Introduction to Artificial Intelligence

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DUKE COMPUTER SCIENCE

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270 Team

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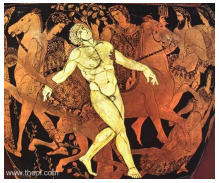
http://www.cs.duke.edu/courses/spring15/compsci270/
Please submit questions via Piazza.

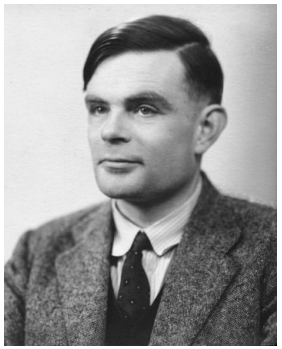
AI: The Very Idea

For as long as people have made machines, they have wondered whether machines could be made intelligent.



(pictures: Wikipedia)

Turing



Computing machinery and intelligence. *Mind*, October 1950.

"Can machines think?"

(picture: Wikipedia)

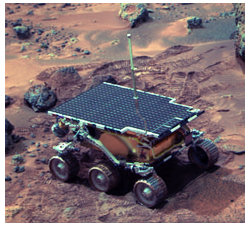
Dartmouth, 1956

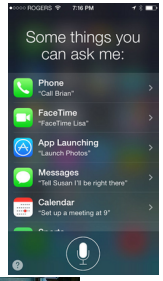
Modern AI

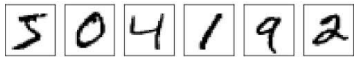
Subject of intense study:

- Nearly ever CS department has at least 1 AI researcher.
- Heavily funded (NSF, DARPA, EU, etc.).
- Google, Amazon, Microsoft, etc.
- ~ 700 PhDs a year in the US
- Thousands of research papers written every year.

Modern AI



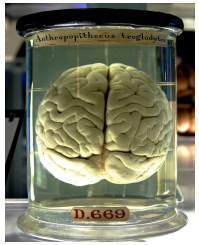




(picture: Wikipedia)

Fundamental Assumption

The brain is a computer.



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(picture: Wikipedia)

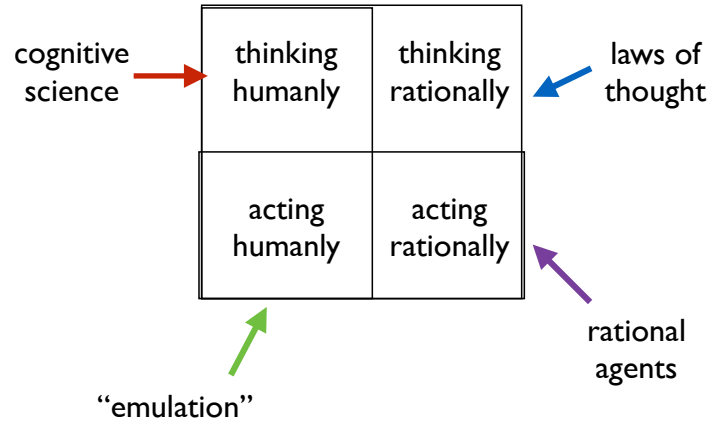
What is AI?

This turns out to be a hard question!

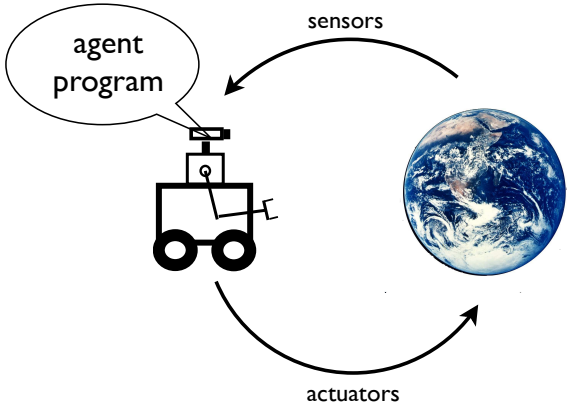
Two dimensions:
- "Humanly" vs "Rationally"
- "Thinking" vs. "Acting".

thinking humanly	thinking rationally
acting humanly	acting rationally

What is AI?



