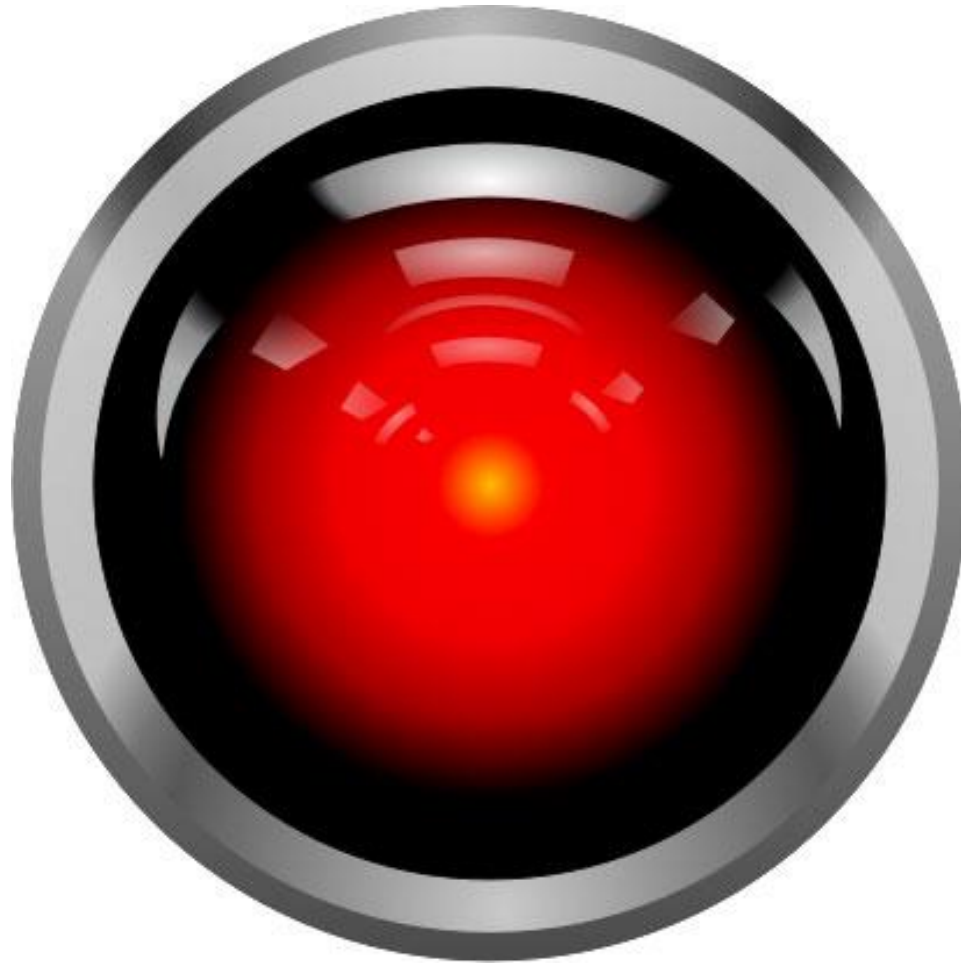
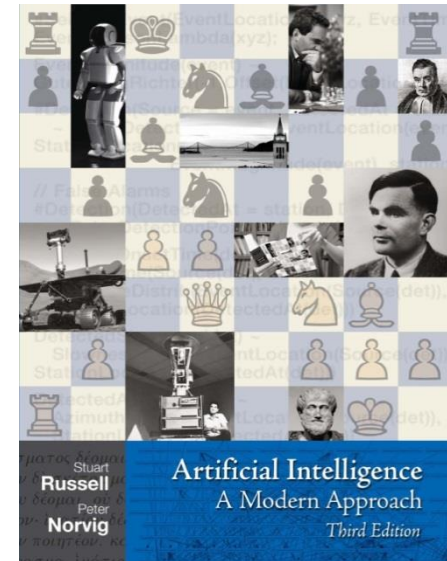
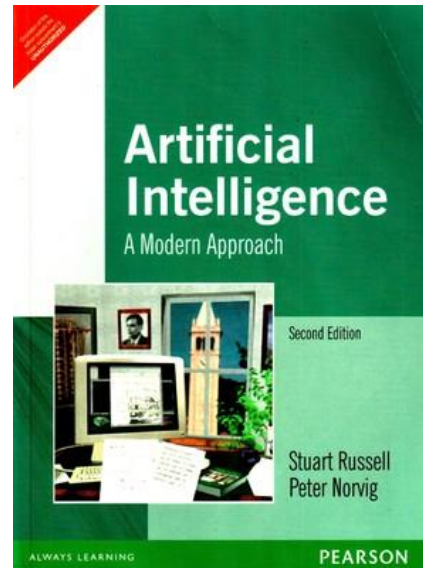
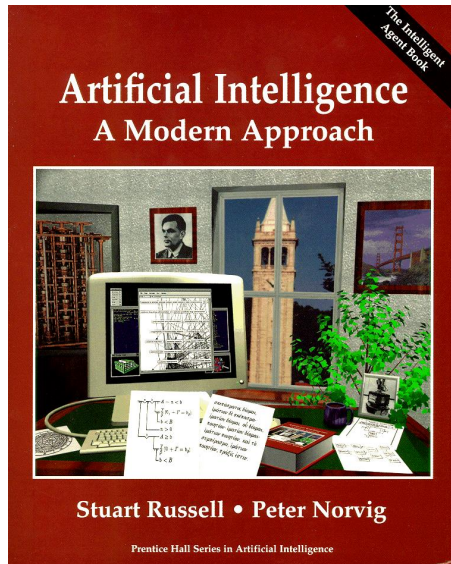


