

Stats 232C (2021 Spring): Cognitive Artificial Intelligence

When & Where

When : Fridays, 4:00 – 6:20 pm
Zoom ID : 415-912-232 (live only, no video recording)

Instructor Info

Professor : Tao Gao (Dept. of Statistics)
Email : tao.gao@stat.ucla.edu (*must include " [Stats232c] " in the title of your emails*)
Office Hours : Fridays 6:20 – 7:20pm , or by appointment
Zoom ID : 415-912-232

Teaching Assistant

TA : Kaiwen Jiang (Dept. of Statistics)
Email : kaiwenj@g.ucla.edu
Office Hours : 3:00 - 5:00pm Wednesdays
Zoom ID : 912-4443-1875

Justification

As the studies of both human cognition and artificial intelligence develop rapidly, the gap between them widens. While human mind is adapted to function under “the poverty of stimuli”, modern AI typically draws its power from “big data”. This course will bridge this gap by introducing recent discoveries of human mind, and formalizing them as rigorous statistical models.

Course Objectives

- (1) Understanding the strengths and weakness of mainstream AI from a statistics perspective.
- (2) Introducing latest findings from cognitive science that are valuable for artificial intelligence.
- (3) Demonstrating how to formalize observations of human behavior as statistical models.
- (4) Developing AI systems that can capture aspects of human intelligence.

Course Description

The course will demonstrate how to build artificial intelligence by following principles of human intelligence revealed by cognitive science. These principles include (a) learning from small data; (b) expressing causality of the physical world; (c) inferring others’ mental states for intuitive social interactions. To achieve this goal, this course requires tools drawn from statistical modeling, cognitive science, artificial intelligence, computer vision, and robotics.

Topics & Tentative Schedule

#	Topic
1	Understanding human mind statistically
2	Reinforcement learning
3	Growing strong AI from babies
4	“One and only one” –Achieving human-like one-shot learning
5	Inference with structured hypothesis space
6	Human mind as an approximated physics engine
7	“To a man with a hammer, everything is a nail” --Tools and functionality
8	It is alive! --Visual roots of social cognition
9	“Do androids dream of electric sheep?” --Social psychology of robots
10	Beautiful mind(s) –Altruism and Collaboration

Assignments

5 coding assignments

Your course grade will be determined by 5 coding assignments. **Basic knowledge of Bayesian statistics and python programming is required.** A maximum of 7-late days will be allowed for submitting your code. **No late submission will be accepted after.** Each assignment will count for 20% of your grade: 33 points for submitting a reasonable code related to the assignment; 33 points for code without runtime error; 34 points for code returning the correct result.