Computer Science Society

Giants of Logic

WEEK 10



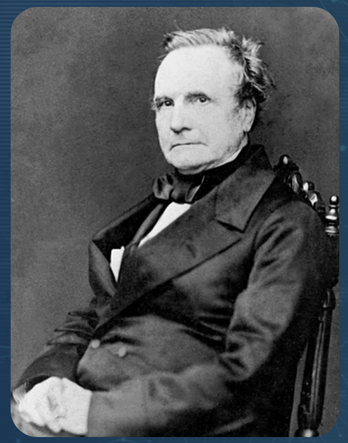
Presented by Aren, Michal, Sergi

THE FIRST PROGRAMMERS

Ada Lovelace & Charles Babbage are influential figures which sparked concepts for a computer predating the first chip by a century.

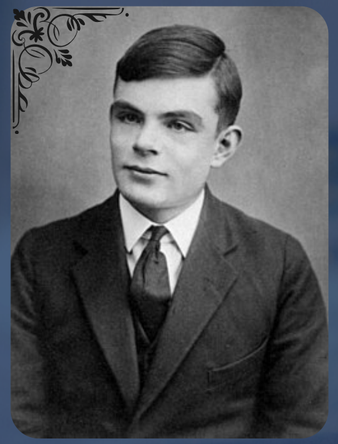


- Ava Lovelace found further complexities that could be computed with the freshly invented newfound concept of computers, realising to what extent that machinery systems could target to replicate human skills



- Charles Babbage hypothesised a sort of “analytical machine” which was the first mechanical computer

CAN MACHINES THINK?



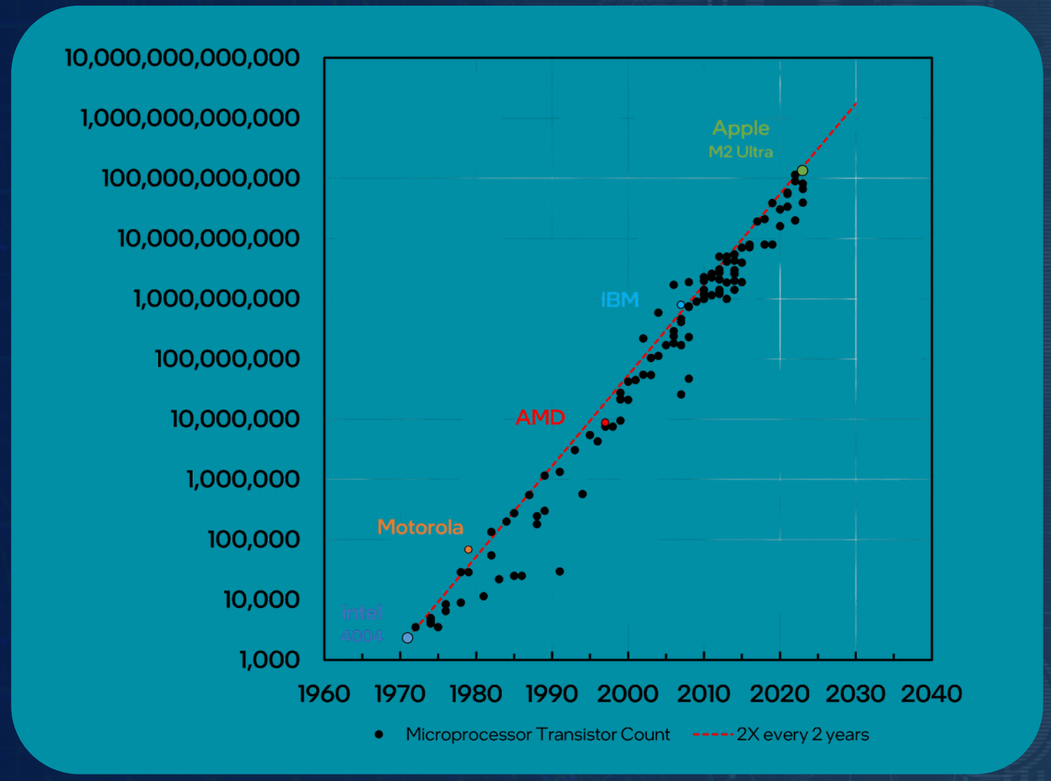
Alan Turing: The father of modern CS. He broke the Enigma code using early computing logic.

