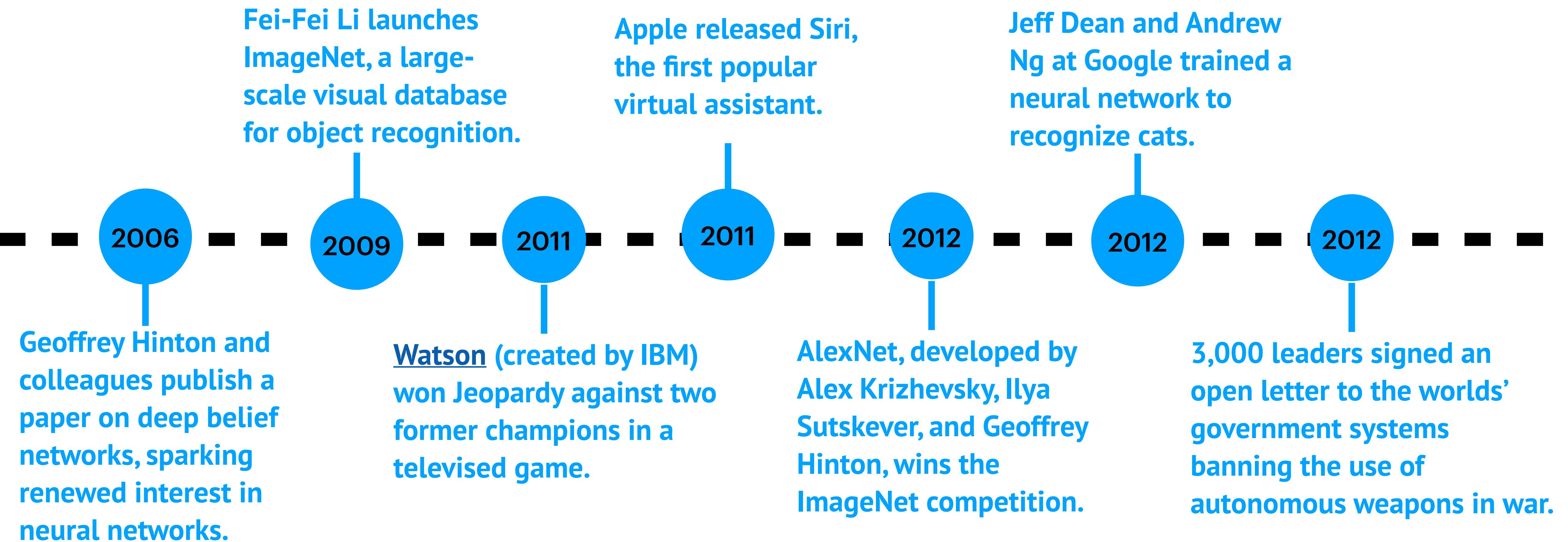
The resurgence of AI interest due to expert systems like MYCIN (medical diagnosis) and DENDRAL (chemical analysis).

1986

IBM's Deep Blue defeats world chess champion Garry Kasparov.

1997

AI Development Timeline



AI Development Timeline

DeepMind's AlphaGo defeats professional Go player Lee Sedol.

2015

2017

2017

2018

2020

2020

2022

2024

Two Facebook chatbots converse and learn how to negotiate and developed their own shorthand language, completely autonomously.

Google publishes “Attention is all you need”, unveiling the Transformer.

Chinese Alibaba beat humans on Stanford reading and comprehension test.

OpenAI releases GPT-3, a powerful language model with 175 billion parameters.

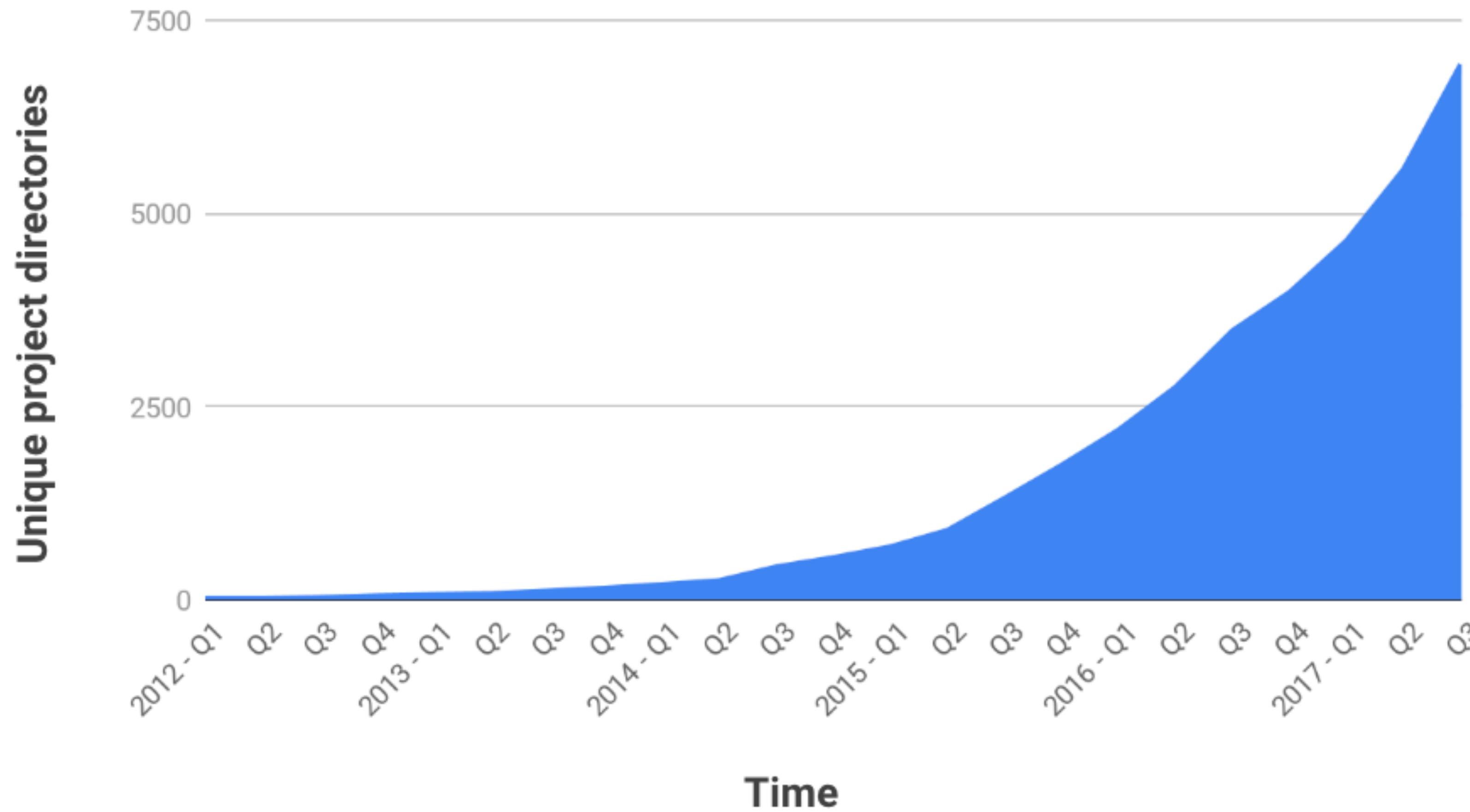
Generative AI goes mainstream with ChatGPT

Open source AI era begins

DeepMind's AlphaFold makes significant progress in protein folding.

Use of Deep Learning at Google

source directories containing deep learning models



Google's AI Awakening

[Sign in / Sign up](#)Jun Rekimoto : 暮本純一 [Follow](#)

人間とテクノロジーの未来を探求しています。HUMANITY AND TECHNOLOGY

Nov 11, 2016 · 5 min read



You seem to have made it into a
neural network Try the beginning
with The Great Gatsby Google
Translate

ニューラルネット化したらしいGoogle翻訳でThe Great Gatsby冒頭
を試してみる：

原文：In my younger and more vulnerable years my father gave me some
advice that I've been turning over in my mind ever since.

“Whenever you feel like criticizing any one,” he told me, “just remember
that all the people in this world haven't had the advantages that you've
had.”

google：私の若くて傷つきやすい年の頃、私の父は私が私の心の中でそれ
以来変わってきたアドバイスを私にくれました。

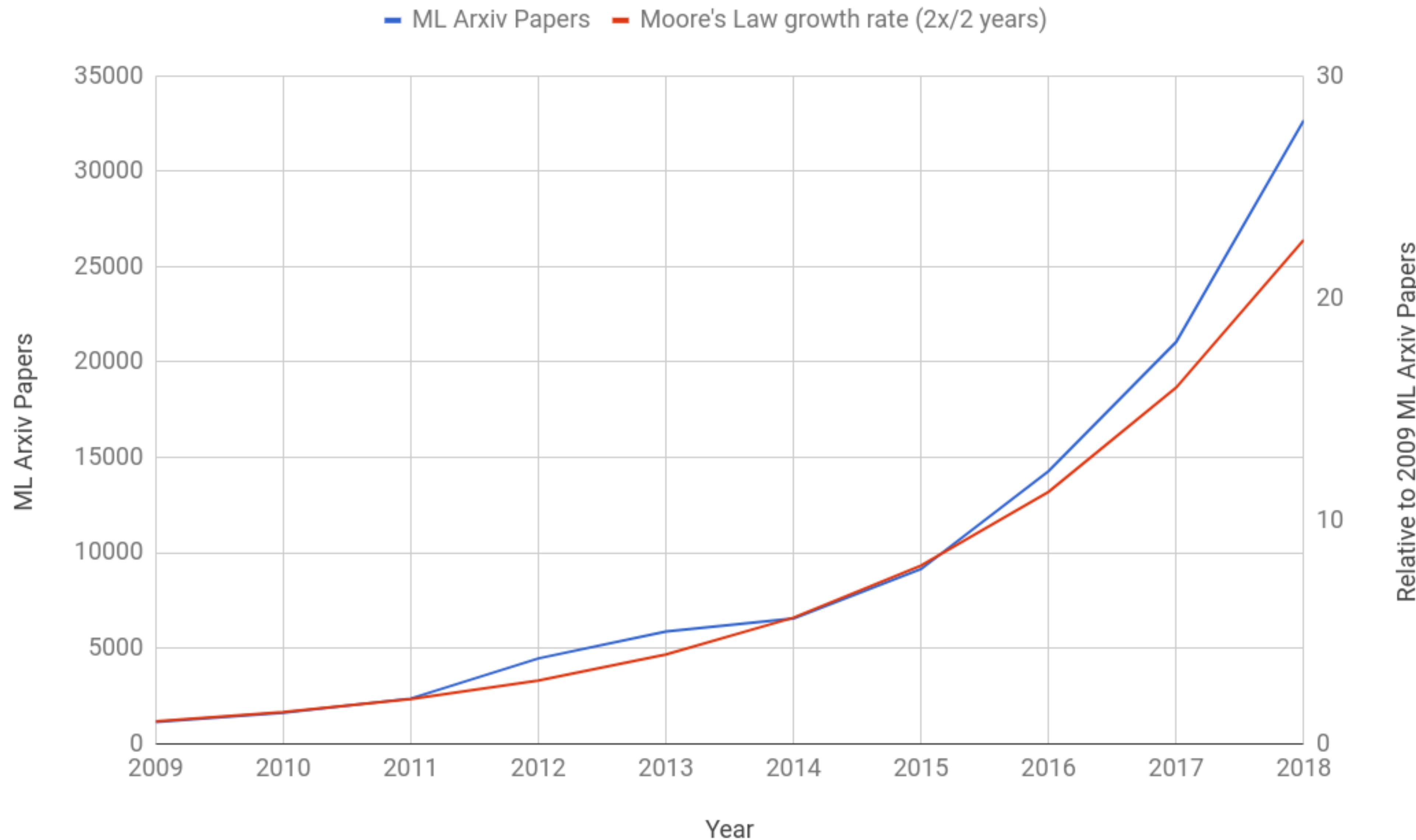
「誰かを批判する気持ちがあるときはいつでも、彼は私に言いました。
「この世界のすべての人々はあなたが持っていた優位性を持っていないこ
とを覚えておいてください。

FEATURE

The Great A.I. Awakening

How Google used artificial intelligence to transform Google
Translate, one of its more popular services — and how
machine learning is poised to reinvent computing itself.

Industry Adoption



THE KURZWEIL CURVE

Moore's Law is just the beginning: The power of technology will keep growing exponentially, says Kurzweil. By 2050, you'll be able to buy a device with the computational capacity of all mankind for the price of a nice refrigerator today.

Computer performance

Plotted by number of calculations per second per \$1,000

Years by which, according to
Kurzweil, \$1,000 of computation
will equal (or has already equaled)
the intelligence of ...

... all human brains

... one human brain

... one mouse brain

... one insect brain

Kurzweil's
projected
trend line

• – COMPUTER TYPE

Hollerith Tabulator
Bell Calculator Model I
Univac I
Apple Mac II

SOURCE: DATA FROM RAY KURZWEIL

10⁴⁰

10³⁰

10²⁰

10¹⁰

1

10⁻¹⁰

1900

1925

1950

1975

2001

'10

'23

2050

2075

Nvidia Is Now Worth \$5 Trillion as It Consolidates Power in A.I. Boom

The A.I. chip maker has become a linchpin in the Trump administration's trade negotiations in Asia.



Listen to this article · 9:05 min [Learn more](#)



Share full article



Link



233



“Spending on data centers, which are filled with the company’s chips, accounted for 92 percent of the country’s gross domestic product growth in the first half of the year...”

0

Jan. April July Oct. Jan. April July Oct.

2024 2025

Source: Factset. Keith Collins/The New York Times

Why did everything change so quickly?

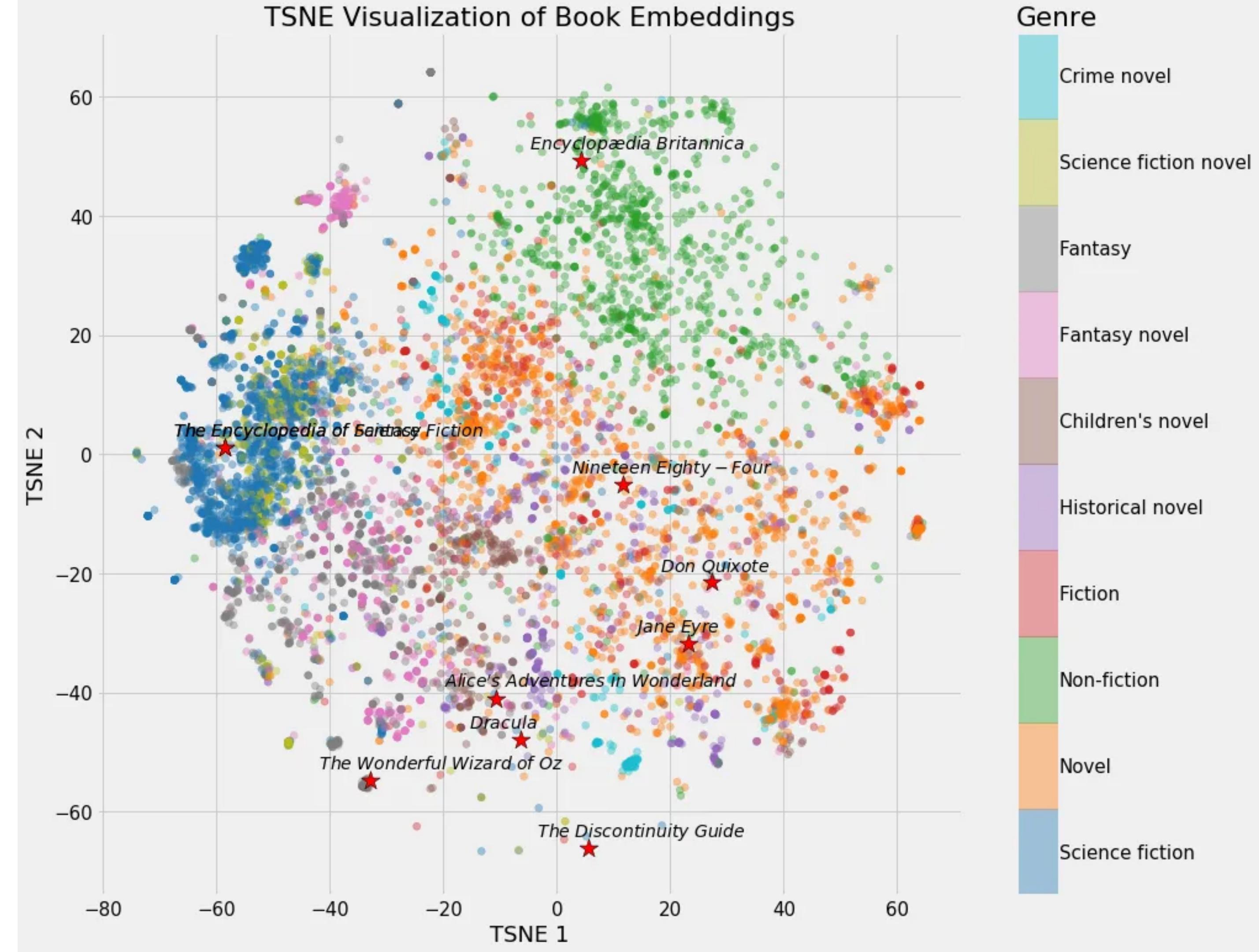
A perfect storm:

- **Moore's Law**
- **GPUs**
- **Cloud Computing**
- **Data abundance**
- **Github + Open Source**
- **New & improved techniques**
- **Transformers**



Mechanics

How does AI work?



