

# **Understanding Artificial Intelligence**

**What a well informed person should know**

**Marc Cohen**

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# Welcome



# 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

- **Gain a conceptual understanding of how AI “works”**
- **Find out about the state of the art in AI**
- **Consider the ethical issues raised by AI**
- **Think critically about AI in your life and in the world**
- **Help you prepare for the continuing revolution**

# Non-Goals

- Deep dive into technology or maths
- Definitely answer difficult ethical or societal questions
- Predict the future

# Agenda

- **My Fave AI App**
- **Definitions**
- **History**
- **Mechanics**
- **State of the Art**
- **Ethics**
- **The Future**



Photo by Domenico Loia on [Unsplash](#)

# 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?**



**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" (with a house icon), "Browse" (with a grid icon), "Create" (with a plus icon), "Play" (with a game controller icon), and "About" (with a document icon). 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

Home

Browse

Create

Play

About

Quizaic

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:

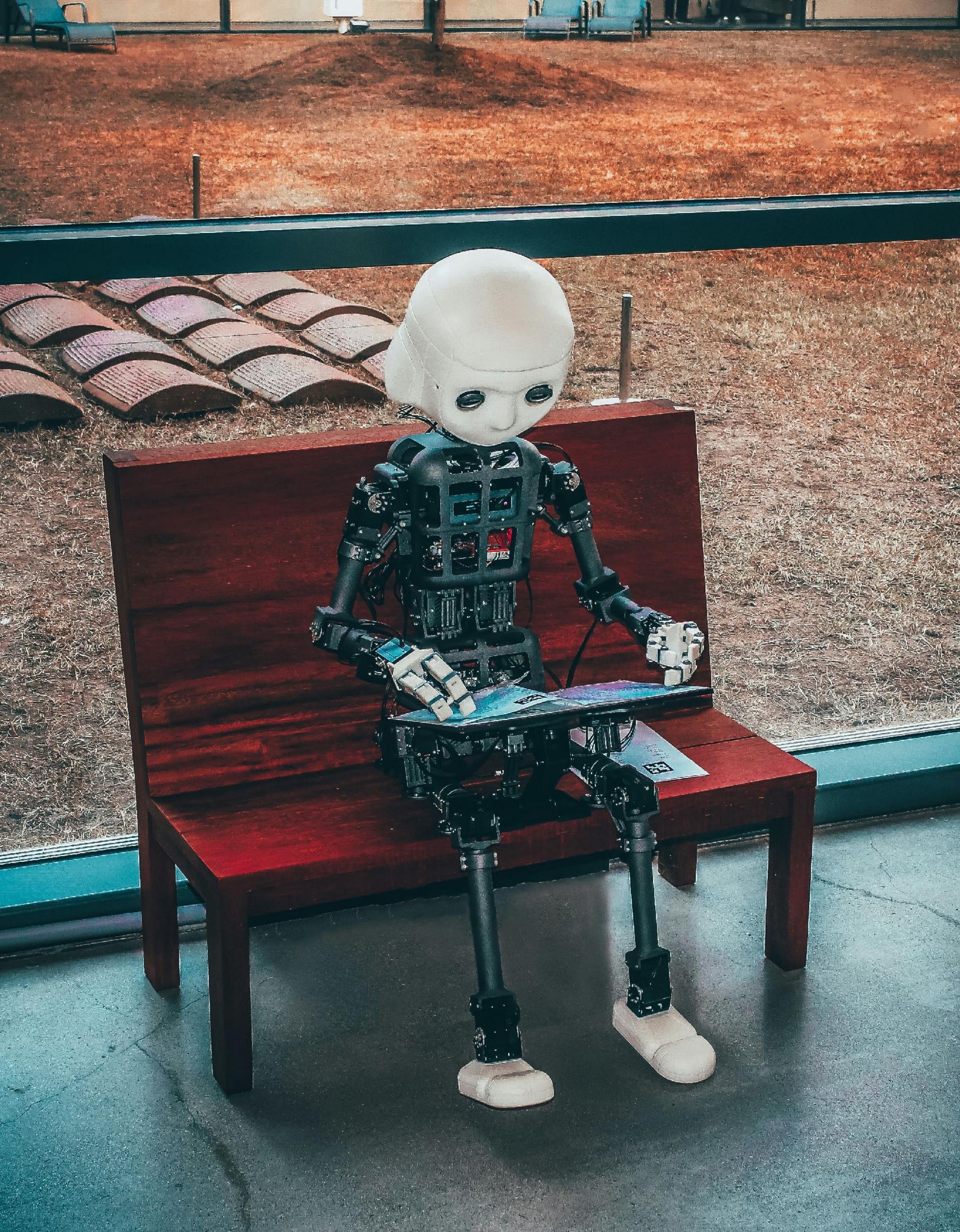
# Definitions

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

Photo by [Stefan](#) on [Unsplash](#)

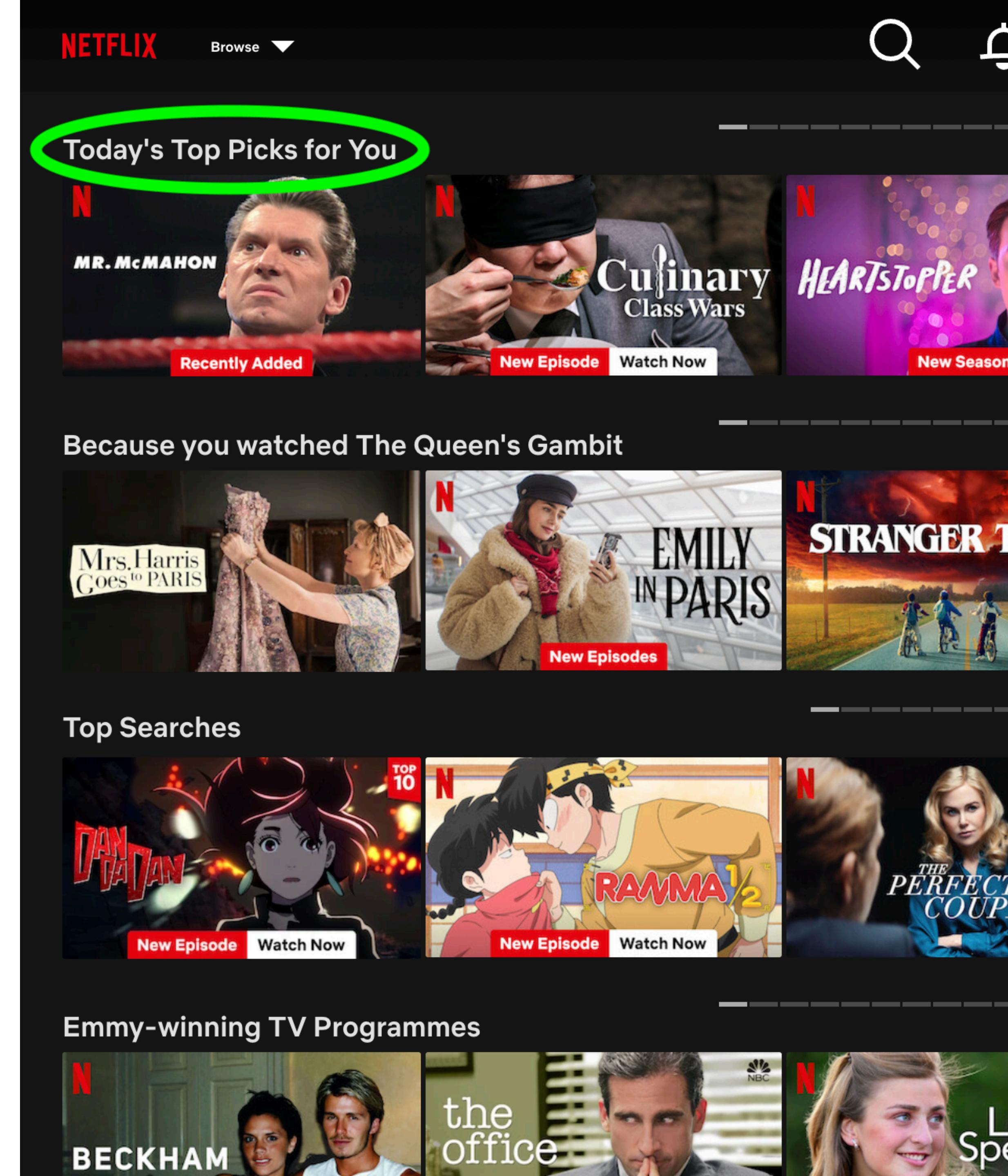
# Definition: Artificial Intelligence

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.



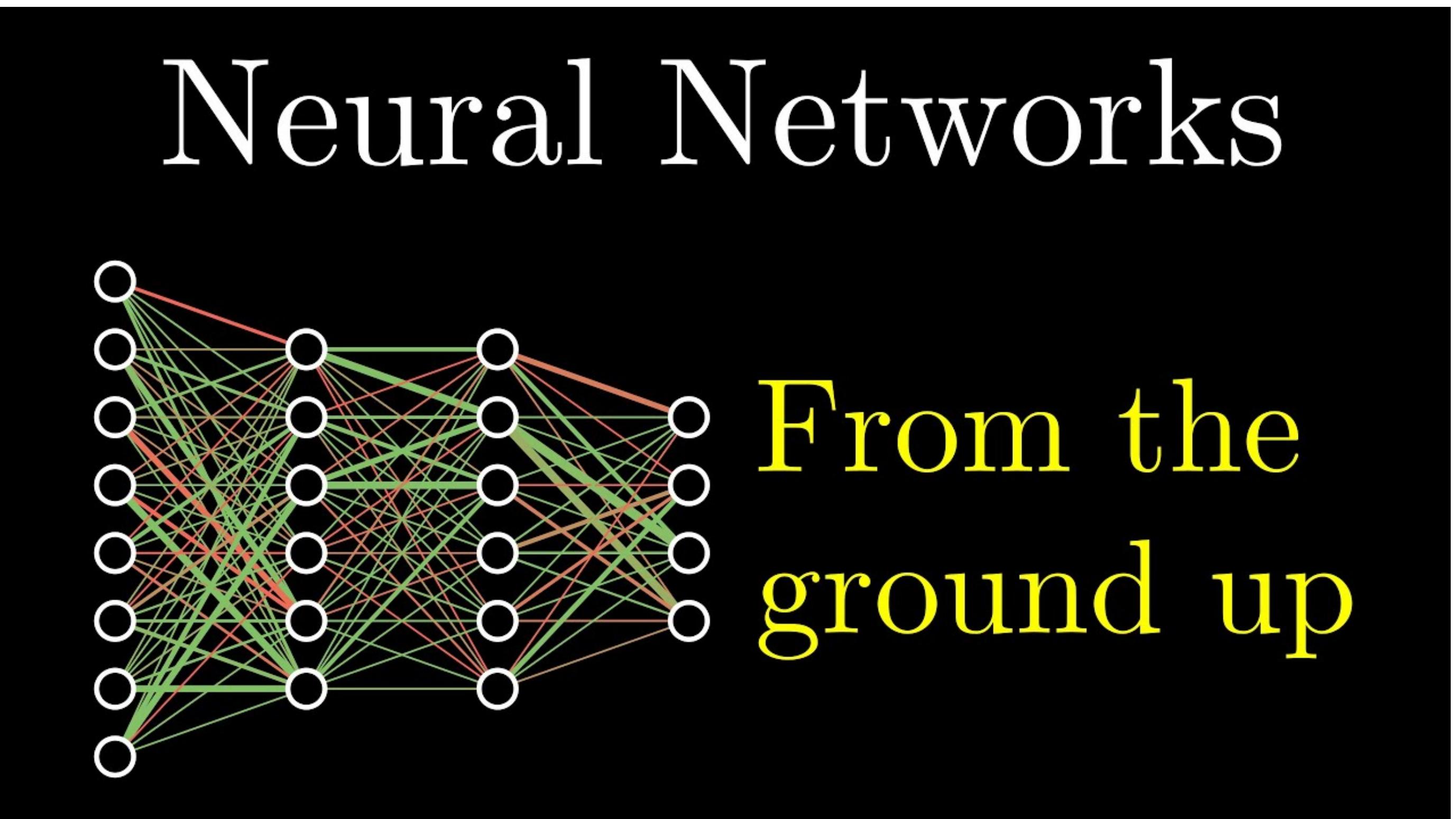
# Definition: Machine Learning

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.



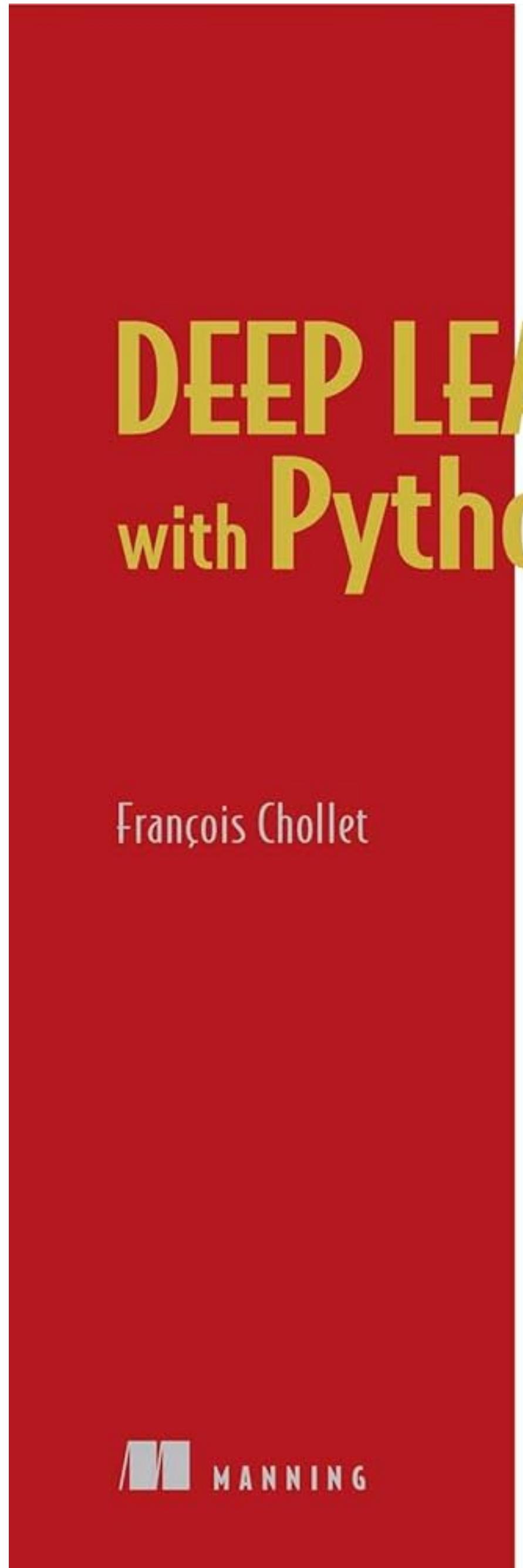
# Definition: Neural Networks

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

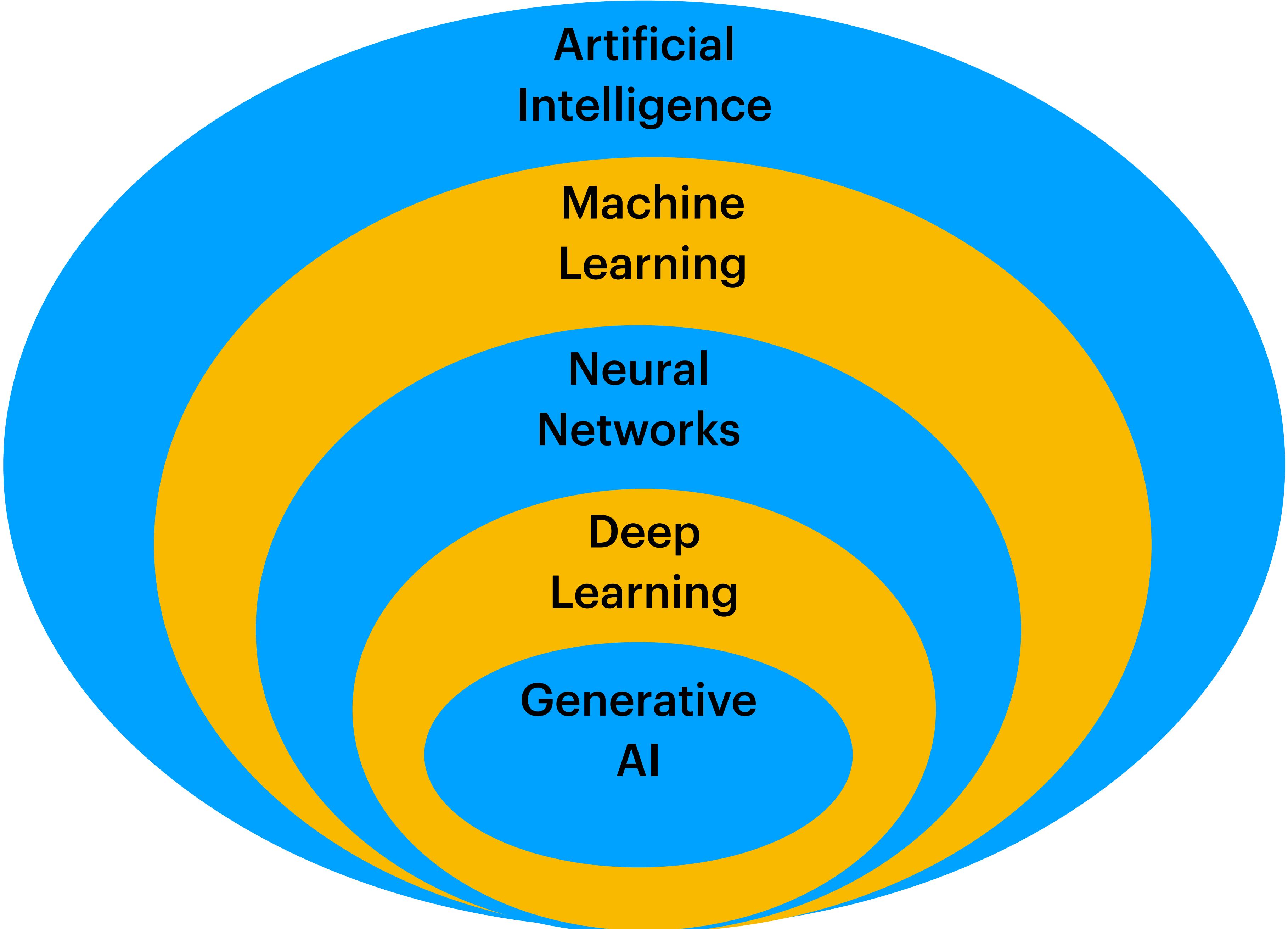
A type of machine learning that uses multi-layer neural networks to train computers to process data and make human-like decisions. Deep learning systems learn from large amounts of data, including images, text, audio, and video to recognize patterns, make predictions, and automate tasks.



# 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



# History

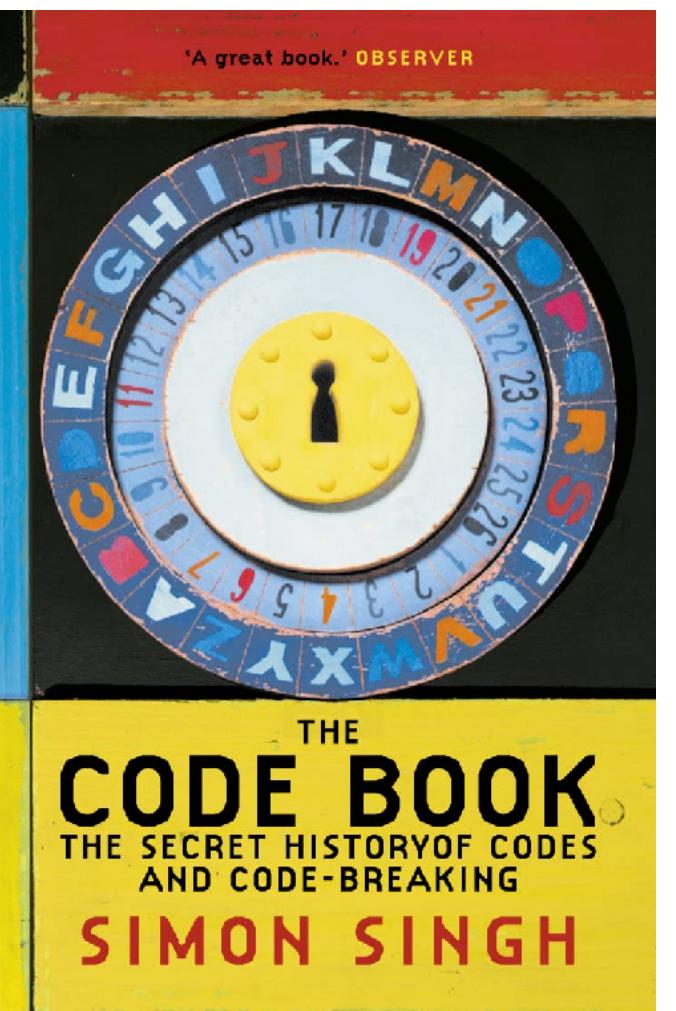
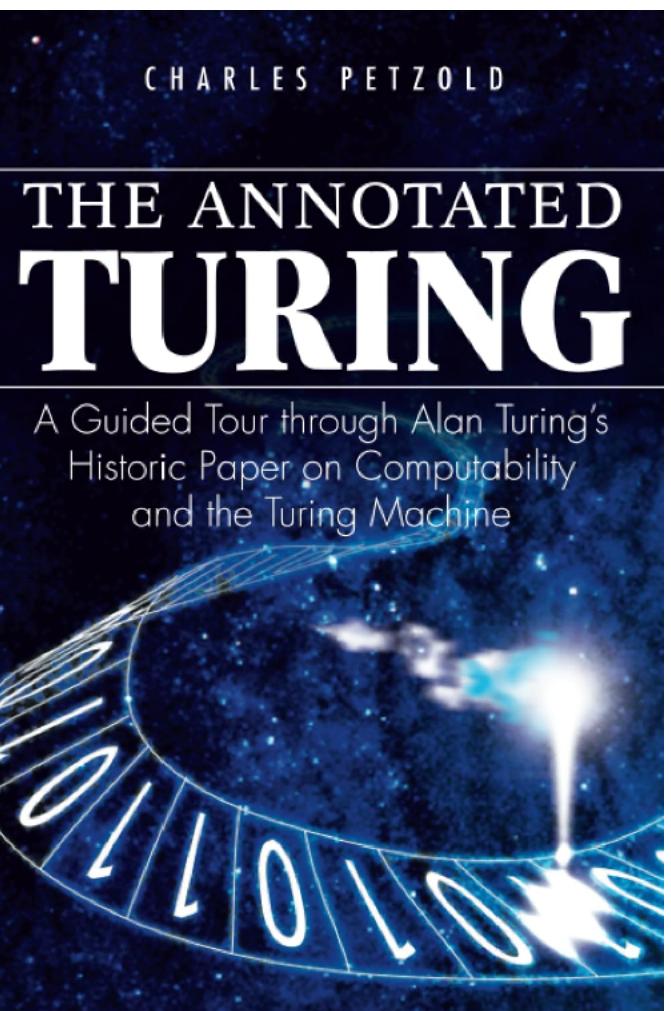
## How did we get here?