He proposed that if a machine can fool a human 30% of the time in a text chat, it is **"intelligent."**



ELIZA (1966): The first chatbot.
It used simple pattern matching:
(e.g., If you say "I'm sad," it replies "Why are you sad?").
The Effect: People cried and confessed secrets to it, even though they knew it was code. (The "ELIZA Effect").

THE HARDWARE REALITY CHECK - (1970)



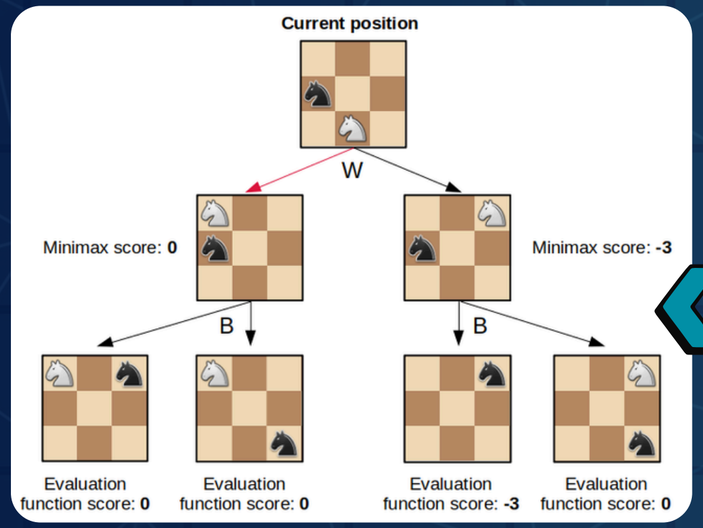
Moore's Law & The AI Winter

Moore's Law: "The number of transistors on a chip doubles every two years."
The Problem: In the 70s, computers had kilobytes of memory.

- To recognize a face, you need megabytes.
- To understand language, you need gigabytes.

The AI Winter: Billions in funding evaporated because the Computer Science (hardware) hadn't caught up to the Math (theory).

BRUTE FORCE VS. INTUITION



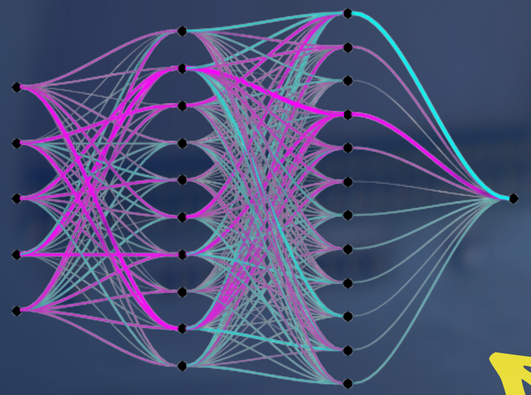
The Event: IBM's Deep Blue defeated Garry Kasparov (World Chess Champion).

How it worked: It didn't "learn." It used Symbolic AI. It calculated 200 million positions per second.



It was a triumph of Search Algorithms (a core CS concept), not Neural Networks.
Kasparov's Reaction: He accused IBM of cheating because the machine made a move that felt "too human" (it was actually a bug).

