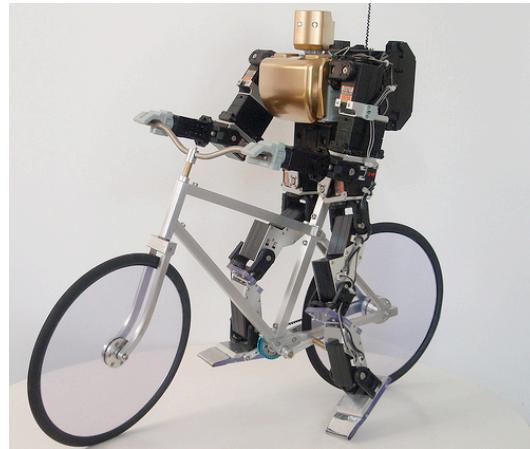


CS10

The Beauty and Joy of Computing

Artificial Intelligence



Anna Rafferty
(Slides adapted from Dan Garcia)
19 March 2012

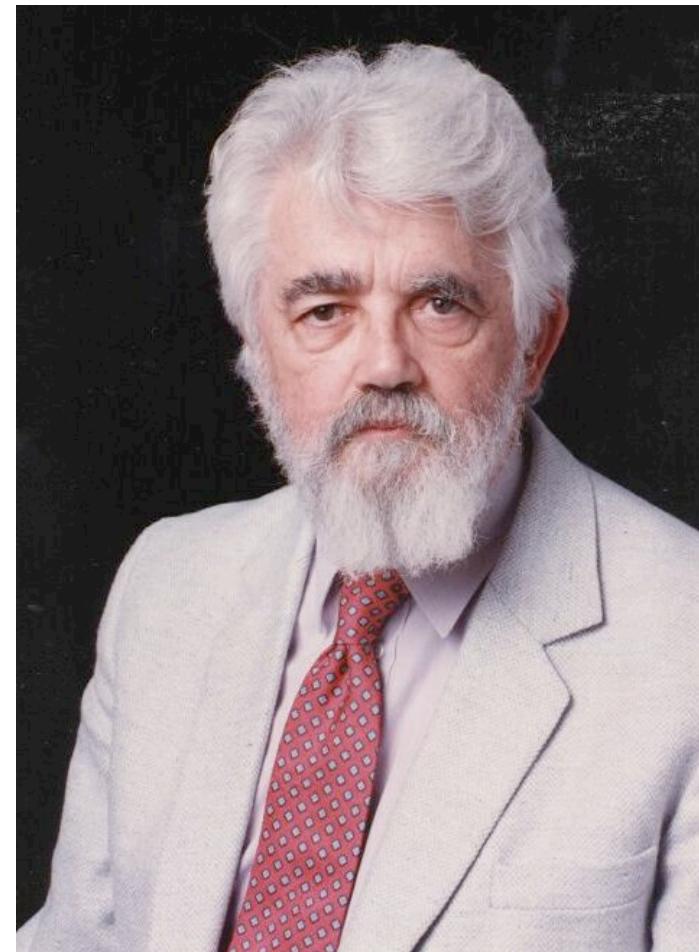
Lecture Overview

- Definition
- Some AI history
- Tour of areas of AI
- Turing Test and the Chinese room