CSCI 446: Artificial Intelligence



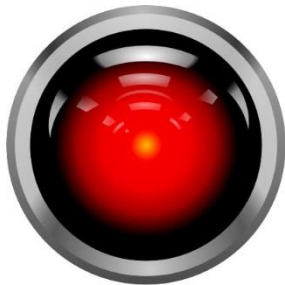


Course Website: <https://katie.mtech.edu/classes/csci446/>

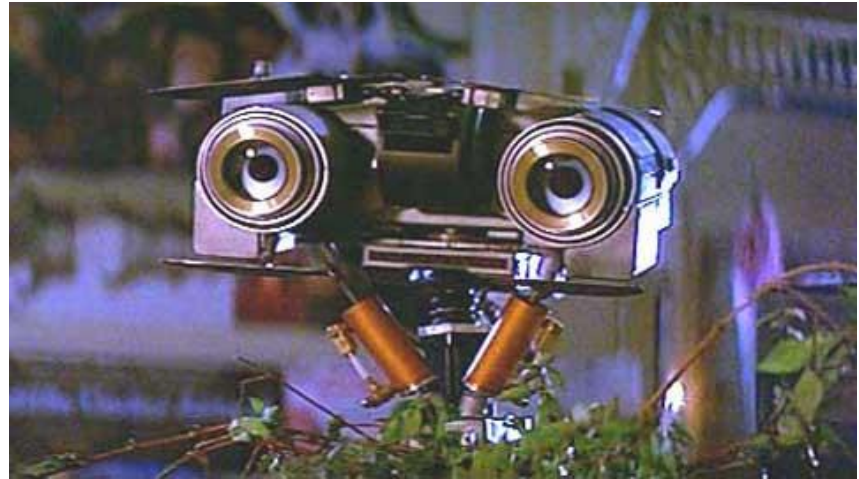
Textbook Website: <http://aima.cs.berkeley.edu/>

Course overview

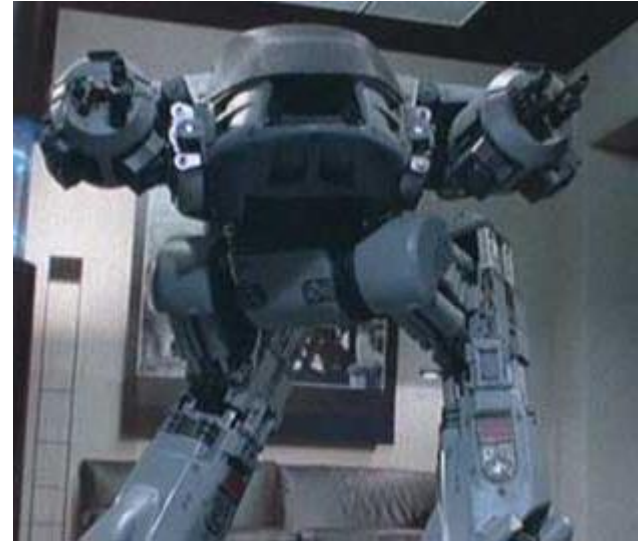
- What is artificial intelligence?
- What can AI do?
- What is this course?



AI in pop culture: nice robots



AI in pop culture: bad hardware



AI in pop culture: bad software



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I'm Feeling Lucky



What is AI?