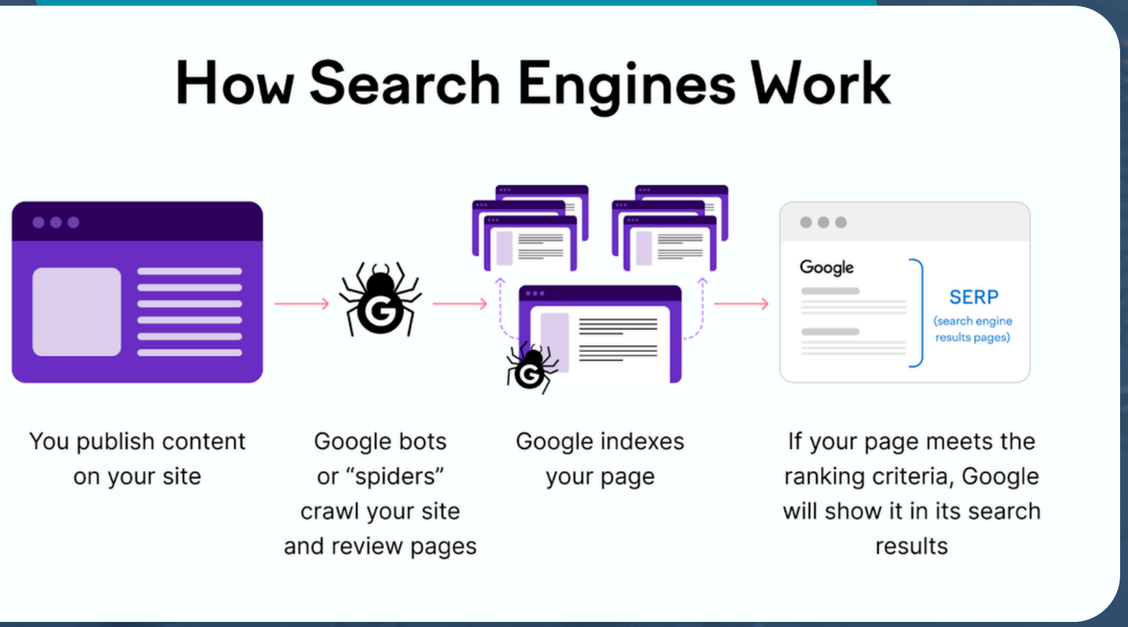
THE FUEL FOR THE ENGINE



The Shift: In the 2000s, we stopped trying to "program" intelligence and started trying to "mine" it.

Data Explosion:

Google indexed the web.
ImageNet labeled millions of photos.
Why it mattered: Neural Networks (invented in the 80s) suddenly started working because they finally had enough examples to learn from.

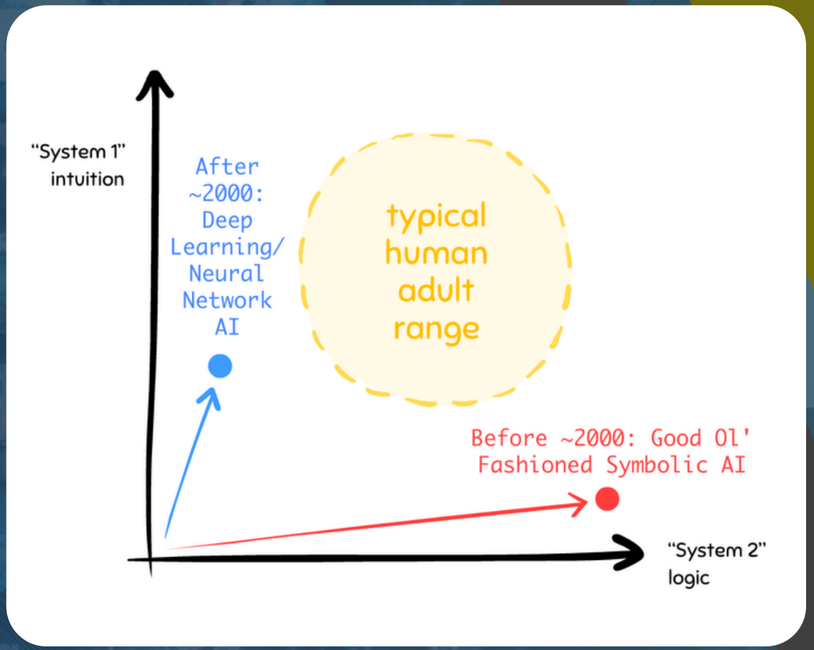


THE MOMENT AI BECAME CREATIVE

The Game: Go is more complex than Chess (more atoms in the universe than legal Go moves). Brute force is impossible.

The Move: In Game 2, AlphaGo played "Move 37" - a move no human would ever play. Commentators thought it was a mistake.

- It turned out to be a winning strategy that changed the game forever.
- **Significance:** The machine wasn't just calculating; it had developed "intuition."



