AI is a huge field

What is AI (artificial intelligence)…

Admin

Tuesday mentor hours back to 5-7pm

My office hours:
  - M: 3-3:50pm
  - T: 11am-12
  - Th: 11am-12:30
  - F: 10-11am
AI is a huge field
What is AI...
One definition:
“Building programs that enable computers to do what humans can do.”
For example:
read, walk around, drive, play games, solve problems, learn, have conversations...

A broader definition
“Building programs that enable computers to do do intelligent things”

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<tr>
<th>thinking</th>
<th>human</th>
<th>vs.</th>
<th>rational</th>
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<tr>
<td>vs.</td>
<td>Think like a human</td>
<td>Think rationally</td>
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<td>acting</td>
<td>Cognitive Modeling</td>
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<td>Turing Test</td>
<td>Act rationally</td>
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<td>Rational Agents</td>
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How is AI viewed in popular media?

What challenges are there?
What challenges are there?

Perception
- perceive the environment via sensors

Computer vision (perception via images/video)
- process visual information
- object identification, face recognition, motion tracking

Natural language processing and generation
- speech recognition, language understanding
- language translation, speech generation, summarization

Knowledge representation
- encode known information
  - water is wet, the sun is hot, Dave is a person, …

Learning
- learn from environment
  - What type of feedback? (supervised vs. unsupervised vs. reinforcement vs …)

Reasoning/problem solving
- achieve goals, solve problems
- planning
- How do you make an omelet? I’m carrying an umbrella and it’s raining… will I get wet?

Robotics
- How can computers interact with the physical world?

What can we currently do?

Understand spoken language?
speech recognition is really good, if:
- restricted vocabulary
- specific speaker with training

Gotten quite good in the last few years and shows up in lots of places:
- Mobile: Siri, Ok Google, etc.
- Home assistants: Alexa, Google Home

What does the spoken language actually mean (language understanding)?
- much harder problem!
- many advances in NLP in small things, but still far away from a general solution
What can we currently do?

Speak?
Understandable, but you wouldn’t confuse it for a person
Can do accents, intonations, etc.
Better with restricted vocabulary
Loquendo
  - https://www.nuance.com/omni-channel-customer-engagement/voice-and
    text-to-speech.html
  - Dealing with facial expression is challenging

What can we currently do?

Drive a car?
Freeway driving is relatively straightforward
Off-road a bit harder
  * see DARPA grand challenges (2004, 2005)
And urban driving is even trickier
  * See DARPA urban challenge (2007)
  * Google’s autonomous vehicle

What can we currently do?

Drive a car?
https://www.google.com/selfdrivingcar/
https://www.tesla.com/autopilot
Uber
...
What can we currently do?

Drive a car?

Many driver assist technologies:
- Automatic breaking
- Automatic pedestrian detection
- Lane drift avoidance
- "smart" cruise control
- Blind spot warning
- …

What can we currently do?

Identify emotion?

This is hard!

Some success in text
- movie reviews (assignment 7!)
- blogs
- twitter
- dealing with sarcasm is hard

Some success with faces
- strongly biased by training data
- works best when exaggerated

What can we currently do?

Reasoning?

Success on small sub-problems

General purpose reasoning is harder
- Wolfram Alpha
- OpenCyc

What can we currently do?

Walk?

Robots have had a variety of locomotion methods

Walking with legs, is challenging
- Differing terrains, stairs, running, ramps, etc.

Recently, a number of successes
- Honda’s Asimo
  - [https://www.youtube.com/watch?v=SARB9O1WwZo](https://www.youtube.com/watch?v=SARB9O1WwZo)
- Sony QRIO
  - [http://www.youtube.com/watch?v=9cZsQ0E07uc](http://www.youtube.com/watch?v=9cZsQ0E07uc)
- Boston Dynamic’s Atlas
  - [https://www.youtube.com/watch?v=HjQk5oaRlBQ](https://www.youtube.com/watch?v=HjQk5oaRlBQ)
When will I have my robot helper?

What can we currently do?

Fold a pile of towels?

UC Berkeley towel folding robot:
http://www.youtube.com/watch?v=gy5g33S0Gzo

What can we currently do?

Computer, clean the house!

Um, OK...??

This one’s got no chance...
Reasoning with knowledge and uncertainty

Many different ways of making an agent intelligent

Fundamental problem of AI