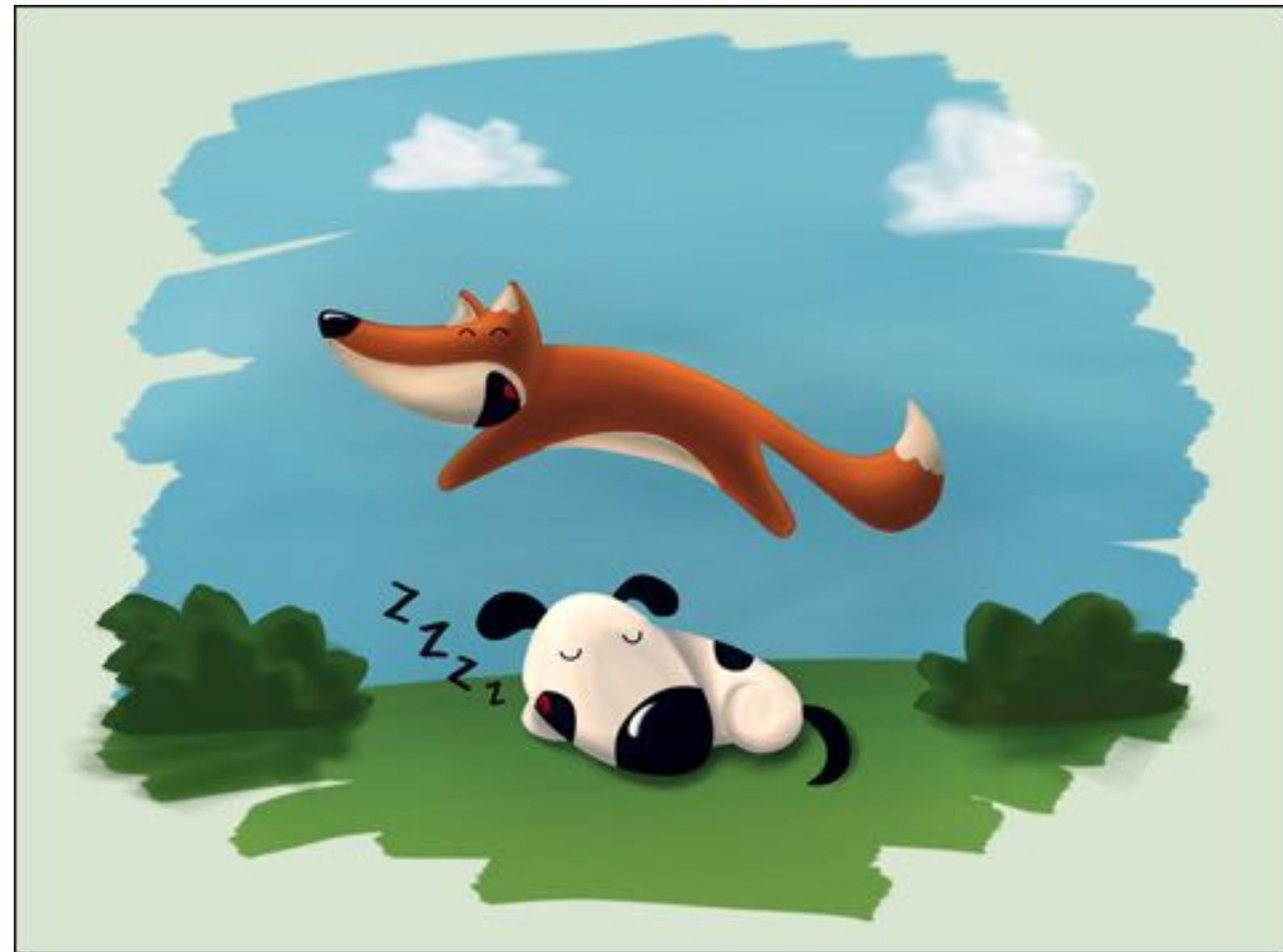
Puppy vs. Muffin



Not so easy



“The brown quick fox jumps over the lazy dog.”



English Adjective Order

1. Quantity or number
2. Quality or opinion
3. Size
4. Age
5. Shape
6. Colour
7. Proper adjective
8. Purpose or qualifier

**Machine learning is
learning from rules
plus experience**

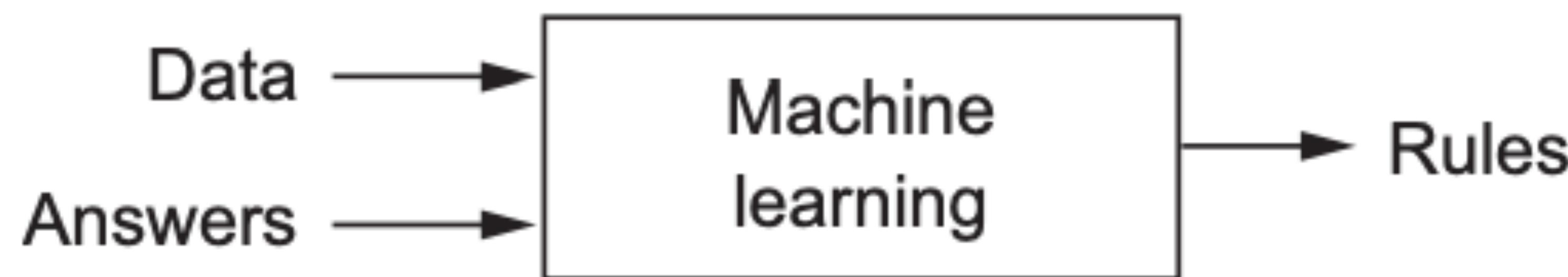
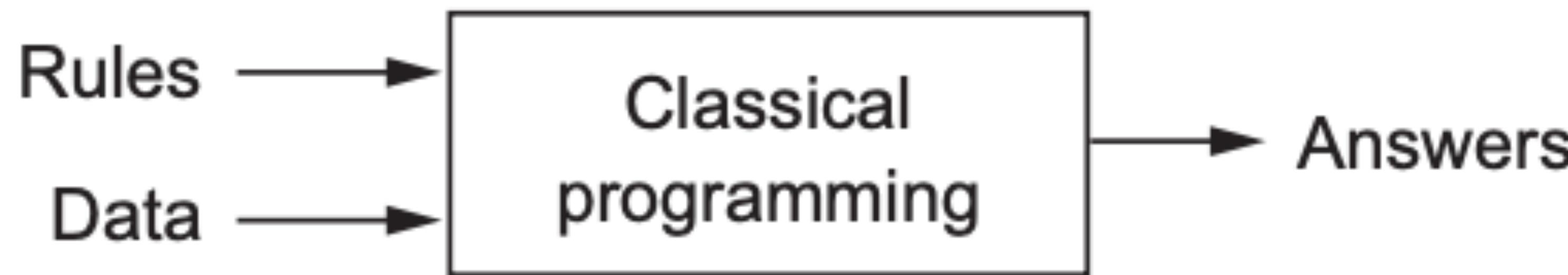


“Instead of trying to produce a program to simulate the adult mind, why not rather try to produce one which simulates the child’s mind?”

- Alan Turing, 1950

This is the main idea behind Machine Learning

Paradigm Shift



Types of Machine Learning

Supervised Learning

- labeled data
- learn relationships

Examples:

- spam detection
- image classification

Unsupervised Learning

- unlabeled data
- find data structure

Examples:

- customer segmentation
- anomaly detection

Reinforcement Learning

- reward based
- find optimal strategy

Examples:

- game playing
- autonomous driving

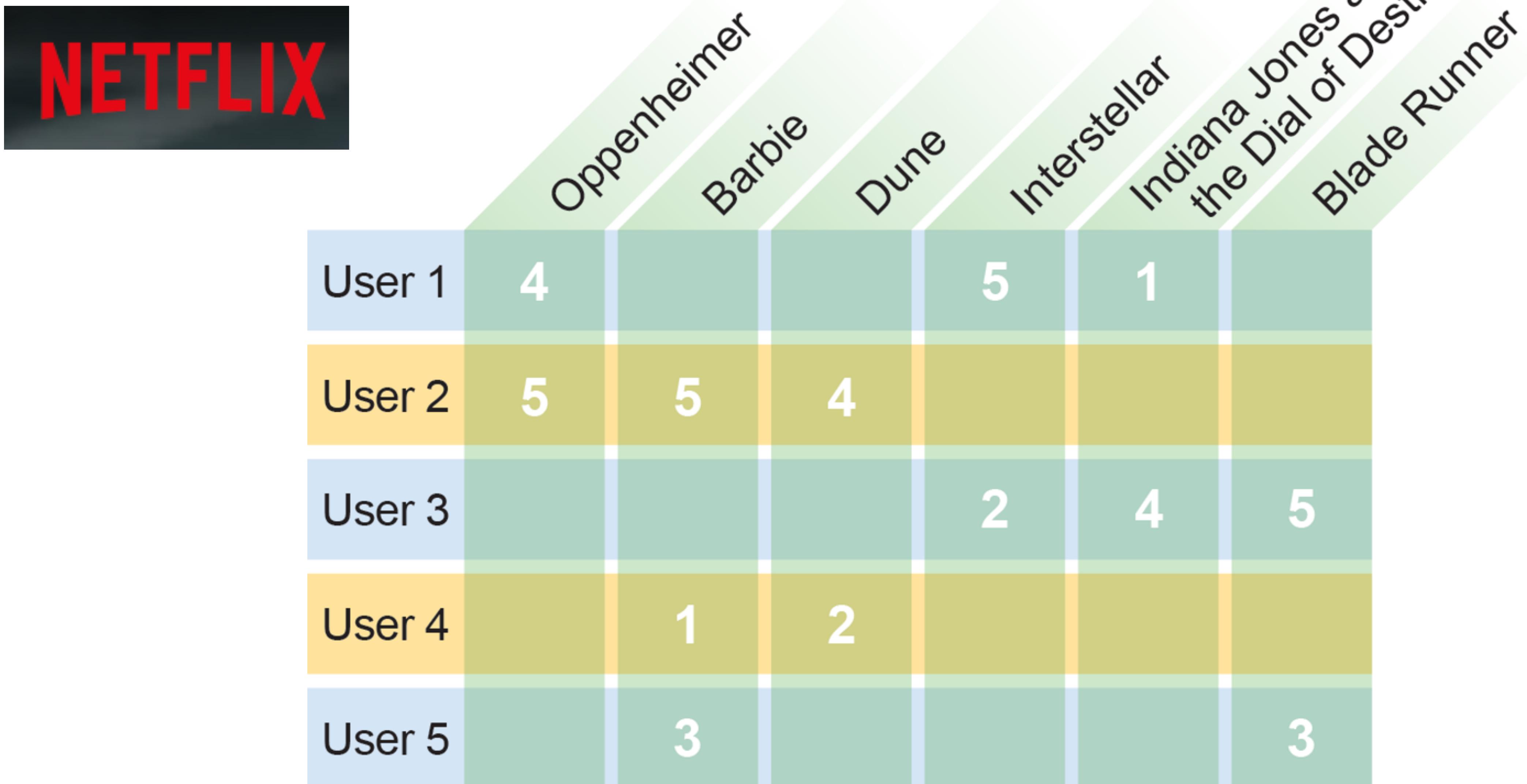
Supervised Learning

Cats vs. Dogs



- **2009 - world's most advanced computer can't tell a cat from a dog**
- **2012 - solved by Google *but* required 16,000 computers!**
- **2015 - Microsoft, Google beat humans at image recognition**
- **2019 - AI beats Stanford radiologists in chest X-ray diagnostics competition**

Unsupervised Learning



Cloud of similarities

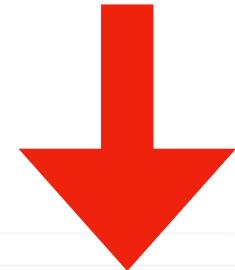


Reinforcement Learning



Types of Machine Learning

We'll focus on this category



Supervised Learning

- labeled data
- learn relationships

Examples:

- spam detection
- image classification

Unsupervised Learning

- unlabeled data
- find data structure

Examples:

- customer segmentation
- anomaly detection

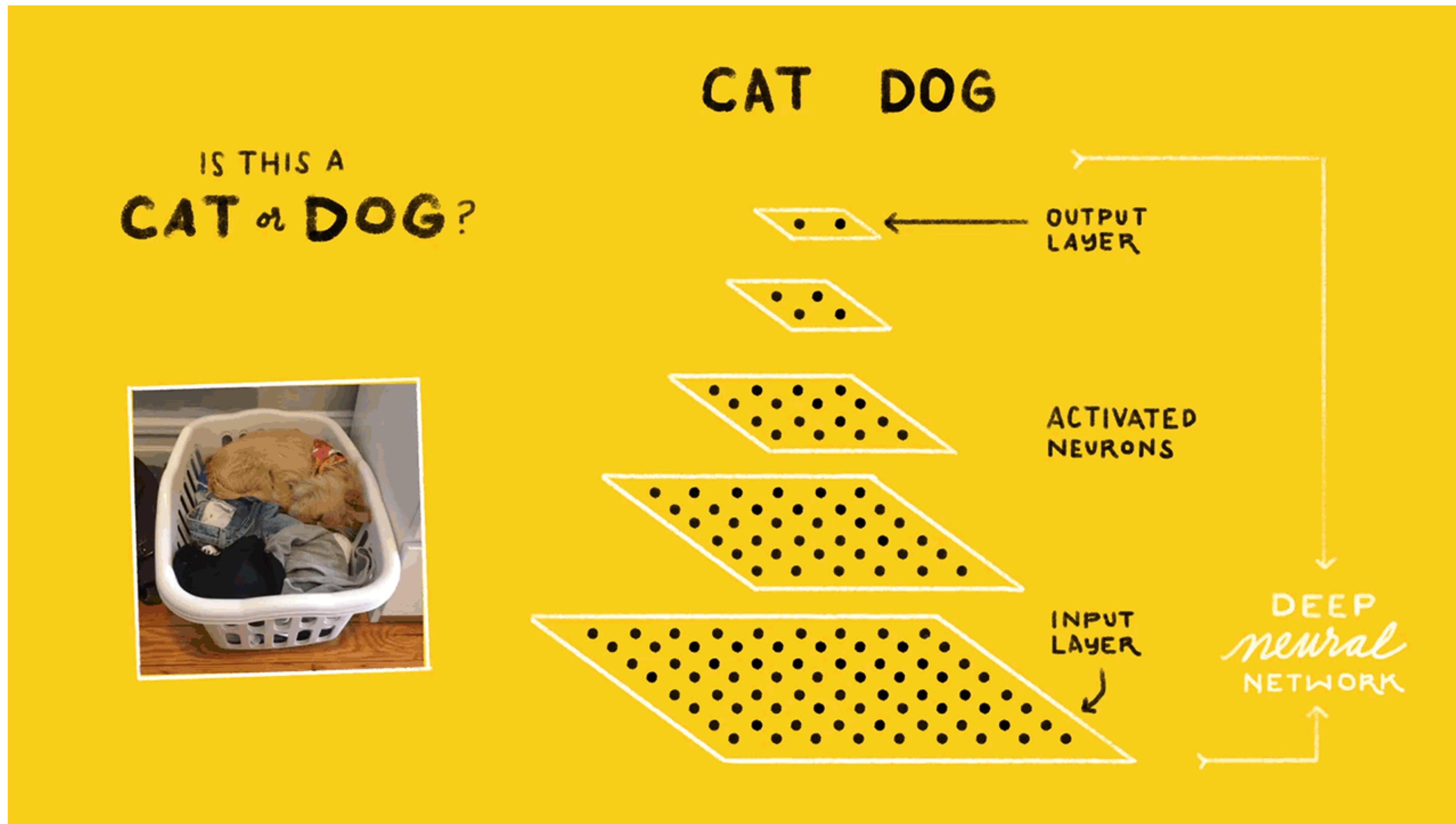
Reinforcement Learning

- reward based
- find optimal strategy

Examples:

- game playing
- autonomous driving

Neural Networks



Which digit is this?