FROM ANALYSIS TO CREATION

Discrimination vs. Generation:

- **Old AI:** "Is this a picture of a dog?" (Yes/No)
  New AI: "Paint me a picture of a dog in the style of Van Gogh."
- The Transformer: The architecture that reads massive amounts of data to predict the next token.

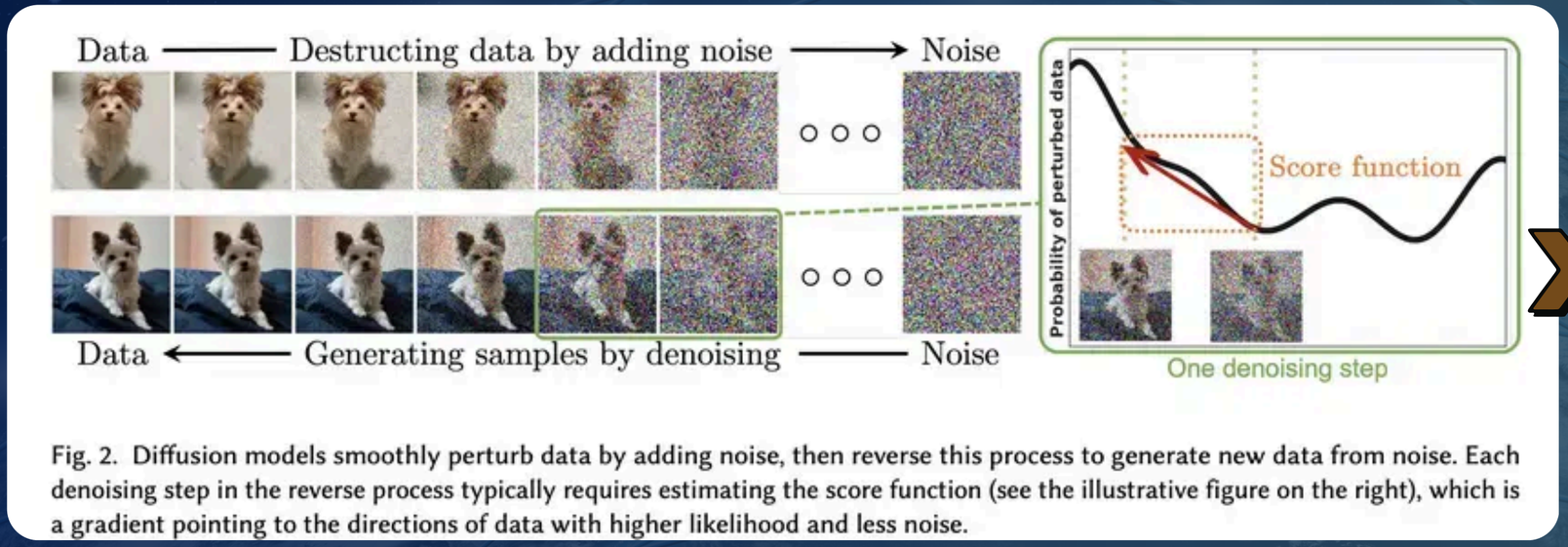


Fig. 2. Diffusion models smoothly perturb data by adding noise, then reverse this process to generate new data from noise. Each denoising step in the reverse process typically requires estimating the score function (see the illustrative figure on the right), which is a gradient pointing to the directions of data with higher likelihood and less noise.



WHY WE NEED COMPUTER SCIENCE

AI is **just one tool**. To build the future, you need the whole toolbox:

- **Cybersecurity:** Protecting the models.
- **Cloud Computing:** Where the models live.
- **Hardware:** The chips that power the models.
- **Ethics:** The rules that govern the models.

What you can expect over the following weeks:

- **Specific topics explaining current events**
- **More hackathons/competitions/events**
- **Practical activities spread out over multiple sessions**
- **Focused series exploring in-depth (video game graphics, the dark web, psychological website design etc)**
- **Sessions on any topic you would like**

Computer Science Society



> **“The best way to predict the future is to invent it.”**
> **— Alan Kay**

Thank you for listening.

PRESENTED BY MICHAL, AREN, SERGI