- Founders
- Timeline



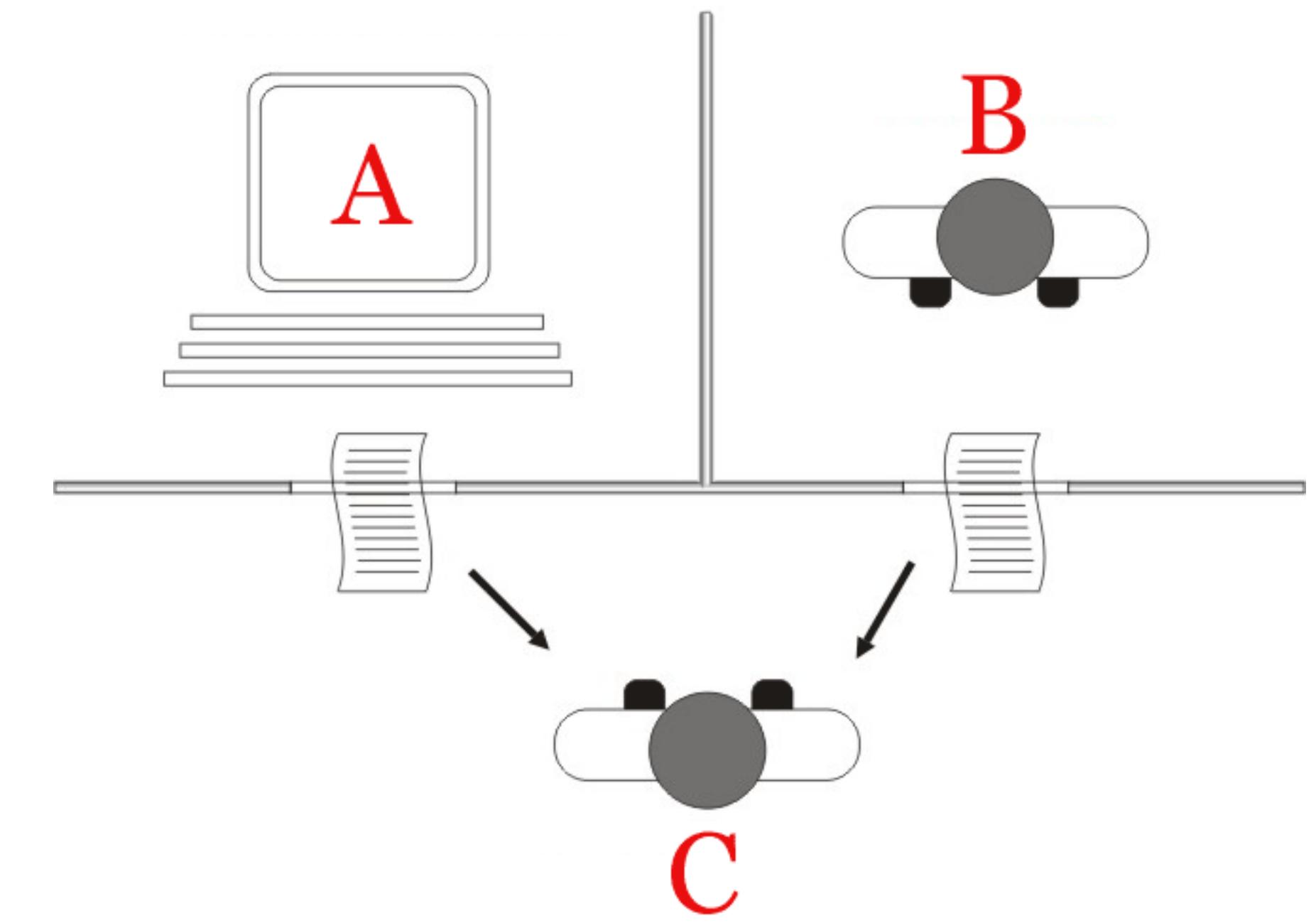
# Alan Turing

A Turing Machine is a theoretical construct that captures the essence of abstract symbol manipulation, i.e. computing. This invention inspired the founding of Computer Science and started the discussion about the possibility of thinking machines.



# 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

We'll conduct our own Turing Test later!

# Claude Shannon

- **Invented digital computer design**
- **World's Greatest Master's Thesis!**
- **Father of Information Theory**
- **Mathematical definition of communication**
- **First appearance of the word “bit”**
- **Designed the first chess computer**



# Geoffrey Hinton

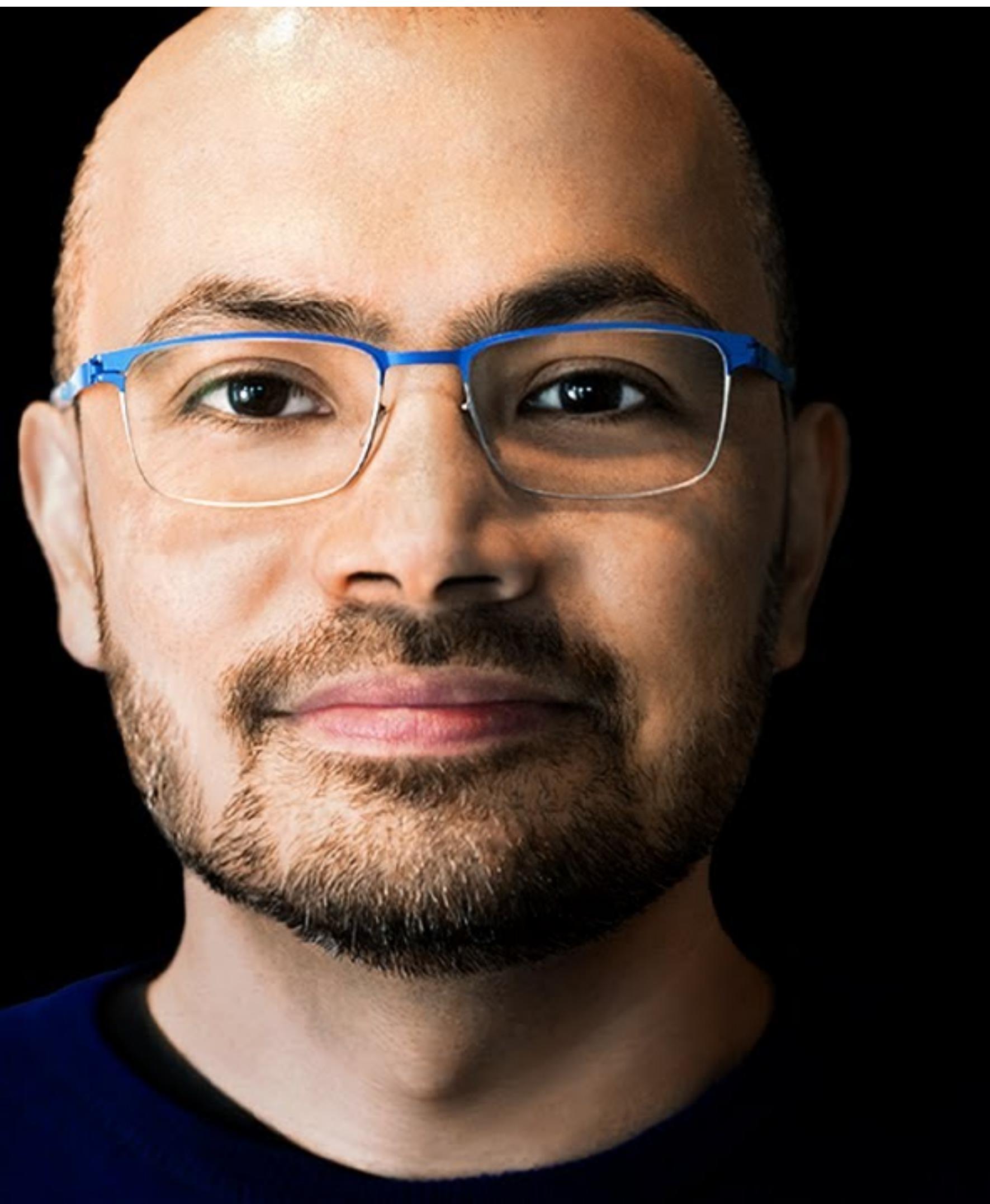


# Demis Hassabis

Demis  
Hassabis

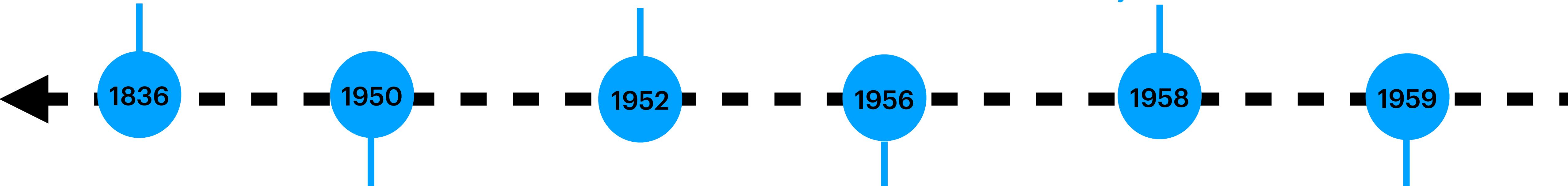
#299

Lex  
Fridman



# AI Development Timeline

Charles Babbage designs 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.

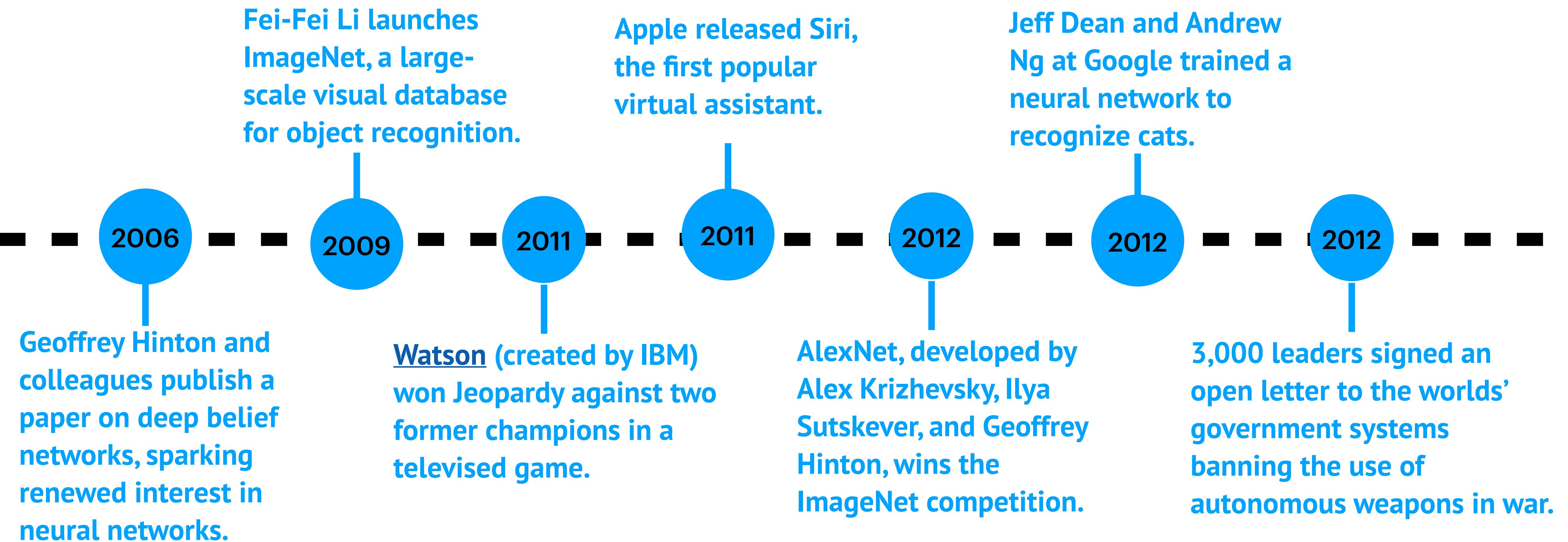
The resurgence of AI interest due to expert systems like MYCIN (medical diagnosis) and DENDRAL (chemical analysis).

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

1986

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, but dropped English and developed their own 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.

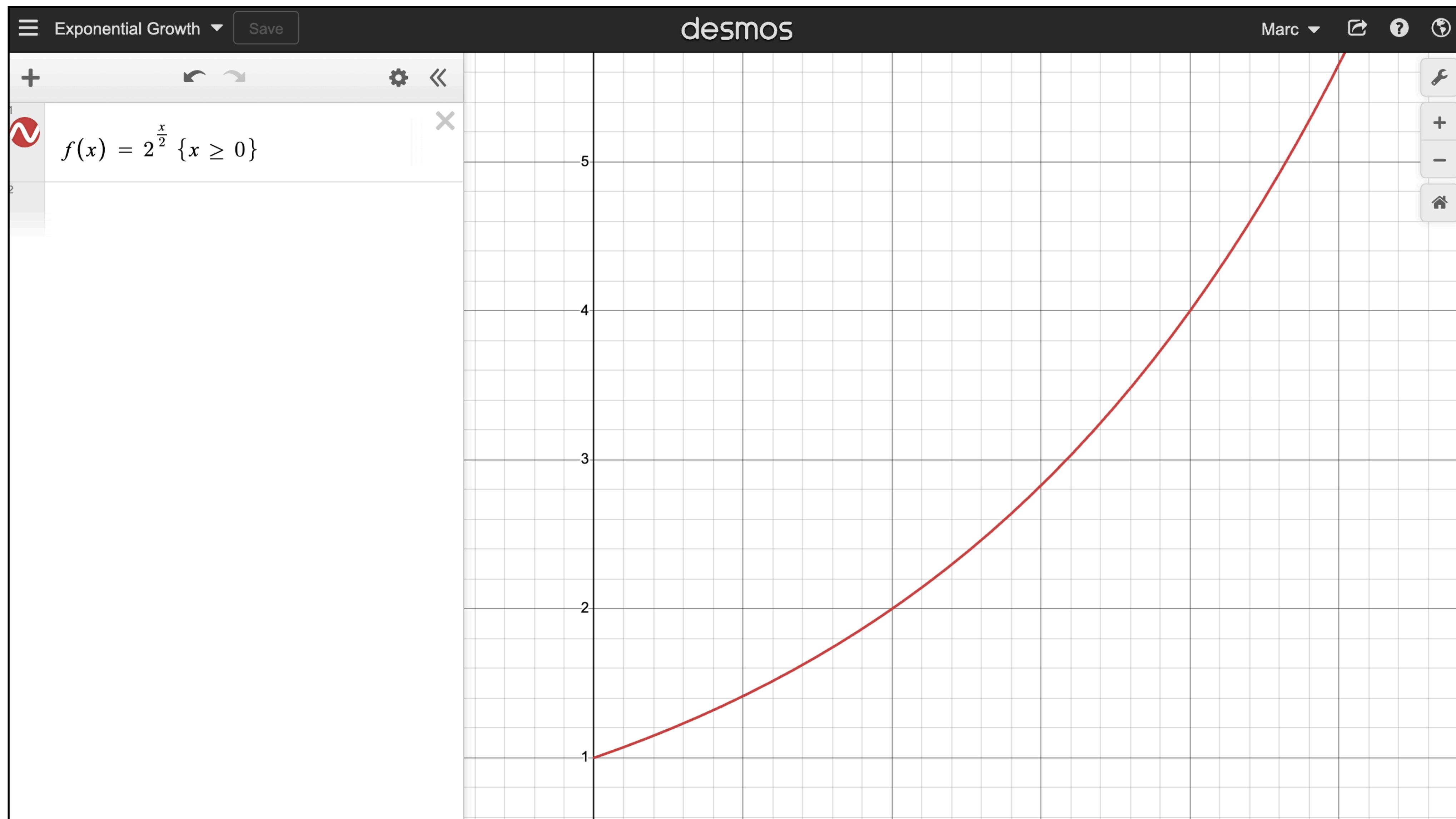
# Why did everything change so quickly?

## A perfect storm:

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



# Exponential Growth



# 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

10<sup>40</sup>

10<sup>30</sup>

10<sup>20</sup>

10<sup>10</sup>

1

10<sup>-10</sup>

1900

1925

1950

1975

2001

'10

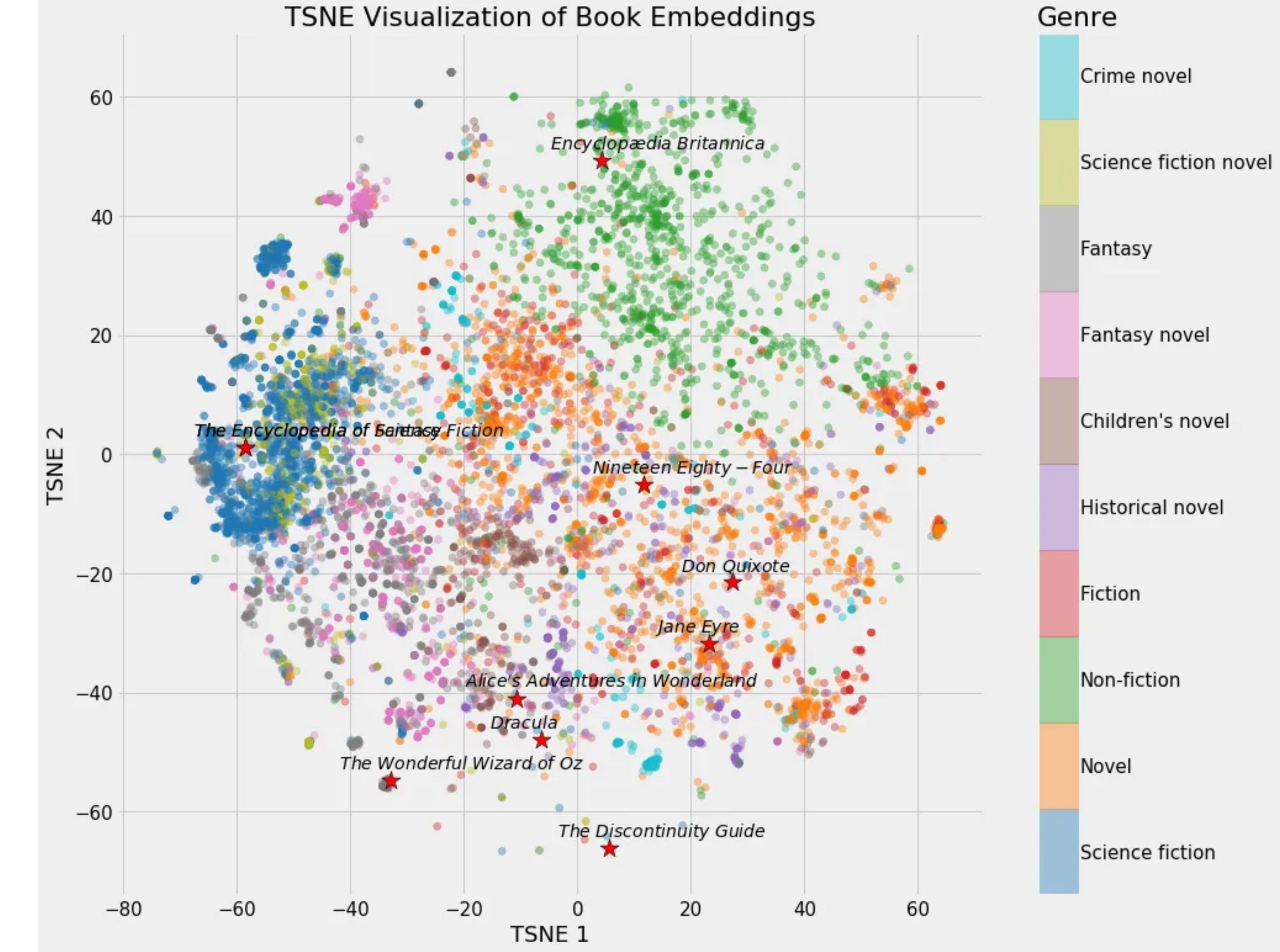
'23

2050

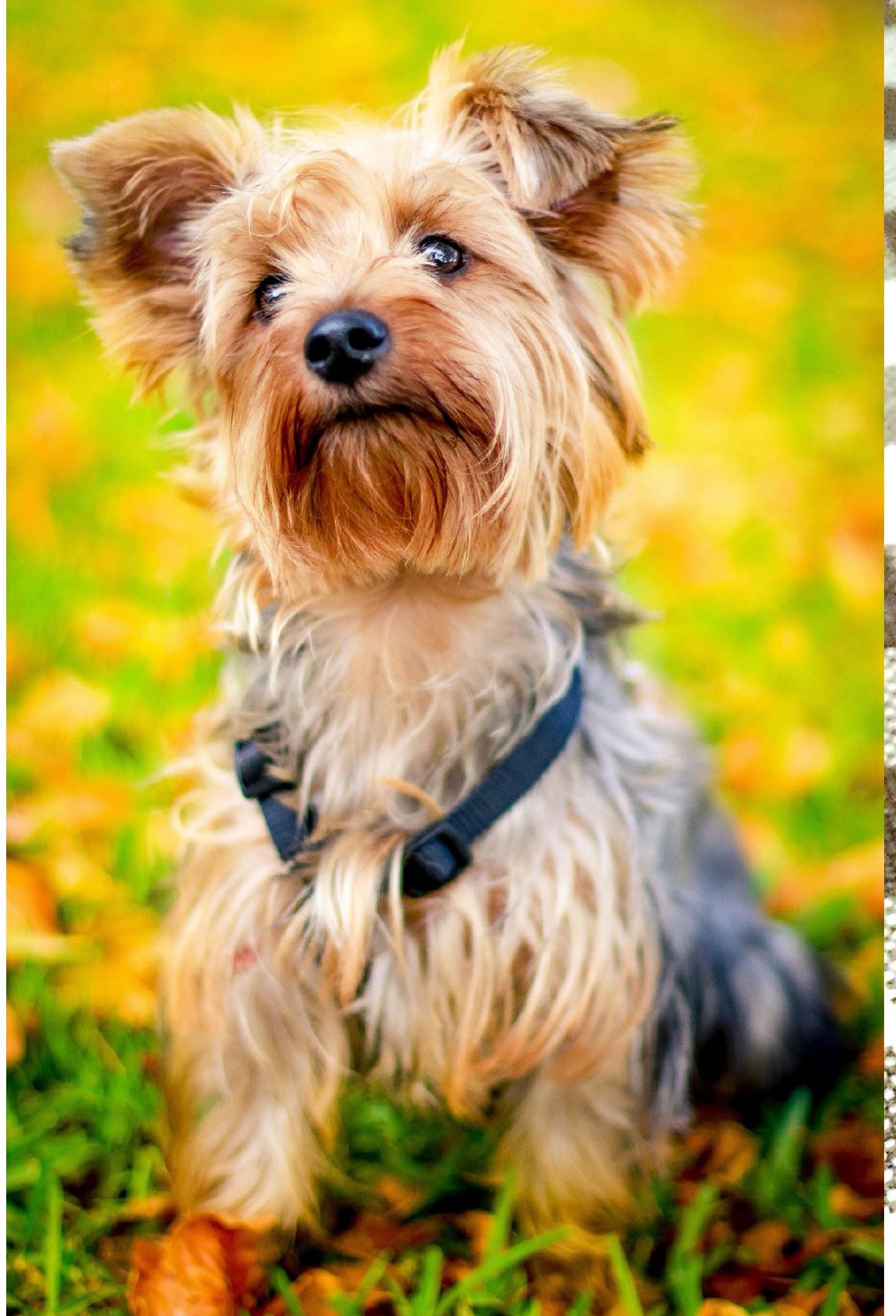
2075

# Mechanics

How does AI work?