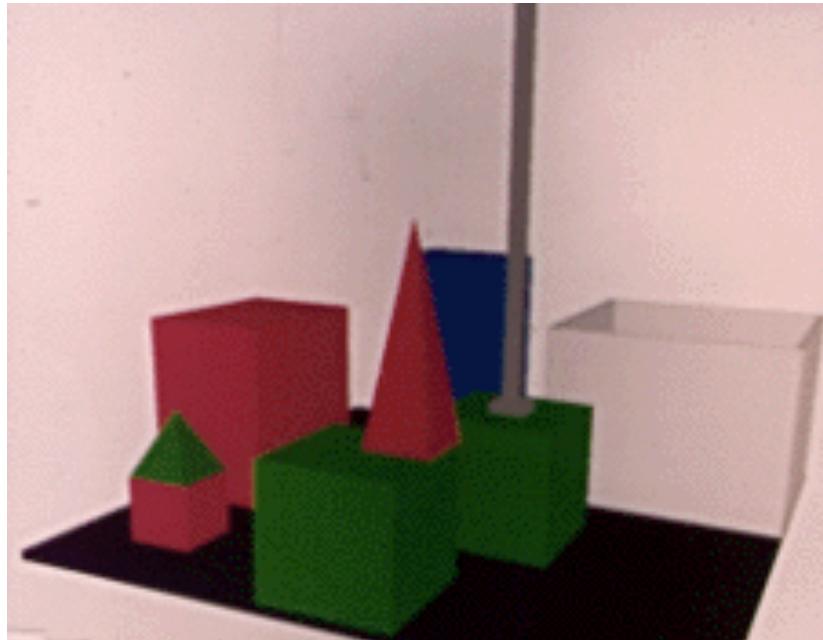
AI Definition by John McCarthy

- “Getting a computer to do things which, when done by people, are said to involve intelligence”
- Finesses the idea of whether a computer has consciousness, whether they have rights, etc



A little history...

- Early AI (1956-early 1970s): symbolic reasoning and lots of optimism
- Neural nets (but very simple)



Person: PICK UP A BIG RED BLOCK.

Computer: OK. (does it)

Person: GRASP THE PYRAMID.

Computer: I DON'T UNDERSTAND WHICH PYRAMID YOU MEAN.

Person: FIND A BLOCK WHICH IS TALLER THAN THE ONE YOU ARE HOLDING AND PUT IT INTO THE BOX.

Computer: BY "IT", I ASSUME YOU MEAN THE BLOCK WHICH IS TALLER THAN THE ONE I AM HOLDING.

Computer: OK. (does it)



Clicker Question

- Which of these rules is true for all dogs?
 - (A) Has four legs
 - (B) Has fur
 - (C) Barks
 - (D) None of the above



(Image from: http://vision.stanford.edu/resources_links.html)

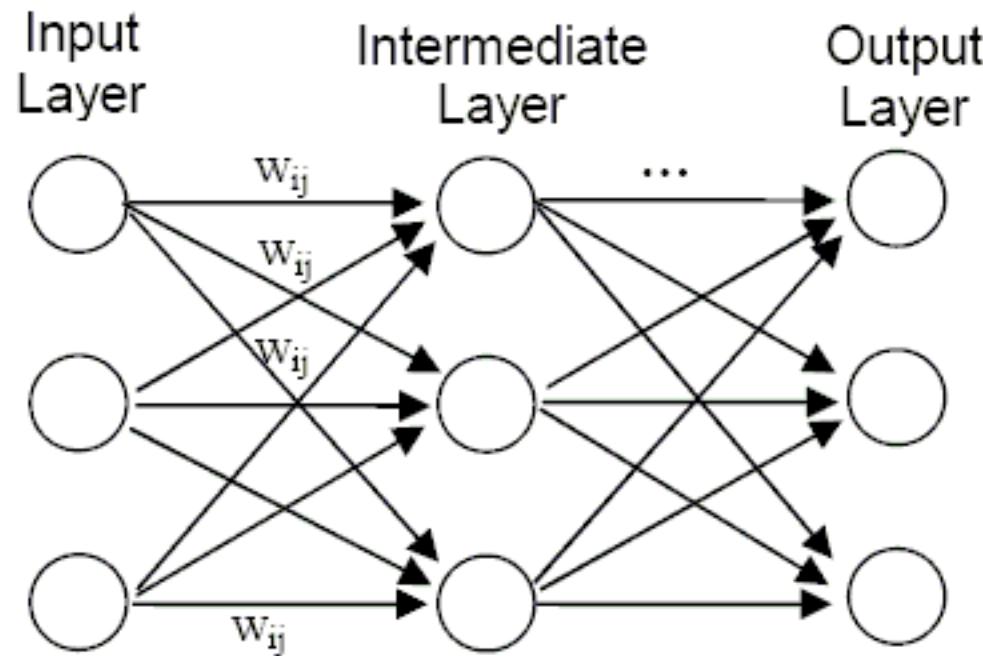
Revival of AI

- Probability and uncertainty
- Rather than trying to specify a dog exactly, what is the probability that the thing we're seeing is a dog?



