The Machine With Two Brains

Paths From Computers To Thinking Machines

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Our topics for today...

- Some early history
- The AI cliff
- A digression on flying
- AI's two brains
- Synthesis & hypothesis
40 years ago, we *almost* had thinking machines

1968: Engelbart—First computer mouse
Minsky—Semantic Information Processing
Example: story problems

(The problem to be solved is)
(The distance from New York to Los Angeles is 3000 miles. If the average speed of a jet plane is 600 miles per hour, find the time it takes to travel from New York to Los Angeles by jet.)

(The time it takes to travel from New York to Los Angeles by jet is 5 hours)

Bobrow's STUDENT solves a story problem
Example: geometric analogies

A geometric analogy solved by Evans' ANALOGY
The punch line

• Bobrow: with “a much larger memory machine”, “communicate well in English” over limited domain

• Evans: similar comments
What went wrong?

Moore's Law vs Estimated Brute Force Effort
Why think it could ever work?

- Nature is smart
- Logic is powerful

\[
A, A \rightarrow B \\ B
\]
Toward flying machines

Da Vinci's Ornithopter: Fly by flapping mechanical wings
First principles

Montgolfier's Balloon: Fly using physics of hot air
Toward thinking machines

- Logic is powerful: work from first principles?
- Nature is smart: emulate natural intelligence?
Automated Reasoning

1952: A.S. Douglas' OXO plays Tic-Tac-Toe on the EDSAC
Computer Chess

The IBM Deep Blue Team: Reasoning and heuristic search
CYC

- Lenat, after EURISKO
- 20 years old now
- Giant funding, business
- Does not appear to actually do anything useful
- “More research is needed”
Machine Learning

1959: Michie's MENACE learns to play “noughts-and-crosses” on a set of matchboxes
Brain cells

Minsky & Papert's *Perceptrons*: ANNs learn “like brain cells”
Selective learning

Slightly altering a model in different ways, then keeping those that work best = “learning” through Genetic Algorithms
Let's do both!

- The dichotomy just presented is false
  - Modern flying machines use bird-inspired wings and physics inspired engines
  - Modern AI systems use heuristics, search, ML, and many modeling techniques
Modern AI: Games

- Backgammon
- Bridge
- Scrabble
- Crosswords
Modern AI: Language

- Speech recognition
- Language translation
Ladder to the moon

How to build a ladder to the moon?
One step at a time?
Or in one giant leap?