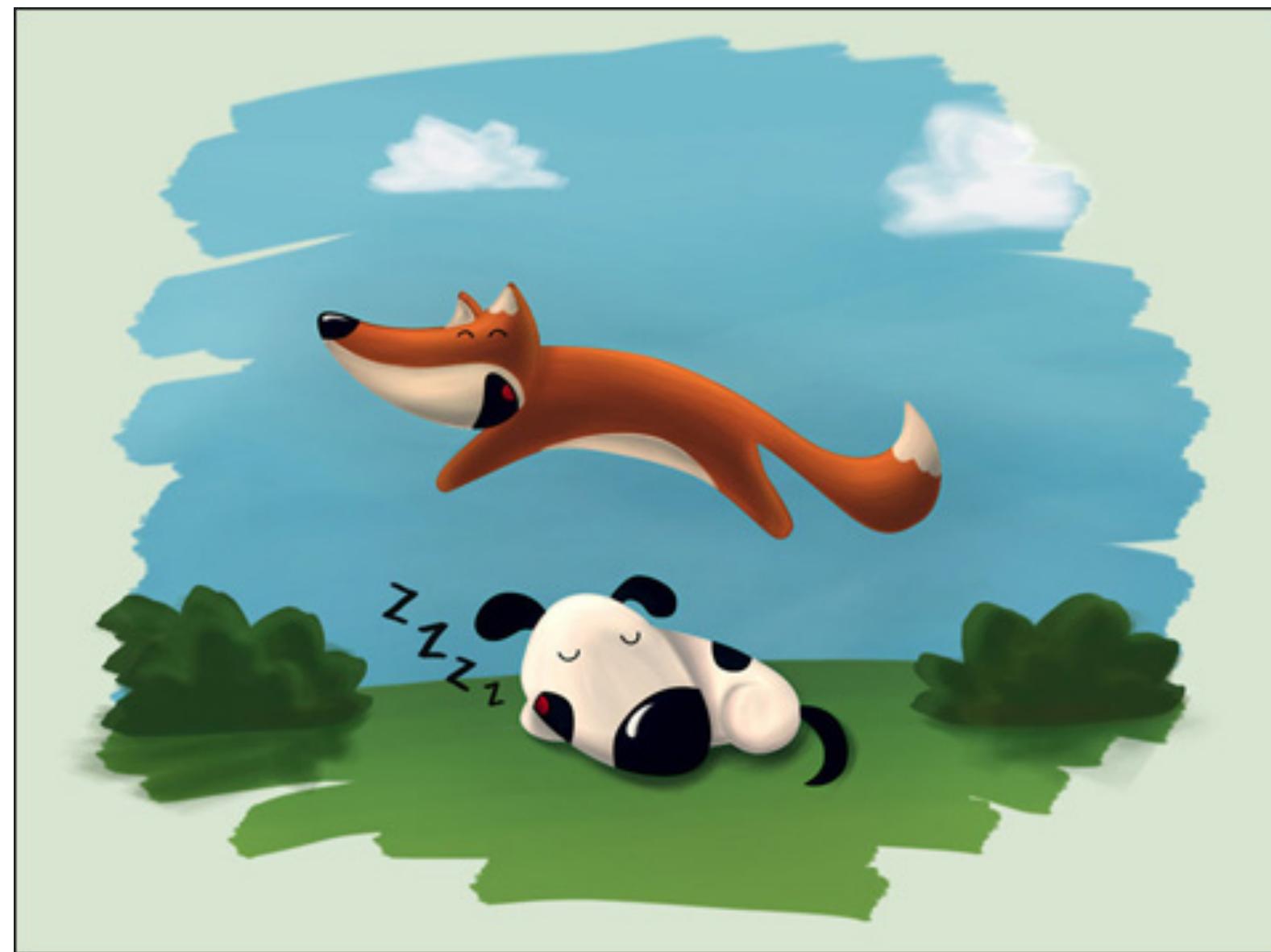
# Puppy vs. Muffin



**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\****

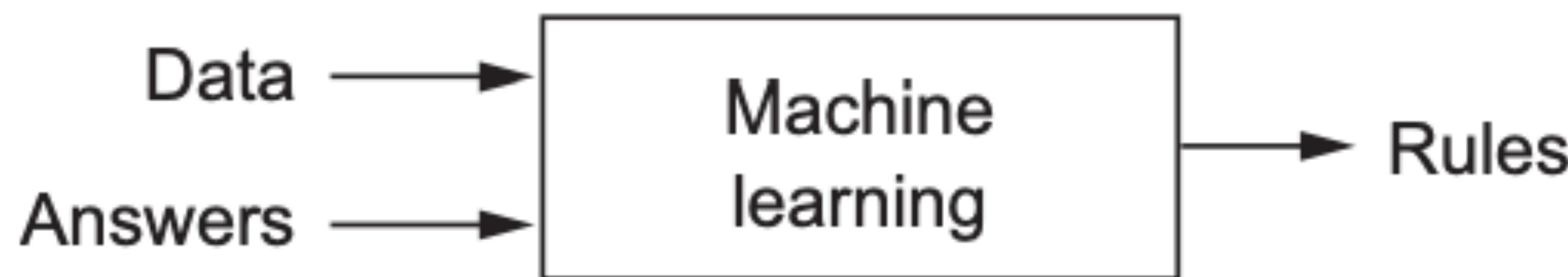
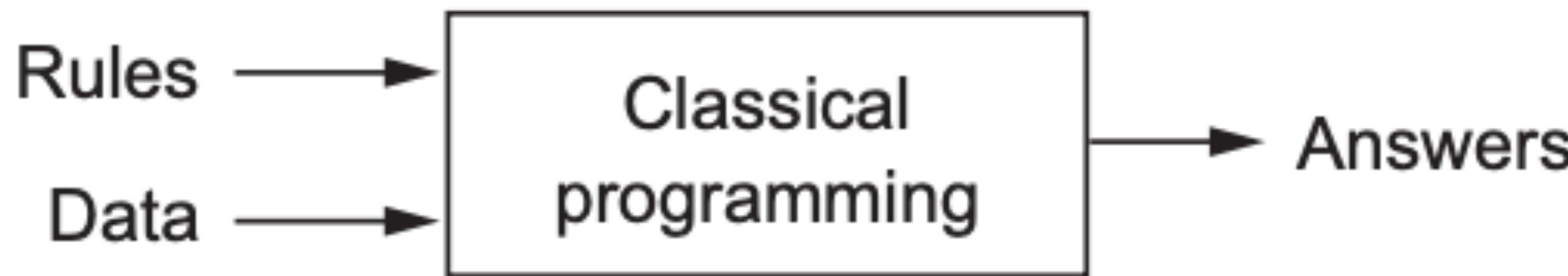


**“Instead of trying to produce a program to simulate the adult mind, why not rather try to produce one which simulates the child’s mind?”**

- 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

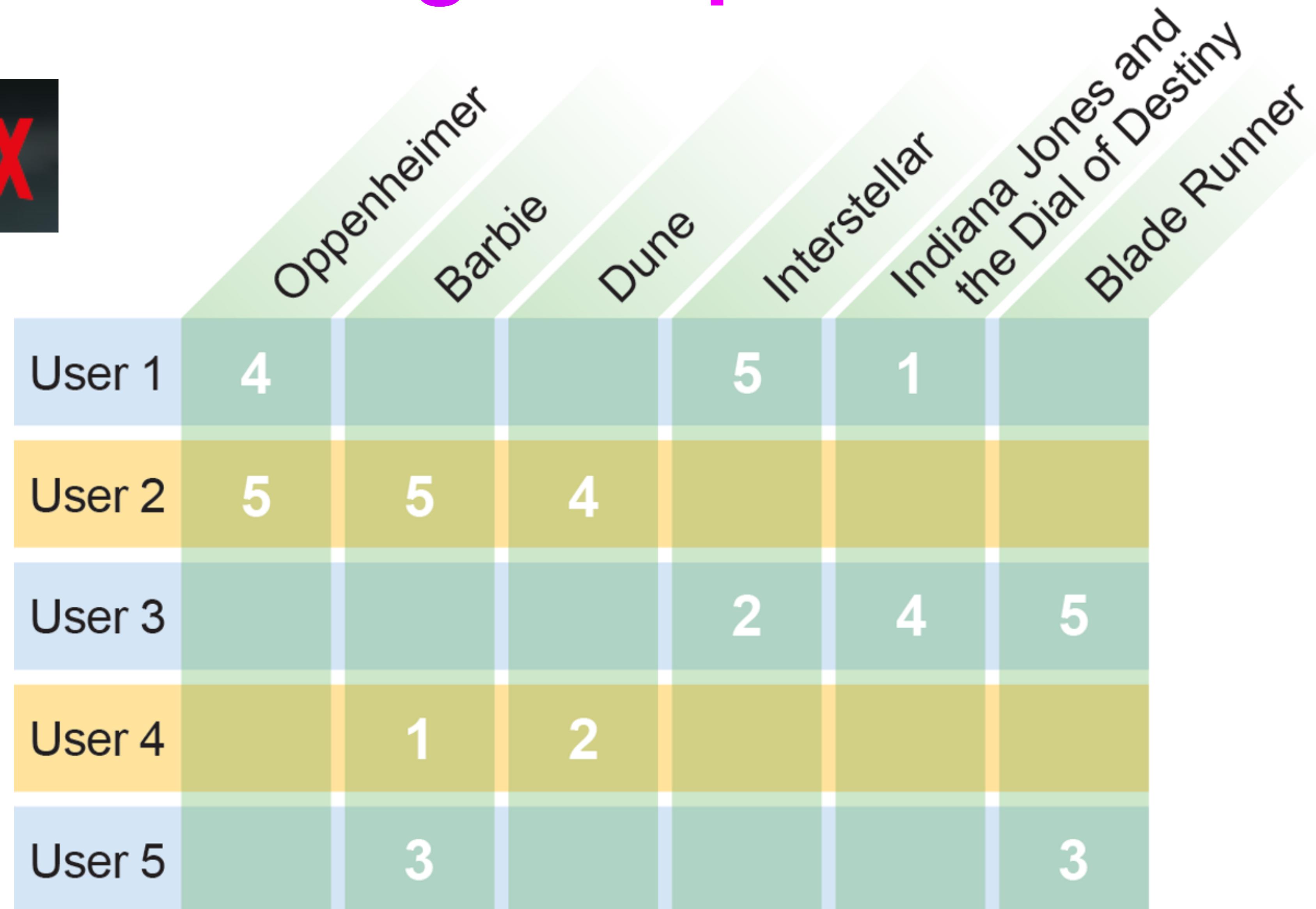
# Supervised Learning Example

## 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 Example



# Cloud of similarities

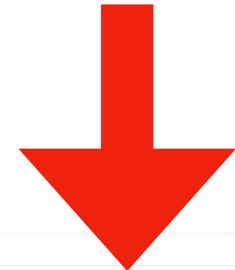


# Reinforcement Learning Example



# 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

# Google's AI Awakening

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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。

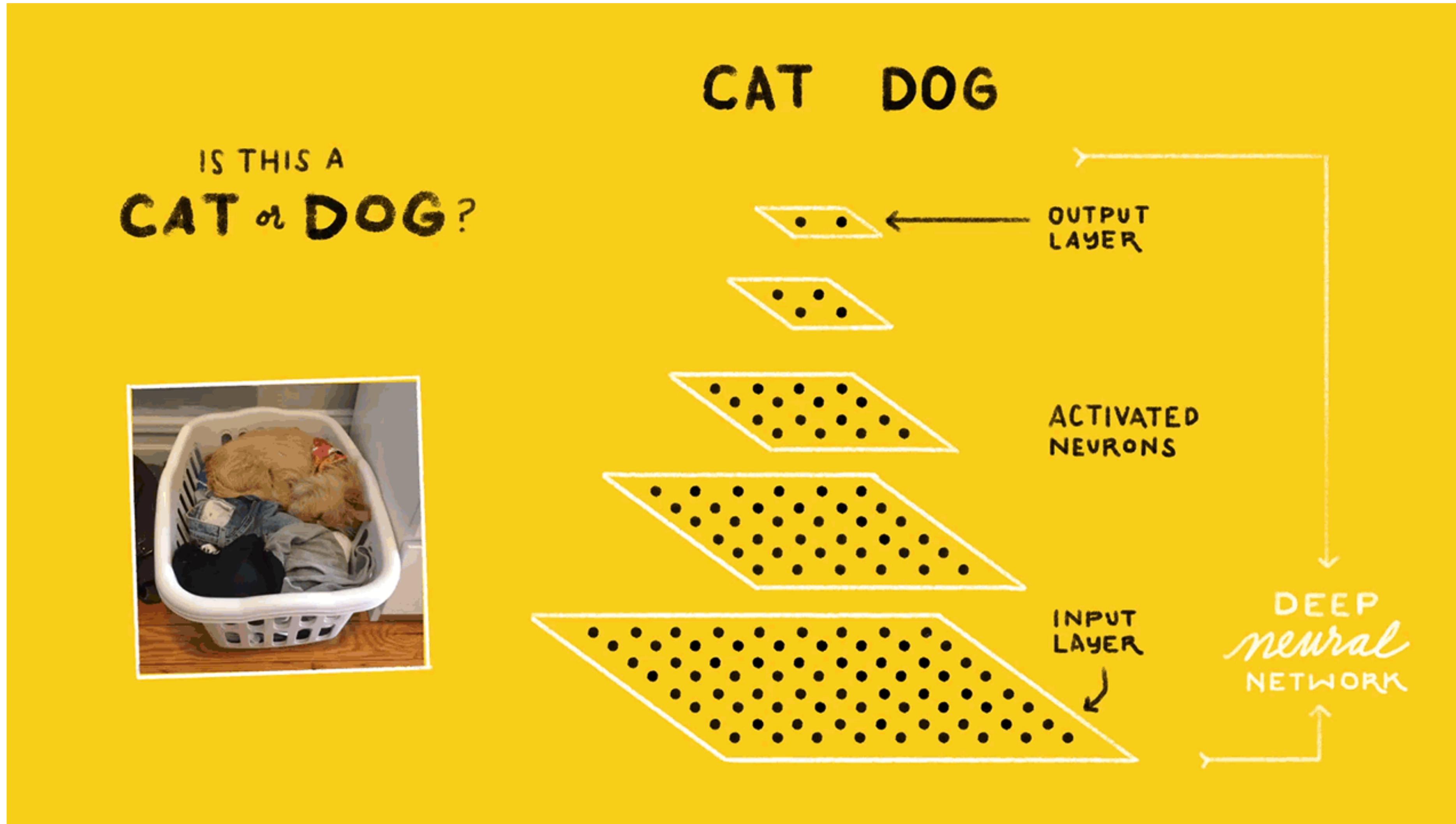
「誰かを批判する気持ちがあるときはいつでも、彼は私に言いました。  
「この世界のすべての人々はあなたが持っていた優位性を持っていないこ  
とを覚えておいてください。

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.

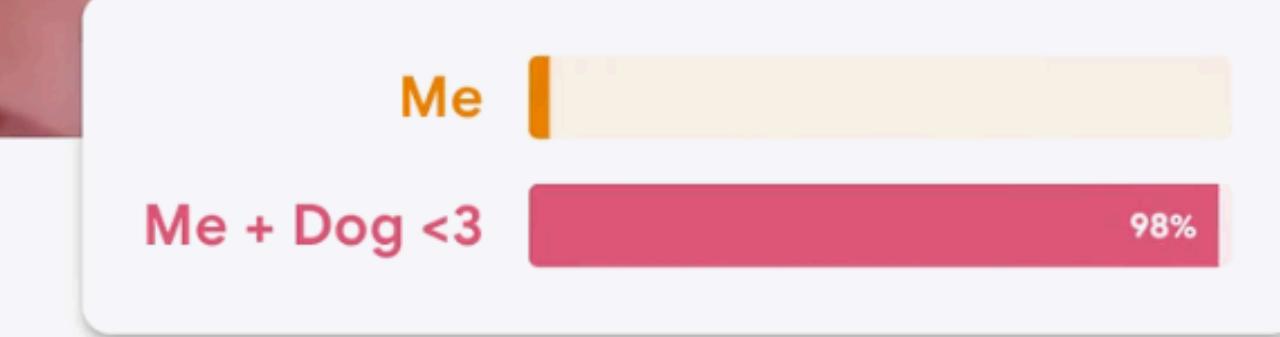
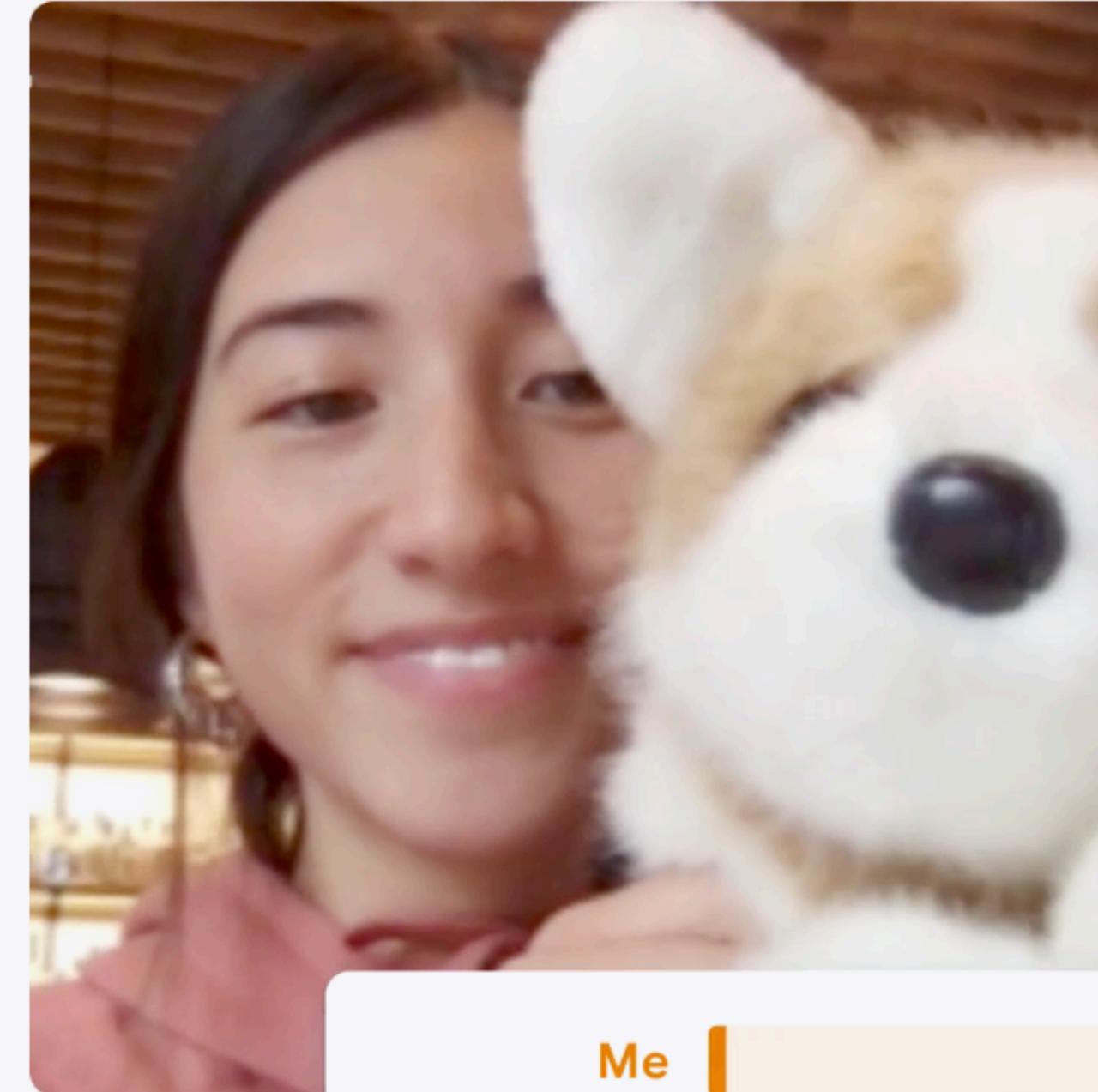
# Neural Networks



# 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](#)



# Demo: Quick, Draw

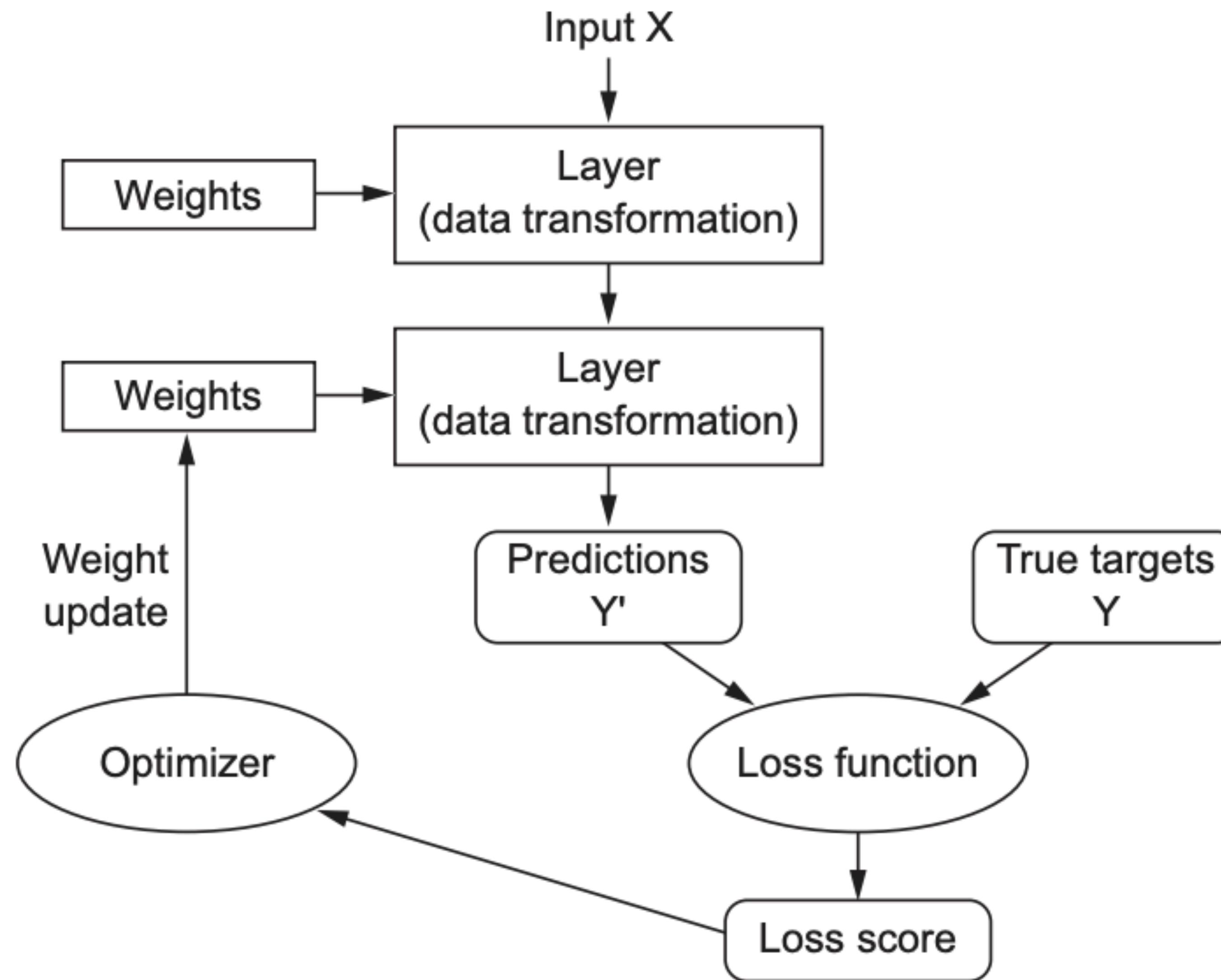


Can a neural network learn to recognize doodling?