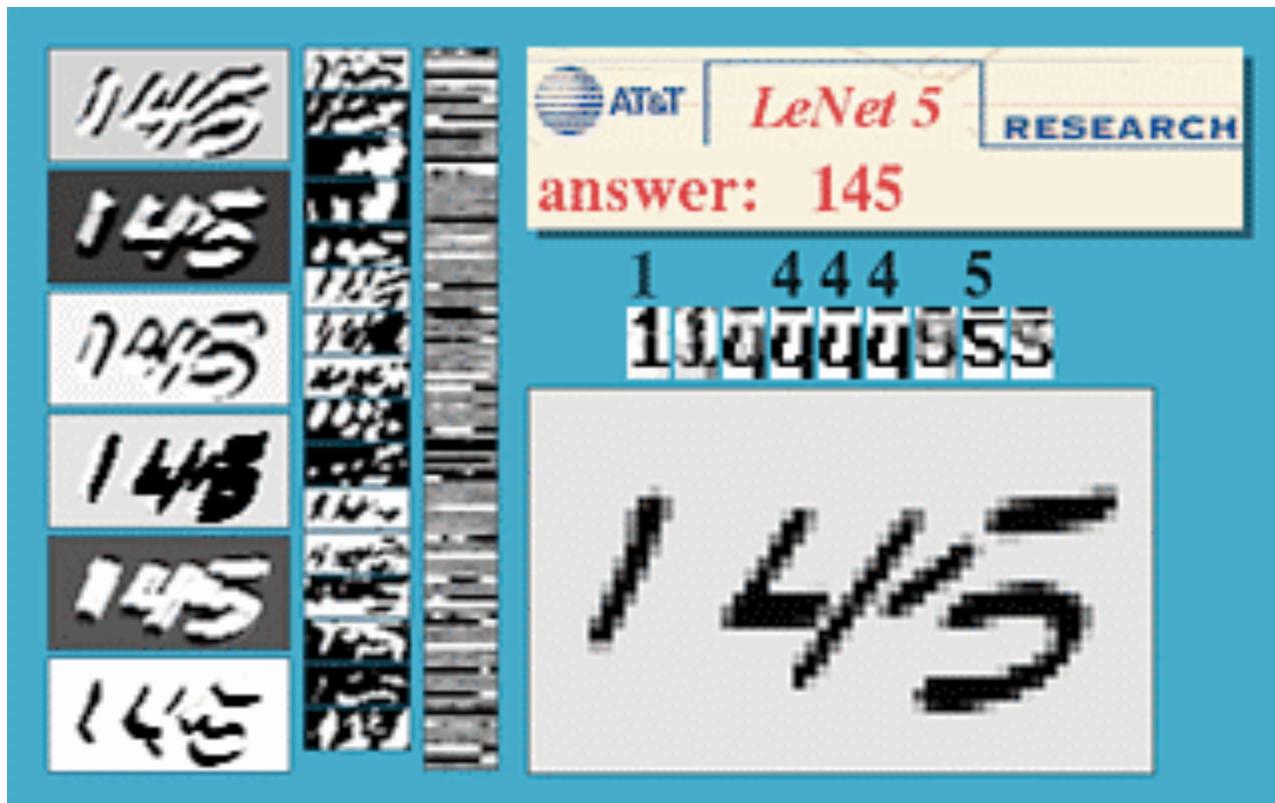
Revival of AI

- Neural nets with layers (lots of local computations, like your brain)



Revival of AI

- Neural nets with layers (lots of local computations, like your brain)



What intelligent things do people do?

- Planning
- (Machine) Learning
- Natural Language Processing
- Motion and manipulation
- Perception
- Creativity
- General Intelligence



