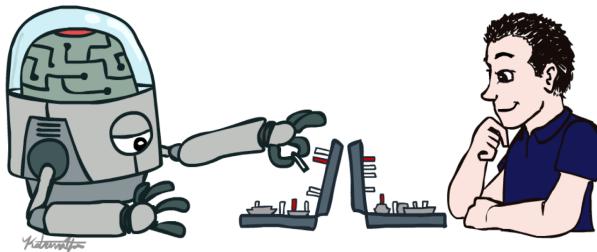


CS 188: Artificial Intelligence

Introduction



Pieter Abbeel & Dan Klein
University of California, Berkeley

Course Staff

GSIs

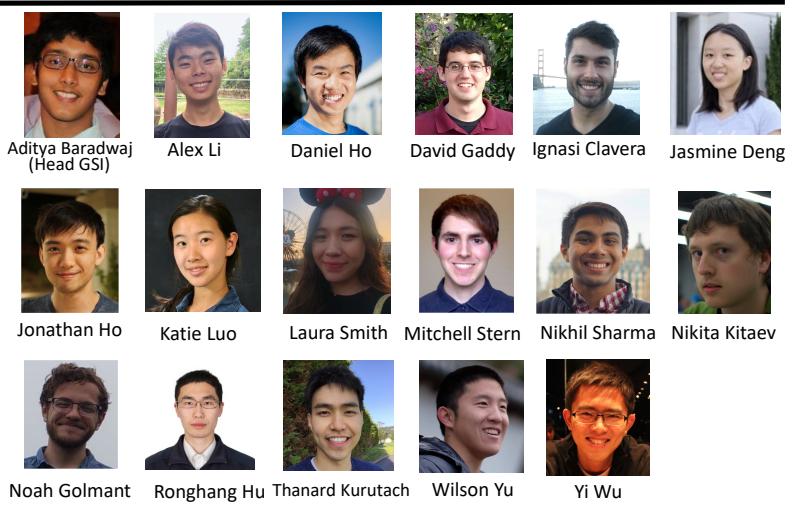
Professors



Pieter Abbeel



Dan Klein



Course Information

<http://inst.cs.berkeley.edu/~cs188>

CS 188 | Fall 2018 Syllabus Staff Schedule Policies Projects

CS 188 | Introduction to Artificial Intelligence
Fall 2018

Lecture: Tu/Th 2:00-3:30 pm, Wheeler 150

 CS188

Description

This course will introduce the basic ideas and techniques underlying the design of intelligent computer systems. A specific emphasis will be on the statistical and decision-theoretic modeling paradigm.

By the end of this course, you will have built autonomous agents that efficiently make decisions in fully informed, partially observable and adversarial settings. Your agents will draw inferences in uncertain environments and optimize actions for arbitrary reward structures. Your machine learning algorithms will classify handwritten digits and photographs. The techniques you learn in this course apply to a wide variety of artificial intelligence problems and will serve as the foundation for further study in any application area you choose to pursue.

See the syllabus for slides, deadlines, and the lecture schedule.

■ **Communication:**

- Announcements on Piazza
- Questions? Discussion on Piazza
- Staff email: cs188@berkeley.edu

■ **Course technology:**

- Website
- Piazza
- Gradescope
- This course is webcast (= Fa18 videos)
 - + edited videos from past semester

Course Information

■ **Prerequisites:**

- (CS 61A or CS 61B) and (CS 70 or Math 55)
 - Recommended: CS 61A and CS 61B and CS 70
- **There will be a lot of math (and programming)**

■ **Work and Grading:**

- 5 programming projects: Python, groups of 1 or 2
 - 5 late days for semester, maximum 2 per project
- 11 homework assignments:
 - Electronic component: Online, interactive, solve alone/together, submit alone
 - Written component: On paper, solve alone/together, submit alone, self-asses
- Two midterms, One final
- Fixed scale
- Participation can help on margins
- Academic integrity policy

■ **Contests!**

Exam Dates

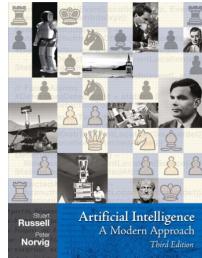
- Midterm 1: October 9th, 7:30-9:30pm
 - Midterm 2: November 15th, 7:30-9:30pm
 - Final Exam: December 11th, 8-11am
-
- There will be no alternate exams