What is a Rational Agent?



Performance measure.

Rational Agents

A rational agent **acts in its environment,** according to **what is has perceived,** in order to **maximize its expected performance measure**.

Example: Chess

Performance measure?

Environment?

Prior knowledge?

Sensing?

Actions?

(picture: Wikipedia)

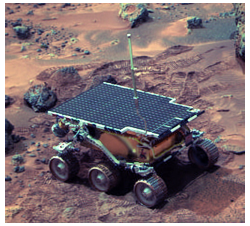
Chess

The chess environment is:

- Fully observable.
- Deterministic.
- Episodic.
- Static.
- Discrete.
- "Known".

(picture: Wikipedia)

Example: Mars Rover



Performance measure?

Environment?

Prior knowledge?

Sensing?

Actions?

(picture: Wikipedia)

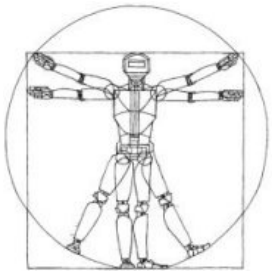
Mars Rover

The Mars Rover environment is:

- Partially observable.
- Stochastic.
- Continuing.
- Dynamic.
- Continuous.
- Partially known.

Are We Making Progress?

Specific vs. General

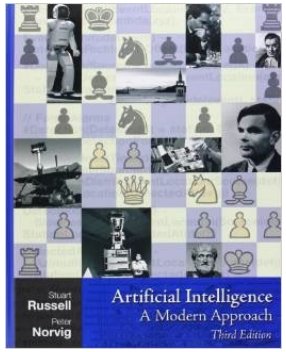


Major Topics Covered

1. Agents and Agenthood
2. Search
   - Uninformed
   - Informed
   - Mini-Max for Game Playing
3. Knowledge Representation and Reasoning
   - Propositional Logic
   - First-Order Logic
   - Reasoning and Logical Inference
   - Uncertain Knowledge
     - Bayes' Rule
     - Probabilistic Reasoning
     - Bayes Nets
4. Planning
   - Task Planning
   - Robot Motion Planning
5. Learning
   - Supervised Learning
   - Unsupervised Learning
   - Reinforcement Learning
6. Philosophy of AI

Required Text

Artificial Intelligence, A Modern Approach
Russell & Norvig, **3rd** Edition.



On Lectures

The textbook contains everything you need to know.

Lectures contain everything you need to know.

Lecture notes **do not**.

Suggested approach:

- Come to lectures and pay attention.
- Revise via textbook (immediately).
- Clarify at office hours.

Grading

Exams: **(closed book)**
Midterm: 30%, in class.
Final: 30%, finals week.

Coursework: 40% of grade.
6 assignments, mix of:
- Short proofs.
- Algorithm design.
- Programming (Python).
- Analysis.

Academic Honesty

I expect all Duke students to conduct themselves with the highest integrity, according to the *Duke Community Standard*.

It is OK to:
- Have high-level discussions.
- Google for definitions and background.

It is NOT OK TO:
- Hand in anyone else's **code**, or **work**, in part or in whole.
- Google for solutions.

ALWAYS HAND IN YOUR OWN WORK.

Academic Honesty

Consequences of cheating:
- Your case will be reported.
- Possible consequences include zeros on the assignment, suspension, failure to graduate, retraction of job offers.

If I catch you I **will** refer you to the Office of Student Conduct.

DO NOT CHEAT.

Prof. Parr will visit class on Friday January 16th to discuss this further.

Homework

I will post some reading on the course website.
- Please join Piazza.
- Please do the reading.
- Please do the coding homework.