Artificial Intelligence

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1410 Team

Instructor: George Konidaris
Wed 4-5pm, CIT 447

TAs:
Enrique Areyan
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AI: The Very Idea

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

(pictures: Wikipedia)
Turing


“Can machines think?”

(picture: Wikipedia)
Dartmouth, 1956
Modern AI

Subject of intense study:

• Nearly every CS department has at least 1 AI researcher.
• Heavily funded (NSF, DARPA, EU, etc.).
  • Pays itself back fast (e.g., DART).
• Google, Amazon, Microsoft, etc.
• ~700 PhDs a year in the US
• Thousands of research papers written every year.
Modern AI

(picture: Wikipedia)
What is AI?
Fundamental Assumption

The brain is a computer.

(picture: Wikipedia)
What is AI?

This turns out to be a hard question!

Two dimensions:
- “Humanly” vs “Rationally”
- “Thinking” vs. “Acting”.

<table>
<thead>
<tr>
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<th>thinking humanly</th>
<th>thinking rationally</th>
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### What is AI?

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**cognitive science**

**laws of thought**

**rational agents**

**“emulation”**
What is a Rational Agent?

Performance measure.
A rational agent:

- acts in its environment
- according to what is has perceived
- in order to maximize
- its expected performance measure

actuators

perceived

agent program

given

sensors
Example: Chess

- Performance measure?
- Environment?
- Prior knowledge?
- Sensing?
- Actions?

(picture: Wikipedia)
Example: Mars Rover

- Performance measure?
- Environment?
- Prior knowledge?
- Sensing?
- Actions?

(picture: Wikipedia)
Are We Making Progress?

Specific vs. General
AI is fragmented:

- Learning
- Planning
- Vision
- Language
- Robotics
- Reasoning
- Knowledge Representation
- Search
Figure 1: Screen shots from five Atari 2600 Games: (Left-to-right) Pong, Breakout, Space Invaders, Seaquest, Beam Rider
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. Natural Language Processing
5. Planning
   - Task Planning
   - Robot Motion Planning
6. Learning
   - Supervised Learning
   - Unsupervised Learning
   - Reinforcement Learning
7. Philosophy of AI
Required Text

Artificial Intelligence, A Modern Approach
Logistics

Course webpage:
http://cs.brown.edu/courses/cs141/
  • Syllabus
  • Calendar
  • Office hours etc.

Comms (Q&A, announcements) via Piazza
Make sure to sign up!
On Lectures

The textbook contains everything you need to know.

Lectures contain everything you need to know.

Lecture notes do not contain everything you need to know.

Suggested approach:

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

Exams: (closed book)
  Midterm: 20%, in class.
  Final: 20%, finals week.

Coursework: 60% of grade.
5 assignments, mix of:
  • Short proofs.
  • Algorithm design.
  • Programming (Python).
  • Analysis.
Academic Honesty

I expect all Brown students to conduct themselves with the highest integrity, according to the Brown Academic Code.

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.
Homework

I will post some reading on the course website.

• Please join Piazza.
• Please do the reading.