Help teach it by adding your drawings to the [world's largest doodling data set](#), shared publicly to help with machine learning research.

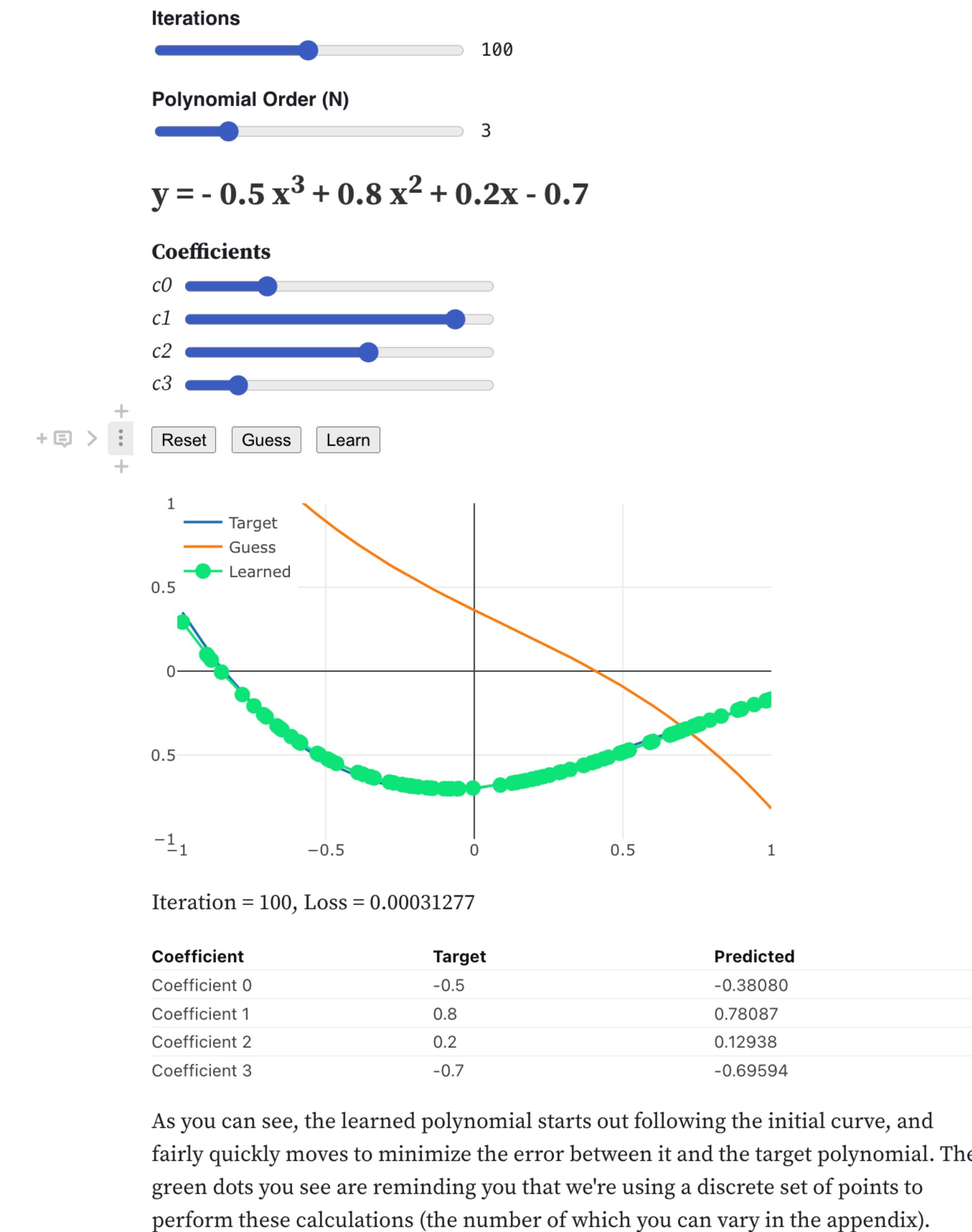
Let's Draw!

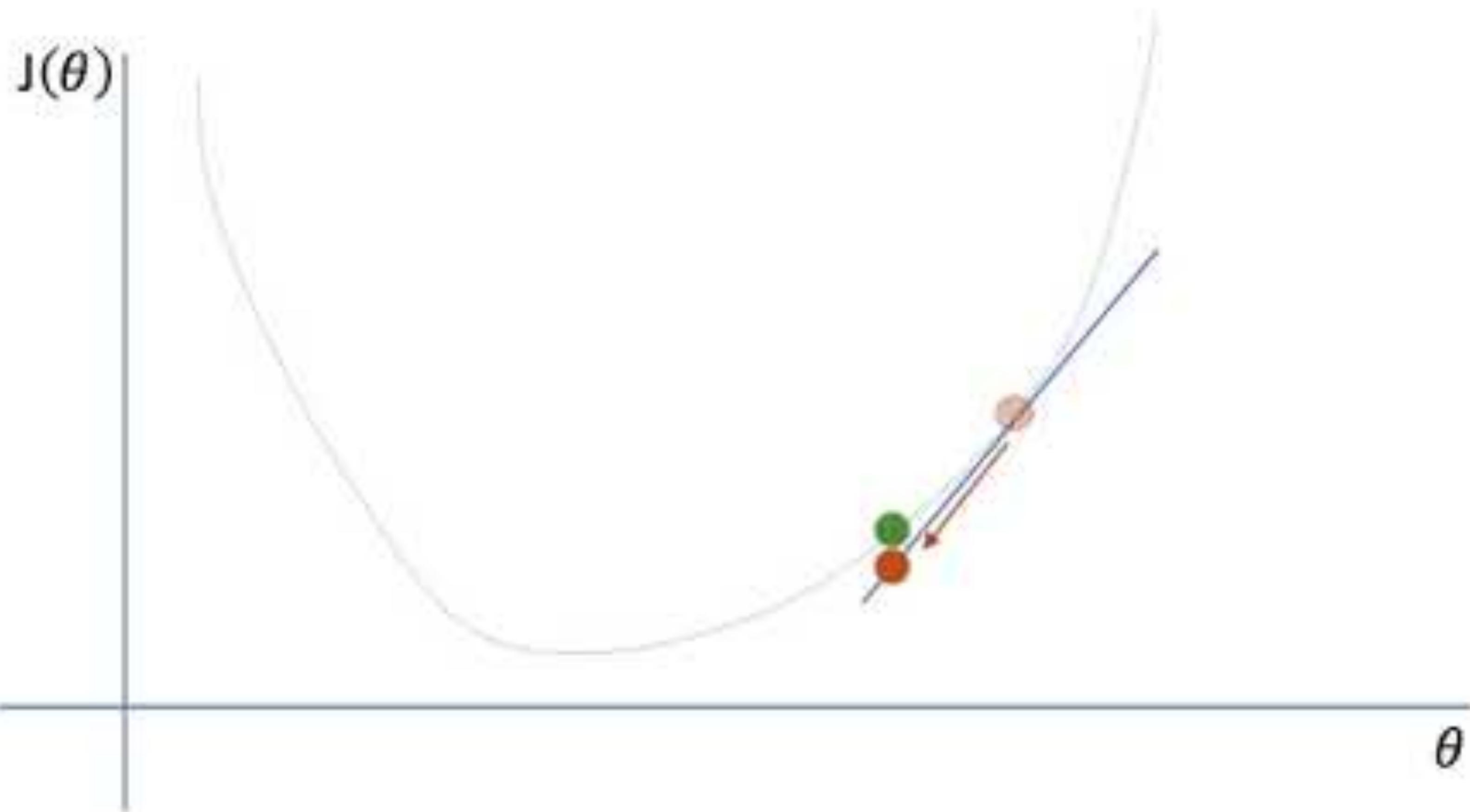
# Inside a Neural Network



# Neural Network Training

- **guess values**
- **improve guess**
- **repeat until “close enough”**





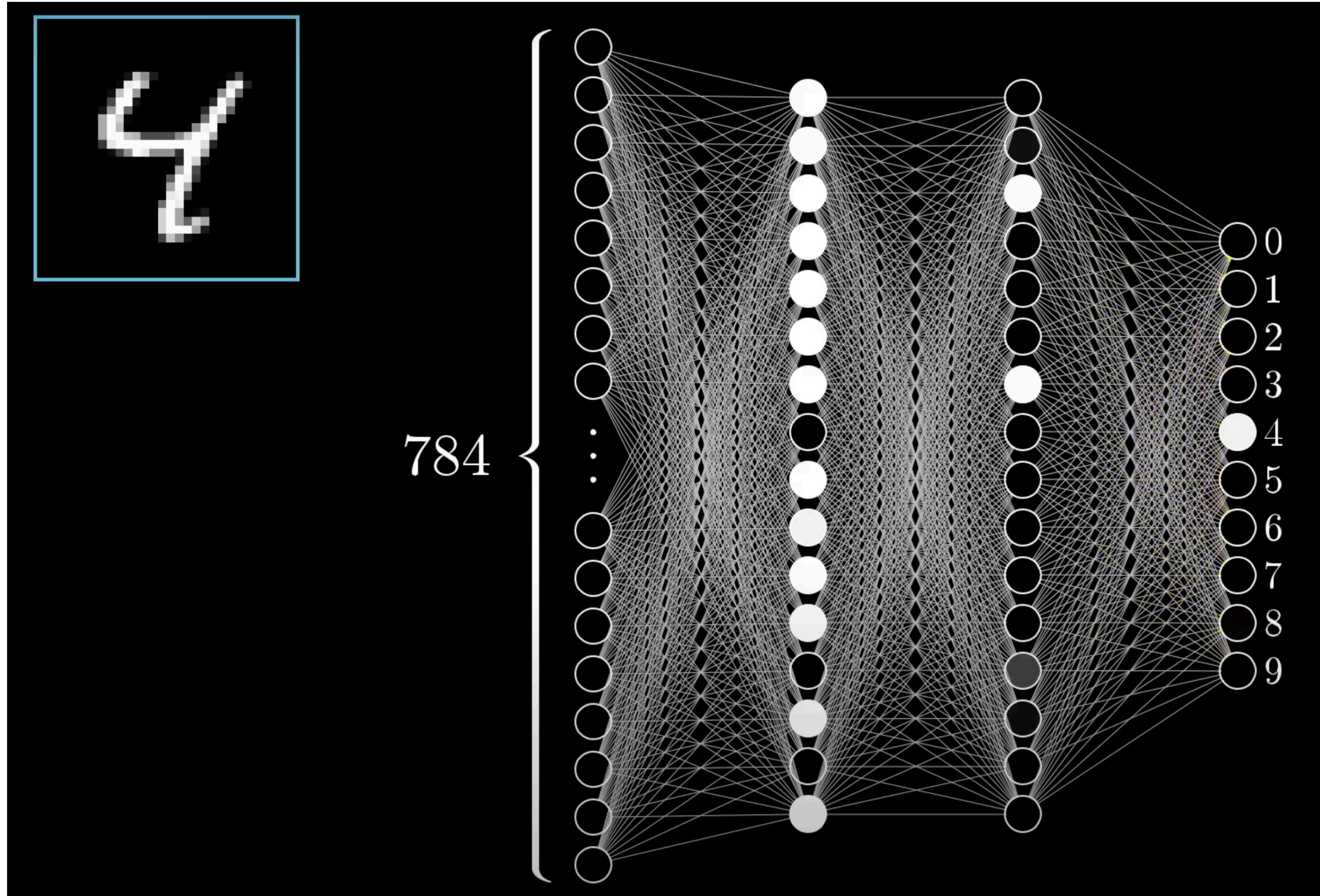
# The MNIST Challenge

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

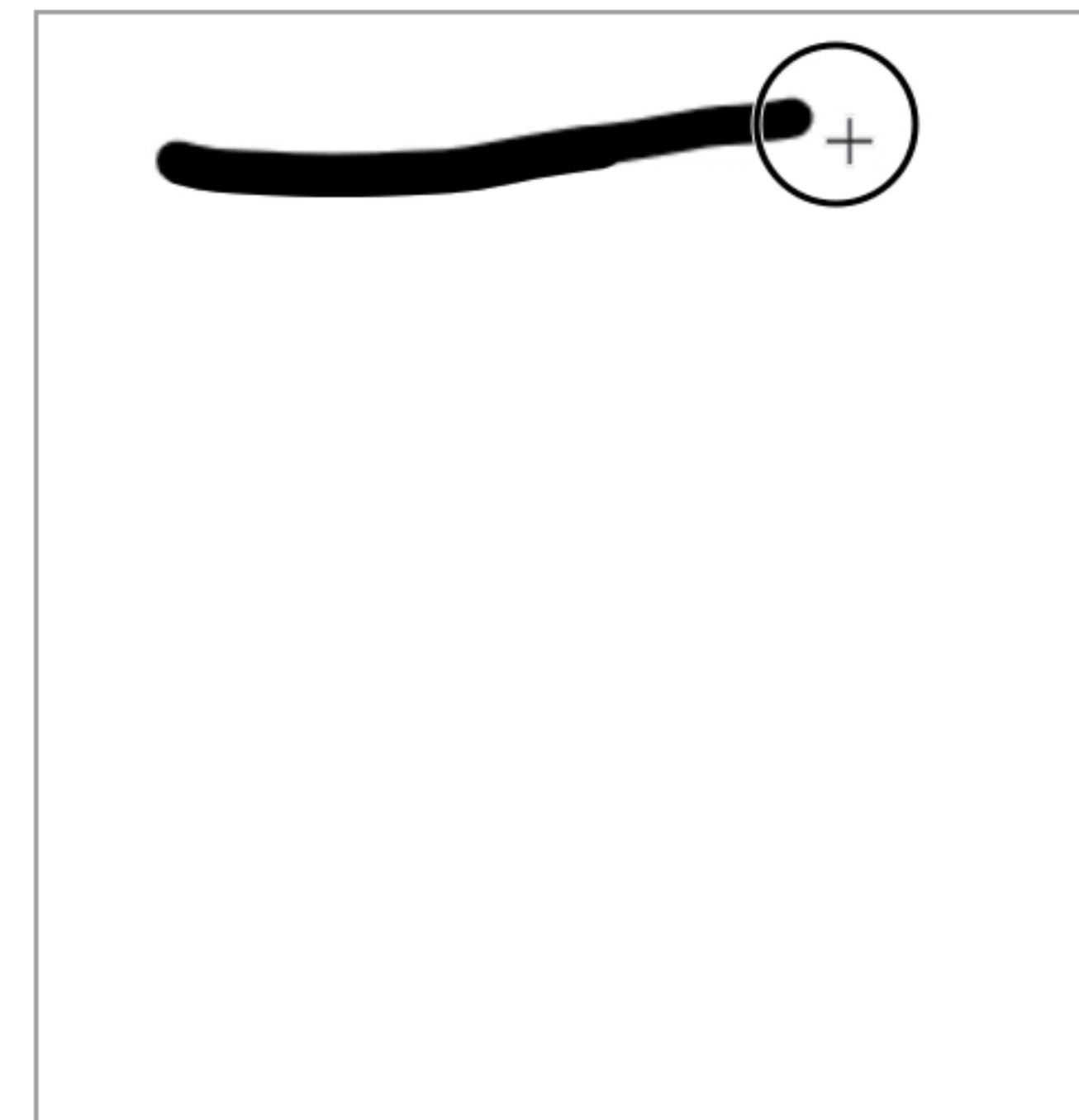
| validation digits and their labels |   |
|------------------------------------|---|
| 7                                  | 7 |
| 2                                  | 2 |
| 1                                  | 1 |
| 0                                  | 0 |
| 4                                  | 4 |
| 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 |

# What's Happening



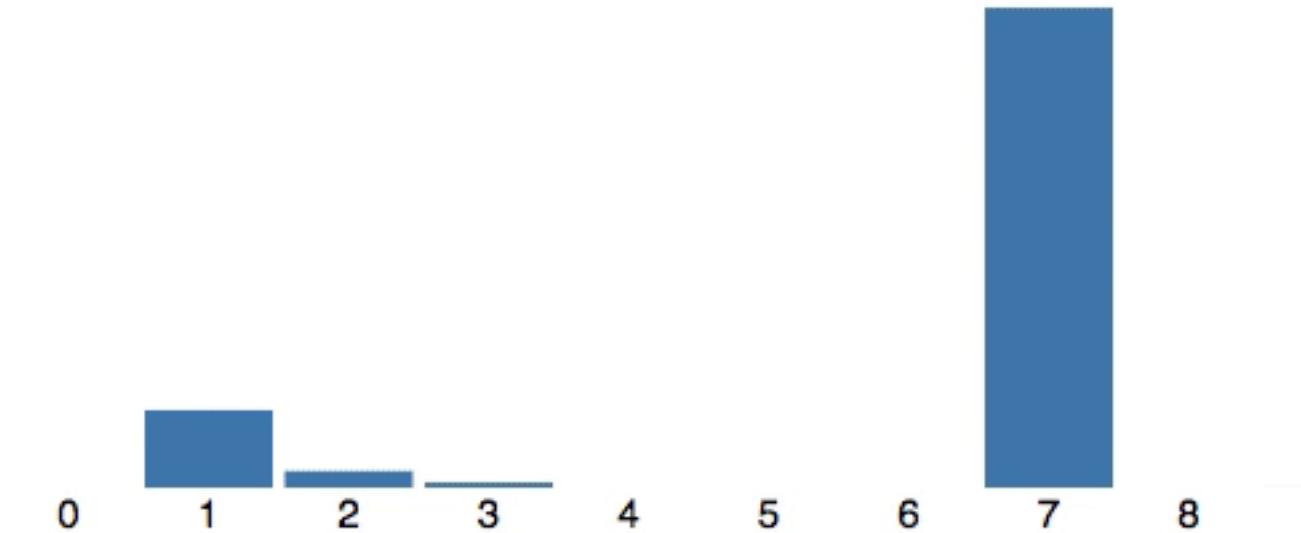
# TensorFlow.js + MNIST

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](https://bit.ly/mco-mnist-lab).



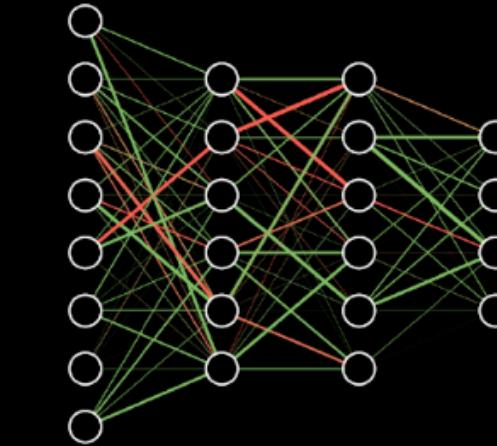
Draw a single digit (0-9) in the empty box.

Clear



Made with ❤ by [Marc](#).

# Neural Networks



## Neural networks

3Blue1Brown · Course

7 videos Updated today



▶ Play

Comments

Learn the basics of neural networks and backpropagation, one of the most important algorithms for the modern world.