The science of making machines that:

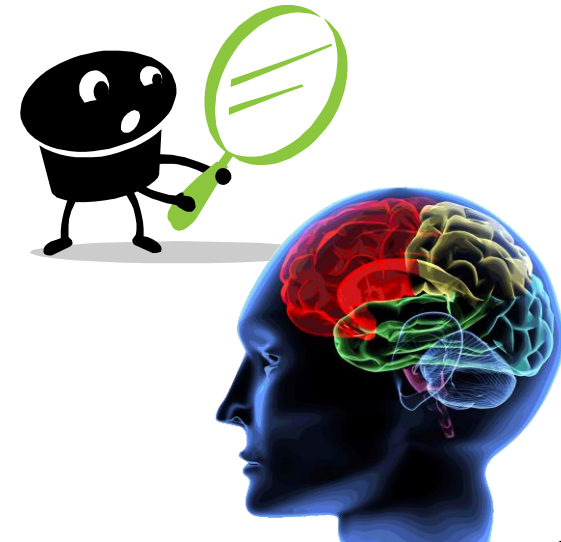
| | |
|-------------------|------------------|
| Think like people | Think rationally |
| Act like people | Act rationally |

What is AI?

The science of making machines that:

| | |
|-------------------|------------------|
| Think like people | Think rationally |
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- Figure out how people think
 - Scientific theories of internal activities of the brain
 - Predict and test behavior of humans
 - Direct identification from neurological data
- Cognitive science, neuroscience
 - Now distinct from AI

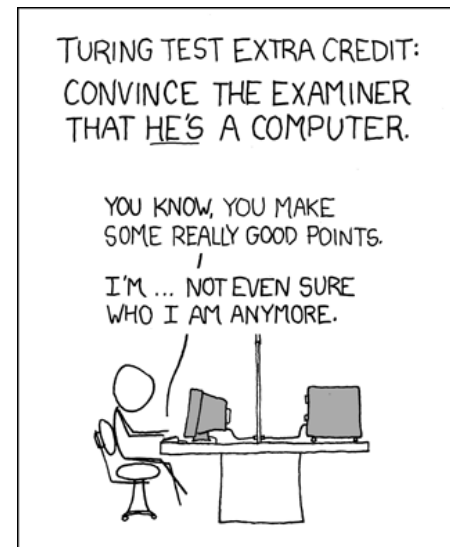
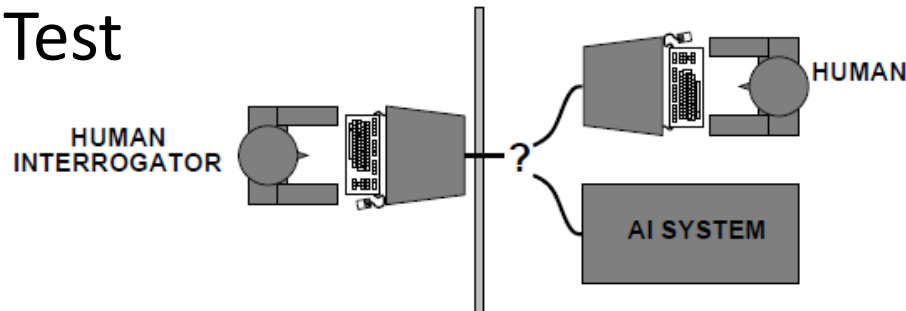


What is AI?

The science of making machines that:

| | |
|-------------------|------------------|
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- Maybe what matters is the external observable behavior
 - Don't worry about actual internal thought process
- Building systems passing for a human
- The Turing Test



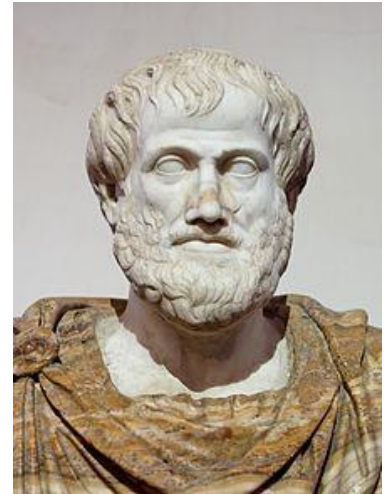
<http://xkcd.com/329/>

What is AI?

