1410 Team

**Instructor:** George Konidaris

Tue 3-4pm, **CIT 447**

**HTA:** Vince Kubala

**TAs:**

Aansh Shah  
Abinaya Raman  
Alan Yu  
Carlene Niguidula  
Devanshi Nishar  
Dorit Rein  
Grant Fong  

Gregory Carlin  
Jerome Ramos  
Jessica Fu  
Peter Frisch  
Vilayvann Ky  
Nakul Gopalan  
Enrique Areyan
AI: The Very Idea

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

(pictures: Wikipedia)
Karel Čapek

R.U.R.
(Rossum’s Universal Robots)

Introduction by IVAN KLÍMA
Turing


“Can machines think?”

(picture: Wikipedia)
Dartmouth, 1956
Modern AI

Subject of intense study:

• Nearly every CS department has at least 1 AI researcher.
• ~700 PhDs a year in the US
• Thousands of research papers written every year.

• Heavily funded (NSF, DARPA, EU, etc.).
  • Pays itself back fast (e.g., DART).

• Google, Amazon, Microsoft, etc.
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”.

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<thead>
<tr>
<th></th>
<th>thinking humanly</th>
<th>thinking rationally</th>
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<tbody>
<tr>
<td>acting humanly</td>
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<td>acting rationally</td>
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<td>Thinking</td>
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<td>Humanly</td>
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<td>Rationally</td>
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**What is AI?**

- Cognitive science
- "Emulation"
- Laws of thought
- Rational agents
What is a Rational Agent?

agent
program

sensors

actuators

Performance measure.
A rational agent:

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

actuators

sensors

agent program
given
Example: Chess

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

(picture: Wikipedia)
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
Structure of the Field

AI is fragmented:

- Learning
- Planning
- Vision
- Language
- Robotics
- Reasoning
- Knowledge Representation
- Search
Progress in AI:

- Clear, precise models of a class of problems
- Powerful, general-purpose tools
- A clear understanding of what each model and tool can and cannot do

Figure 1: Screen shots from five Atari 2600 Games: (Left-to-right) Pong, Breakout, Space Invaders, Seaquest, Beam Rider
AI
Major Topics Covered

Syllabus:

1. Agents and Agethood
2. Search
   (a) Uninformed
   (b) Informed
   (c) Game Theory and Adversarial Search
3. Knowledge Representation and Reasoning
   (a) Logical Representations: Reasoning and Inference
   (b) Uncertain Knowledge
      i. Bayes’ Rule
      ii. Probabilistic Reasoning
      iii. Bayes Nets
      iv. Hidden Markov Models
4. Planning
   (a) Classical Planning
   (b) Robot Motion Planning
   (c) Planning Under Uncertainty: Markov Decision Processes
5. Learning
   (a) Reinforcement Learning
   (b) Supervised Learning
   (c) Unsupervised Learning
6. Advanced Topics
   (a) Natural Language Processing
   (b) Machine Vision
   (c) Robot Learning
   (d) Algorithmic Game Theory

7. Philosophy of AI
8. Social and Ethical Issues
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.
Required Text

*Artificial Intelligence, A Modern Approach*
Logistics

Course webpage:
http://cs.brown.edu/courses/cs141/
  • Syllabus
  • Calendar - **office hours**!
  • Assignments etc.

Logistics (grades etc.) via Canvas
Comms (Q&A, announcements) via Piazza

**Make sure to sign up!**

I am away next week.
  • Please see Canvas for the lecture 2 (Search) video on Tuesday.
  • Vince will guest lecture on Thursday.
Questions

**Piazza:** Quick question, or question many people may want to know the answer to.

**UTA Hours:** Assignment and coding questions, material covered in lectures.

**GTA / Professor Hours:** Conceptual questions, or questions beyond the coursework.
Recitations

There will be three refresher lectures:

**Python Tutorial:**
Carlene Niguidula
Thursday September 14th, 8pm-9:30pm (CIT 201)

**Logic Review:**
Abinaya Raman
Wednesday September 20th, 7pm in Motorola (CIT 165)

**Probability Review:**
Peter Frisch
Sunday September 24th, 2pm in Motorola (CIT 165)
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, and I will push for a hearing with the Standing Committee.

DO NOT CHEAT.
Grading

Exams:
• Midterm: 15%, in class.
• Final: 15%, finals week.
• Closed book.

Six assignments
• 50% of grade.
• Python programming
• Report
• Generally 1-2 weeks long

Extended project: 20%.