### Neural Networks

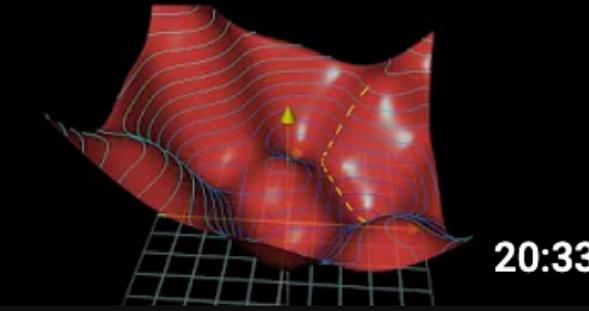
1

From the ground up

18:40

### How machines learn

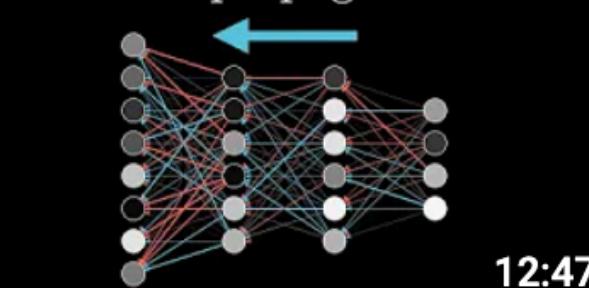
2



20:33

### Backpropagation

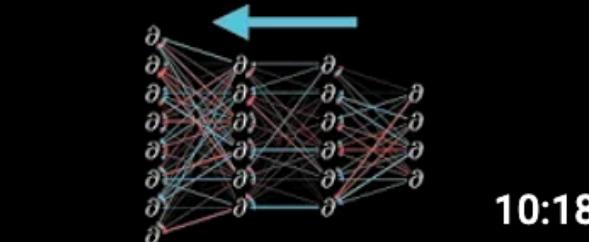
3



12:47

### Backpropagation calculus

4



10:18

### But what is a neural network? | Chapter 1, Deep learning

3Blue1Brown · 17M views · 7 years ago

⋮

### Gradient descent, how neural networks learn | Chapter 2, Deep learning

3Blue1Brown · 7.1M views · 7 years ago

⋮

### What is backpropagation really doing? | Chapter 3, Deep learning

3Blue1Brown · 4.6M views · 6 years ago

⋮

### Backpropagation calculus | Chapter 4, Deep learning

3Blue1Brown · 2.9M views · 6 years ago

⋮

### How large language models work, a visual intro to transformers | Chapter 5, Deep Learning

3Blue1Brown · 3.3M views · 6 months ago

⋮



27:14

6



26:10

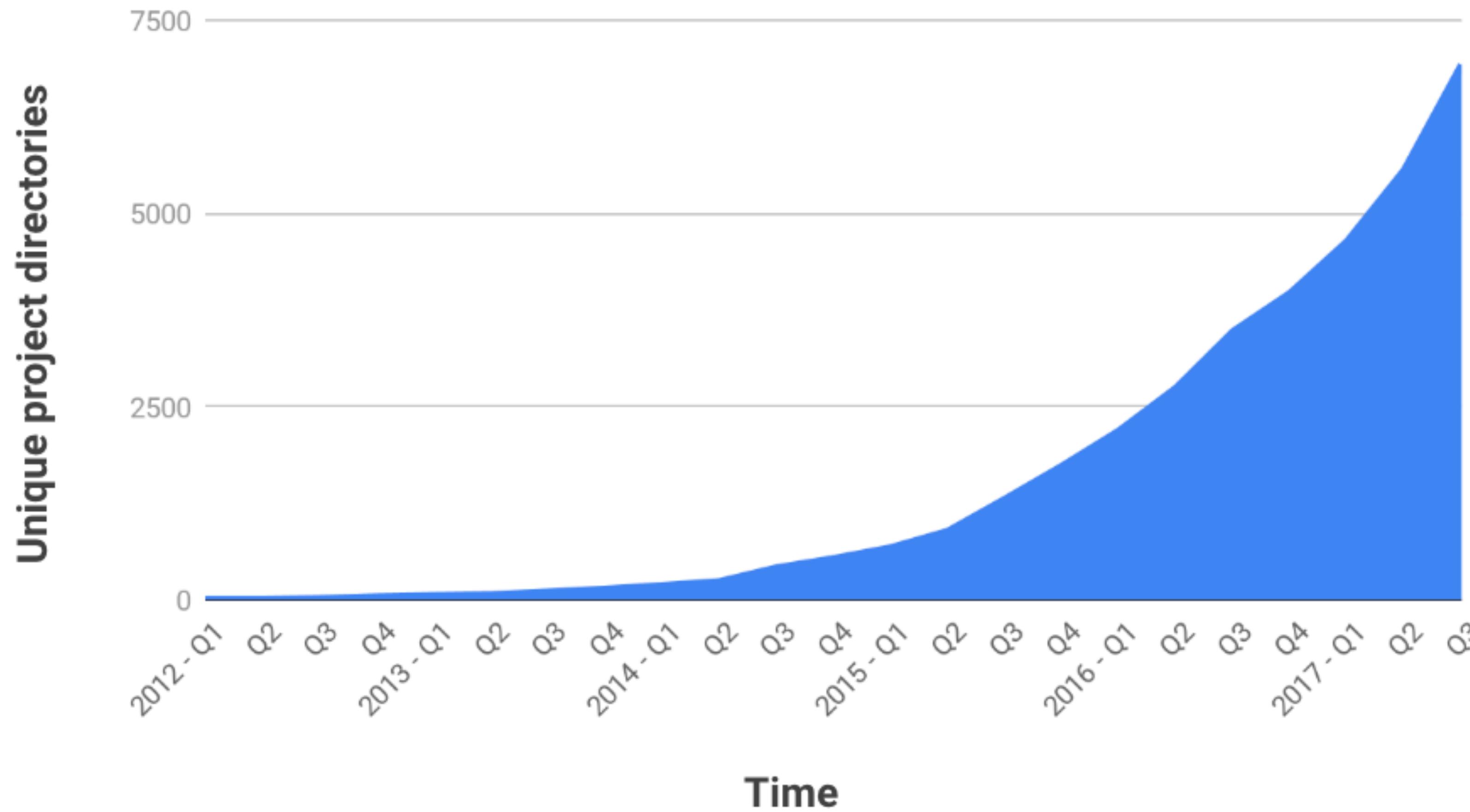
### Attention in transformers, visually explained | Chapter 6, Deep Learning

3Blue1Brown · 1.7M views · 6 months ago

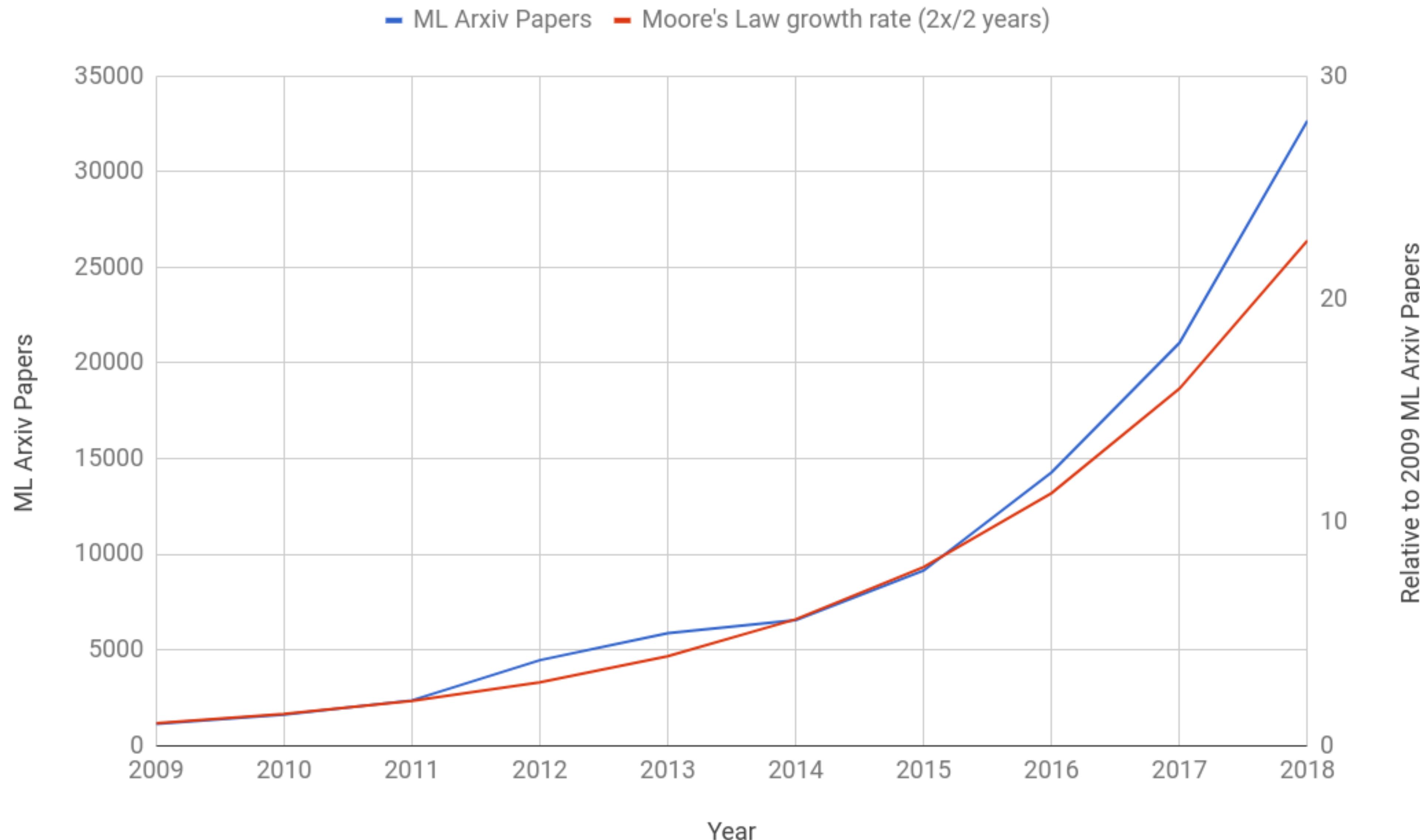
⋮

# Use of Deep Learning at Google

source directories containing deep learning models



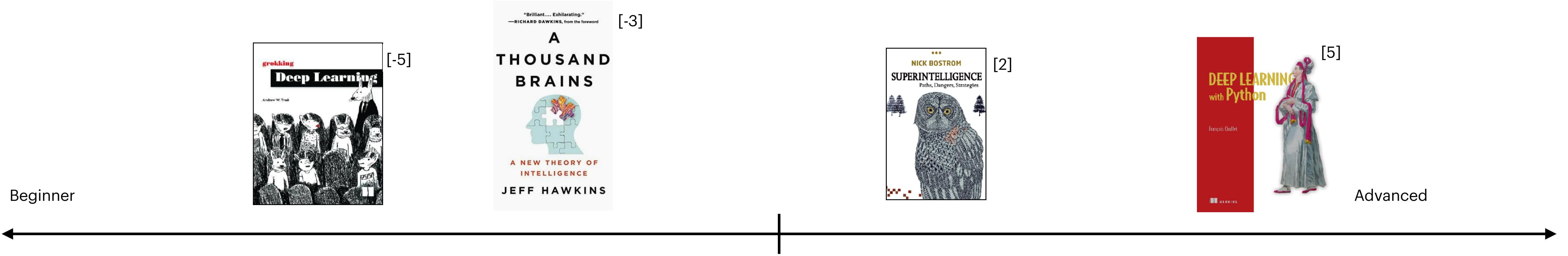
# Industry Adoption



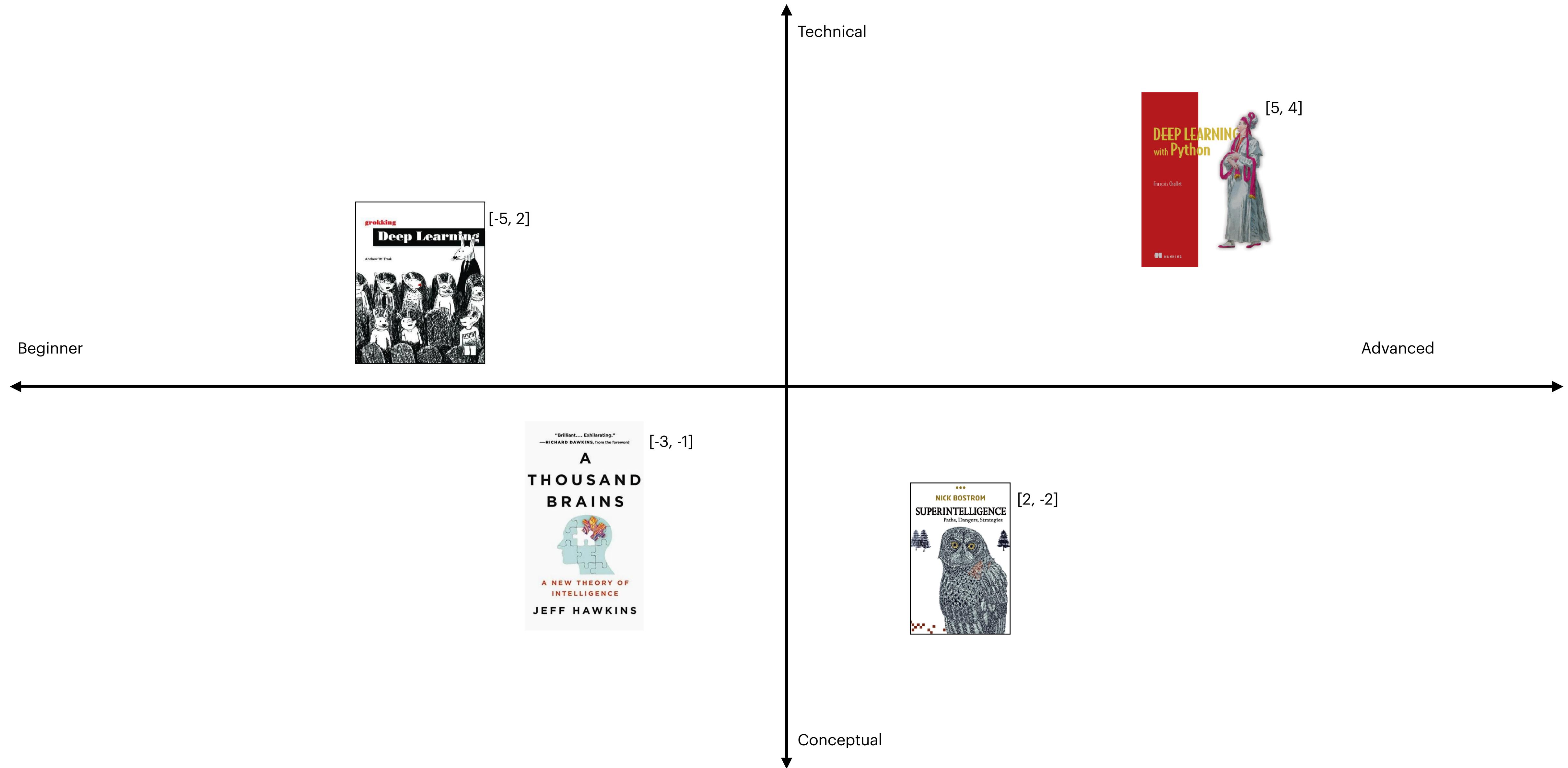
# **Embeddings**

**(The secret sauce of deep learning)**

# Recommending AI Books



# Better: 2-D Coordinate System



# Even better: use N-dimensions

- Neural networks choose the dimensions for us.
- Based on the labelled training data (think “cat” vs. “dog”), neural networks are able to “embed” objects (words, images, video, audio) into N-dimensional space.
- We can represent embeddings as vectors:
  - [a<sub>0</sub>, a<sub>1</sub>, a<sub>2</sub>, ..., a<sub>N</sub>]
  - Similar objects get embedded in similar locations,
  - 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

