1 Course information

1.1 Instructor

Dave Gottlieb
Ph.D. candidate, Philosophy and Symbolic Systems
dngi@stanford.edu
office hours: Th 2-4 & by appointment – Dave is happy to see any student for any reason during office hours. Students can use this Zoom link for the office hours (if prompted for a password, use “officehours”). The link is also on Canvas under the “Zoom” section.

1.2 Teaching Assistant

Eva Wallack, ewallack@stanford.edu
office hours:

1.3 Meeting times and Zoom

Tuesdays and Thursdays 10:30-11:50am, from June 23 to August 13.

All class meetings are conducted via Zoom. The Zoom link for each class is available on Canvas, under the “Zoom” section. The first meeting (6/23) uses Zoom meeting id 947 7460 1225 and no password. (Due to new security requirements imposed
by Stanford, you may need a password for subsequent meetings. All details will be available on Canvas.)

Attendance is mandatory for students receiving a letter grade, and you should keep your Zoom video feed on for the duration of the class if possible.

Please mute your microphone, except when you are asking a question or participating in discussion.

Zoom meetings will be recorded, so that students can review lectures and for my own quality-control.

1.4 Description

An overview of the interdisciplinary study of cognition, information, communication, and language, with an emphasis on foundational issues: What are minds? What is computation? What are rationality and intelligence? Can we predict human behavior? Can computers be truly intelligent? Lectures focus on how the methods of philosophy, mathematics, empirical research, and computational modeling are used to study minds and machines. Undergraduates considering a major in Symbolic Systems should take this course as early as possible in their program of study.

Beginning with the Class of 2018, students must take this course before being approved to declare Symbolic Systems as a major. All students interested in studying Symbolic Systems are urged to take this course early in their student careers. The course material and presentation will be at an introductory level, without prerequisites.

1.5 A note on pedagogy

Cognitive science, and the Symbolic Systems program, encompasses psychology, neuroscience, philosophy, computer science, linguistics, and more. Even though the field is relatively young, it is impossible to cover every topic in an 8-week class. What I have aimed to do instead is to give an overview of the aims of the field, some of its foundational ideas, and some of its important research programs.

Much will be left out. In particular, we won't be covering any areas in deep technical detail. This is an unfortunate but necessary limitation of our approach. If you would like to be pointed to more technical resources on a particular topic, feel free to ask the teaching team.
Since I’m a philosopher by training, my approach to this class will be a philosophical one. We will focus on understanding the concepts and arguments behind the research programs. Philosophers have been involved in cognitive science from the beginning. But a philosophical understanding is useful not only for philosophers, but for all practitioners.

Finally, this is the first time I have taught this class via remote instruction, and the first time I have taught any class via remote instruction. Furthermore, the course was originally designed for in-person instruction. I think interactive discussion is important in getting to grips with this material, but I am not yet sure how to accomplish this in the setting of a remote class. Accordingly, this offering of the course is going to involve a certain amount of experimentation, as well as a certain amount of compromise. We're going to try to deliver a version of the course as good as the in-person version, but we are limited by what's possible.

1.6 Assignments

The assignments will consist of:

- weekly short responses posted on Canvas (see below),
- a short paper (<6pp), and
- a take-home exam assessing your understanding of the material.

We’ll discuss the paper and exam in more detail later in the quarter, but the paper assignment is available below, in the interest of allowing you to plan ahead.

A set of topics and/or study questions will be released ahead of the exam.

1.6.1 Short paper: Rapaport’s Rules

Due 7/23 11:59pm.

Choose one of the readings from the course so far (through week 4). It should be a reading that makes one or more arguments, defending a particular viewpoint. As long as it makes an argument, it can be a more philosophical reading or a more technical reading.