Discussion Section (Optional Attendance)

- Topic: review / warm-up exercises
 - Currently, none of you are assigned to sections
 - You are welcome to attend any section of your preference
 - Piazza survey later this week to help keep sections balanced
-
- From past semesters' experience we know sections will be (over)crowded the first two weeks of section, but then onwards section attendance will be lower and things will sort themselves out
 - There will be a webcast of section
 - There is no section in the current week (8/20-8/24).

Textbook

- Not required, but for students who want to read more we recommend
 - Russell & Norvig, AI: A Modern Approach, 3rd Ed.



- Warning: *Not a course textbook, so our presentation does not necessarily follow the presentation in the book.*

Laptops in Lecture

- Laptops can easily distract students behind you

Please consider sitting towards the back if using your laptop in lecture

Announcements This Week

- **Important this week:**
 - **Check out website:** <https://inst.eecs.berkeley.edu/~cs188/fa18>
 - **Register on Gradescope and Piazza** (check your email for links)
 - **HW0: Math self-diagnostic** is online now (due on Monday 8/27 at 11:59pm)
 - **P0: Python tutorial** is online now (due on Monday 8/27 at 11:59pm)
 - **One-time (optional) P0 lab hours** (Friday 3-6pm, 330 Soda Hall)
 - **Inst accounts:** not needed, but if you want one, check instructions on Piazza
- **Also important:**
 - **Sections** will be loosely assigned via Piazza poll (check the cs188 Piazza page)
 - **Sections** start next week. You may go to any section that has space.
 - The **waitlist** might take a while to sort out. We don't control enrollment. Please see <https://eecs.berkeley.edu/resources/undergrads/cs/degree-reqs/enrollment-policy> for information regarding enrollment into CS classes, including email contact for staff if you have additional enrollment-related questions.

Instruction vs. Assessment



Instruction

Grow knowledge, collaborate,
work until success



Assessment

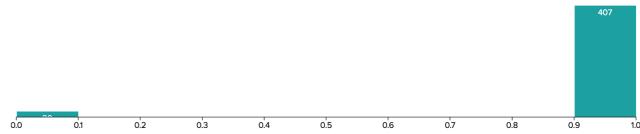
Measure knowledge, each student
on their own, stopped before success

Our experience: these two goals don't mix

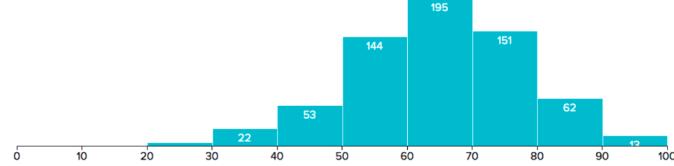
- Lecture / Section / OH / Piazza / Homework / Projects are instruction
 - collaborative, work until success (but please no spoilers)
- Exams are assessment
 - on your own

Some Historical Statistics

- Homework and projects: work alone/together, iterate/learn till you nailed it



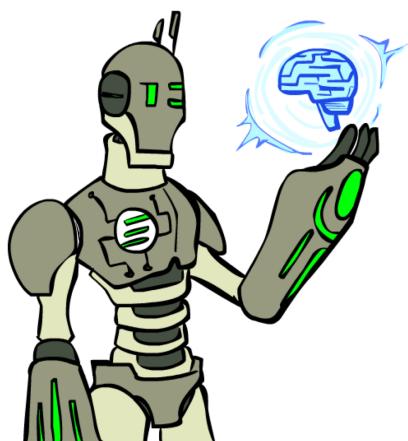
- Exams: assessment



- New this year: written component to homework (= old exam questions)
- Suggestion: assess yourself by first spending some time working alone

Today

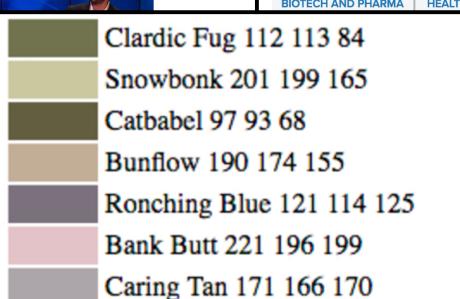
- What is artificial intelligence?
- What can AI do?
- What is this course?