▼

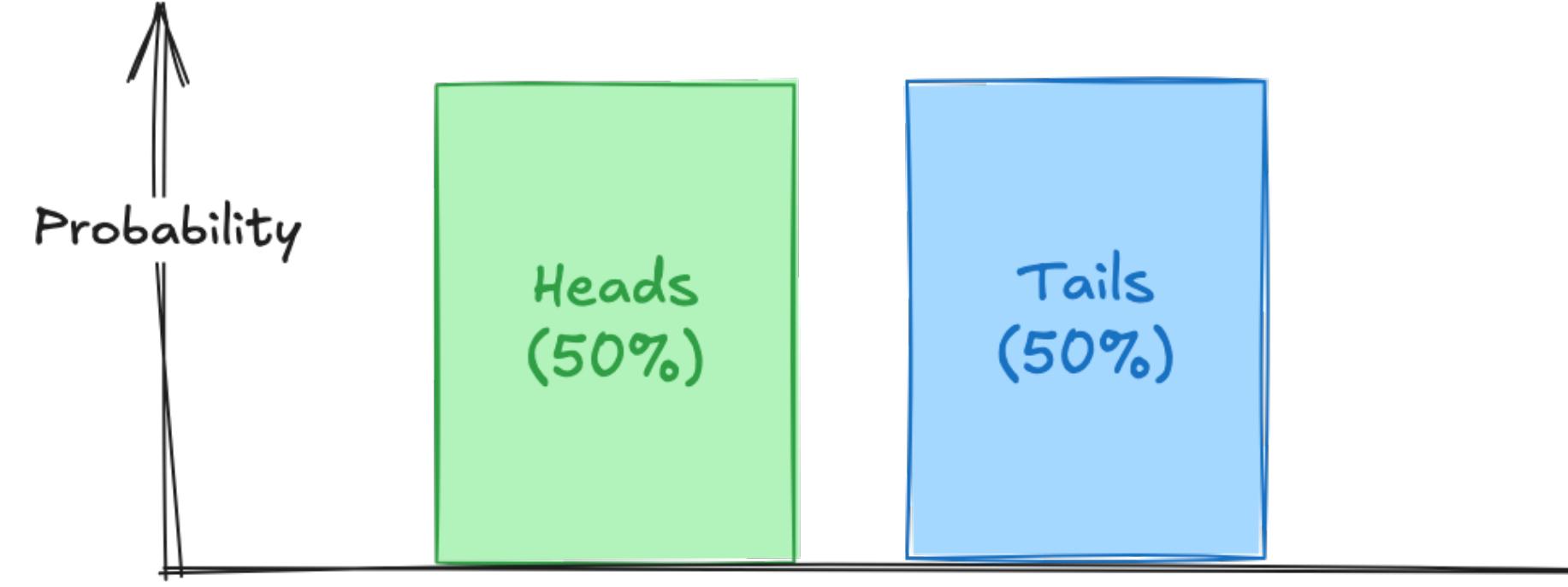
AI

# An Intuitive Guide to How LLMs Work

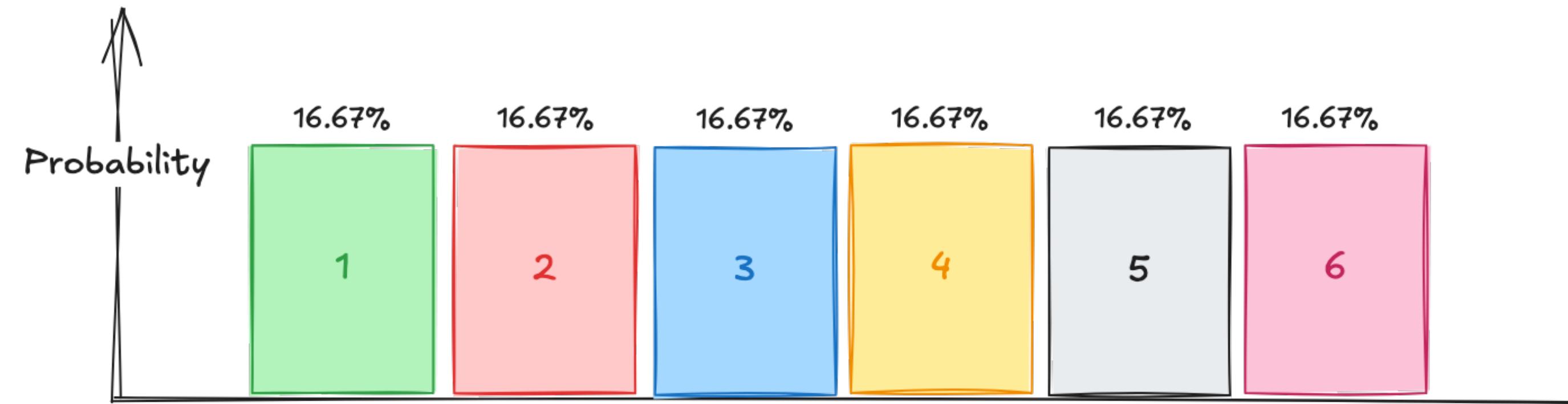
Chatting by chance

OCTOBER 6, 2024

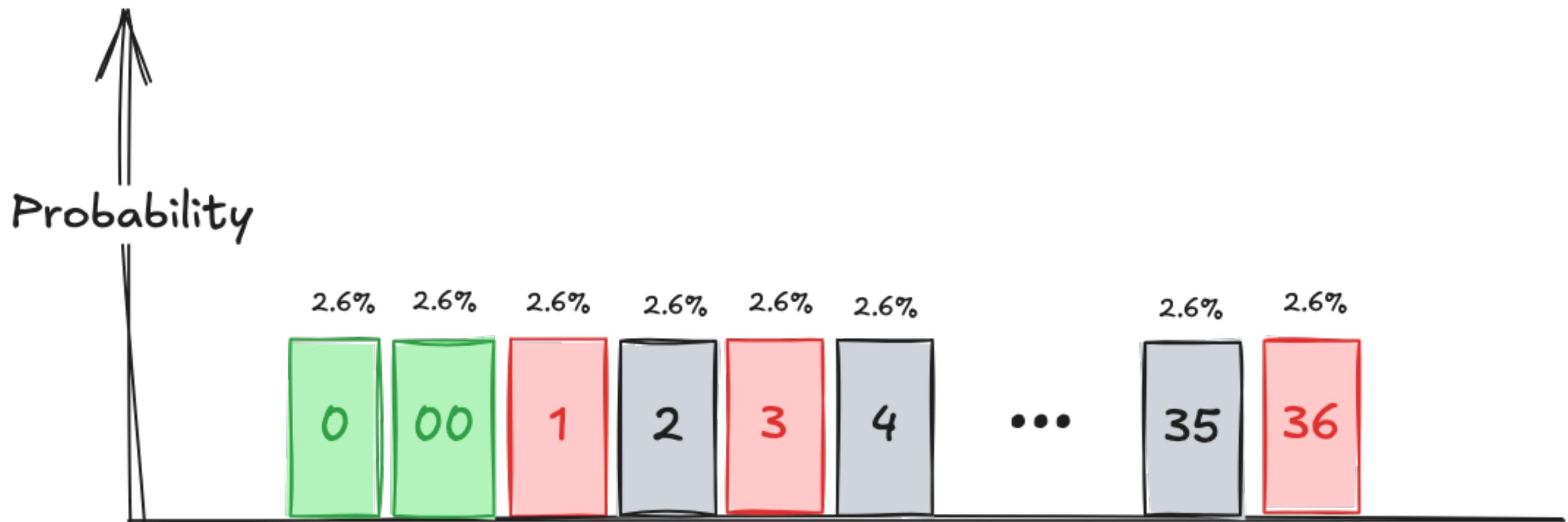




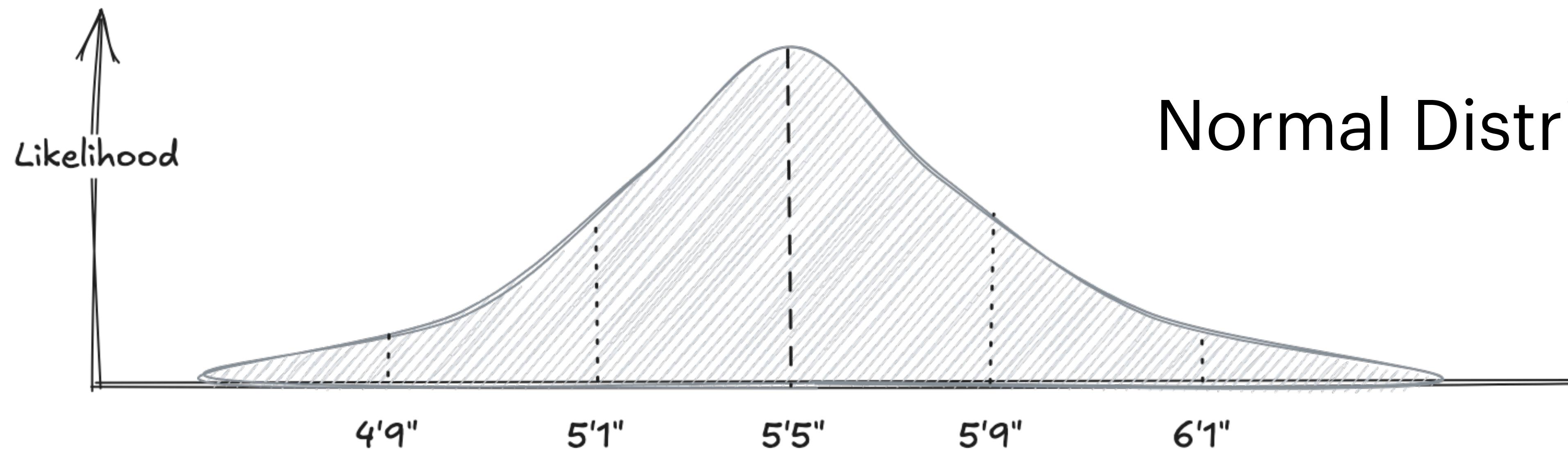
## Coin Flip



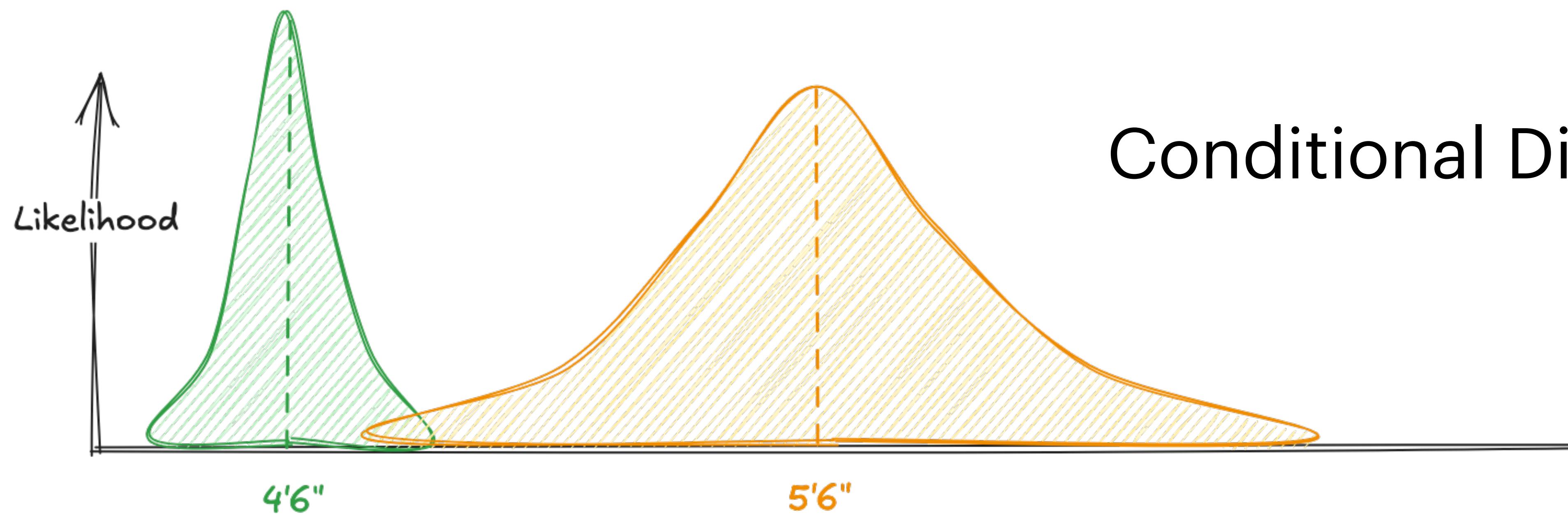
## Die



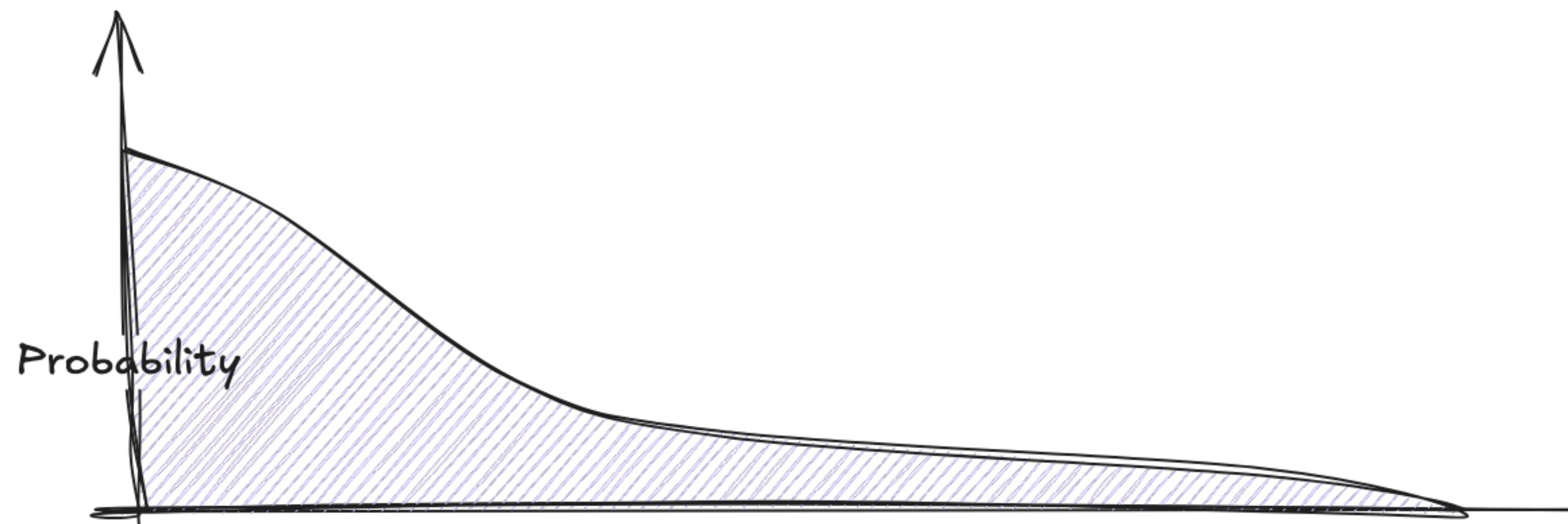
## Roulette Wheel



Normal Distribution



Conditional Distribution



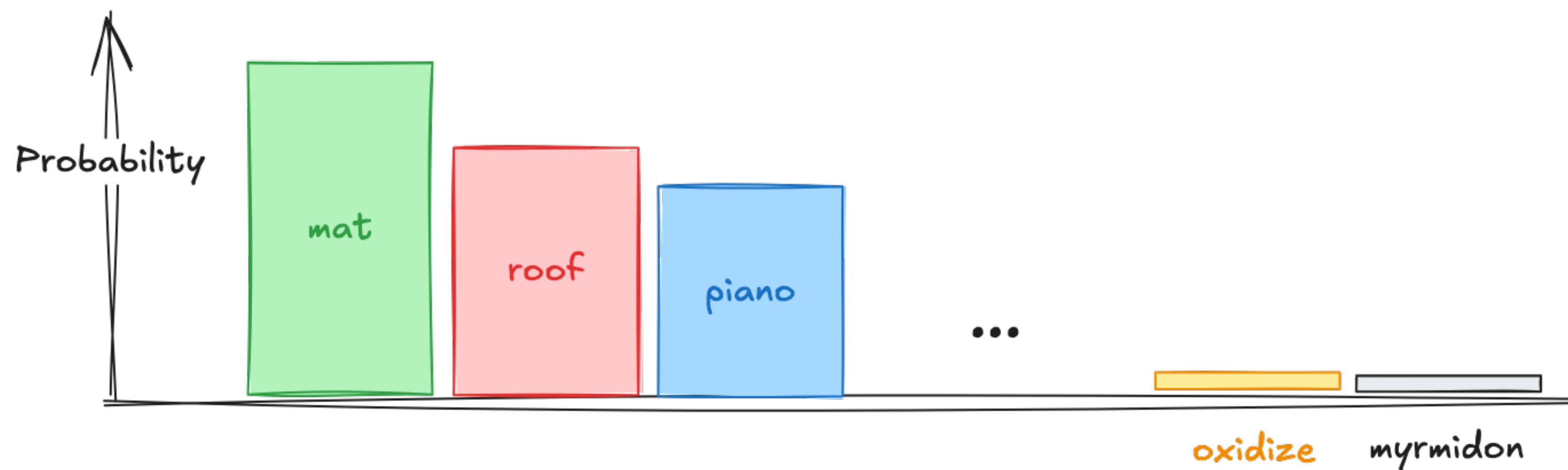
is  
the  
a

street  
yellow  
climb

oxidize  
fissure  
catalyst

peripatetic  
verisimilitude  
myrmidon

The cat sat on the \_\_\_\_\_



**“I.” “WANT.” “HAIR!”**

**(IMPROVISERS / GET  
PERSONAL)**



# Diffusion Models

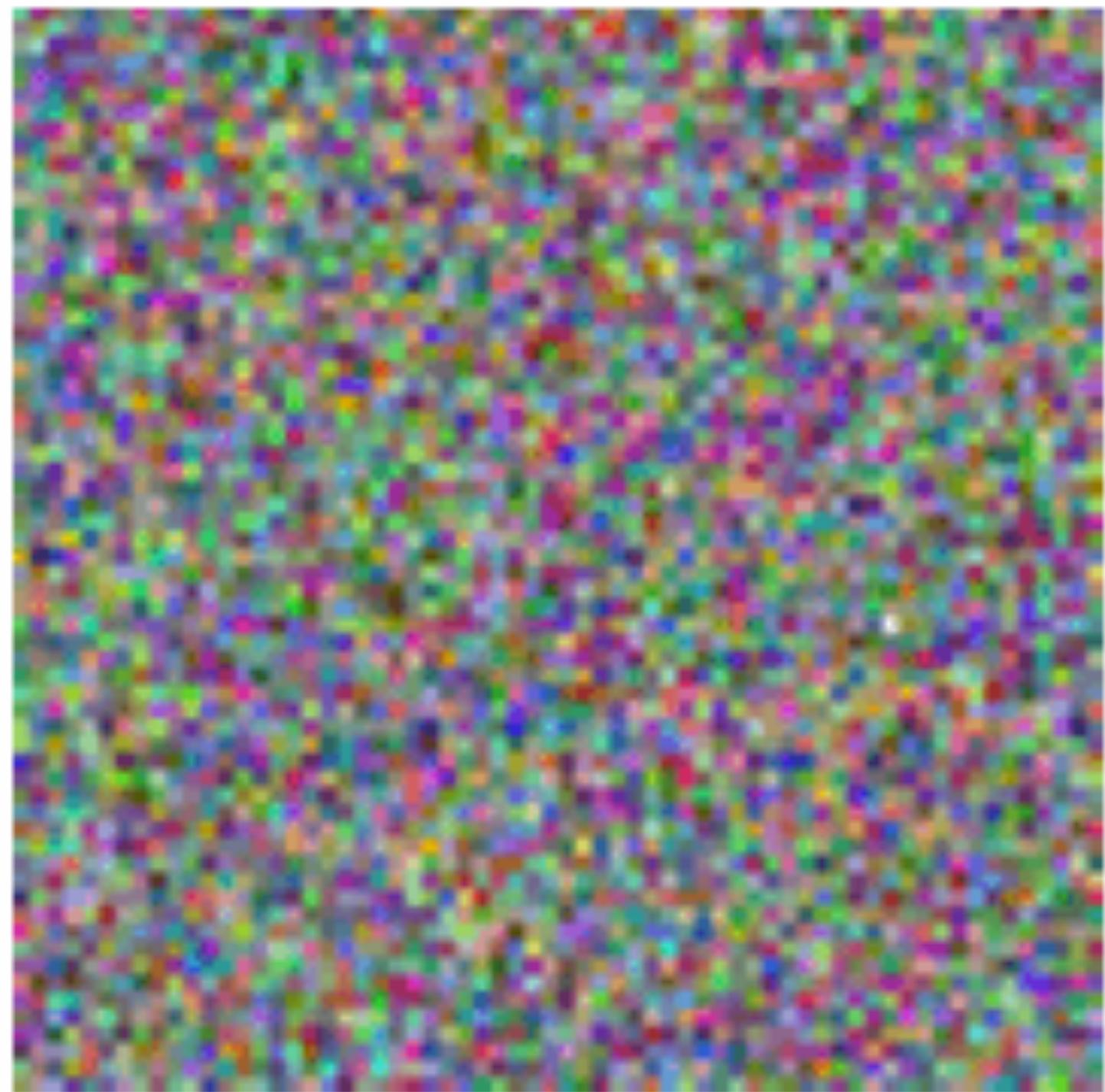
image



Forward diffusion  
noisy image



noise



# Diffusion Models



MJ

What will you imagine?



Search



berada.travel 15h



A child is playing with a baby koala really tiny, they both seem to be friends. The photo should look real and not a cartoon.

ar 9:16 v 6.1

Use

Image

Style

Prompt

Imagine 3m

≡ ⌂ Q

Show how diffusion models  
take a random noisy image and  
iteratively convert them into a clear  
image guided by a text prompt

v 6.1



Creation Actions

More options

Vary

Subtle

Strong

Upscale

Subtle

Creative

More

Rerun

Editor

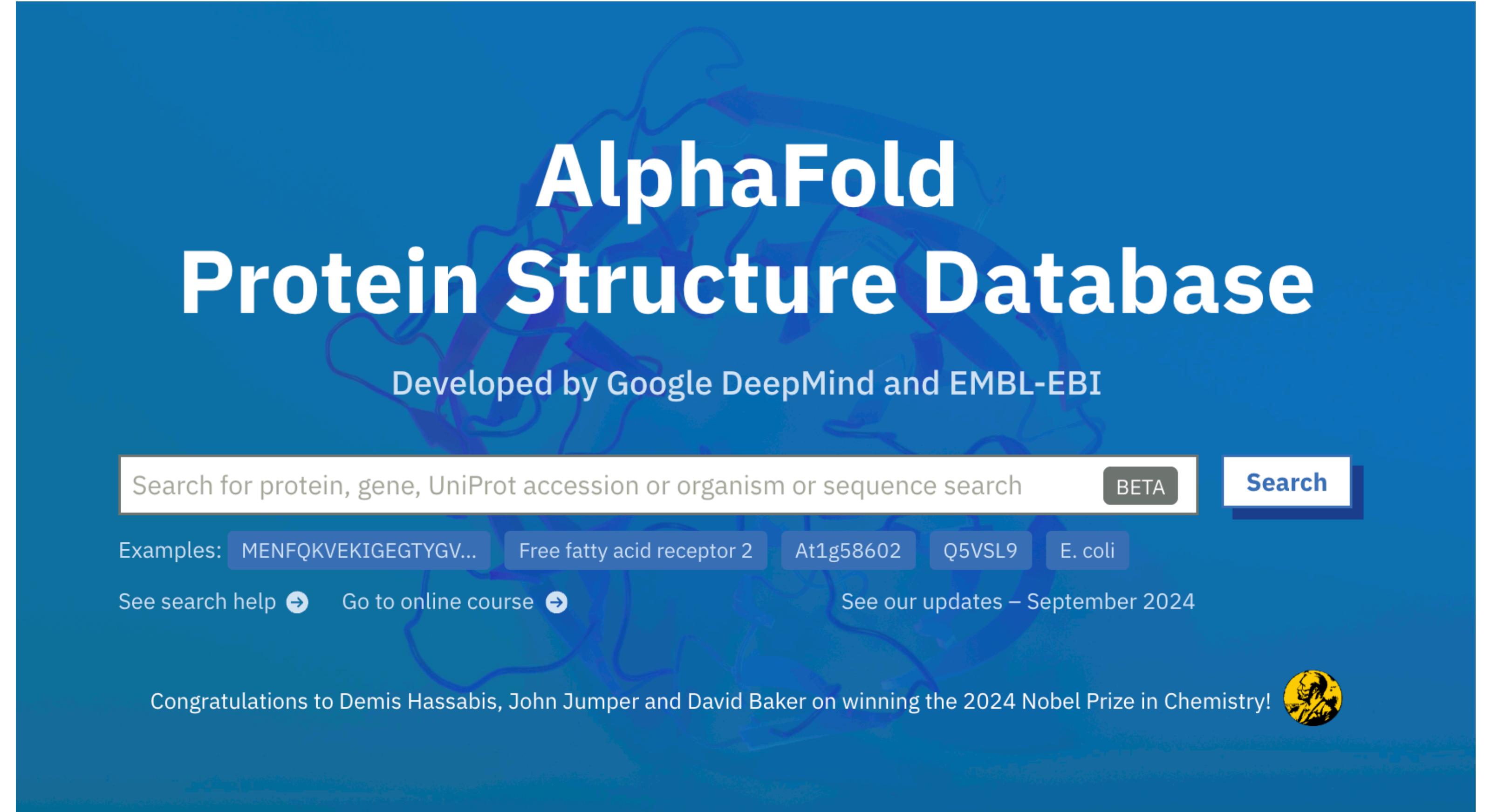
Use

Image

Style

Prompt

# State of the Art



The image shows the homepage of the AlphaFold Protein Structure Database. The background is a blue gradient with a faint, stylized protein structure model. The title "AlphaFold Protein Structure Database" is prominently displayed in large white font. Below the title, it says "Developed by Google DeepMind and EMBL-EBI". A search bar at the top allows users to "Search for protein, gene, UniProt accession or organism or sequence search". There is a "BETA" button next to the search bar and a "Search" button. Below the search bar, there are examples of search terms: "MENFQKVEKIGEGTYGV...", "Free fatty acid receptor 2", "At1g58602", "Q5VSL9", and "E. coli". Links for "See search help" and "Go to online course" are also present. A note mentions "See our updates – September 2024". At the bottom, it congratulates Demis Hassabis, John Jumper, and David Baker on winning the 2024 Nobel Prize in Chemistry, accompanied by a small portrait of Demis Hassabis.

**AlphaFold**  
**Protein Structure Database**

Developed by Google DeepMind and EMBL-EBI

Search for protein, gene, UniProt accession or organism or sequence search BETA Search

Examples: MENFQKVEKIGEGTYGV... Free fatty acid receptor 2 At1g58602 Q5VSL9 E. coli

See search help → Go to online course → See our updates – September 2024

Congratulations to Demis Hassabis, John Jumper and David Baker on winning the 2024 Nobel Prize in Chemistry! 

AlphaFold DB provides open access to over 200 million protein structure predictions to accelerate scientific research.

# Text to Text - ChatGPT

What can I help with?

0 Message ChatGPT



Create image

Summarize text

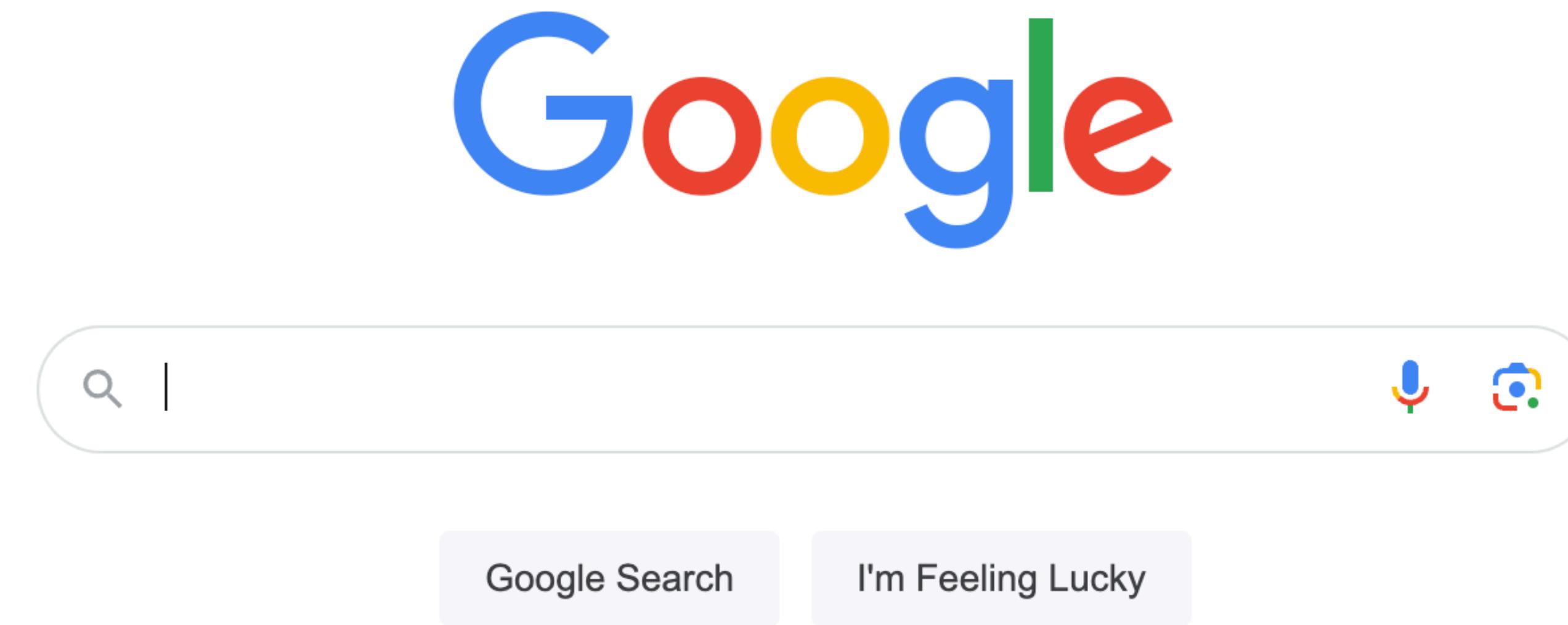
Brainstorm

Code

Make a plan

More

# Does that look familiar?



# Generating Software



I want to build a live demo of a Turing test where I start two parallel chat dialogs with a human and with ChatGPT. The human should be able to participate from their own laptop in another location. The two dialogs should be displayed in parallel but it should not be obvious which is talking to the human and which is talking to ChatGPT. Can you write that app for me?



Building a live demo of a Turing test with two parallel chat dialogs (one with a human and one with ChatGPT) requires a real-time chat application with a user-friendly interface. Below is an outline of how you could create this app, along with some code samples to help you get started.