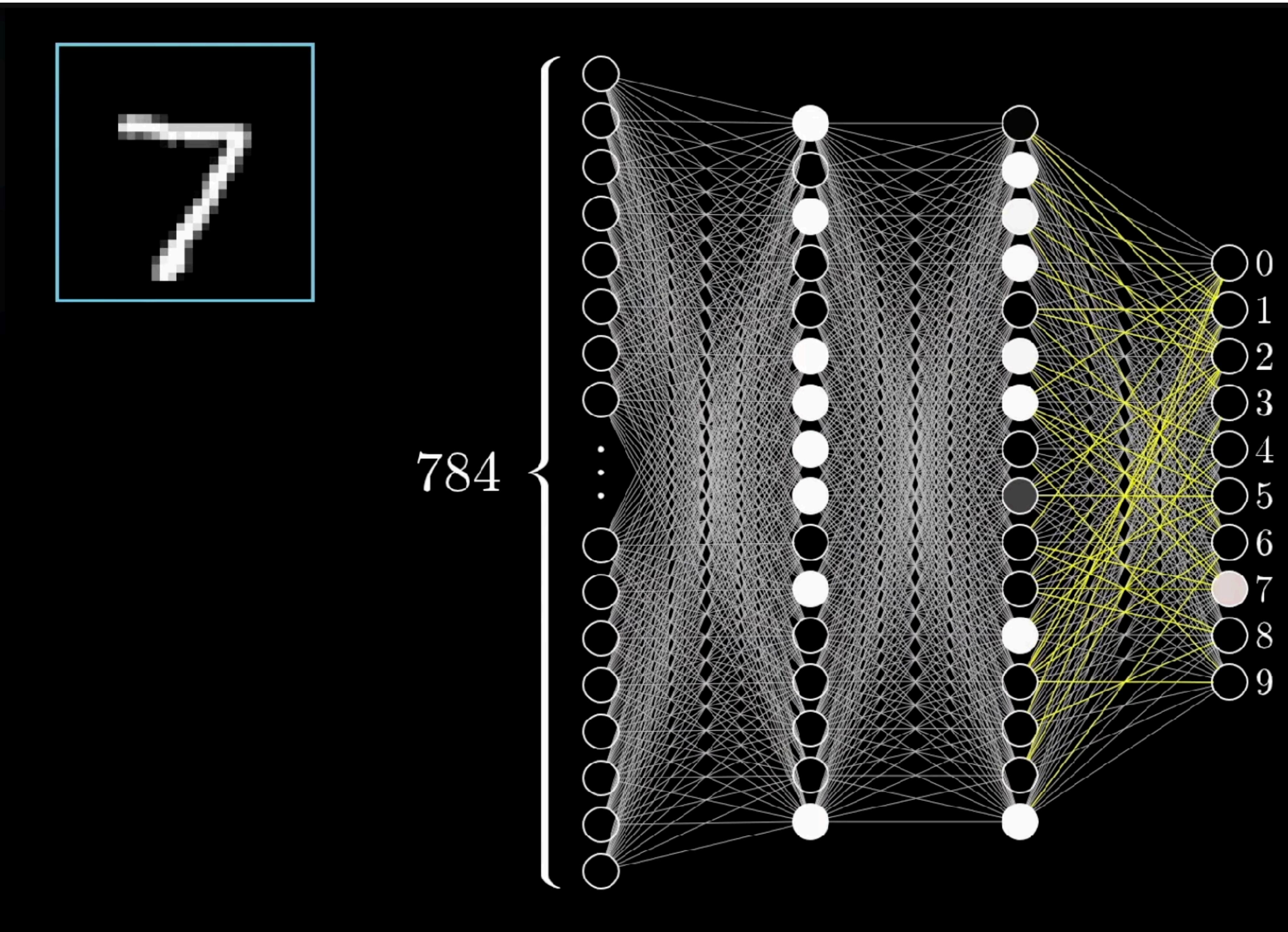


The MNIST Challenge

training digits and their labels	
9	9
1	1
0	0
3	1
1	1
6	6
6	5
5	0
0	5
7	7
2	2
5	5
8	8
4	4
9	9
9	9
7	7
0	0
0	0
4	4
9	9
4	4

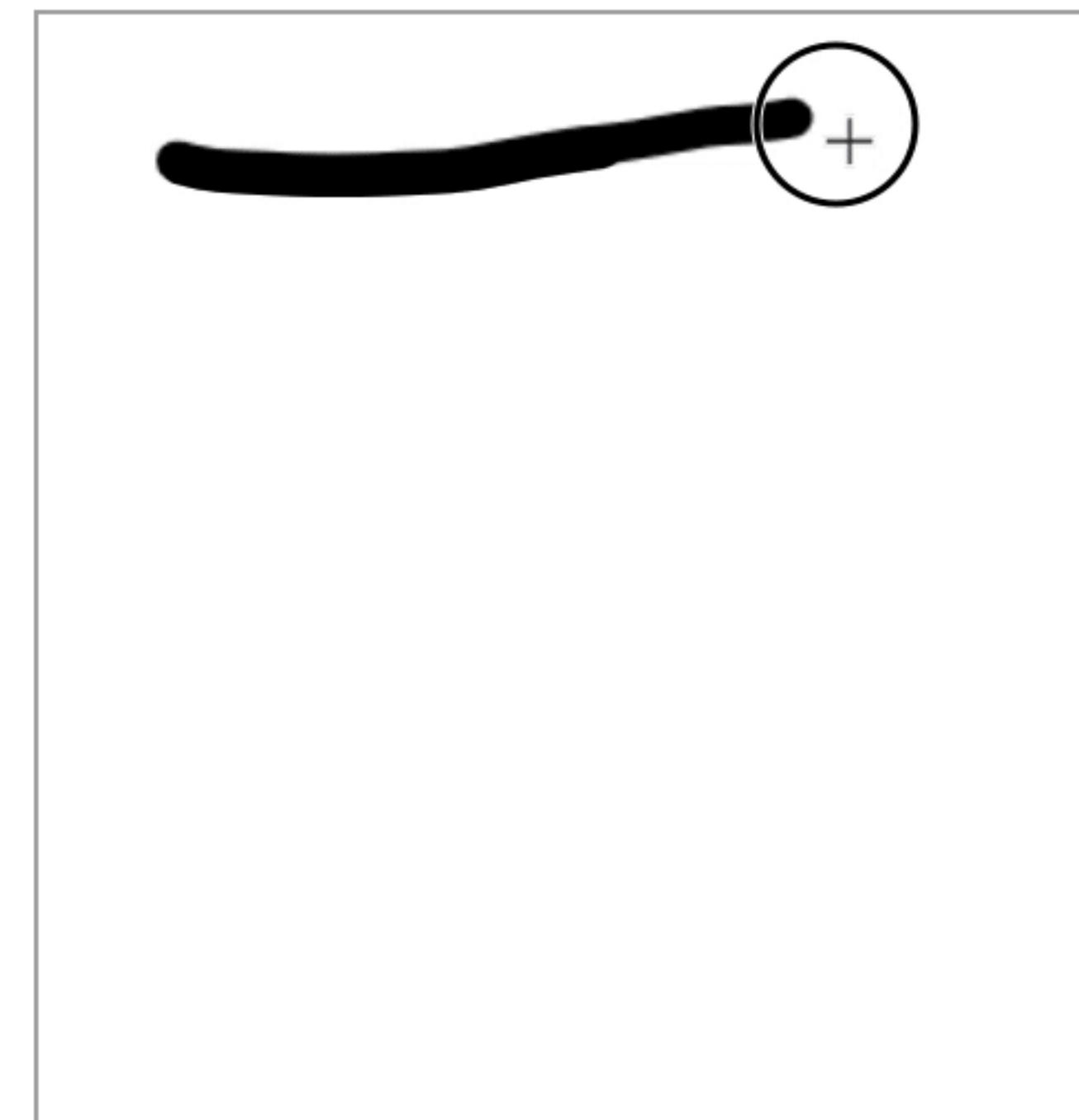
validation digits and their labels	
7	7
2	2
1	1
0	0
4	4
1	1
4	4
9	9
5	5
9	0
0	6
6	9
9	0
1	1
5	5
9	9
7	7
3	3
4	4
9	9
6	6
4	5

2:40 - 5:30



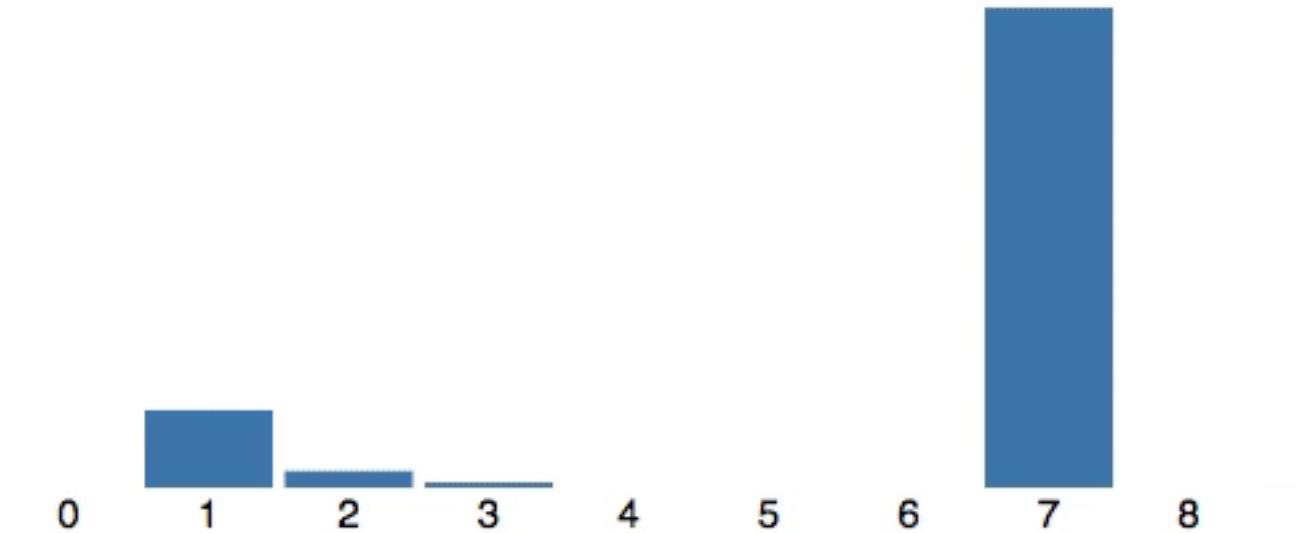
TensorFlow.js + MNIST

Draw a digit by hand and have it classified in real time, as you draw, by a machine learning model trained against the [MNIST](#) dataset. The model used for this page is a convolutional neural network (CNN) built using Keras/TensorFlow on a Google Tensor Processing Unit (TPU). It's explained in depth and is available for you to build for yourself at bit.ly/mco-mnist-lab.



Draw a single digit (0-9) in the empty box.

Clear



Made with ❤ by [Marc](#).

BOOK YOUR FREE GENERAL ADMISSION TICKETS TO VISIT THE MUSEUM HERE. SCHOOLS AND GROUPS CAN BOOK FREE GENERAL ADMISSION TICKETS HERE. ADDITIONAL 9-10AM FREE GENERAL ADMISSION TICKETS NOW AVAILABLE FOR HALF TERM (MONDAY 27 OCTOBER-SUNDAY 2 NOVEMBER 2025).

[HOME](#) → [OBJECTS AND STORIES](#)

LOVELACE, TURING AND THE INVENTION OF COMPUTERS

Published: 14 December 2018

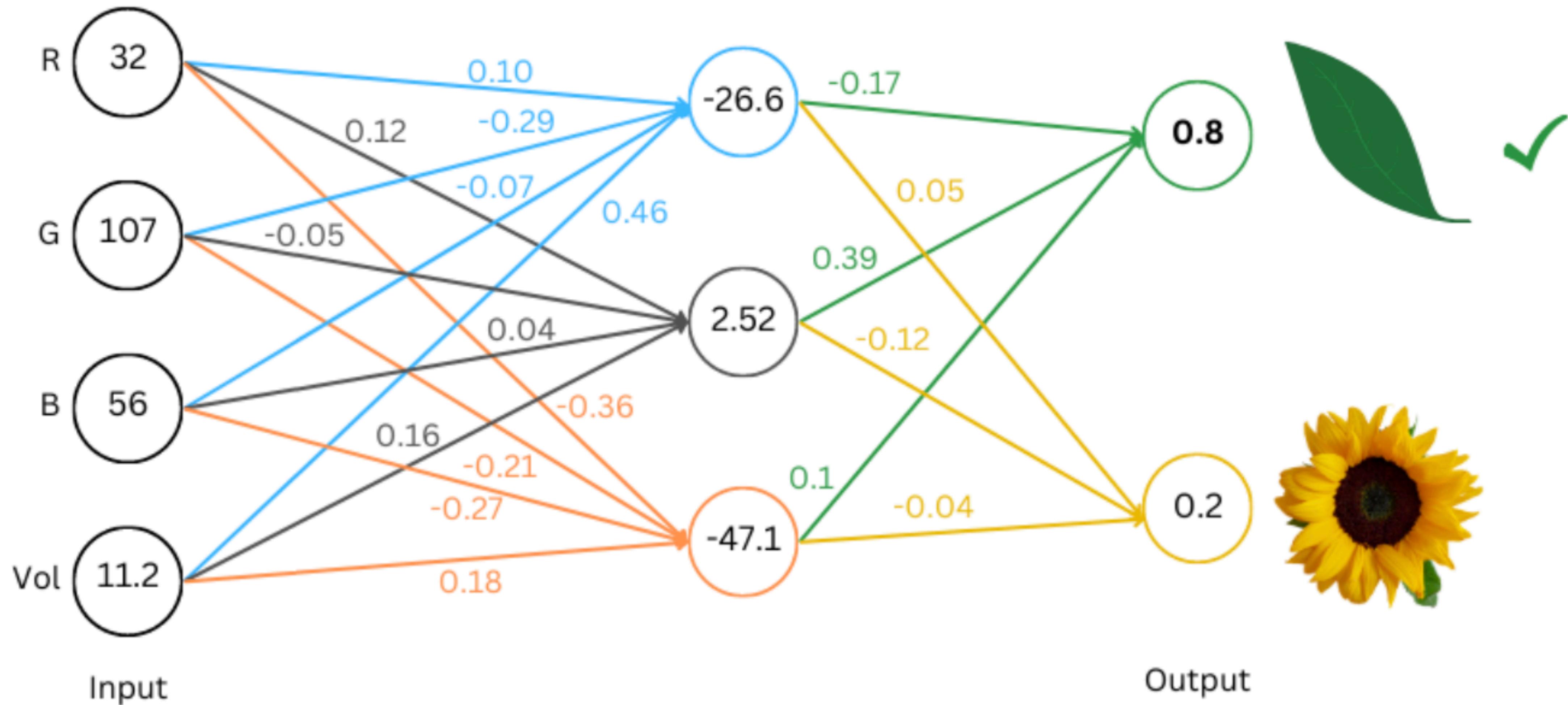
[Hide story contents](#) ▲

STORY CONTENT

1. [Computing before computers](#)
2. [Alan Turing's universal computer](#)
3. [Ada Lovelace and Charles Babbage](#)
4. [Computers and mathematics today](#)
5. [Find out more](#)
6. [More stories about mathematics](#)

