Title: Historical notes AIMA: Chapter 1

> Introduction to Artificial Intelligence CSCE 476-876, Fall 2022 URL: www.cse.unl.edu/~cse476 URL: cse-linux-01.unl.edu/~c-bchoueiry2/CSCE476_1238

> > Berthe Y. Choueiry (Shu-we-ri)

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Summary

- Goal of AI:
 - Understand intelligent entities
 - Build intelligent entities
- Multidisciplinary:
 - philosophy, psychology, cognitive science
 - mathematics, engineering, computer science
- Study:
 - general mechanisms
 - specific tasks
- Dimensions:
 - Concern: thought+mental processes vs. action+behavior
 - Performance: human-like vs. rational

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What is AI?

• Acting humanly:

Turing test: NLP, KR, Automated Reasoning, ML Total Turing test: computer vision, robotics

- Thinking humanly: Build a theory of the mind Cognitive science = computer models + psychological experiments
- Thinking rationally: Logic, probability
- Acting rationally: Rational agent Does the 'right' think Limited/bounded rationality

Beneficial machines: value alignment problem: machine's and humans objectives

 \longrightarrow Machines provably beneficial to humans

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Disciplines

- Philosophy: from the physical brain to the mind, source of knowledge, how knowledge lead to action
- Mathematics: inference, computability, reasoning under uncertainty
- Economics: handling preferences, collaborating/competing, decision/game theory, multiagents, optimization (OR)
- Neuroscience
- Psychology: cognitive science
- Computer Engineering
- Control theory, cybernetics
- Linguistics: NLP/computational linguistics

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Main milestones

- Minsky, McCarthy: Foundations, Knowledge representation and reasoning
- Feigenbaum, Reddy: Expert systems to solve real-world problems
- Pearl: Reasoning about uncertainty
- Bengio, Hinton, LeCun: Deep Learning

Quick historical note (I)

1956: McCarthy organizes a two-month workshop in Dartmouth no breakthrough, united major players, term coined

1952-1969: Early enthusiasm and great expectations General Problem Solver (Newell & Simon),

Chess program (learning disproved "computers do what they are told to do"),

LISP in 1958, time sharing, principles of knowledge representation and reasoning,

Split: logic (neat) vs. anti-logic (scruffy, clumsy),

Microworlds (e.g., block world: \rightarrow vision, constraint

propagation, NL understanding, planner), Neural Nets, etc.

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Quick historical note (II)

1966-1973: hard reality. Too big claims, wildly optimistic

1- Systems work on 1 or 2 examples, failed otherwise

NLP: Russian \rightarrow English.

The spirit is willing but the flesh is weak

 \rightarrow the vodka is good but the meat is rotten

2- Intractability: difficulty to scale up, handle combinatorial explosion

UK \rightarrow report Lighthill in 1973, etc.

Neural Net almost disappears

1969-1979: Knowledge-based systems

Knowledge-based system (DENDRAL) expert knowledge expert systems (MYCIN), certainty factors, frames (OO!)

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Quick historical note (III)

1980-present: AI becomes an industry
R1 at DEC, Fifth Generation project.
S/W: Carnegie Group, Inference, Intellicorp, Teknowledge
H/W: Lisp Machines, TI, Symbolics, Xerox.

1986-present: The return of neural networks. Late 80's-early 90's: AI winter

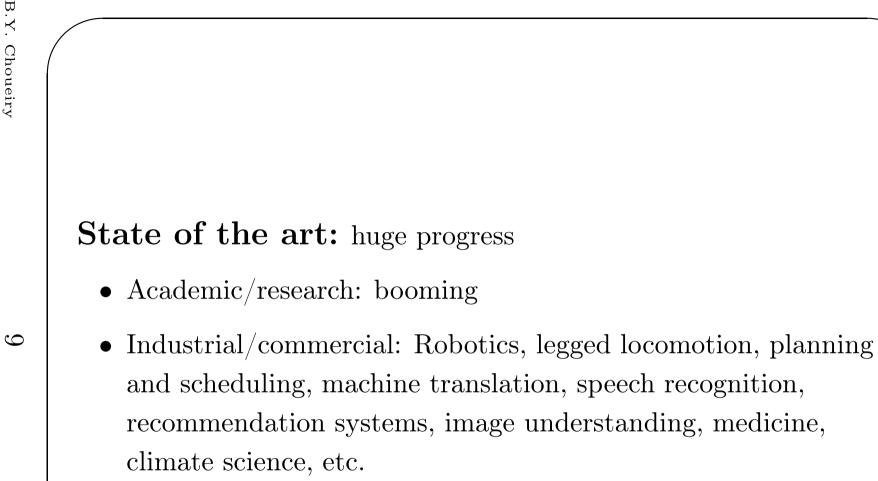
1987-present: Big changes. AI becomes a science Claims more rigorously supported: empirically or theoretically Resurgence of probabilistic & decision theory (UAI). Machine Learning

"Nouvelle AI:" ALife, GAs, soft computing

1995-present: Emergence of intelligent agents

2001-present: Big Data: Image recognition, IBM's Watson (2011)2011-present: Deep Learning (CNN)

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B.Y.

Choueiry

Risks and benefits of AI, ethics debates

- Lethal autonomous weapons
- Surveilland and persuasion
- Biased decision making
- Impact on employment
- Safety-critical applications
- Cybersecurity

 \longrightarrow In this class, we focus on the basics: representation and reasoning

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