CSCI 3202: Intro to Artificial Intelligence

Lecture 1: Introduction, Agents

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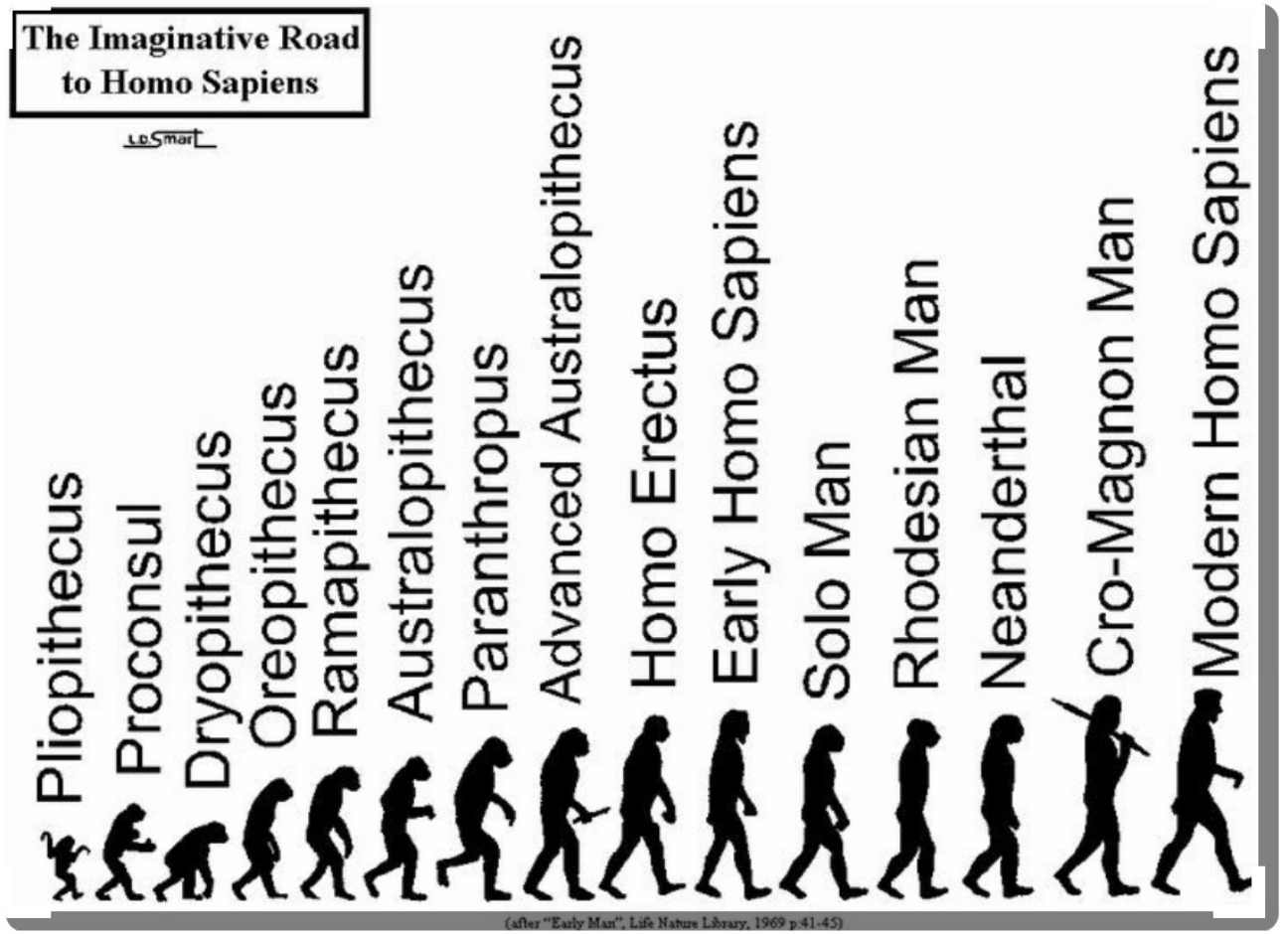
These slides are on Canvas

What is Artificial Intelligence?

What is Intelligence?

homo sapiens - “wise man”



Foundations of Artificial Intelligence

Philosophy

- Can formal rules be used to draw valid conclusions?
- How does the mind arise from a physical brain?
- Where does knowledge come from?
- How does knowledge lead to action?

Modus Ponens

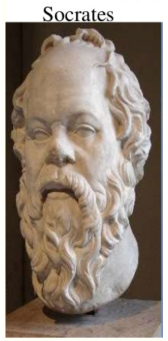
$$\frac{p \qquad p \rightarrow q}{\therefore q}$$

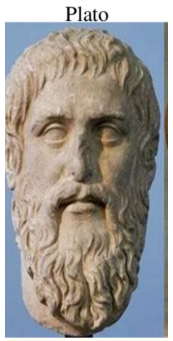
Modus Tollens

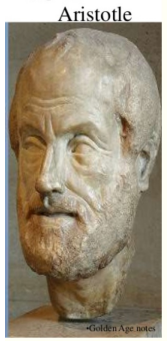
$$\frac{\neg q \qquad p \rightarrow q}{\therefore \neg p}$$

Hypothetical Syllogism

$$\frac{p \rightarrow q \qquad q \rightarrow r}{\therefore p \rightarrow r}$$







From our book (pg. 6):

"It's one thing to say that the mind operates, at least in part, according to logical rules, and to build physical systems that emulate some of these rules; its another to say that the mind itself is such a physical system. …if the mind is governed entirely by physical laws, then it has no more free will than a rock "deciding" to fall toward the center of the earth."

Foundations of Artificial Intelligence

This formula is known as **Bayes' Theorem.** $p(F \mid E) = \frac{p(E \mid F)\, p(F)}{p(E)}$

Mathematics

- What are the formal rules to draw valid conclusions?
- What can be computed?
- How do we reason with uncertain information?

Thomas Bayes

Portrait purportedly of Bayes used in a 1936 book,[1] but it is doubtful whether the portrait is actually of him.[2] No earlier portrait or claimed portrait survives.

Foundations of Artificial Intelligence

Economics

- How should we make decisions so as the maximize payoff?
- How should we do this when others may not go along with us?
- How should we do this when the payoff may be far in the future?

➢ Later in the semester: Decision theory, Game theory, Markov decision processes

Neuroscience

- How do brains process information?

"*brains cause minds*" - John Searle

Psychology

- How do humans and animals think and act?

Foundations of Artificial Intelligence

Computer Engineering

- How can we build an efficient computer?

➢ For artificial intelligence to succeed, we need two things: intelligence and an artifcact

Control Theory and Cybernetics

- How can artifacts operate under their own control?

Linguistics

- How does language relate to thought?

Foundations of Artificial Intelligence

"Acting Humanly"

- What does a computer need to pass itself off as human?

"Thinking Humanly"

- Need to get inside the actual workings of human minds.

"Thinking Rationally"

- What are the rules that govern correct thought?

What is rational?

Modern Approach: "Acting Rationally"

- Here **"rational" means "optimal"** - a rational system is one in which the system optimally achieves predefined goals.

- maximally achieving pre-defined goals
- only concerns what decisions are made, not why

Goals

- expressed in terms of quantifiable utility
- being rational means maximizing your expected utility

Maximize: evaluate all options and pick the best
Expected: decisions conditioned on available data → probability/statistics!

A few current problems

Speech/text recognition:

How do we categorize this new digit?

A few current problems

Computer Vision:

Is this vehicle a threat?