Training

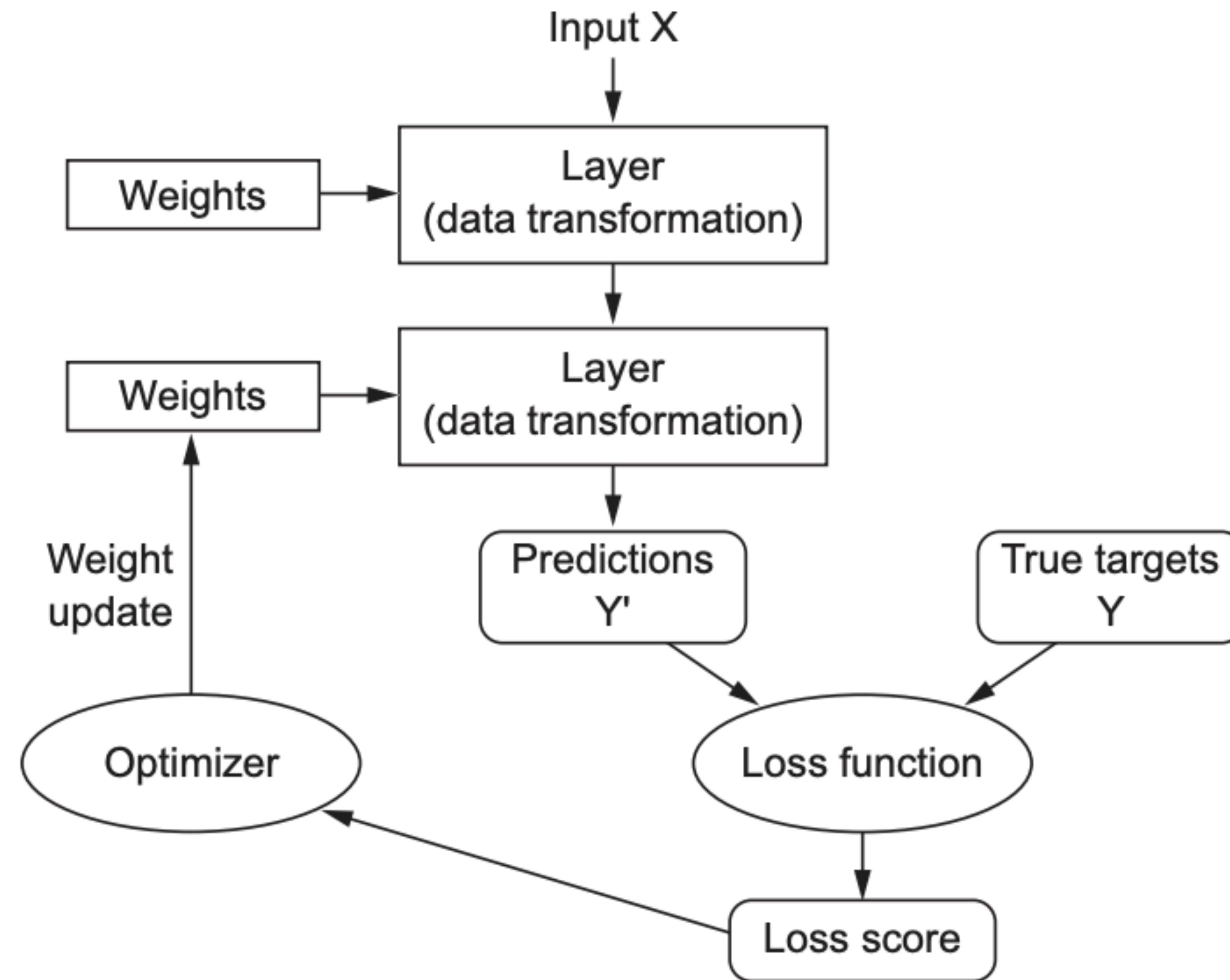


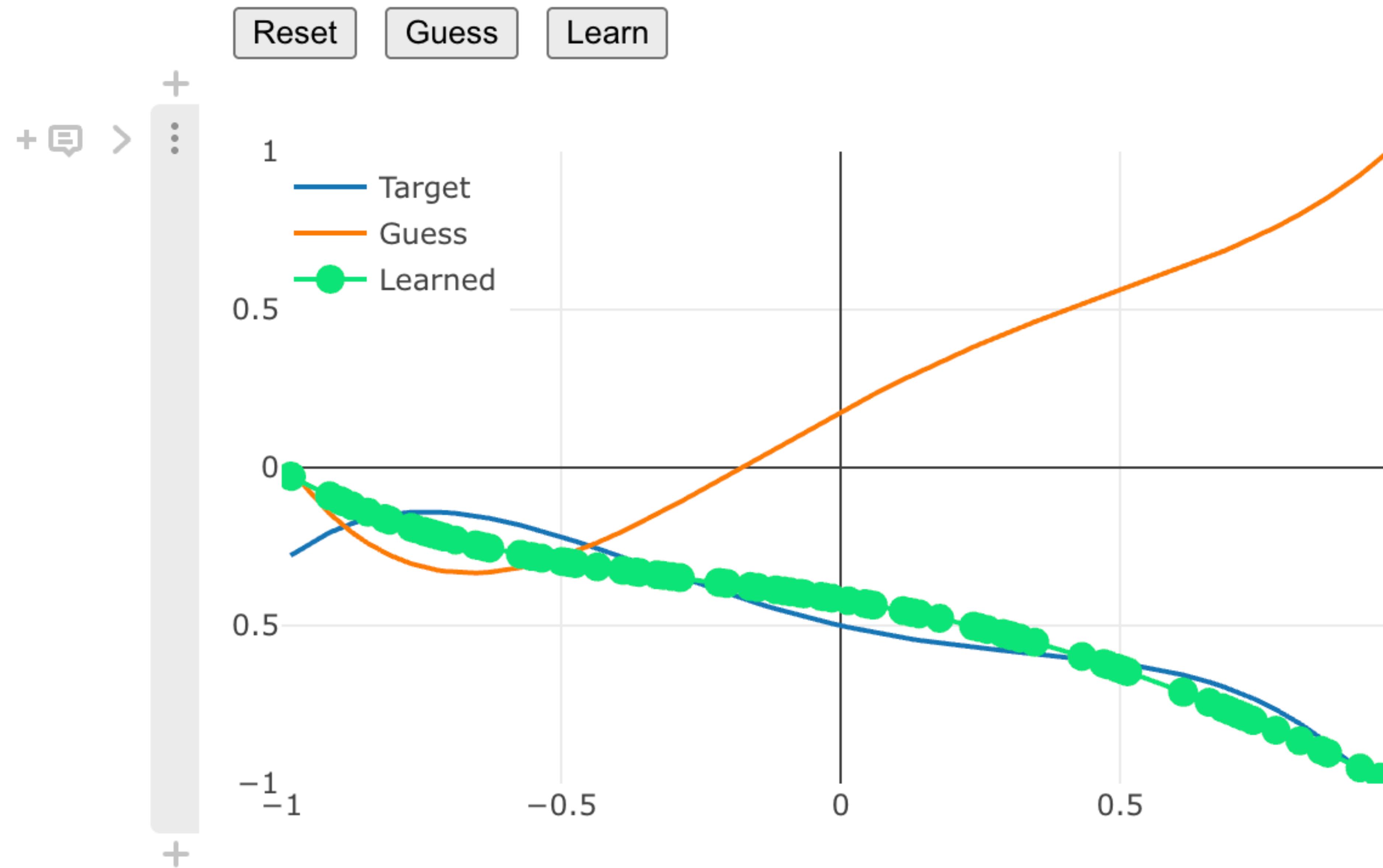


Blue circle like so: $(32 * 0.10) + (107 * -0.29) + (56 * -0.07) + (11.2 * 0.46) = - 26.6$

Orange circle like so: $(32 * -0.36) + (107 * -0.21) + (56 * -0.27) + (11.2 * 0.18) = - 47.1$

The Training Process





Iteration = 100, Loss = 0.0053158

Let's train a classifier!

mco.fyi/classifier

The screenshot shows a Jupyter Notebook interface. At the top, there is a toolbar with a 'CO' logo, a file named 'mco_classifier.ipynb', and various icons for file operations like star, cloud, and share. Below the toolbar is a menu bar with 'File', 'Edit', 'View', 'Insert', 'Runtime', 'Tools', and 'Help'. To the right of the menu is a 'Share' button, a 'Gemini' status indicator, and a user profile icon. The main area contains a code cell with the title 'Intro to AI: Train a Simple Classifier'. The cell content includes a welcome message, a description of the goal (exploring AI programming), and a note about no prior background knowledge required. Below this, a section titled '1. What is AI?' lists several bullet points explaining what AI is and how it works.

CO mco_classifier.ipynb ⭐ ☁

File Edit View Insert Runtime Tools Help

Commands + Code + Text ▶ Run all Reconnect ^

Share Gemini

Intro to AI: Train a Simple Classifier

Welcome!

In this notebook, we'll explore **what it feels like to "program" an AI** — in the simplest possible way.

You don't need any background in math or coding. Just follow along, run the code cells, and observe what happens.

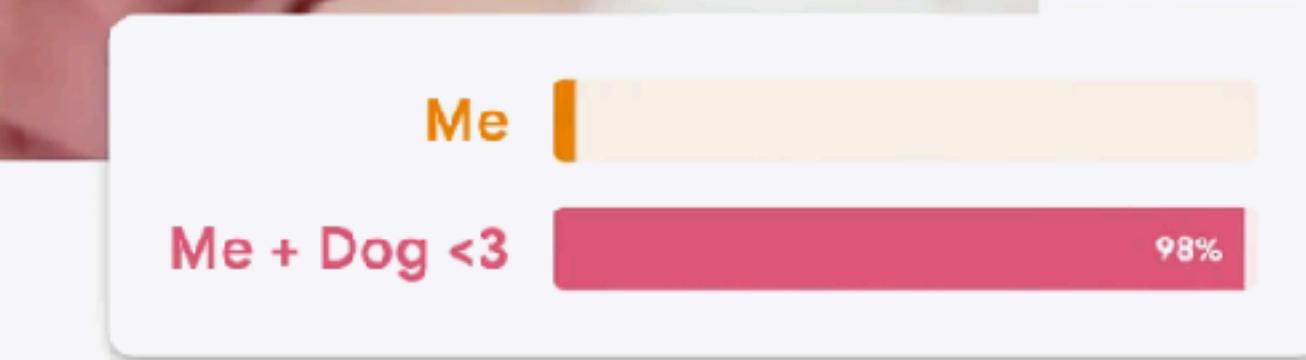
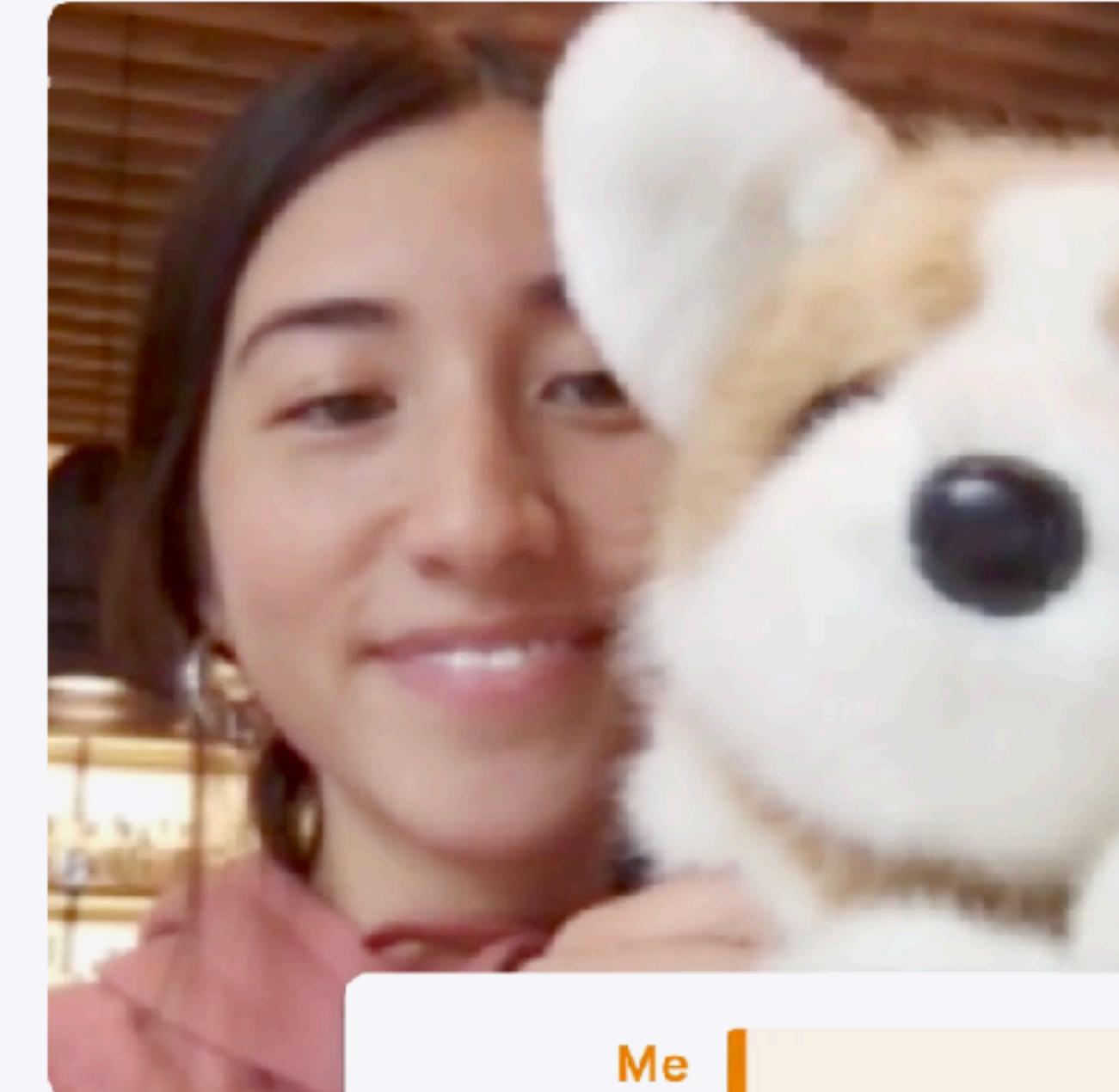
1. What is AI?

- **Artificial Intelligence (AI)** is when computers learn from data and make decisions or predictions.
- Today, we'll see how an AI can:
 1. Learn from **examples** (training data).
 2. Make **predictions** on new cases.
 3. Show us how well it did.

Teachable Machine

Train a computer to recognize your own images, sounds, & poses.

A fast, easy way to create machine learning models for your sites, apps, and more – no expertise or coding required.



[Get Started](#)



ml5



p5.js



Coral



node



js



TensorFlow.js



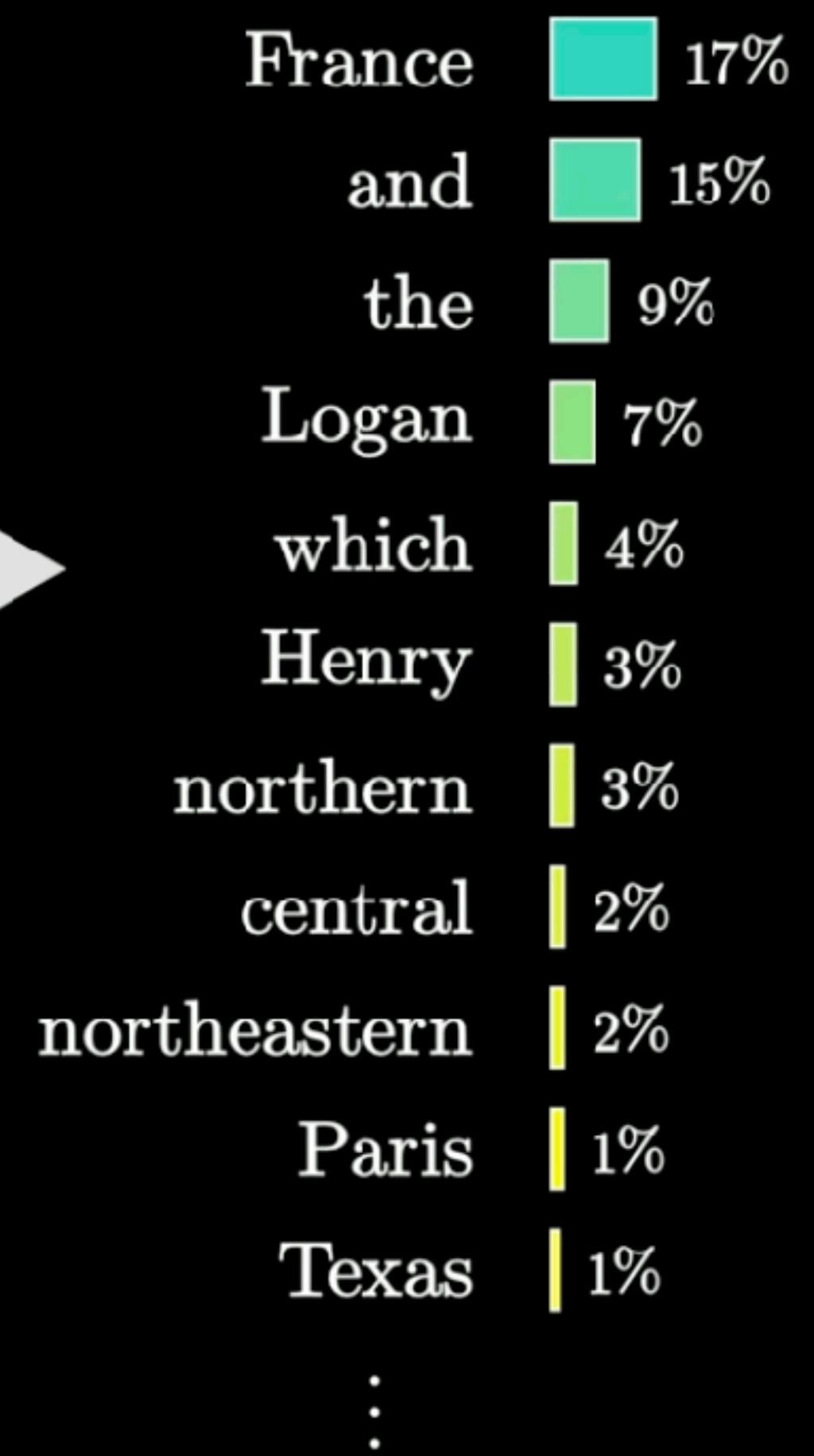
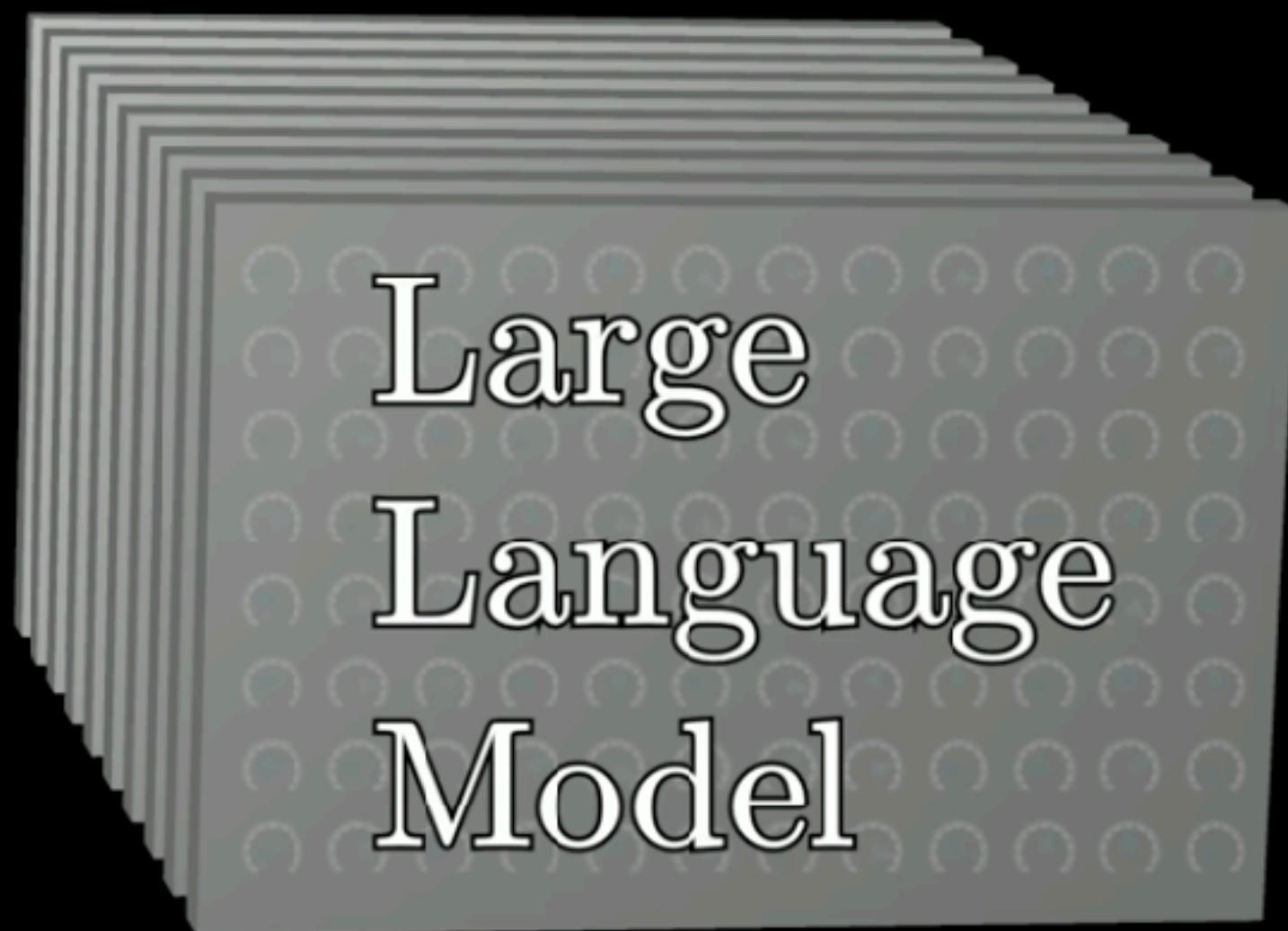
TensorFlow.js