The science of making machines that:

| | |
|-------------------|------------------|
| Think like people | Think rationally |
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- System should think right: *rationally*
 - What are the correct laws of thoughts?
 - Ancient Greeks, Aristotle
 - Now philosophy and math
- But:
 - We don't actually care about the process, only the success of the behavior
 - Not all intelligent behavior mediated by logical deliberation



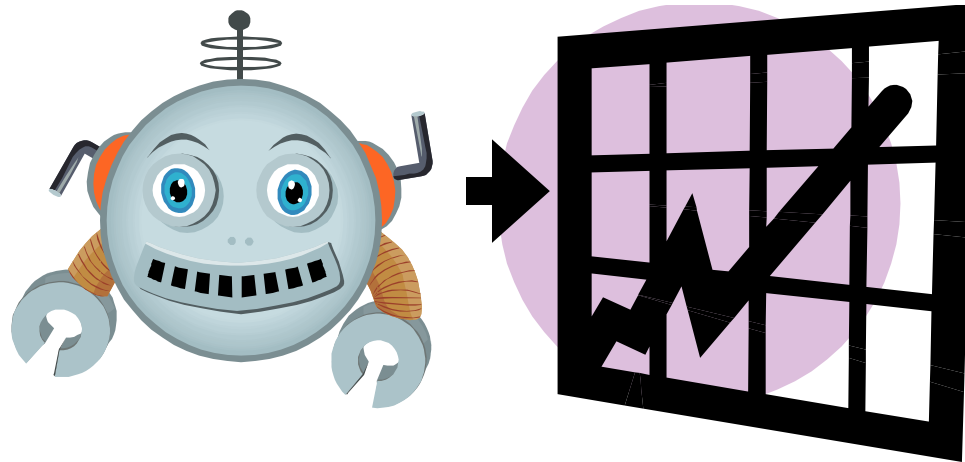
What is AI?

The science of making machines that:

| | |
|-------------------|------------------|
| Think like people | Think rationally |
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- Doing the right *rational* thing
- What do we mean by rational?
 - Maximally achieving pre-defined goals
 - Only what decisions are made, not the thought process behind them
 - Goals are expressed by the *utility* of outcomes
 - Means maximizing your expected utility

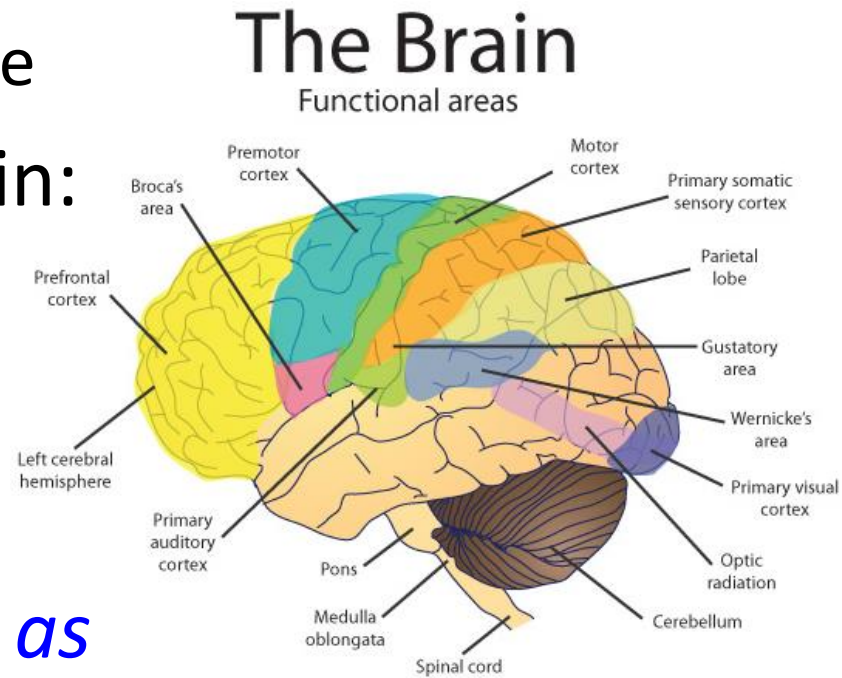
Maximize Your Expected Utility



What about the brain?