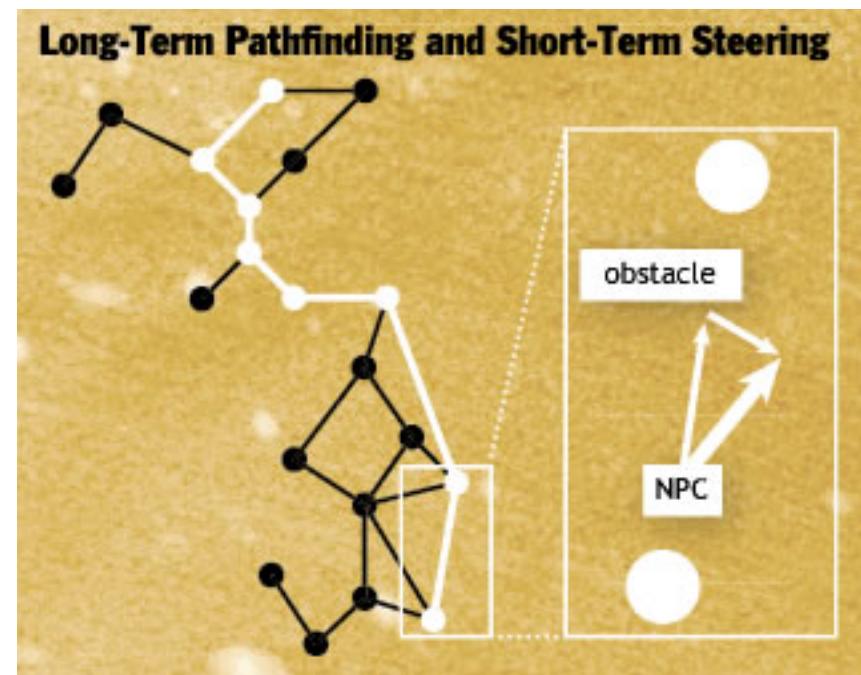
Tour of AI Applications

- Questions to keep in mind:
 - How would you evaluate how well a machine performed on the tasks we talk about?
 - Where would you draw the line between intelligent/not intelligent behavior?



Planning (from Video Games lecture)

- Range of intelligence
 - Low: simple heuristics
 - Medium: pathfinding
 - High: Learns from player
- Dynamic difficulty
 - Must hold interest
 - “Simple to learn, difficult to master is the holy grail of game design.”
 - Adjust to player’s skill



www.businessweek.com/innovate/content/aug2008/id20080820_123140.htm
en.wikipedia.org/wiki/Dynamic_game_difficulty_balancing
en.wikipedia.org/wiki/Game_artificial_intelligence
queue.acm.org/detail.cfm?id=971593



Clicker Question



The WORLD'S BEST AI StarCraft player is from:



- a) Google
- b) IBM (folks who did Watson)
- c) Stanford
- d) Berkeley
- e) MIT



Machine Learning

- “A program learns if, after an experience, it performs better”
- Algorithm Types
 - Supervised learning
 - Give a system input & output training data, and it produces a classifier
 - Unsupervised learning
 - Goal: determine how data is organized, or clustered
 - Reinforcement learning
 - No training data, real-time corrections adjust behavior

