

CMSC 373

Artificial Intelligence

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02 Introduction

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Watch this...

- The Thinking Machine (1961)

<https://techtv.mit.edu/videos/10268-the-thinking-machine-1961---mit-centennial-film>

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Recap

- 1956 Dartmouth Summer School
- Scientific *versus* Practical Agenda of AI
Understanding versus simulating intelligence behaviors
thinking as computation
- Turing Test
- Strong AI *versus* Weak AI
ELIZA *versus* Winograd Schemas
- AGI *versus* Narrow AI

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The Dichotomies of AI: Symbolic AI vs Subsymbolic AI

- Modeling the mind: the processes of conscious reasoning, problem solving, etc. (**semantic networks, logic-based systems**)

Uses symbols (i.e. explicit representations) that stand for things that the system is reasoning about.

E.g. car54, room451, cleanRoom(room451)

- Modeling the brain: biologically inspired computation (**neural networks**)

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The Dichotomies of AI: Symbolic AI vs Subsymbolic AI

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Symbolic AI

Uses symbols that stand for things that the system is reasoning about.

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- Modeling the brain: biologically inspired computation (**neural networks**)

Subsymbolic AI

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AI Methodology in the 1960s

- Divide & Conquer

Instead of starting by building complete intelligent systems identify various capabilities that seem to be required for general intelligence:

perception: building sensors for sight, hearing, touch, smell, taste

problem solving & planning: achieving goals

automated reasoning: representing knowledge and using it

natural language understanding and interaction

machine learning: learning from and making predictions from data

When done with each of the above somehow magically put them all together into a complete intelligent system!

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Easier said than done!!

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The Seasons of AI

- **1950s – 1966 First AI Summer: Irrational Exuberance**

Early successes in game playing, theorem proving, problem solving

- **1967 – 1977 First AI Winter**

No useful deliverables led to loss of research funding and cancellation of AI programs. In UK *The Lighthill Report* (toy AI systems do not scale due to combinatorial explosion).

- **1978 – 1987 Second AI Summer/Spring**

Rise of knowledge-based systems, success of Expert Systems. Boom times.

- **1988 – 1993 Second AI Winter**

Failure of AI Hardware companies (Symbolics, LMI, Lisp Machines) and AI Companies (Teknowledge, Inference Corp. etc.) Commercial deployments of Expert Systems were discontinued.

- **1993 – 2011 Third AI Summer (Mostly academic advances)**

Statistical approaches and extensions to logic (Bayesian Nets), Non-Monotonic Reasoning (in Logic), Fuzzy Logic, advances in Machine Learning (Decision Trees, Random Forests, Neural Nets), Cognitive Models, Logic Programming, Case-Based Reasoning, Genetic Algorithms, Agent-based approaches, etc.

- **2011 – Now Third AI Spring**

Rise of Deep Learning, Neuro-symbolic AI, ChatGPT and other chatbots, generative AI.

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Reading

- Chapter 1 from Wooldridge and pages 17-26 from Mitchell. Start reading Chapter 2 from Wooldridge.
- Watch The Thinking Machine again if you need to. We will have a discussion next class.

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References

- M. Mitchell: Artificial Intelligence-A Guide for Thinking Humans. Farrar, Straus, and Giroux Books, 2019.
- M. Wooldridge: A Brief History of Artificial Intelligence. Flatiron Books, 2020.

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