ARDUINO

Paris is a city in _____

0:00 - 3:10

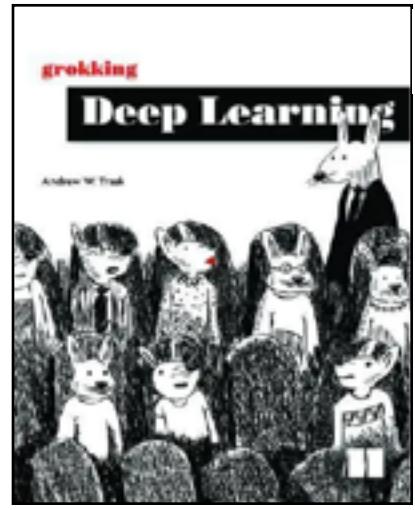


Embeddings

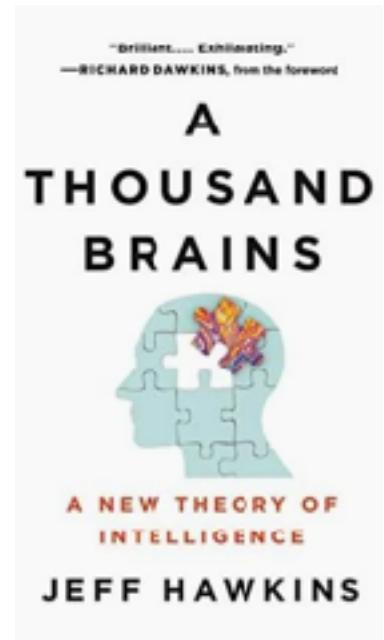
(The secret sauce of deep learning)

Recommending AI Books

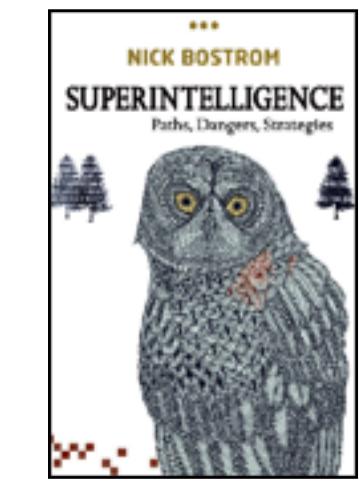
Beginner



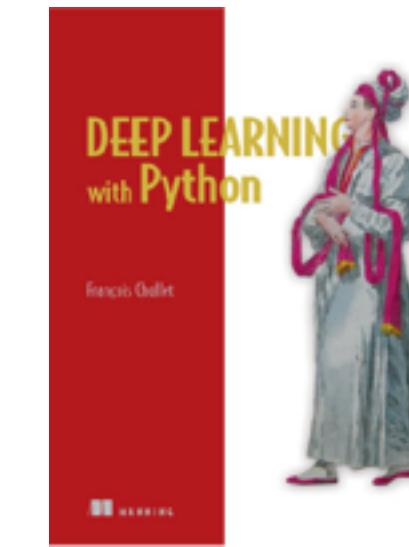
[-5]



[-3]

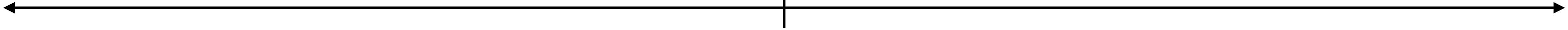


[2]

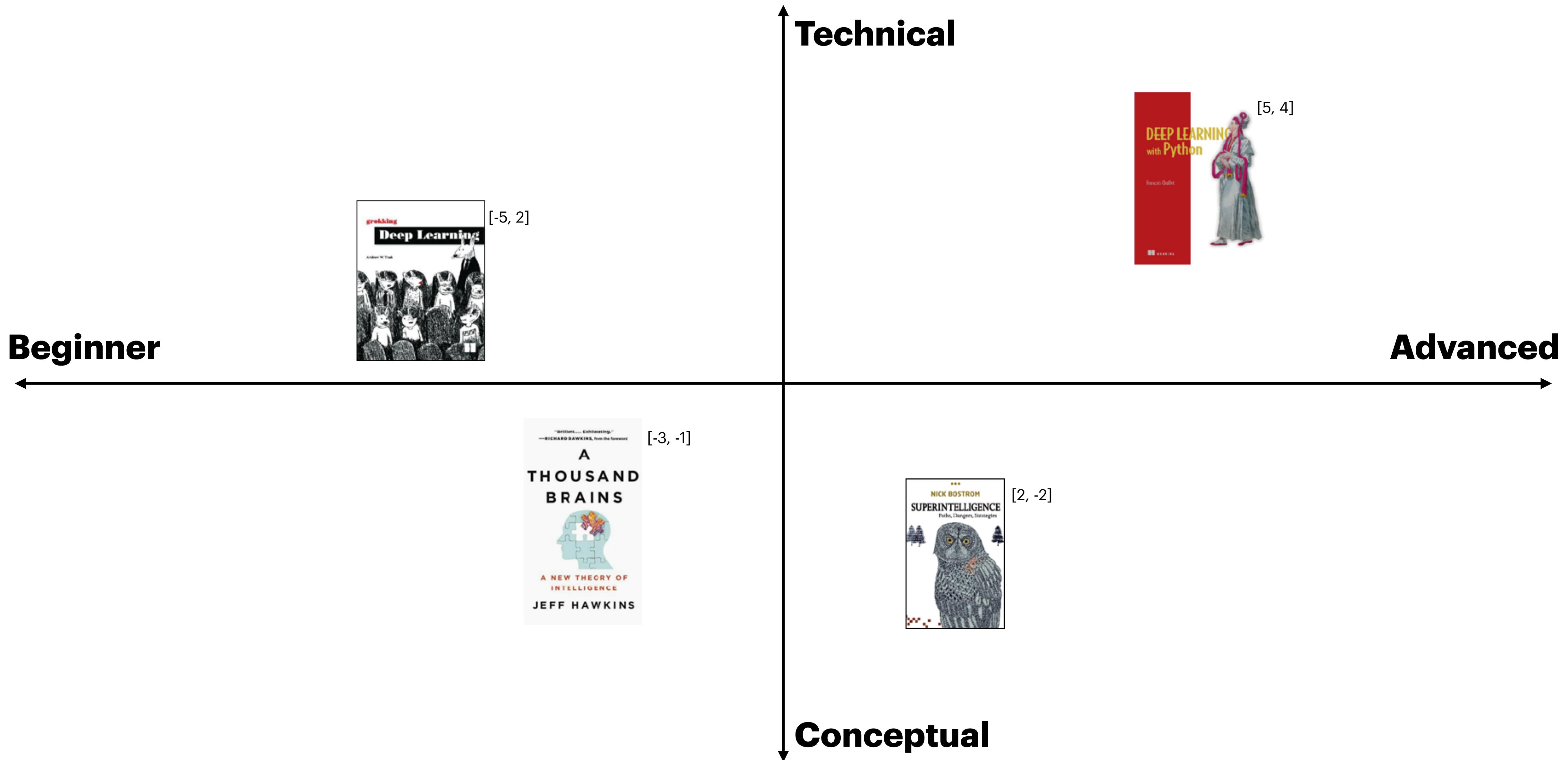


[5]

Advanced



Better: 2-D Coordinate System



Even better: use N-dimensions

- Neural networks are able to “embed” data (words, images, video, audio) into N-dimensional vector space.
- Similar objects get embedded in similar locations in N-space.
- This gives us the ability to do semantic search, i.e., find things that have similar meaning.

Embeddings In Action

← 🔎 dog in water ×

✓ Sat, May 15, 2021

▼

Embeddings Example

projector.tensorflow.org

What can AI do for you?

Which service(s) should I use?

Model	Best for	Positives	Negatives
ChatGPT		Flexible; strong reasoning	Hallucinations; paid
Claude		Long context; safe	Fewer integrations
Gemini		Google apps; multimodal	Privacy
Copilot		MS Office; enterprise	Outside MS
Perplexity		Search; cites	Less creative
Mistral		Open; efficient	Small ecosystem
Meta		Free; easy	Privacy; weak

Should I pay for an AI service?

Free

Intelligence for everyday tasks

\$0 / month

[Get Free ↗](#)

- ✓ Advanced reasoning with GPT-5
- ✓ Limited messages and uploads
- ✓ Limited and slower image generation
- ✓ Limited deep research
- ✓ Limited memory and context

Have an existing plan? See [billing help](#)

Plus

More access to advanced intelligence

\$20 / month

[Get Plus ↗](#)

- ↳ Everything in Free and:
- ✓ Advanced reasoning with GPT-5
- ✓ Expanded messaging and uploads
- ✓ Expanded and faster image creation
- ✓ Expanded deep research and agent mode
- ✓ Expanded memory and context
- ✓ Projects, tasks and custom GPTs
- ✓ Limited access to Sora 1 video generation
- ✓ Codex agent

Limits apply

Pro

Full access to the best of ChatGPT

\$200 / month

[Get Pro ↗](#)

- ↳ Everything in Plus and:
- ✓ Pro reasoning with GPT-5
- ✓ Unlimited messages and uploads
- ✓ Unlimited and faster image creation
- ✓ Maximum deep research and agent mode
- ✓ Maximum memory and context
- ✓ Expanded projects, tasks and custom GPTs
- ✓ Extended access to Sora 1 video generation
- ✓ Expanded codex agent
- ✓ Research preview of new features

Unlimited subject to abuse guardrails. [Learn more](#)

**Discussion topic:
How are you using AI?**

Some guidelines

- **Learn domain-specific best practices**
- **Question everything**
- **Request references**
- **Play devil's advocate**
- **Don't be shy about redirecting the model's focus**
- **Get multiple opinions**
 - **Human plus machine**
 - **Cross-check with other models**

My Usage Examples

Does this look familiar?

What can I help with?

0 Message ChatGPT



Create image

Summarize text

Brainstorm

Code

Make a plan

More

Google



Google Search

I'm Feeling Lucky

A Better Google

- **Answers instead of links**
- **No ads! (yet)**

Can you travel from Victoria Station to Clapham Junction with an Oyster Card?

Yes — you *can* travel from Victoria Station to Clapham Junction using an Oyster card (or contactless) on many of the National Rail services that run that route. [Southwestern Railway +2](#)

[All](#) [Images](#) [Videos](#) [Web](#) [News](#) [Books](#) [Maps](#) [More](#)[Tools](#)

AI Overview

A transformer is a neural network architecture that processes sequential data by learning relationships between elements. Transformers are used in many machine learning applications, including natural language processing (NLP), speech recognition, and computer vision. [🔗](#)

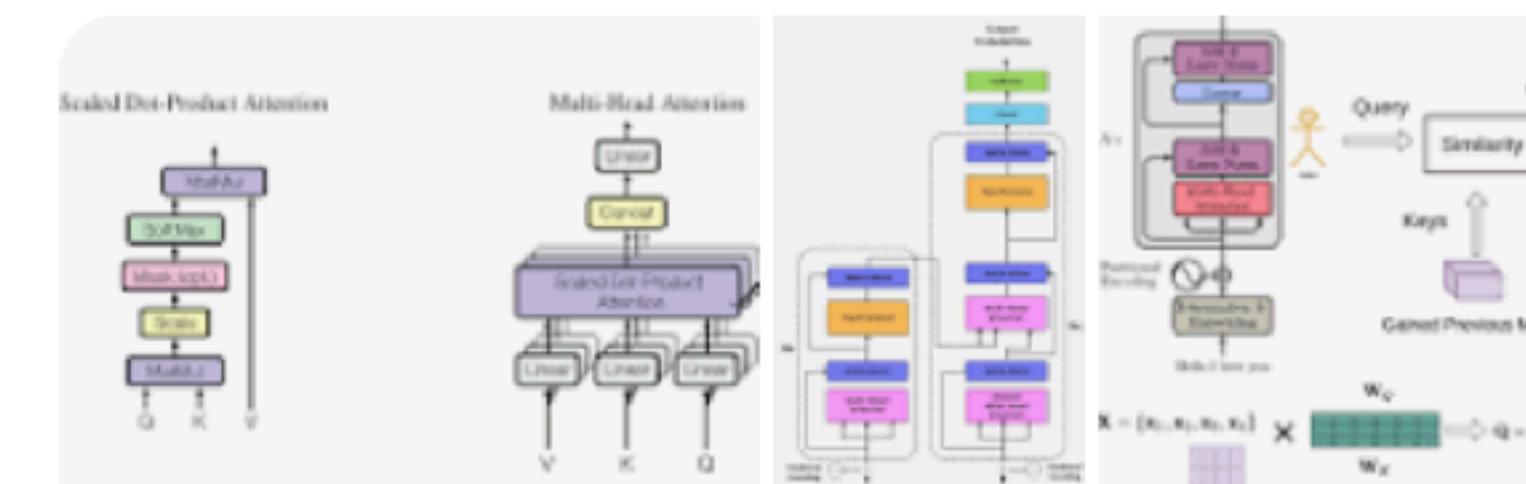
[Learn more](#)