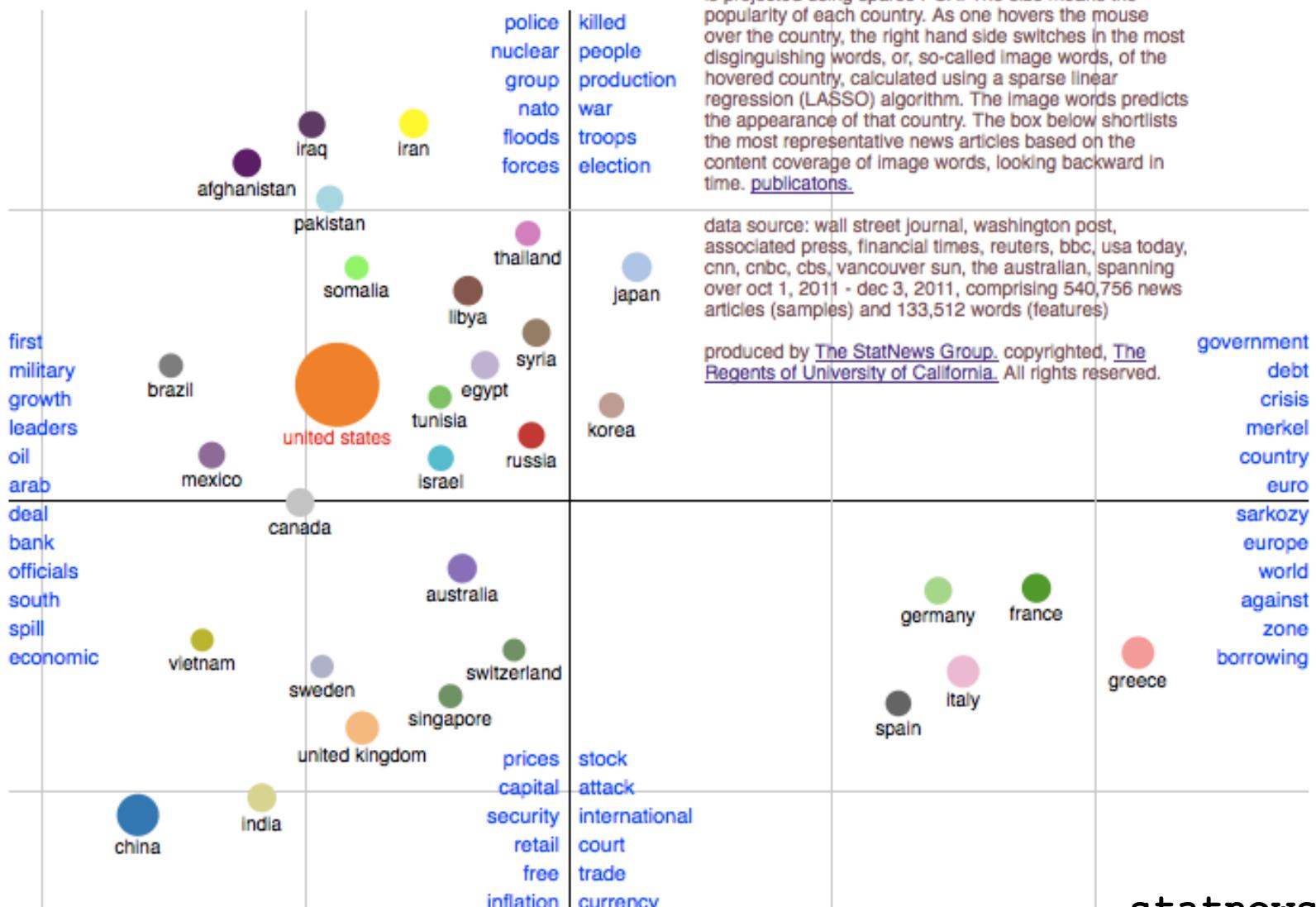


Natural Language Processing

- Known as “AI-complete” problem
 - Requires extensive knowledge of world
- Statistical NLP
 - Imagine a supervised learning system trained on all text of Web
 - It could easily correct your text (and guess what you’d say) by seeing what’s common

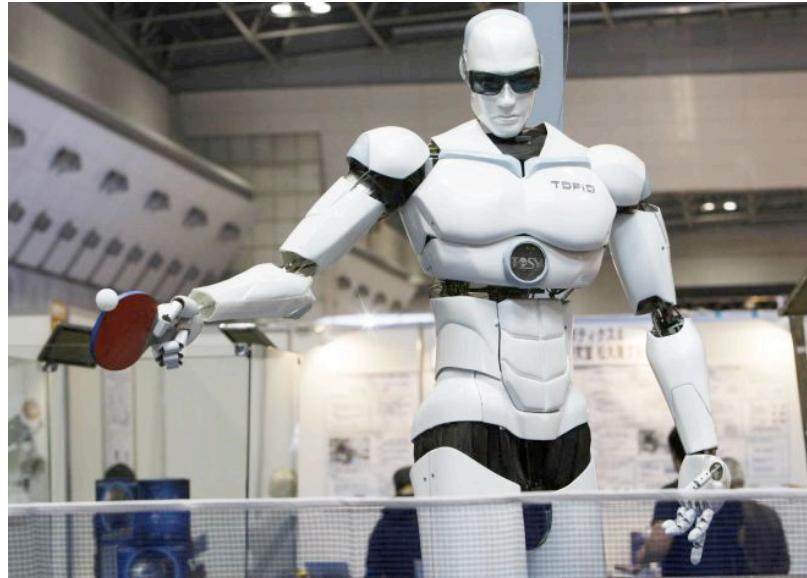


Unsupervised Learning Example

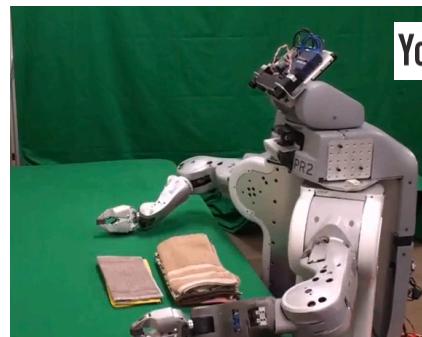


Robotics

- For many, the coolest and scariest part of AI
- Involves HCI
- Combines fields of AI
 - Speech recognition
 - Synthetic voice
 - Machine vision
 - Planning