### Tech Stack:

- **Backend:** Node.js with Express (for real-time communication)
- **Frontend:** HTML/CSS/JavaScript (for chat interface)
- **WebSocket:** Socket.IO (to handle real-time messaging between the server, the human participant, and the client performing the test)
- **AI Model:** ChatGPT API (via OpenAI API)
- **Database (optional):** You could use MongoDB or Firebase for logging the chat conversations, but this is optional.

● ● ●

```
~/p/turing$ ls -l
total 72
-rw-r--r--@ 1 mco  staff  11357 Oct 15 14:00 LICENSE
-rw-r--r--@ 1 mco  staff     71 Oct 15 14:00 README.md
-rw-r--r--@ 1 mco  staff   2405 Oct 15 14:12 app.py
-rw-r--r--@ 1 mco  staff   1286 Oct 15 14:13 human.html
-rw-r--r--@ 1 mco  staff  1928 Oct 15 14:13 index.html
-rw-r--r--@ 1 mco  staff     14 Oct 15 14:12 run.sh
-rwxr-xr-x@ 1 mco  staff    42 Oct 15 14:11 setup.sh
```

```
~/p/turing$
```

```
~/p/turing$ wc -l *
```

```
201 LICENSE
  2 README.md
  73 app.py
  55 human.html
  74 index.html
   1 run.sh
   1 setup.sh
407 total
```

```
~/p/turing$ █
```

# How the pros do it



A screenshot of a computer screen showing a GitHub Copilot interface integrated into a code editor. The interface includes a sidebar with icons for file, search, and navigation, and a main area for chat and code.

**GITHUB COPILOT: CHAT**

monalisa  
Write unit tests for this function

**GitHub Copilot**

```
import unittest
import datetime

class TestParseExpenses(unittest.TestCase):
    def test_parse_expenses_with_valid_input(self):
        expenses_string = '2023-01-02 -34.01 USD\n2023-01-03 2.59 DKK\n2023-01-03 -2.72 EUR'
        expected_output = [(datetime.datetime(2023, 1, 2), -34.01, 'USD'),
                           (datetime.datetime(2023, 1, 3), 2.59, 'DKK'),
                           (datetime.datetime(2023, 1, 3), -2.72, 'EUR')]
        self.assertEqual(parse_expenses(expenses_string), expected_output)

    def test_parse_expenses_with_empty_input(self):
        expenses_string = ''
        expected_output = []
        self.assertEqual(parse_expenses(expenses_string), expected_output)

if __name__ == '__main__':
    unittest.main()
```

The code assumes that the `datetime` module is imported. The test cases cover different scenarios such as valid input, empty input, input with comments, invalid date format, and invalid value format.

Ask a question or type '/' for commands ➤

**parse\_expenses.py** × **addresses.rb** × **sentiments.ts** ×

```
1 import datetime
2
3 def parse_expenses (expenses_string):
4     """Parse the list of expenses and return the list of triples (date, amount, currency)
5     Ignore lines starting with #.
6     Parse the date using datetime.
7     Example expenses_string:
8         2023-01-02 -34.01 USD
9         2023-01-03 2.59 DKK
10        2023-01-03 -2.72 EUR
11        """
12        expenses = []
13
14        for line in expenses_string.splitlines():
15            if line.startswith("#"):
16                continue
17            date, value, currency = line.split(" ")
18            expenses.append((datetime.datetime.strptime(date, "%Y-%m-%d"),
19                             float(value),
20                             currency))
21
22        return expenses
23
24 expenses_data = '''2023-01-02 -34.01 USD
25                     2023-01-03 2.59 DKK
26                     2023-01-03 -2.72 EUR'''
```

# Turing Test Demo



Prospective Students

Current Students

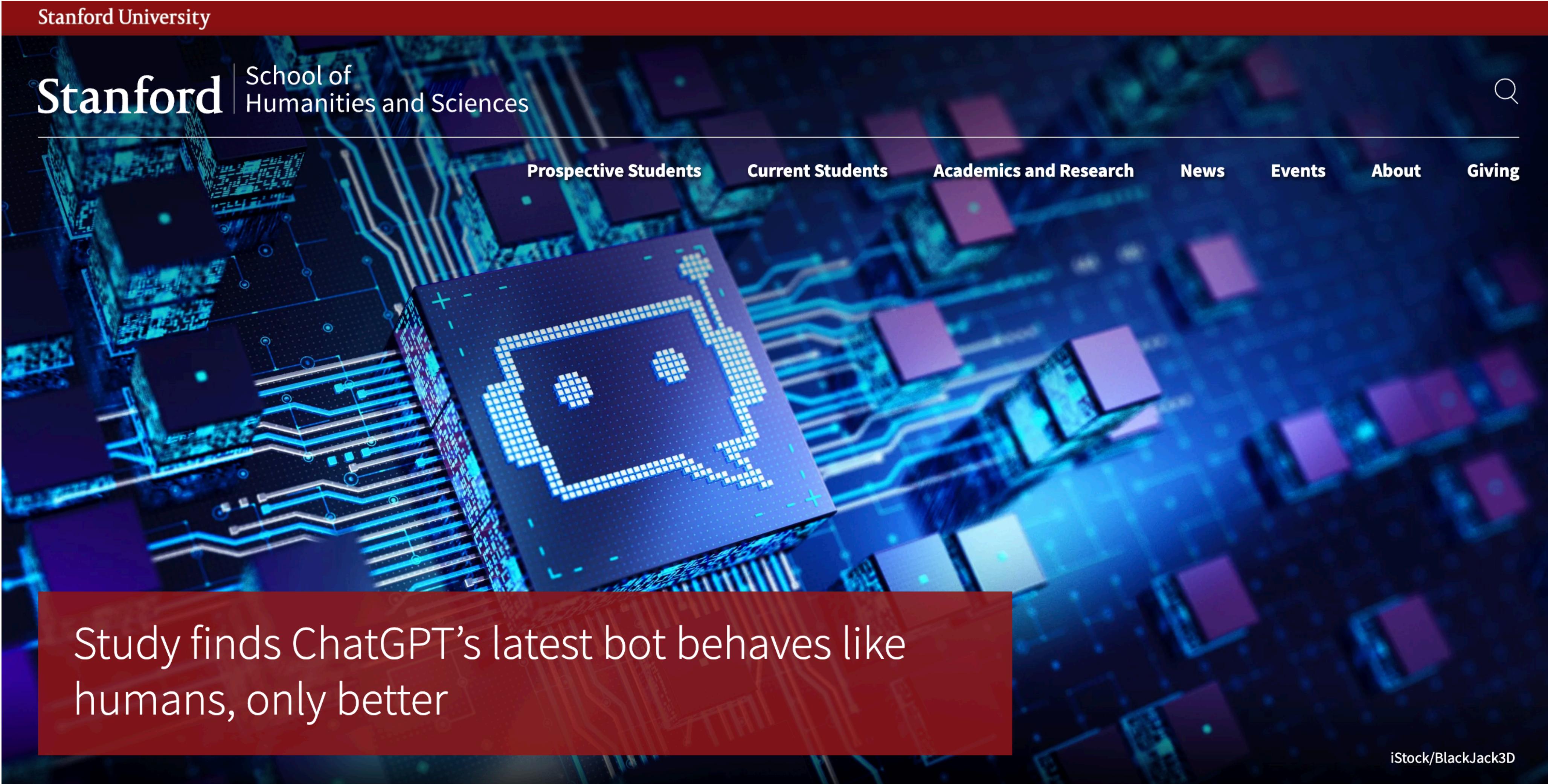
Academics and Research

News

Events

About

Giving



Study finds ChatGPT's latest bot behaves like humans, only better

iStock/BlackJack3D

The most recent version of ChatGPT passes a rigorous Turing test, diverging from average human behavior chiefly to be more cooperative.

# 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

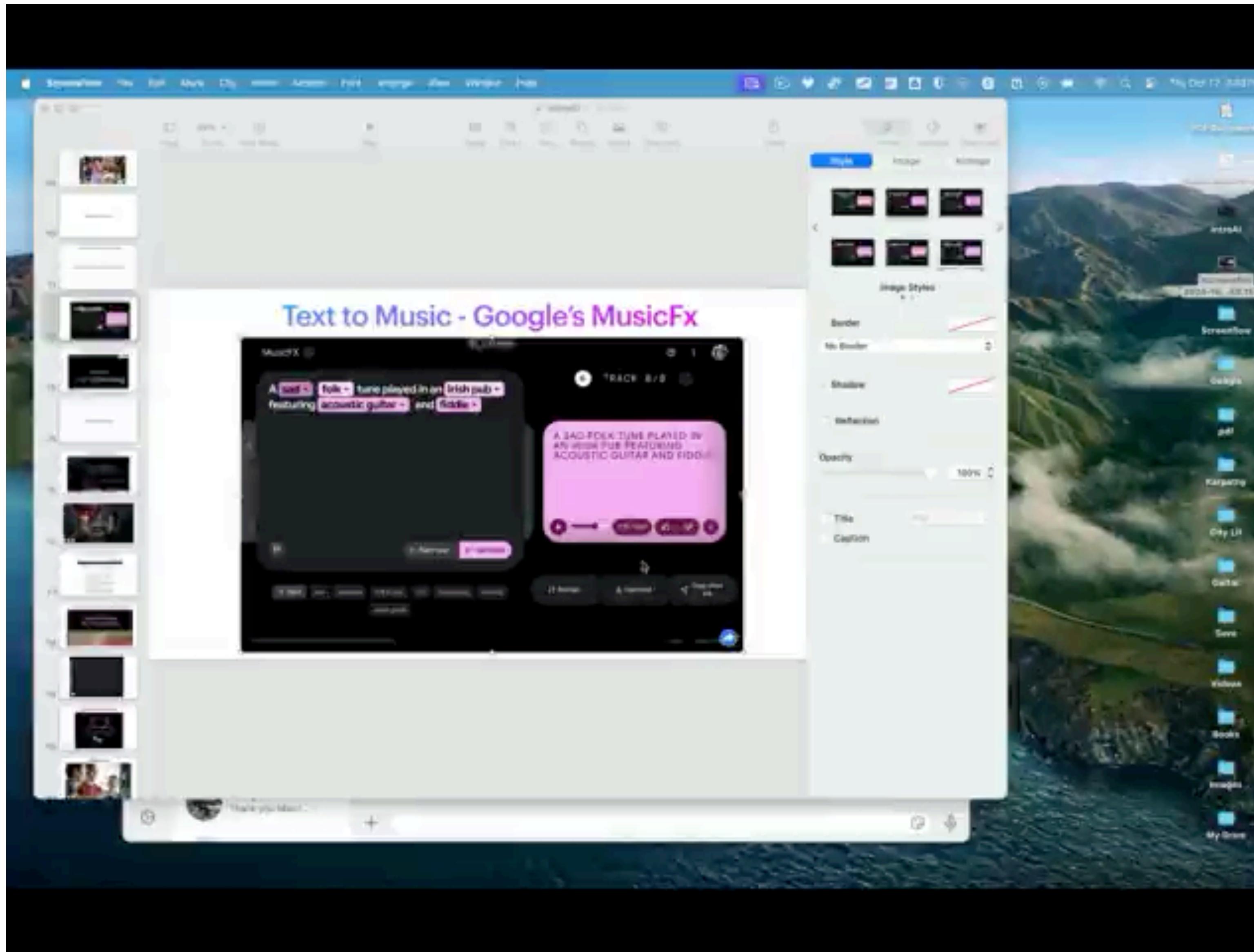
Updates

Light Mode

Search

Text to Speech - [ElevenLabs](#)

# Text to Music - Google's MusicFx



# Text to Audio - NotebookLM

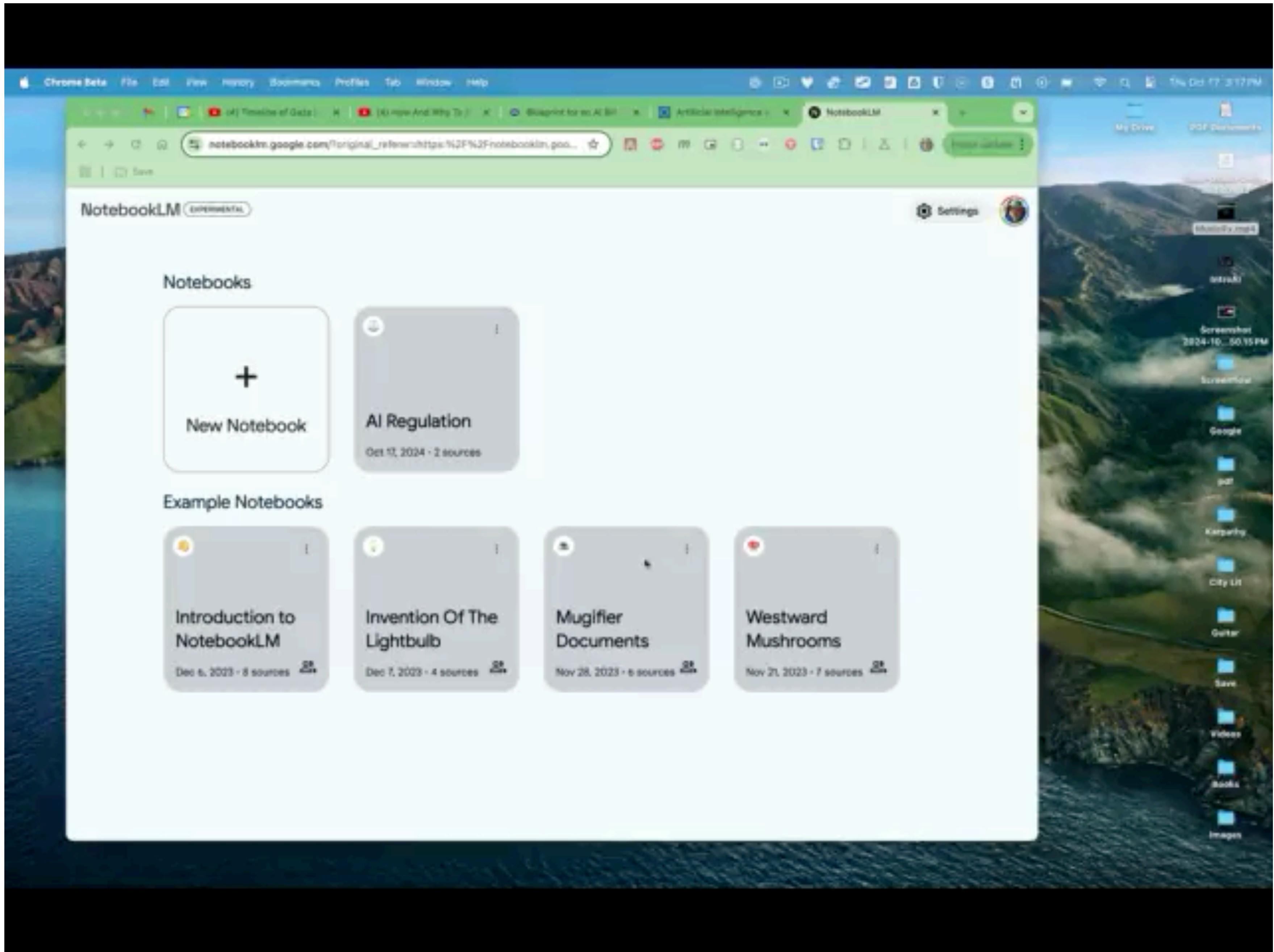
NotebookLM EXPERIMENT

[Try NotebookLM](#)

Do your best

brainstorming

NotebookLM is your personalized AI research assistant powered by Google's most capable model, Gemini 1.5 Pro.



# Text to Video - Runway

“Make the kid in this photo come alive and dance a little dance”





SILVER  
AI FILM  
FESTIVAL  
2024



# Video to Text - Gemini

Gemini ▾

Try Gemini Advanced



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



summarize this video: [https://www.youtube.com/watch?v=UvObKRaxZ\\_Q](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.

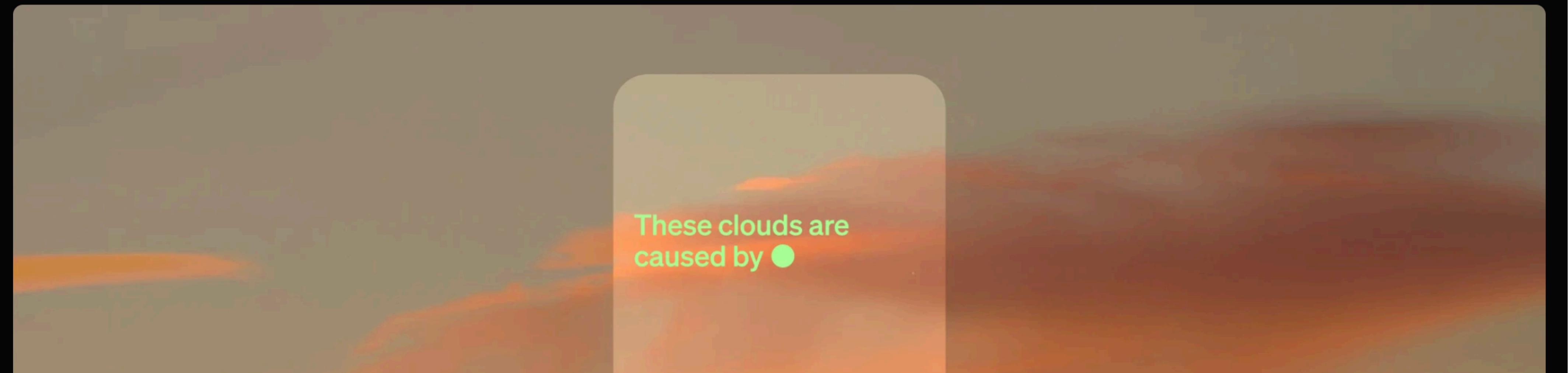
The AI Bill of Rights has five core principles: safe and effective systems, prevention of algorithmic discrimination, data privacy, proper notice and explanation, and alternative options. Rivera believes that the bill is a good start but that it needs to be implemented carefully. He also warns that AI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

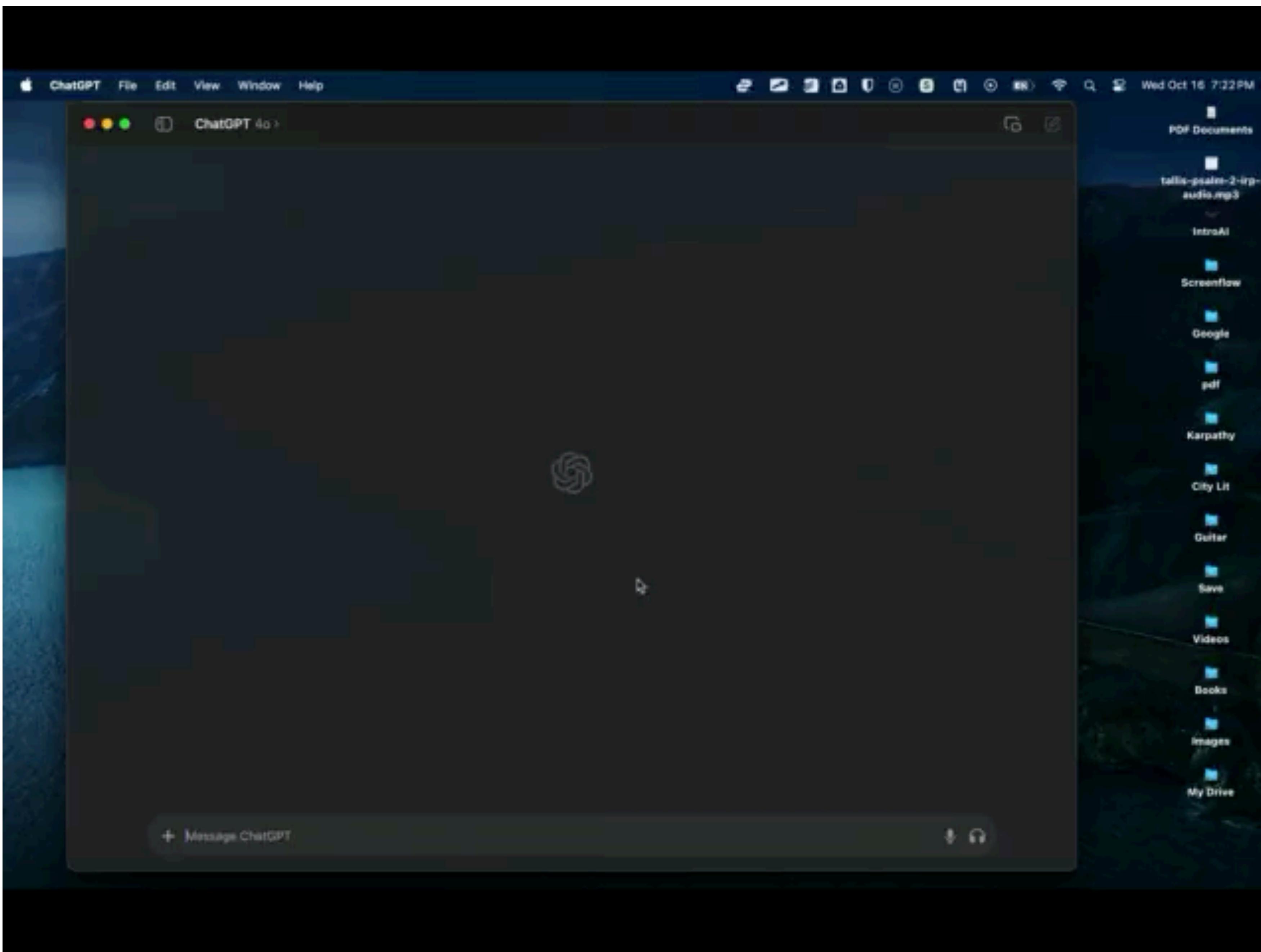
by

# The Dream: Multimedia to Multimedia

September 25, 2023

ChatGPT can now  
see, hear, and speak





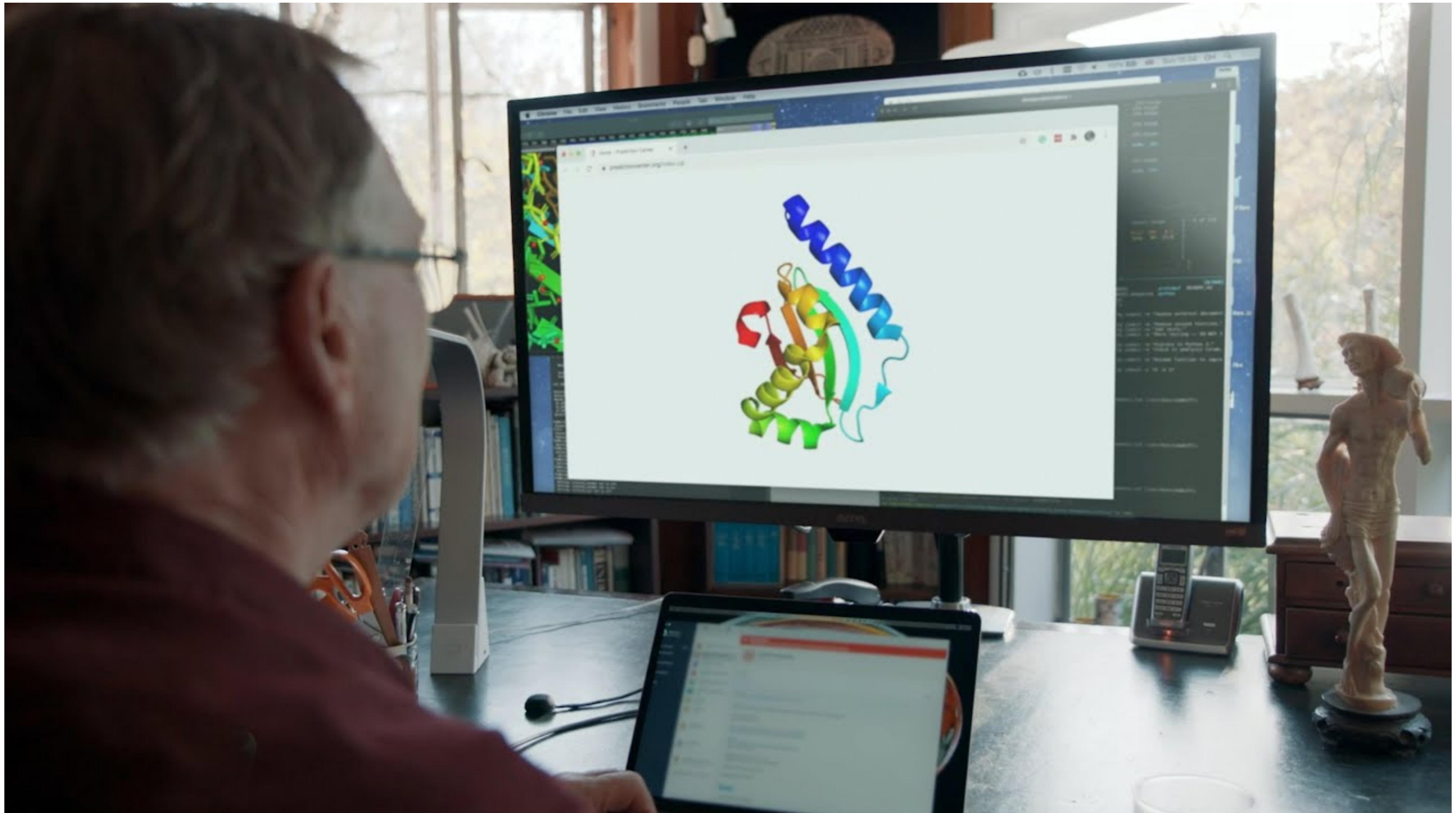
# AlphaGo



# AlphaZero



# AlphaFold



# AlphaFold is Open Source

<https://github.com/google-deepmind/alphafold>

# AI Advances in Medicine

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

# Unexpected Discoveries



Image of retina



Blood pressure predictions  
focus on blood vessels



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

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 TWO MINUTE PAPERS

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[users.cg.tuwien.ac.at/zsolnai](https://users.cg.tuwien.ac.at/zsolnai) and 3 more links