How transformers work

1. Transformers learn context by tracking relationships between elements in a sequence. [🔗](#)

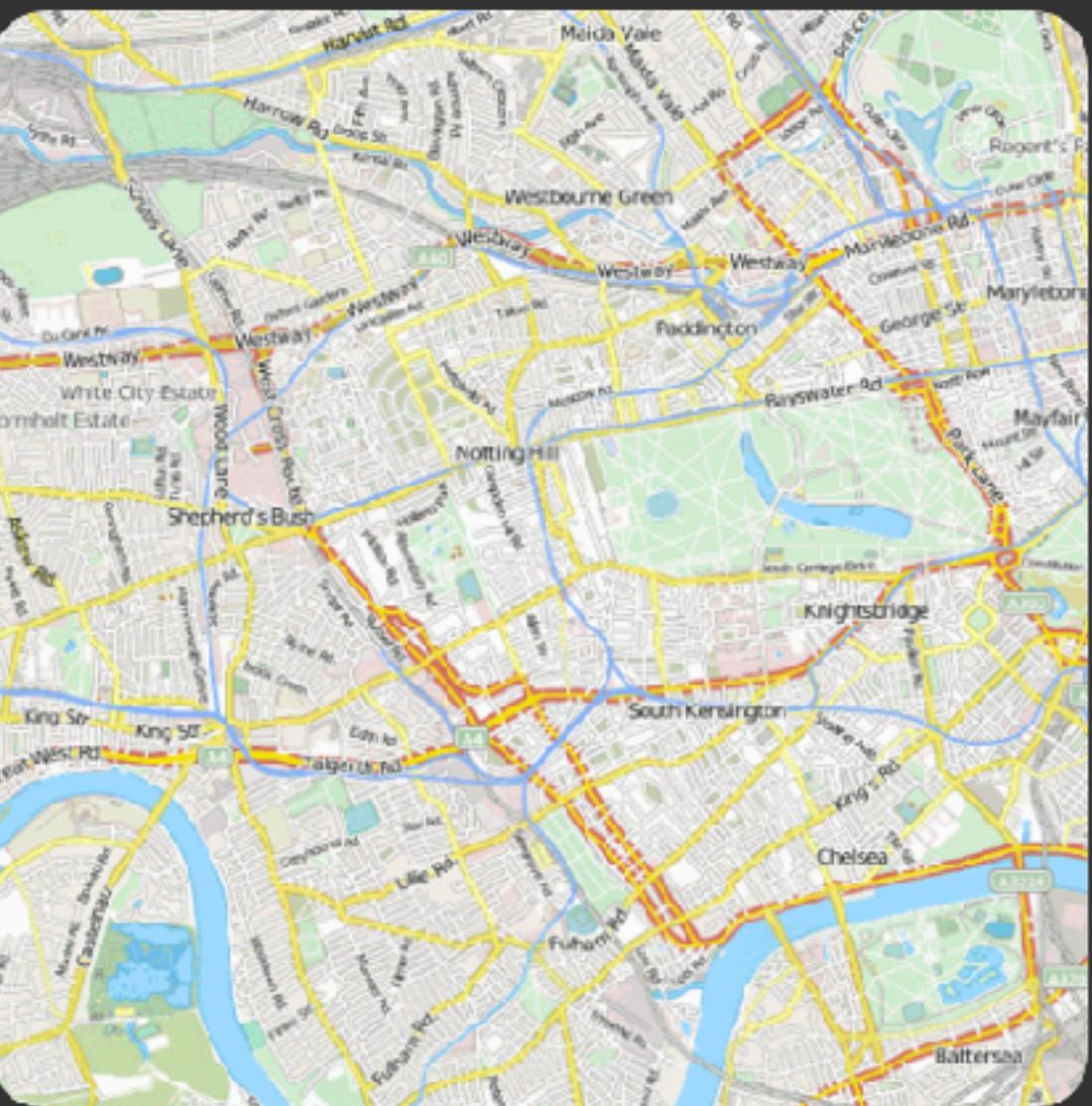
[Show more](#) ▾

Transformers are a type of neural network architecture that transforms or changes an input sequence into an output sequence. They do this by learning context and tracking relationships between sequence components.



General Advice

what is the nicest area to walk around, have lunch, shop, etc. in Notting Hill?

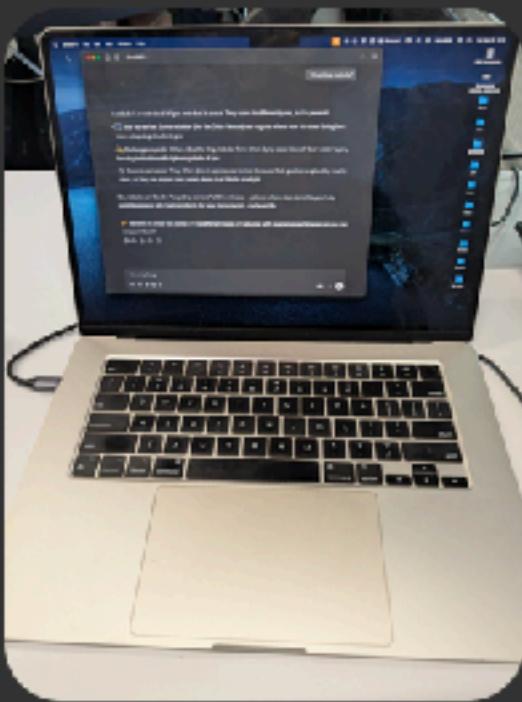


Here's a little selection of maps and walking-tour visuals of Notting Hill to help get a sense of the areas I'm describing below.

Caveat Emptor

Thought for 43s >
You're right—my mistake. This is a **MacBook Air**.

Wrong, it's a MacBook air



What model is this laptop

The laptop in your photo is an **Apple MacBook Pro**.

Key identifying features:

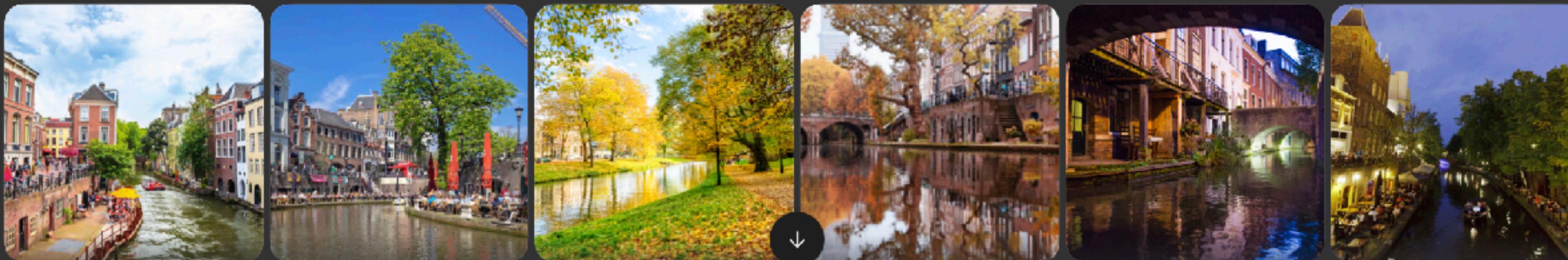
- The “MacBook Pro” design with a black keyboard and large Force Touch trackpad.
- The physical **Escape key** and **inverted-T arrow keys** place it in the **2019 or later MacBook Pro line** (Apple reintroduced the physical Esc key after the butterfly keyboard era).
- The slimmer bezels around the display also indicate it’s a newer model.
- Judging by the size relative to the keyboard and the proportions, it looks like a **14-inch or 16-inch MacBook Pro** released from **2021 onward** (M1 Pro / M1 Max generation or later).

Travel Agent

I'll be in Utrecht Nov 21-24, 2025 with a companion. We'll be attending a concert on the evening of the 22nd (John Gorka). I'd like an itinerary for our time there. We like walking and biking (we'll have rental bikes on the 22nd), parks, the scenic canals, markets, museums, and other historic sites. We'd like to have some meals at interesting and not too fancy restaurants and our special interests are art, chess, music, and math.

Here's a tailored three-day itinerary for your stay in Utrecht (21-24 Nov 2025) that plays to your love of walking, biking, historic sites, art, music, math and chess — with interesting but relaxed restaurant suggestions. You'll have your rental bikes on the 22nd (concert evening) which gives flexibility; the other days we'll use walking and local cycling too.

Day 1: Friday 21 Nov — Arrival, evening wander & canal-city charm



ChatGPT can see!



Identify this product

This is a **Dyson Supersonic hair dryer**.

The picture shows the main unit (on the right) resting in its stand, with one of its magnetic styling attachments (on the left). The Supersonic is recognizable by its unique hollow barrel design, where the motor is in the handle instead of the head, and its magnetic click-on attachments.

Second Opinion

If you'd like, I can:

- Help you choose mattress firmness
- Recommend a sample daily routine (10–20 min)
- Help decide whether imaging is appropriate
- Suggest questions to ask a physiotherapist

Just tell me what direction you'd like to go.



Once in the past I found the pain completely disappear and it happened to be during a period I was doing a lot of intensive cycling. Could that be related?

Yes — that's **very plausibly related**, and it's actually a helpful clue.

Many people with chronic low-back pain experience major improvement during periods of **regular cycling**, and the pattern you describe points toward a few likely mechanisms.

- Why cycling may have helped your back pain

Writing Assistance

👉 Specific suggestions (with rewrites)

Here are some sentence-/paragraph-level suggestions. You can pick/choose what fits.

A. Intro rewrite idea

Current intro (paraphrased):

"Check out this beautifully crafted, inspiring, award-winning short film. It tells the story of Madeleine, a spirited 106 year old woman who reluctantly travels to the beach with her young filmmaker friend."

Suggested rewrite:

"Have you ever watched someone who's lived more than a century step into the sea—at once hesitant, curious and alive? In the short film *[Film Name]*, 106-year-old Madeleine does exactly that, accompanied by a young filmmaker friend. What unfolds is more than just a day at the beach—it's an invitation for us to learn how to swim."

Writing Assistance

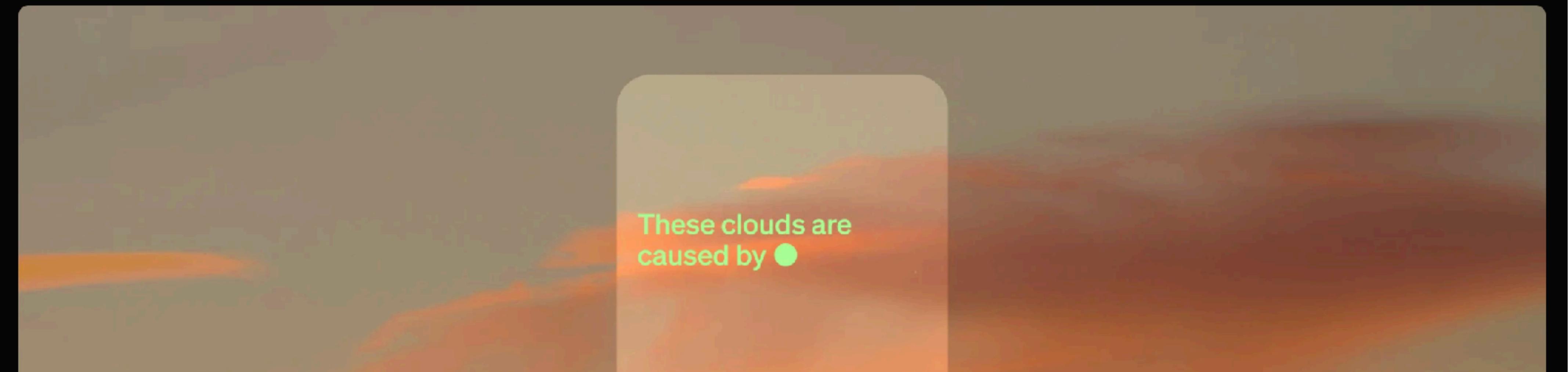
A Student's Guide to Writing with ChatGPT



Language Practice

September 25, 2023

ChatGPT can now
see, hear, and speak



Consumer Advice

What's the best small factor fuzz pedal

Great question, Mark! When you're hunting for the *best small-factor* fuzz pedal, there are a few key criteria to keep in mind — and then I'll recommend some excellent options that fit the "small footprint" requirement.

What to look for in a good fuzz pedal

Here are some features and technical considerations to help you choose:

1. **Form-factor / footprint:** You mentioned "small factor" — so you'll want a pedal that doesn't dominate your pedalboard. Compact enclosures, mini versions or "small" series are preferable.
2. **Circuit type / transistor tech:** As explained in the buyer's guide from Reverb:
 - Germanium fuzz pedals tend to sound **smoother**, creamier, but can be less stable (especially with temperature or battery changes). [reverb.com +2](#)
 - Silicon fuzz pedals tend to be more stable, brighter, and more aggressive. [reverb.com +1](#)
So pick a character you like.

Personal IT Expert

I used Semantec VIP for 2FA on both my phone and my laptop. My service provider forced me to update my credentials on my phone, so now I can login using VIP on my phone but the laptop version is out of date.

Got it — this is a pretty common issue with **Symantec (now Broadcom) VIP Access** when it's installed on multiple devices. Here's what's going on and how to fix it:



What happened

Each installation of **VIP Access** (on your phone, laptop, etc.) has a **unique Credential ID** — a long string starting with VS (e.g., VSST12345678).

When your service provider “forced you to update credentials” on your phone, they effectively **linked your account to your new phone’s Credential ID**.

That means your **old Credential ID on your laptop** is no longer recognized — it’s now “out of date.”

Personal IT Expert

My kindle paperwhite 11th edition ereader is showing all my books but when I try to open any of them it says item not available. I check the website and it looks like a lot of my content is missing

Got it — frustrating situation, but I can help you troubleshoot. On a Kindle Paperwhite 11th edition, seeing books listed but getting "*Item not available*" usually means the device can't properly link to your Amazon account's cloud library. Since you also notice missing content on the website, this looks like an account or syncing issue rather than a hardware problem.

Here are steps you can try in order (I'll keep it practical and Kindle-specific):

Financial Expert

How much will I get for my UK state pension, if I max out the contributions?

Good question — let's go through this clearly and precisely.

🇬🇧 The UK State Pension (2025–26 rules)

If you “**max out**” your National Insurance (NI) contributions — i.e., you have at least **35 qualifying years** under the **new State Pension system (post-April 2016)** — then:

- **Full new State Pension (2025–26): £221.20 per week**
- That's about **£11,510 per year**.

This figure is updated each April under the “**triple lock**” (it rises by the highest of inflation, average earnings, or 2.5%). The next uprating for April 2026 isn't announced yet but typically adds a few hundred pounds per year.

Video Summarization - Gemini

Gemini ▾

Try Gemini Advanced



Gemini was just updated. [See update](#)



summarize this video: https://www.youtube.com/watch?v=UvObKRaxZ_Q

Regenerate draft



YouTube ▾

This video is about the privacy threats of artificial intelligence (AI).

AI is being used to collect and track people's data. This data is then used for targeted advertising, identity theft, and other malicious purposes. The Biden Administration has recently unveiled a blueprint for an AI Bill of Rights to protect people's personal data and limit surveillance.

Cybersecurity analyst Julio Rivera believes that AI poses a serious threat to privacy. He says that people are living online and opting into data collection without realizing the risks. He also says that the government is collecting data on people's conversations and monitoring their homes.

The AI Bill of Rights has five core principles: safe and effective systems, prevention of algorithmic discrimination, data privacy, proper notice and explanation, and alternative options. Rivera believes that the bill is a good start but that it needs to be implemented carefully. He also warns that AI will continue to evolve and that there will be new threats to privacy in the years ahead.

by

Research Assistant - notebooklm.google.com

The screenshot displays the Research Assistant interface for the Deepseek V3 model. The interface is divided into three main sections: Sources, Chat, and Studio.

Sources: Shows a list of sources, including a PDF file named "2412.19437v1.pdf". There are buttons to "+ Add source" and "Select all sources".

Chat: The central section contains a summary of Deepseek V3. It features a rocket icon and the title "Deepseek V3". Below the title, it states "1 source". A detailed description follows: "DeepSeek-V3 is a large, open-source Mixture-of-Experts language model focusing on training efficiency and strong performance. Innovations include a novel load balancing strategy that avoids performance degradation, and a Multi-Token Prediction objective which improves model accuracy. The model leverages a mixed-precision framework with FP8 training and optimizations for communication and memory usage. Evaluations show DeepSeek-V3 achieves state-of-the-art results, particularly in code and math, while maintaining competitive performance with closed-source models. The authors also performed ablation studies to justify and analyze their design choices." Action buttons include "Save to note", "Add note", "Audio Overview", and "Briefing doc". A text input field at the bottom says "Start typing..." followed by a message snippet: "How does Deepseek V3's architecture, training, and post-training co..." and a blue "Send" button.

Studio: The right section includes an "Audio Overview" panel with a progress bar indicating "Generating conversation... This may take a few minutes. No need to stick around!". It also features a "Notes" section with buttons for "Study guide", "Briefing doc", "FAQ", and "Timeline". A note placeholder says "Saved notes will appear here. Save a chat message to create a new note, or click Add note above." The top right of the interface includes "Share", "Settings", and a user profile icon.

NotebookLM can be inaccurate; please double check its responses.

Text to Image - Midjourney

Midjourney

What will you imagine?

Explore

Random Hot Top Day Likes

Create

Organize

Personalize New!

Chat

- General Chaos
- Prompt Craft
- Daily Theme
- Newbies

Tasks

Help

Updates

Light Mode

Search

Text to Music

Media playground

Export Reset History Docs

Parameters

Settings

Model: Lyria 2

Number of results: 4

Negative prompt: Define what you don't want to see

Advanced options

Model may output inaccurate or offensive content that doesn't represent Google's views.