Sci-Fi AI?



News AI?



HEALTH AND SCIENCE

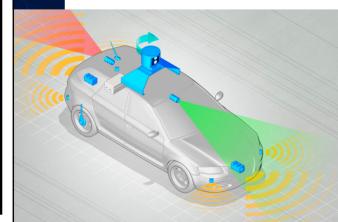
BIOTECH AND PHARMA | HEALTH INSURANCE | HOSPITALS | SCIENCE

A.I. can transform
we know it.
they should slow

Artificial Intelligence

**Stephen Hawking: 'I fear AI may
replace humans altogether'**

Musk was speaking to US governors. CREDIT: AP



What is AI?

The science of making machines that:

Rational Decisions

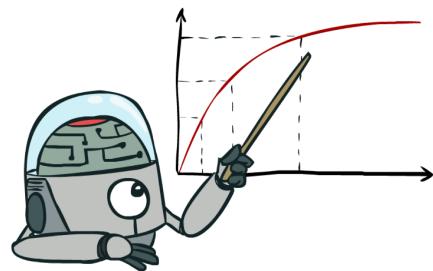
We'll use the term **rational** in a very specific, technical way:

- Rational: maximally achieving pre-defined goals
- Rationality only concerns what decisions are made
(not the thought process behind them)
- Goals are expressed in terms of the **utility** of outcomes
- Being rational means **maximizing your expected utility**

A better title for this course would be:

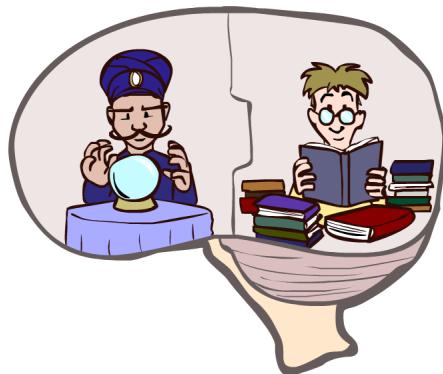
Computational Rationality

Maximize Your Expected Utility



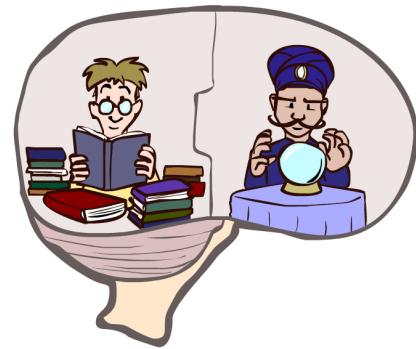
What About the Brain?

- Brains (human minds) are very good at making rational decisions, but not perfect
- Brains aren't as modular as software, so hard to reverse engineer!
- “Brains are to intelligence as wings are to flight”
- Lessons learned from the brain: memory (data) and simulation (computation) are key to decision making

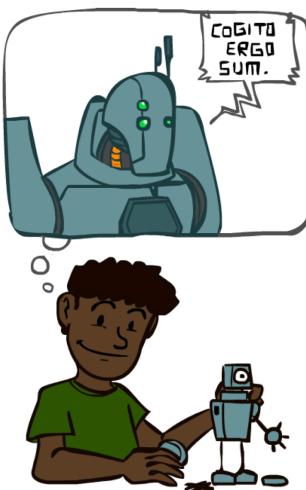


Course Topics

- Part I: Intelligence from Computation
 - Fast search / planning
 - Constraint satisfaction
 - Adversarial and uncertain search
- Part II: Intelligence from Data
 - Bayes' nets
 - Decision theory
 - Machine learning
- Throughout: Applications
 - Natural language, vision, robotics, games, ...