TOPIO, the ping-pong playing robot



UC Berkeley's
towel-folder



Autonomous
helicopter



Recap

- All of these applications are tough because they require:
 - Knowing about context
 - Uncertainty about input
 - Intensive computations
- But AI has been relatively successful at making progress (and in some cases like certain games, better than people!)



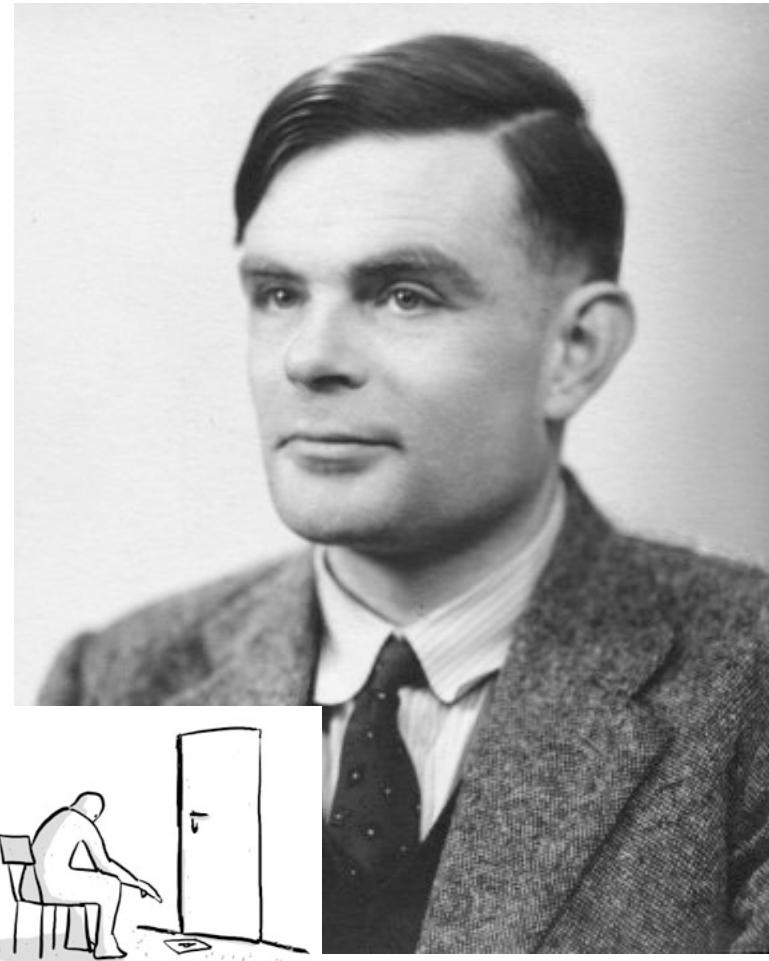
Clicker Question

- What would a “truly intelligent” AI system look like?
 - (A) Behaves in an optimal or rational manner
 - (B) Can do the same things people do (and makes the same kinds of mistakes people make)
 - (C) Carries out the same type of processing (mental representations) people do – i.e., thinks like people



Turing Test for Intelligence

- In 1950, Turing defined a test of whether a machine could “think”
- “A human judge engages in a natural language conversation with one human and one machine, each of which tries to appear human. If judge can’t tell, machine passes the Turing test”
- John Searle argued against the test via the Chinese room experiment, in which someone carries on a conversation by looking up phrases in a book. Does that person understand Chinese?



en.wikipedia.org/wiki/Turing_test



Summary

- AI systems excel in things computers are good at
 - big data (using web to parse language)
 - constrained worlds (chess, math)
- It's getting better at...
 - Language understanding
 - Real-time robotics
- Lots more applications that I didn't have time to talk about!
- CS188: Artificial Intelligence
 - One of the most popular courses on campus!
- CogSci131: Computational Models of Cognition



Thanks! Feel free to email me with questions at rafferty@cs.berkeley.edu