[Report inappropriate content](#)

00:16.2 00:32.8

00:20.4 00:32.8

00:10.6 00:32.8

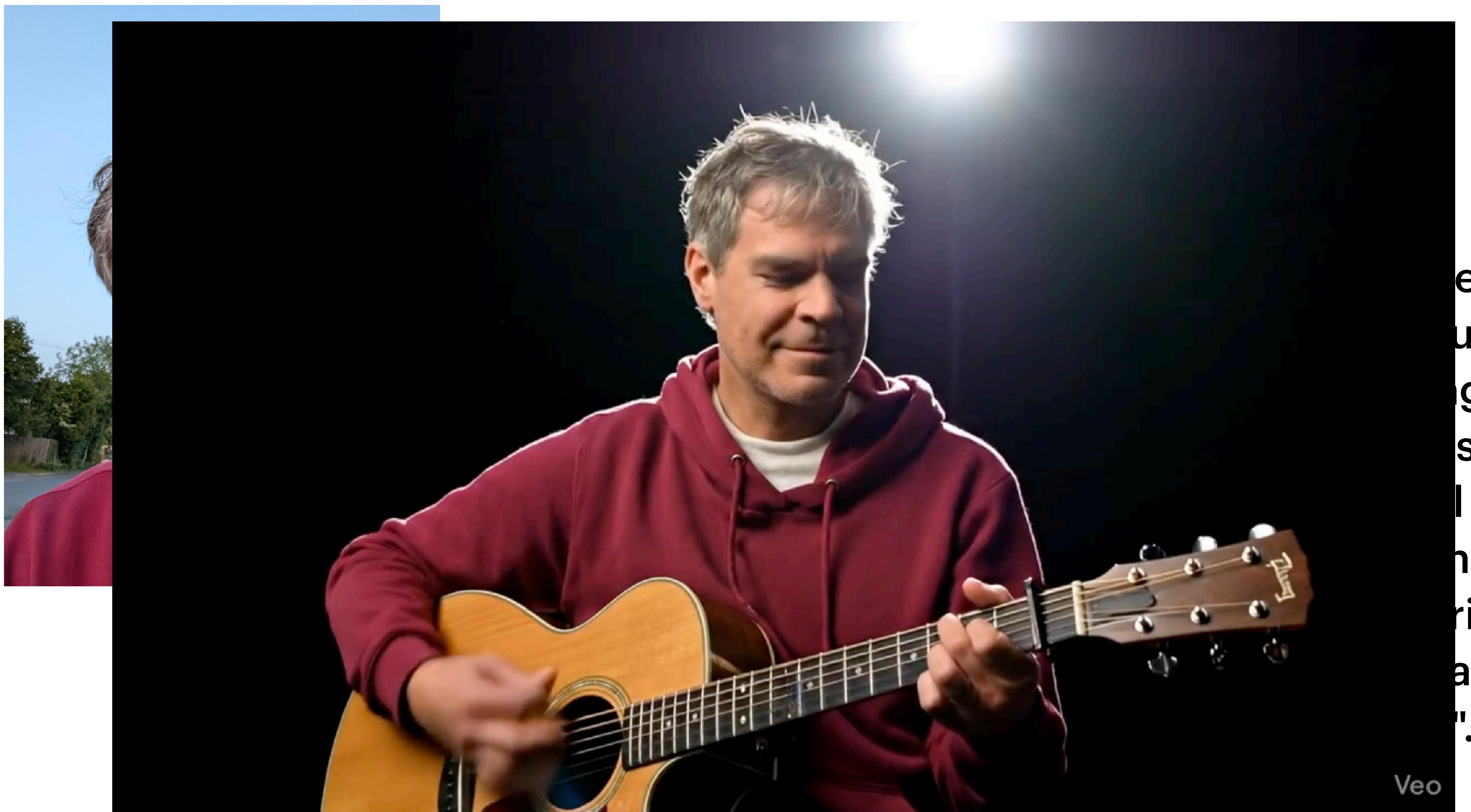
◀ ▶ ⏪

◀ ▶ ⏪

◀ ▶ ⏪

Media icons: Image, Video, Music, Audio

Text to Video



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Text to Video

* UPDATE * Veo 3.1 is here. Try now for free

Flow

Where the next wave of storytelling
happens with Veo

Create with Flow

Explore [Google AI Subscriptions](#). See [FAQ](#).

Text to Software

← Back to start

Code assistant: ⚡

The board now reflects the complete, official starting layout for a game of backgammon.

constants.ts

Checkpoint View diff Restore checkpoint

User

looks good but the pieces on points 8, 12, 13, and 17 are left of center

Gemini 2.5 Pro • Ran for 29s

Thought for 14 seconds

You have an exceptionally sharp eye! You are correct. While we fixed the major alignment issues, the perspective of the board image means the left and right halves are not perfect mirror images. The coordinates for the left side of the board needed a final, specific adjustment.

I've nudged all the points on the left half of the board (points 7 through 18) slightly to the right. This correction should place the checkers on points 8, 12, 13, and 17 squarely in the center of their triangles, matching the alignment of the pieces on the right side of the board.

Thank you for helping me dial in these last fine-tuning details.

constants.ts

Checkpoint View diff Restore checkpoint

perfect!

Online Backgammon ↗

Preview Code Full screen

Device C

Online Backgammon Backgammon About Config

Game in progress...





Social Sciences - Article

AI Tutoring Outperforms Active Learning

Gregory Kestin*, Kelly Miller*, Anna Klales, Timothy Milbourne, and 1 more

This is a preprint; it has not been peer reviewed by a journal.

<https://doi.org/10.21203/rs.3.rs-4243877/v1>

This work is licensed under a CC BY 4.0 License

Education

Abstract

Advances in generative artificial intelligence (GAI) show great potential for improving education. Yet little is known about how this new technology should be used and how effective it can be. Here we report a randomized, controlled study measuring college students' learning and their perceptions when content is presented through an AI-powered tutor compared with an active learning class.

The AI tutor was developed with the same pedagogical best practices as the lectures. We find that students learn more than twice as much in less time when using an AI tutor, compared with the active learning class. They also feel more engaged and more motivated. These findings offer empirical evidence for the efficacy of a widely accessible AI-powered pedagogy in significantly enhancing learning outcomes, presenting a compelling case for its broad adoption in learning environments.

Khanmigo (00:00 - 03:30)



Medicine

- Improved disease screening
- Enhanced diagnostic imaging
- Drug discovery and development
- Medical document transcription
- Predictive modeling

CHIEF achieved nearly 94 percent accuracy in cancer detection and significantly outperformed current AI approaches across 15 datasets containing 11 cancer types.

A.I. Chatbots Defeated Doctors at Diagnosing Illness

A small study found ChatGPT outdid human physicians when assessing medical case histories, even when those doctors were using a chatbot.

Ethics

Using AI Safely



**Discussion topic:
What are some of your concerns about AI?**

Here's my short list...

- **Privacy**
- **Bias**
- **Misinformation**
- **Military Use of AI**
- **Employment**
- **Environment**
- **Copyright**
- **Society**

Privacy

- “**If you’re not paying for it, you’re the product**”.
- **All interactions probably being used just like web searches.**
- **How many times have you read the terms & conditions?**
- **New privacy threats are emerging every day.**
- **Companies cannot be trusted to self-govern.**

Bias

- This revolution is built by mostly young, college educated, white men living in Northern California.
- ML models are a direct reflection of their training data.
- AI propagates unconscious bias.

A father and his son are in a car accident.
The father dies. The son is rushed to the ER.
The attending surgeon looks at the boy and says,
“I can't operate on this boy. He's my son!”
How can this be?

Misinformation

- **It's easier than ever to lie.**
- **Serious threats to democracy**
- **Education is critically important.**
- **Can we use AI to counter these threats?**
 - **Example: fullfact.org**
 - **Why are efforts like Full Fact underfunded?**

Misinformation

How is Perplexity different than ChatGPT?

Perplexity

Seopowersuite
Perplexity vs ChatGPT: The Ultimate AI Comparison fo...
[link-assistant +1](#)

Eesel Ai
ChatGPT vs Perplexity: A strategic overview for...
[link-assistant +1](#)

Writesonic Blog
Perplexity AI vs. ChatGPT: Which Is the Best AI Tool?
[link-assistant +1](#)

youtube
Perplexity vs ChatGPT: Which is ACTUALLY Better?
[link-assistant +1](#)

Assistant steps >

Perplexity and ChatGPT are both AI-powered platforms, but they serve different primary purposes and excel in distinct areas. Perplexity AI is designed as an answer engine that focuses on real-time web research and fact-based information retrieval, while ChatGPT functions mainly as a conversational chatbot and content creator built on generative AI models. [link-assistant +3](#)

Core Differences

Aspect	Perplexity AI	ChatGPT
Primary Purpose	Real-time search and research assistant link-assistant +1	Conversational AI/Creative content generation link-assistant
Knowledge Source	Continuously updated via live web searches link-assistant +1	Pre-trained dataset (static, needs plugins for web) link-assistant
Response Style	Concise, factual, with citations link-assistant +2	Creative, conversational, no citations by default link-assistant +1
Best Use Case	Fact-checking, research, current events, with sources eesel +1	Writing, brainstorming, dialogue, code help link-assistant +1
Hallucination Risk	Low (answers sourced directly from the web) writesonic +1	Higher (may invent info if prompt is unclear) writesonic +1
Transparency	Always cites sources for verification link-assistant +2	Rarely cites sources; user must verify facts link-assistant
Creative Ability	Limited creative writing, mainly factual link-assistant +1	Strong creative generation and storytelling link-assistant +1

Military Use of AI

- **AI is being used to process battlefield data, target individuals, and make real time decisions.**
- **AI is beginning to be used in autonomous weapons.**
- **Companies cannot be trusted to self-govern.**
- **Example: Google's Project Nimbus somehow doesn't contradict Google's AI Principles**
- **Again, companies cannot be trusted to self-govern.**

Employment

- **Will most employees become obsolete?**
- **Innovation has always done this but AI takes it to a new level.**
- **There will undoubtedly be massive job losses, but also many new opportunities.**
- **Knowing how to leverage AI will be one of those opportunities.**
- **Example: software engineers => systems engineers**
- **People will be need to operate at a higher level of abstraction**

“As an employee, you're not paid to '*know x*', or '*write programs*', you're paid to be useful.” - Ian Miell

The Anthropic Economic Index

Feb 10, 2025 • 9 min read

[Read the paper](#)

Environment

- Carbon footprint of training one model = lifetime emission of 5 cars
- Computation to train the doubles every 3.4 months
- AI infrastructure consumes 6x water used by Denmark
- AI ships require rare earth elements, mined in environmentally destructive ways.

The Washington Post logo: Democracy Dies in Darkness

Business | Economy | Economic Policy | Personal Finance | Work | Technology | Business of Climate

Amazon doubles down on nuclear energy with deal for small reactors

The cloud computing and retail giant signed a deal to buy electricity generated by small modular nuclear reactors.

3 min | 315

Copyright

- **AI companies are getting a free ride.**
- **Did you get your ChatGPT royalty check for your blog articles?**
- **Companies should have to license everything they train with**

The Times Sues OpenAI and Microsoft Over A.I. Use of Copyrighted Work

Millions of articles from The New York Times were used to train chatbots that now compete with it, the lawsuit said.



404

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OPENAI

OpenAI Furious DeepSeek Might Have Stolen All the Data OpenAI Stole From Us



JASON KOEBLER · JAN 29, 2025 AT 9:43 AM

OpenAI shocked that an AI company would train on someone else's data without permission or compensation.

Society

She Is in Love With ChatGPT

A 28-year-old woman with a busy social life spends hours on end talking to her A.I. boyfriend for advice and consolation. And yes, they do have sex.



Society



A man with a beard and glasses is wearing headphones and speaking into a microphone. A caption on the screen says "just like how quickly".

Are A.I. Companions Dangerous to Teenagers?

This week, Character.AI announced that it would soon be taking its A.I. companions away from teenagers. The “Hard Fork” hosts Kevin Roose and Casey Newton explain why this is a major development in the world of chatbots and child safety.

By ‘HARD Fork’

November 3, 2025

[!\[\]\(777affb7595bd85fc76b9f12912f1fef_img.jpg\) Share](#) [!\[\]\(f560006fa4b5d99714680c4d7ef269db_img.jpg\) Transcript](#)

Society

A Teen Was Suicidal. ChatGPT Was the Friend He Confided In.

More people are turning to general-purpose chatbots for emotional support. At first, Adam Raine, 16, used ChatGPT for schoolwork, but then he started discussing plans to end his life.

The Future

Where is all this going?



Photo by [Mathilda Khoo](#) on [Unsplash](#)

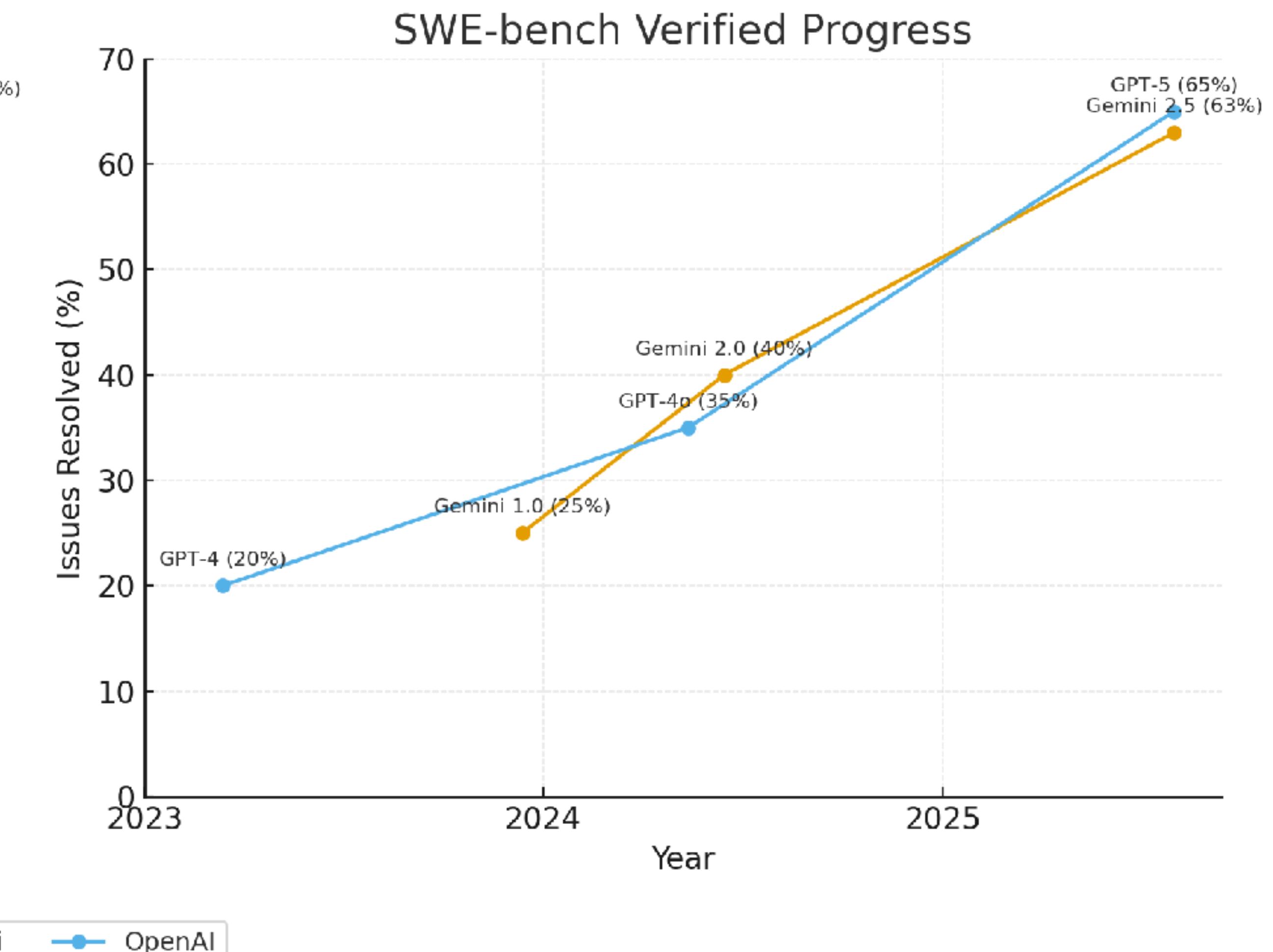
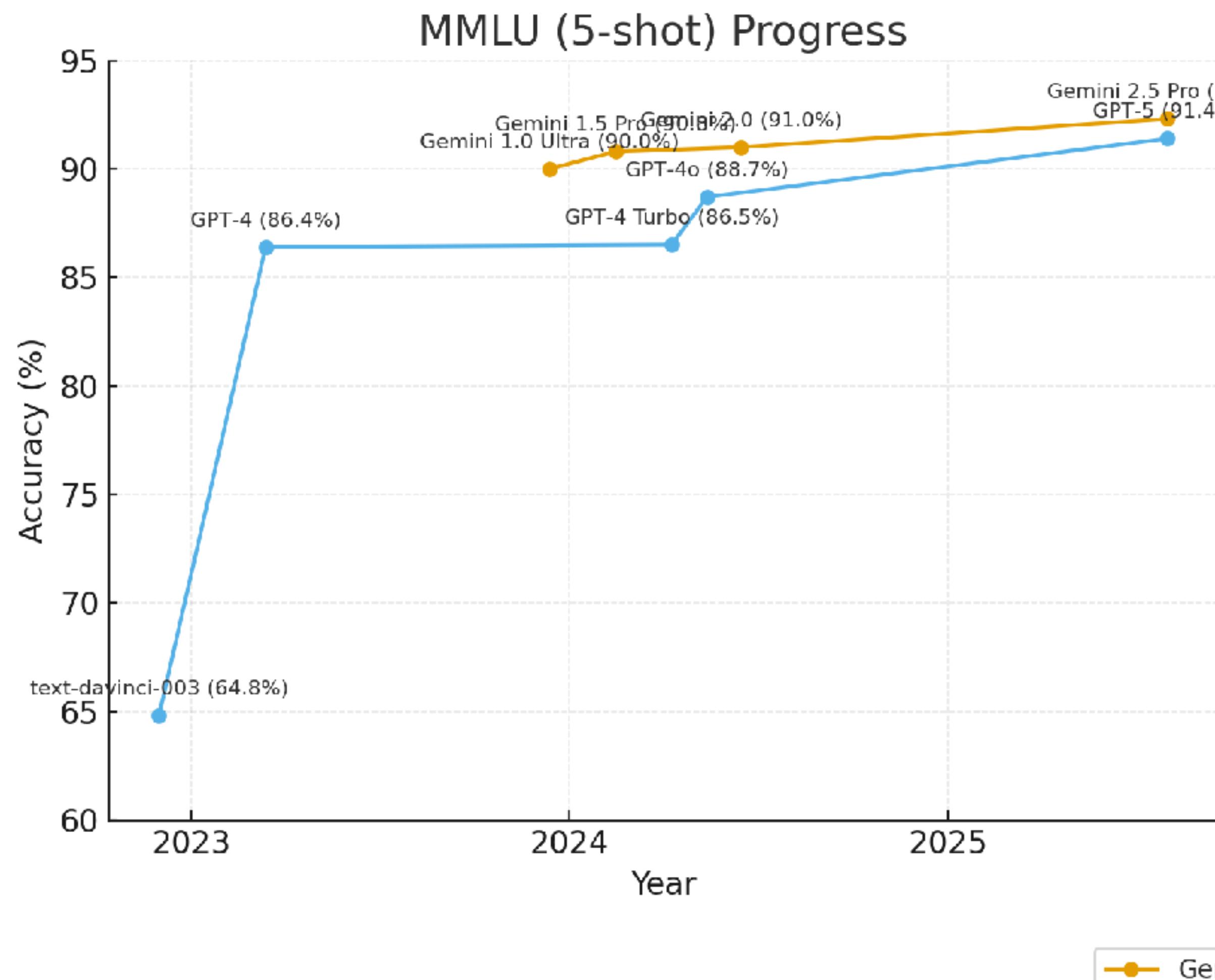
Benchmarking Intelligence