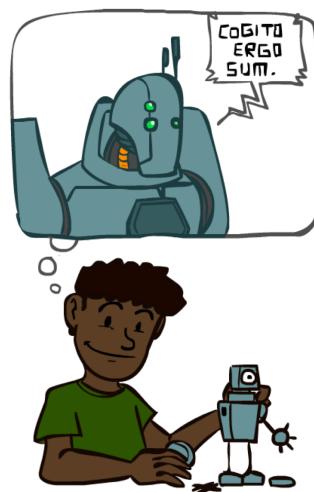
A (Short) History of AI



“the thinking machine”

A (Short) History of AI

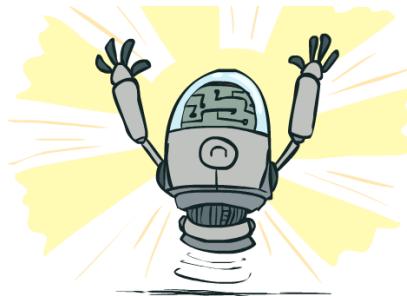
- 1940–1950: Early days
 - 1943: McCulloch & Pitts: Boolean circuit model of brain
 - 1950: Turing's “Computing Machinery and Intelligence”
- 1950–70: Excitement: Look, Ma, no hands!
 - 1950s: Early AI programs, including Samuel's checkers program, Newell & Simon's Logic Theorist, Gelernter's Geometry Engine
 - 1956: Dartmouth meeting: “Artificial Intelligence” adopted
 - 1965: Robinson's complete algorithm for logical reasoning
- 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”
- 1990–2012: Statistical approaches + subfield expertise
 - Resurgence of probability, focus on uncertainty
 - General increase in technical depth
 - Agents and learning systems... “AI Spring”?
- 2012—____: Excitement: Look, Ma, no hands again?
 - Big data, big compute, neural networks
 - Some re-unification of sub-fields
 - AI used in many industries



What Can AI Do?

Quiz: Which of the following can be done at present?

- ✓ Play a decent game of table tennis?
- ✓ Play a decent game of Jeopardy?
- ✓ Drive safely along a curving mountain road?
- ✗ Drive safely along Telegraph Avenue?
- ✓ Buy a week's worth of groceries on the web?
- ✗ Buy a week's worth of groceries at Berkeley Bowl?
- ✗ Discover and prove a new mathematical theorem?
- ✗ Converse successfully with another person for an hour?
- ✗ Perform a surgical operation?
- ✓ Translate spoken Chinese into spoken English in real time?
- ✗ Fold the laundry and put away the dishes?
- ✗ Write an intentionally funny story?



Unintentionally Funny Stories

Follow  **Janelle Shane** @JanelleCShane

Tried retraining the neural net on just "what do you get when you cross a X with a X?" jokes. Results did not improve. And for some reason, bungees are its favorite thing.

What do you get when you cross a dog and a vampire? A bungee

What do you get when you cross a gorilla and a bull? A spider.

What do you get when you cross a cow with a rhino? A bungee with a dog.

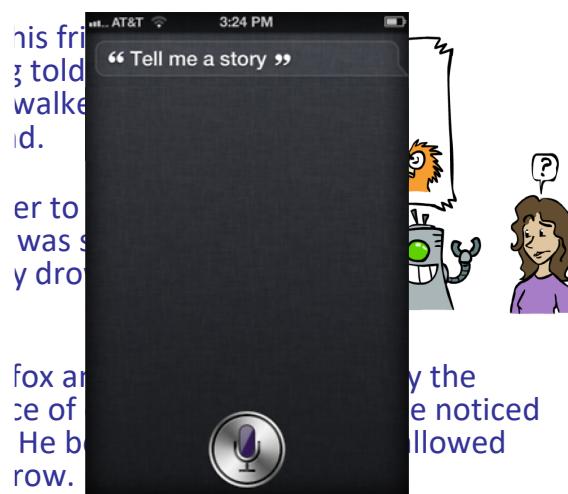
What do you get when you cross a mountain and a bungee and a cow? A cow with a rhinocero.

What do you get when you cross a street and a bungee with a cow? A bungee and a pig with a cow.

What do you get when you cross a street and a cow? A bungee with a bungee and a rhino.

What do you get when you cross a pig with a cow with a party? Because the engineers with a dog.

What do you get when you cross a weee and a rooster? I don't know that wouldn't deer.



[Shank, Tale-Spin System, 1984]