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This paper was written by Bowen Baker, Ingmar Kanitscheider, Todor Markov, Yi Wu, Glenn Powell, Bob McGrew and Igor Mordatch, who all contributed significantly to it. For brevity, the "Source" in the lower left has been shortened to "OpenAI".

The agents can move by setting a force on themselves in the x and y

The agents can see objects in their line of sight and within a frontal

The agents can sense distance to objects, walls, and other agents

OpenAI Plays Hide and Seek...and Breaks The Game! 🤖

10,310,414 views • 4 years ago

Check out Weights & Biases here and sign up for a free demo:  
<https://www.wandb.com/papers>

Their blog post is available here:  
<https://www.wandb.com/articles/better...>

+ 4



# **STATE OF AI REPORT.**

**October 10, 2024**

**Nathan Benaich**

**AIR STREET CAPITAL.**

[stateof.ai](http://stateof.ai)

[airstreet.com](http://airstreet.com)

# Ethics

## Using AI Safely



**“With great power comes great responsibility”**

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

# Here's my list...

- **Privacy & Surveillance**
- **Bias & Fairness**
- **Misinformation & Disinformation**
- **Military use of AI**
- **Economic Impact**
- **Environmental Impact**
- **Copyright Protection**

# Privacy & Surveillance

- “**If you’re not paying for it, you’re the product**”.
- **Your AI interactions are being used just like your web searches.**
- **How many times have you read the terms & conditions?**
- **Facial recognition is widely used in the UK without your consent.**
- **Legislators and companies are working on regulation but progress is much slower than technological advances.**
- **New privacy threats are emerging every day.**
- **IMO, companies cannot be trusted to self-govern.**

# Privacy & Surveillance





# Bias & Fairness

- 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 & Disinformation

- **It's easier than ever to lie.**
- **Deepfakes are a particularly alarming development.**
- **This poses serious threats to democracy and is increasingly being weaponized.**
- **Education is critically important.**
- **Can we use AI to counter these threats?**
- **Example: fullfact.org**
- **Why are efforts like Full Fact so underfunded?**

# 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**

# Employment Impact

- **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

# Environmental Impact

- Carbon footprint of training one deep learning model same as the lifetime emission of 5 cars.
- Computation required to train the most advanced AI models doubles every 3.4 months.
- Globally, AI-related infrastructure consumes six times more water than Denmark.
- Chips that power AI 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 Protection

- How will it work in the AI era?
- AI companies are getting a free ride.
- Did you get your ChatGPT royalty check for your blog articles?
- My opinion: 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.

# AI Regulation

- US: [Blueprint for an AI Bill of Rights](#)
- EU: [Artificial intelligence act](#)

## NotebookLM:

Both the US and EU are taking steps to regulate AI, albeit with different approaches. The US Blueprint focuses on setting ethical guidelines and promoting responsible AI development, while the EU AI Act establishes legally binding rules with a stronger focus on enforcement. These frameworks highlight the growing global recognition of the need to govern AI development and use to protect individual rights and ensure its societal benefits are realized.

# The Future

## Where is all this going?



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

# Discussion: Four Questions

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

# My Answers

## 1. Are language models intelligent?

- Yes. These models “understand” things.
- How do we understand things?

## 2. Can humans be trusted with this tool?

- Clearly not. 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.
- Nothing new about humans using tools for bad purposes.
- We've been on this path for a while (internet, smart phones, social media).
- The solution to most problems is education.

## 4. Are we doomed?

- Possibly, but given my answer to 1, I'm not sure that's all bad. :)
- Geoff Hinton's view

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

- Geoff Hinton

**Recommended  
Listening**

The  
Guardian

**BLACK BOX**



**What are the biggest risks associated with the AI revolution?**



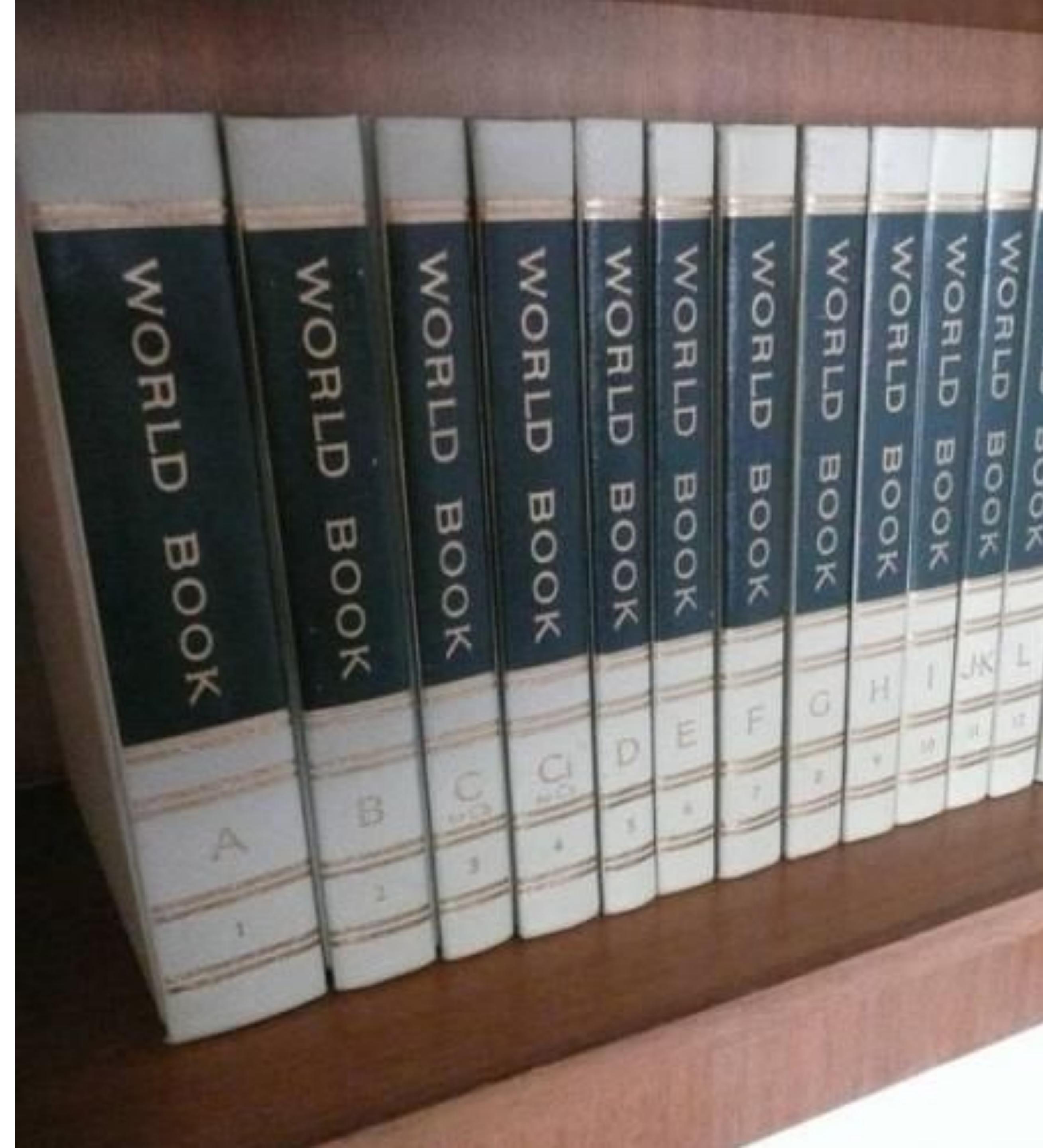
# Navigating Change

- high level languages
- portable operating systems
- Moore's Law
- PC proliferation
- the internet
- the web
- smart phones
- the cloud
- data science boom
- ML & AI

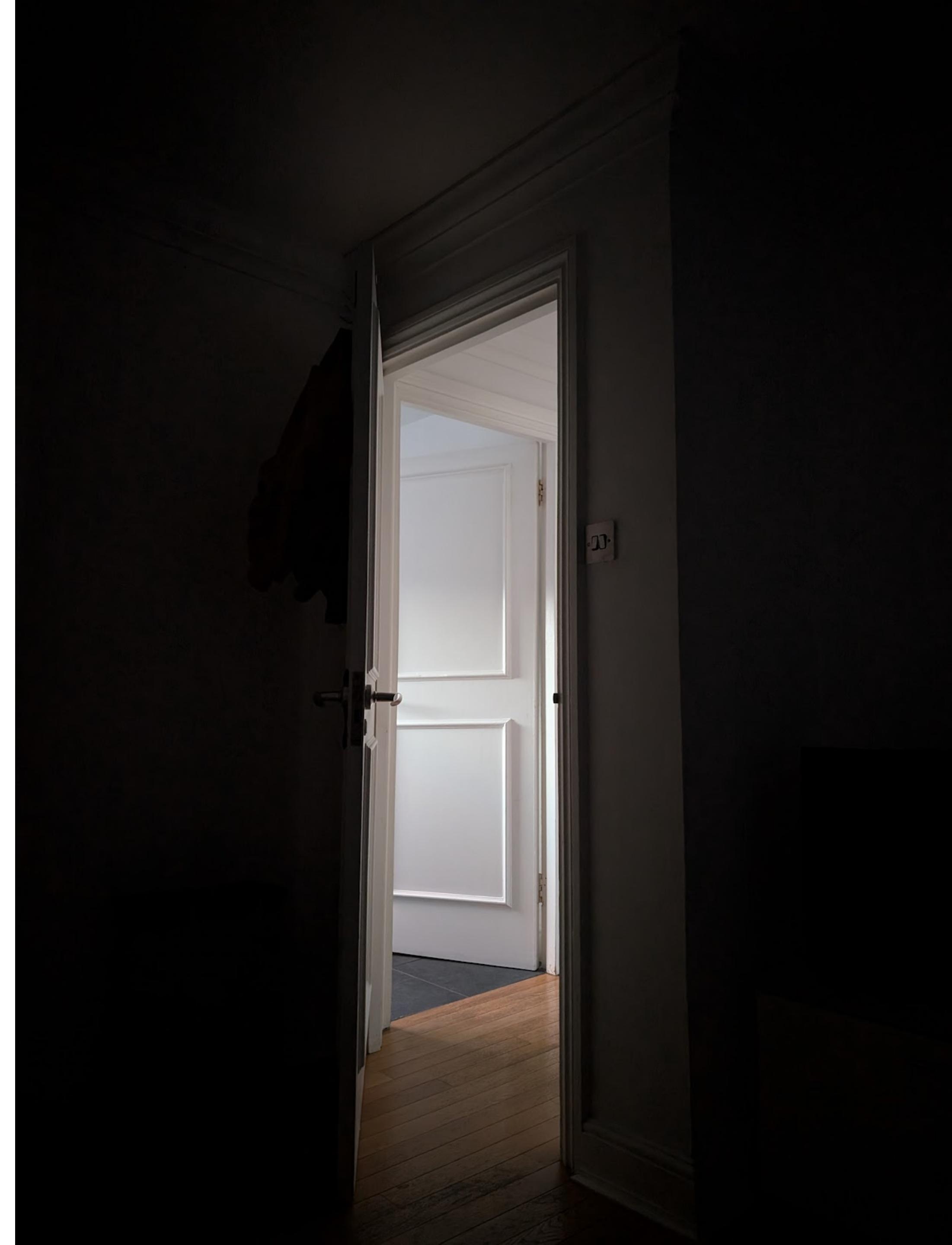
A close-up photograph of a black dog's face, looking slightly upwards and to the left. The dog has dark eyes and a visible nose. To the left, a person's arm and shoulder are partially visible, wearing a light-colored shirt. A colorful, translucent triangular shape, possibly a toy or a piece of clothing, is held near the dog's head. The background is a plain, light-colored wall.

Ok, but how?

**Be curious**

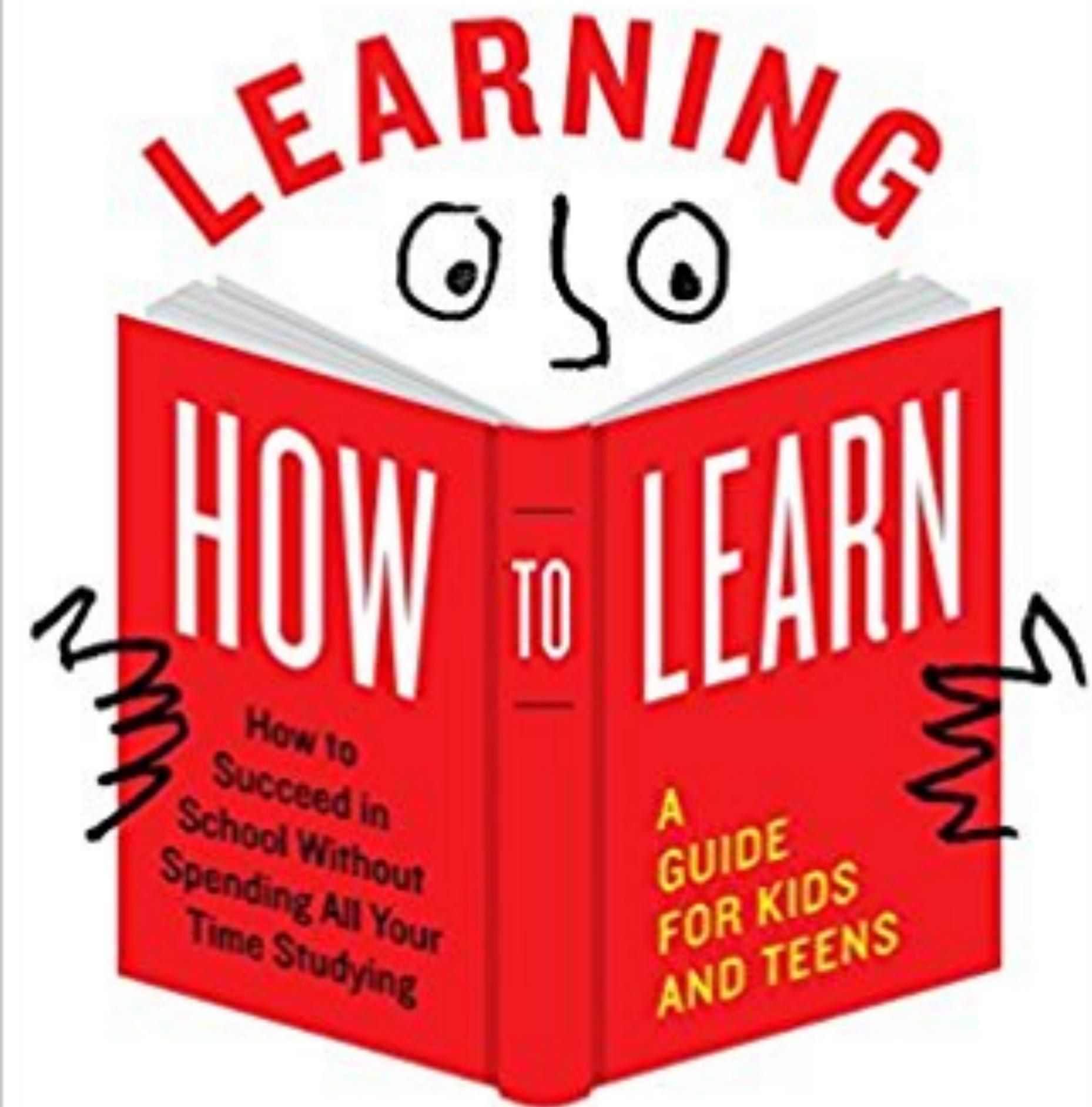


**Be open to opportunity**



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



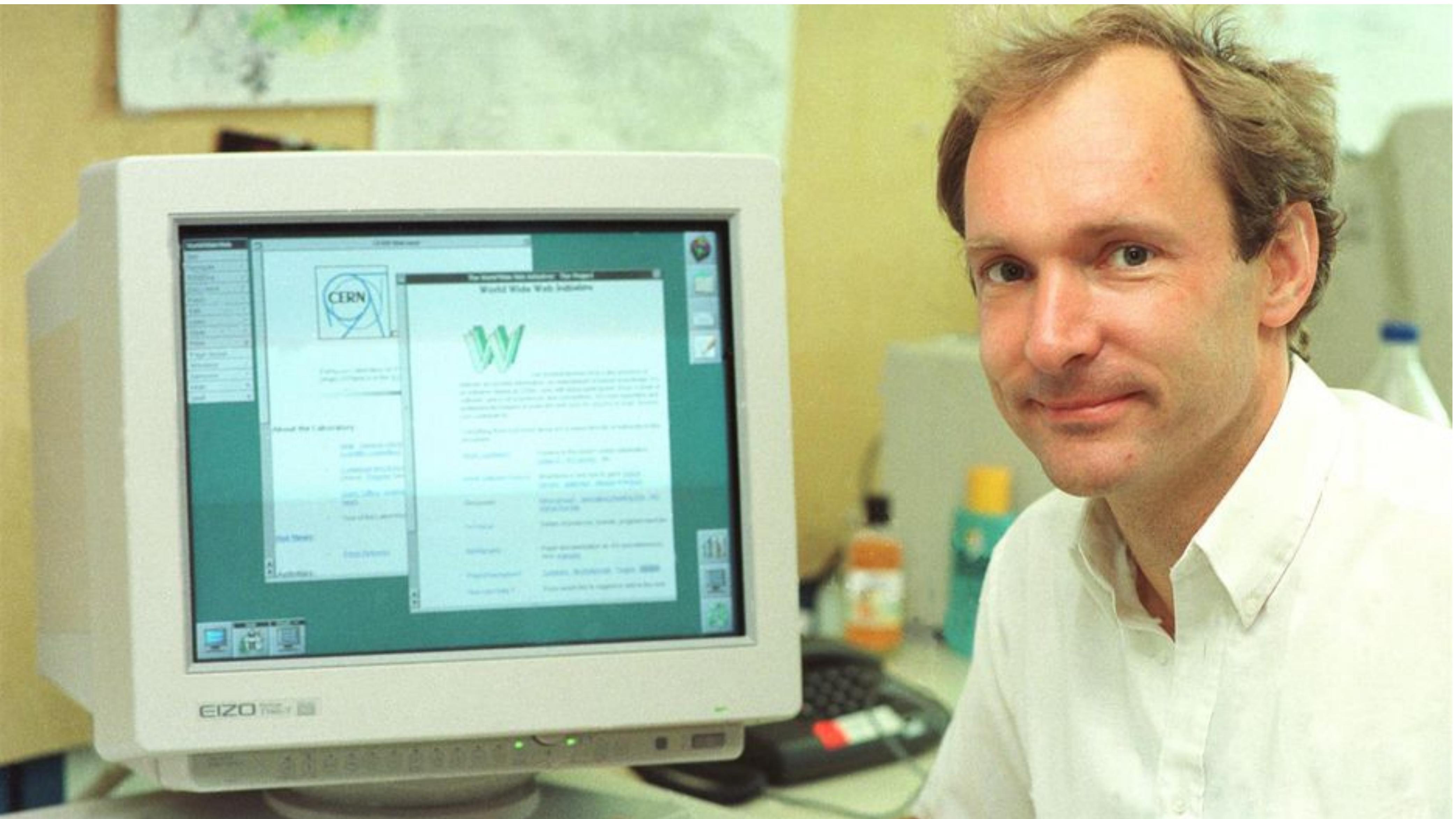
BARBARA OAKLEY, PhD, AND  
TERRENCE SEJNOWSKI, PhD,  
WITH ALISTAIR McCONVILLE

**Be intentional  
(make plans!)**



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

# This is for everyone



# Slides

[mco.dev/ai](https://mco.dev/ai)

# Feedback

<https://bit.ly/citylit-ai-eval>