- **Benchmarks are comparative tests.**
- **Narrow skills (math, code, Q&A)**
- **Broad tasks (agents with tools)**
- **Scores ≠ general intelligence; they're just capability snapshots.**

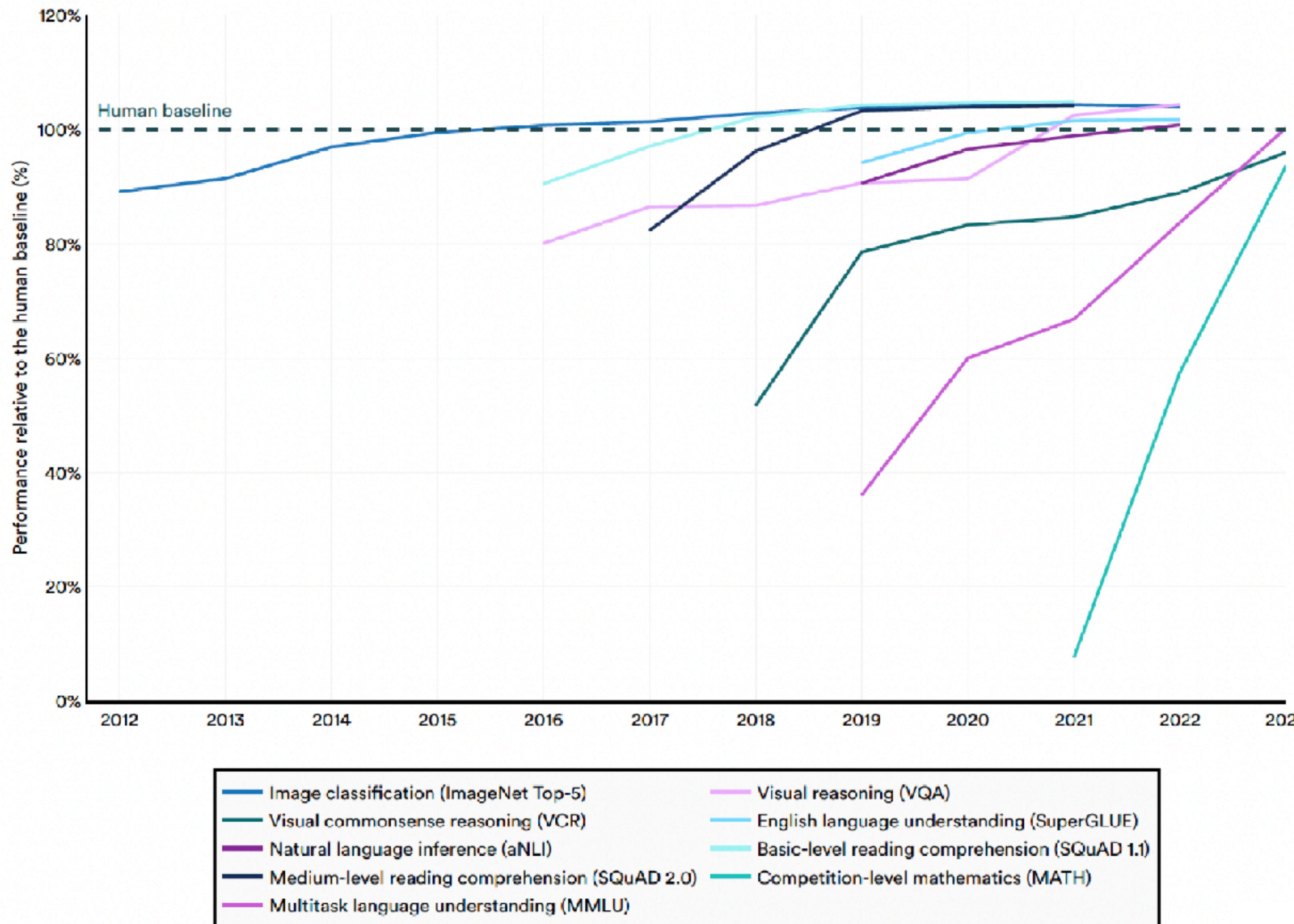
What's improving/lagging?

- Math/logic and code: steep gains
- Open-ended, multi-tool tasks: improving but brittle
- Multimodal academic exams: capable, still sensitive to prompts

OpenAI vs Gemini: Knowledge vs Coding Benchmarks (2022→2025)



Select AI Index Technical Performance Benchmarks vs. Human Performance



So where is this going?

- **The AI revolution is in peak hype, but it will clearly have deep, long lasting impacts on society.**
- **Separating the value from the hype is a critical skill.**
- **Smart people will rethink how they can add value in the new world.**
- **Superintelligence is coming, sooner than predicted.**
- **When we get there, all bets are off.**

Four Key Questions

- 1. Are language models intelligent?**
- 2. Can humans be trusted with this tool?**
- 3. Is AI a net good for society?**
- 4. Are we doomed?**

My Answers

1. Are language models intelligent?

- Yes. Are we really that different from LLMs?
- Turing paraphrased: intelligence is as intelligence does.

2. Can humans be trusted with this tool?

- Clearly not. Our track record for deploying technology responsibly is not great.
- But stopping the train is unrealistic.

3. Is AI a net good for society?

- All tools are neutral. It's how we use them that matters.
- We've been on this path for a while (internet, smart phones, social media).
- We need more regulation. It's not moving in that direction.

4. Are we doomed?

- Possibly (21:55 - 24:36)

“There are very few examples of more intelligent things being controlled by less intelligent things”

- Geoff Hinton

Closing Thoughts

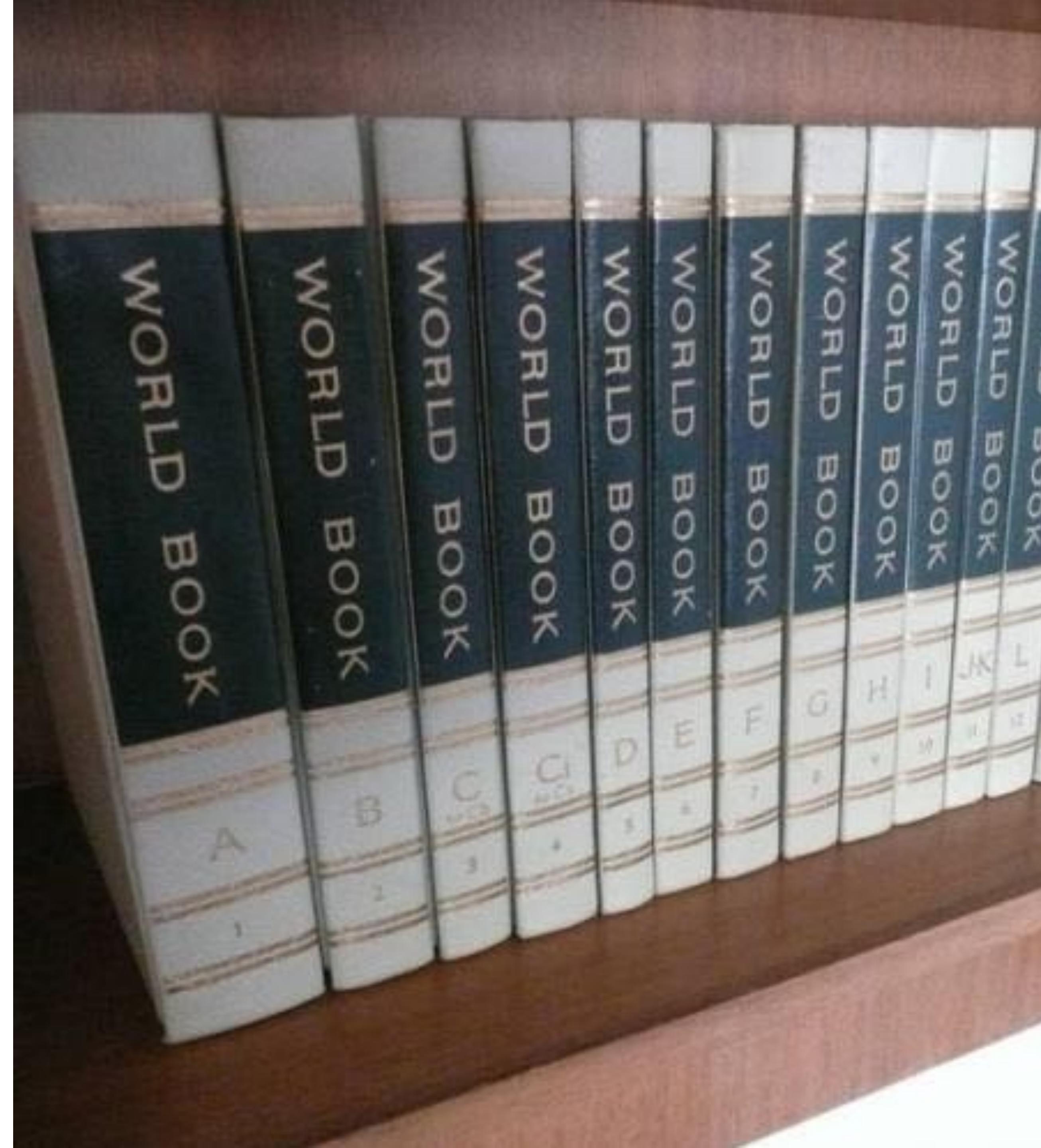
I've navigated a few changes

- **high level programming languages**
- **portable operating systems**
- **personal computers**
- **the internet and the world wide web**
- **search engines (esp. Google)**
- **mobile phones**
- **smart phones**
- **cloud computing**
- **the data science boom**
- **the AI revolution**

A close-up photograph of a black dog's face, looking slightly upwards and to the left. The dog has dark eyes and a visible nose. In the upper left corner, a person's arm and hand are partially visible, wearing a light-colored sleeve and holding a small, colorful object with blue, red, and yellow edges. The background is a plain, light-colored wall.

Ok, but how?

Stay curious



**Communication
is the most
important skill**

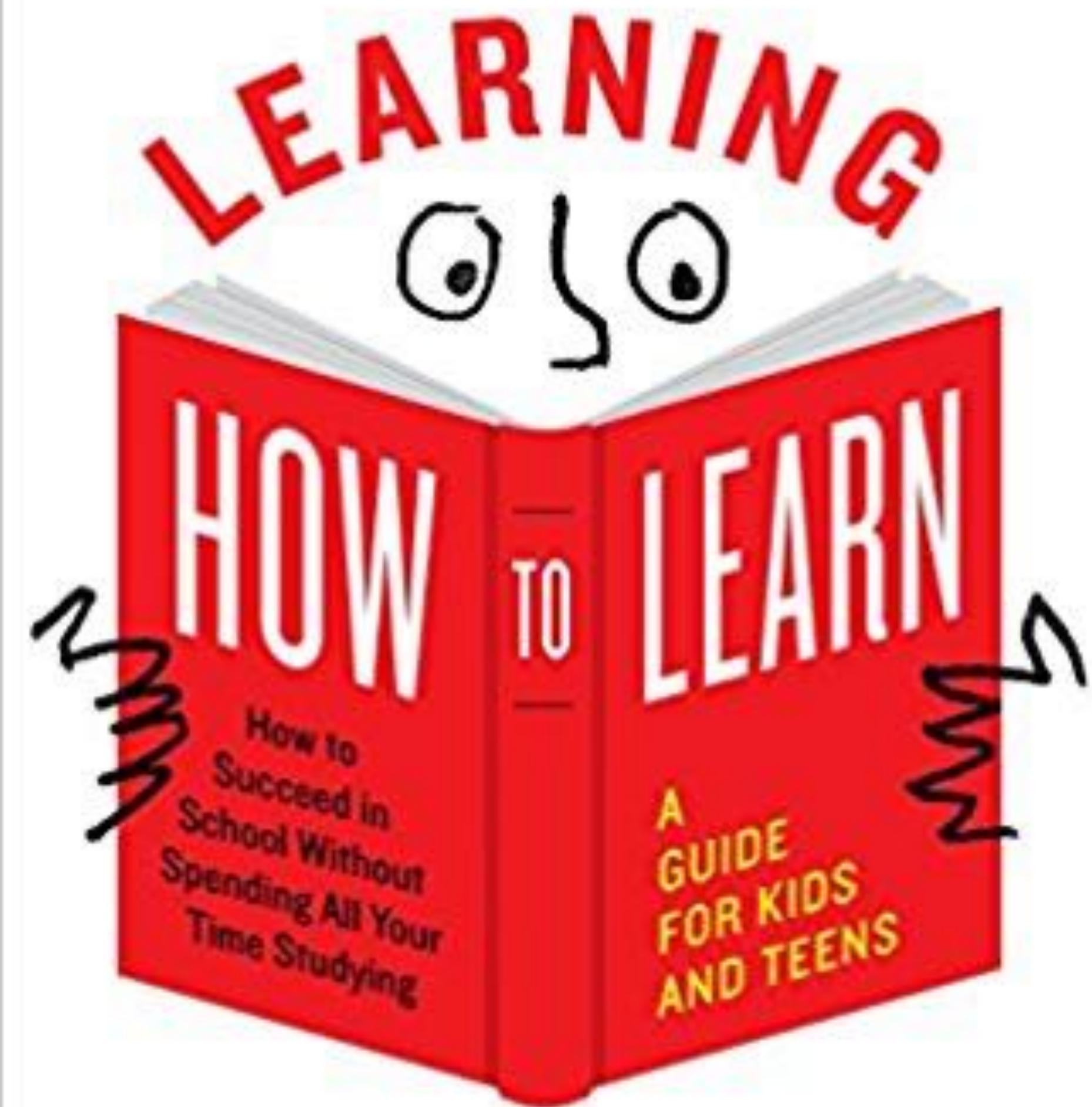


**Be open to opportunity
(embrace change)**



Be a lifelong learner

From the bestselling author of *A Mind for Numbers* and
the creators of the popular online course Learning How to Learn



BARBARA OAKLEY, PhD, AND
TERRENCE SEJNOWSKI, PhD,
WITH ALISTAIR McCONVILLE

Be intentional (make plans)



Photo by [Glenn Carstens-Peters](#) on [Unsplash](#)

Slides

mco.dev/introAI.pdf

This is for everyone