- Brains are good at thinking rationally
 - Not perfect, but better than anything we can build
- We have a proof of concept!
 - But hard to reverse engineer
 - Not as modular as software
- Lessons learned from brain:
 - Memorization
 - Simulation

“Brains are to intelligence as wings are to flight”



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A short history of AI

<https://www.youtube.com/watch?v=tONNlv6osG4> (24:40)

<https://www.youtube.com/watch?v=E1zbCU5JnE0> (2:46)

Automatic translation gone wrong: *“The spirit is willing but the flesh is weak”*
“The vodka is good but the meat is rotten”

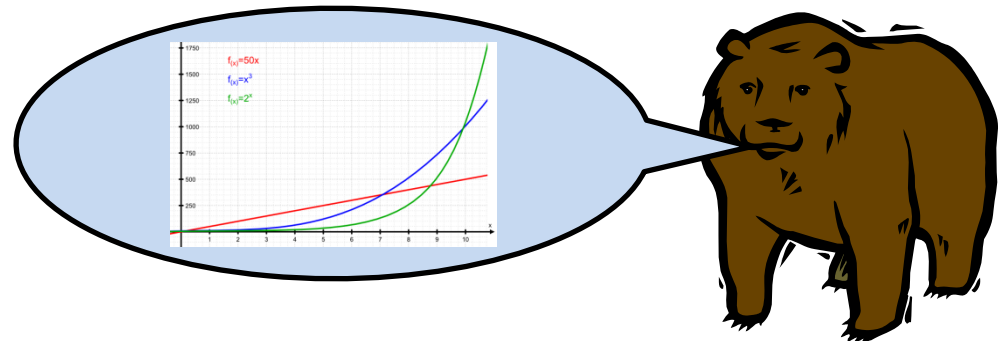
- **1940-1940: Early days**

- 1943: McCulloch & Pitts: Boolean circuit of brain
- 1950: Turing’s “Computing Machinery and Intelligence”

- **1950-70: Excitement: Look Ma, no hands!**

- 1950s: Early AI programs:
 - Samuel’s checkers, Newell & Simon’s Logic Theorist, Gelernter’s Geometry Engine
- 1956: Dartmouth meeting: “Artificial Intelligence” adopted
- 1965: Robinson’s complete algorithm for logical reasoning
- Blocks microworld

<https://www.youtube.com/watch?v=QAJz4YKUwqw>



A short history of AI

- 1970-90: Knowledge-based approaches
 - 1969-79: Early development of knowledge-based systems
 - 1980-88: Expert systems industry booms
 - 1988-93: Expert systems industry busts: “AI Winter”
- 1990- : Statistical approaches
 - Resurgence of probability, focus on uncertainty
 - General increase in technical depth
 - Agents and learning systems: “AI Spring”
- 2000- : Where are we now?

State of the art

- Which of the following can be done?

- ✓ Play a decent game of table tennis? <https://www.youtube.com/watch?v=tIIJME8-au8>
- ✓ Play a decent game of Jeopardy? https://www.youtube.com/watch?v=II-M7O_bRNg (1:10)
- ✓ Drive along a curvy mountain road? <https://www.youtube.com/watch?v=0UVKBhKPPuc> (4:20)
- ✗ Drive through uptown Butte in the winter?
- ✓ Buy a week's worth of groceries on the web?
- ? Buy a week's worth of groceries at Safeway?
- ? Discover and prove a mathematical theorem?
- ✗ Converse successfully with another person for an hour? <http://nlp-addiction.com/eliza/>
<http://www.mitsuku.com/>
- ? Perform a surgical operation?
- ✓ Put away the dishes and fold the laundry? <https://www.youtube.com/watch?v=gy5g33S0Gzo>
<https://www.youtube.com/watch?v=1zD45o00ZO4>
- ✓ Translate spoken German into spoken English in real time? <https://www.youtube.com/watch?v=eu9kMIeS0wQ>
- ✗ Write an intentionally funny story?

Unintentionally funny stories

- One day Joe Bear was hungry. He asked his friend Irving Bird where some honey was. Irving told him there was a beehive in the oak tree. Joe walked to the oak tree. He ate the beehive. The End.
- Henry Squirrel was thirsty. He walked over to the river bank where his good friend Bill Bird was sitting. Henry slipped and fell in the river. Gravity drowned. The End.
- Once upon a time there was a dishonest fox and a vain crow. One day the crow was sitting in his tree, holding a piece of cheese in his mouth. He noticed that he was holding the piece of cheese. He became hungry, and swallowed the cheese. The fox walked over to the crow. The End.
- Joe Bear was hungry. He asked Irving Bird where some honey was. Irving refused to tell him, so Joe offered to bring him a worm if he'd tell him where some honey was. Irving agreed. But Joe didn't know where any worms were, so he asked Irving, who refused to say. So Joe offered to bring him a worm if he'd tell him where a worm was. Irving agreed. But Joe didn't know where any worms were, so he asked Irving, who refused to say. So Joe offered to bring him a worm if he'd tell him where a worm was...

[Tale-Spin, <http://bin.sc/Readings/New%20Media/MeehanTaleSpin.pdf>]