In 6 pages (double-spaced) or less, you should (1) sympathetically summarize one of the main arguments of the chosen text, and (2) critique or rebut that argument.
You should be guided in this task by “Rapaport’s Rules,” guidelines for charitable argument developed by the game theorist Anatol Rapaport, which I pass down by way of the philosopher Daniel Dennett:

Just how charitable are you supposed to be when criticizing the views of an opponent? If there are obvious contradictions in the opponent's case, then of course you should point them out, forcefully. If there are somewhat hidden contradictions, you should carefully expose them to view—and then dump on them. But the search for hidden contradictions often crosses the line into nitpicking and worse. The thrill of the chase and the conviction that your opponent just has to be harboring a confusion somewhere encourages uncharitable interpretation, which gives you an easy target to attack. But such easy targets are typically irrelevant to the real issues at stake and simply waste everybody's time and patience, even if they give amusement to your supporters. The best antidote I know for this tendency to caricature one's opponent is a list of rules promulgated many years ago by the social psychologist and game theorist Anatol Rapoport (creator of the winning TitforTat strategy in Robert Axelrod’s legendary prisoner’s dilemma tournament).

How to compose a successful critical commentary: 1. You should attempt to reexpress your opponent’s position so clearly, vividly and fairly that your opponent says, “Thanks, I wish I’d thought of putting it that way.” 2. You should list any points of agreement (especially if they are not matters of general or widespread agreement). 3. You should mention anything you have learned from your opponent. 4. Only then are you permitted to say so much as a word of rebuttal or criticism.

One immediate effect of following these rules is that your opponent will be a receptive audience for your criticism: you’ve already shown that you understand his position as well as he does, and demonstrated good judgment (you agree with him on some important matters, and have even been persuaded by something in his case).

In summary, then, the paper assignment is: use Rapaport’s Rules to critically respond to one of the readings from the course.
1.7 Readings

Students should do all assigned readings in advance of the class for which they are assigned. This is crucial for success in the class, and lectures will assume prior familiarity with the contents of the readings.

Readings will be available online or on Canvas, as indicated on the syllabus.

1.8 Course videos

The course includes a number of pre-recorded supplementary lectures on cognitive science topics, about an hour each but varying in length. These are all by distinguished Stanford faculty, and in some cases by world pioneers in their subject matter. Several of them have been assigned as part of the syllabus (see below). All of them are highly recommended.

The videos are available on Canvas under the “Course Videos” section.

1.9 Grading

Students taking the class for a letter grade will be graded based on the following assessments (exact proportions tbd):

- Participation and Canvas posts
- Take-home exam
- Short paper

1.10 Students with documented disabilities

Students who may need an academic accommodation based on the impact of a disability must initiate the request with the Office of Accessible Education (OAE). Professional staff will evaluate the request with required documentation, recommend reasonable accommodations, and prepare an Accommodation Letter for faculty dated in the current quarter in which the request is being made. Students should contact the OAE as soon as possible since timely notice is needed to coordinate accommodations. The OAE is located at 563 Salvatierra Walk (phone: 650-723-1066, URL: http://oae.stanford.edu).
1.11 Collaboration and plagiarism policy

You are allowed and encouraged to discuss the materials and assignments (except the take-home exam) with each other. However, all work that you submit must be your own, and not include contributions from either other students or outside sources without explicitly saying so.

This class, and Stanford University, have detailed policies on plagiarism which you should familiarize yourself with. The SymSyst Collaboration and Plagiarism Policy is posted here. Download this document and read it carefully as these policies will be applied.

You should also consult Stanford's plagiarism policy carefully. If you use ideas from someone else, you should cite a source. If you use someone else's words, you should indicate this by using a quotation and citing a source.

Failure to follow the plagiarism policy is a serious offense and can lead to major sanctions, including failing the class and official sanctions through the Office of Community Standards.

If you have a question about what you’re allowed to do, please ask.

1.12 Canvas

If you’re enrolled in the class, you should have access to the Canvas site. If you aren’t yet on Canvas, contact the instructors ASAP – you need to be on Canvas to receive assignments and to participate online (see below).

1.13 Participation

We are trying to work out a scheme for participation in discussions that can take place over Zoom. We’ll talk about this, and experiment, at the beginning of the quarter.

In addition to coming to class and participating in discussion, your participation grade includes a weekly Canvas discussion post.

1.13.1 Canvas posts

Every Monday by noon, starting 6/29, you should make a short post on the Canvas forum responding to one or more of the readings for the week. This has two functions: (i) it will
help me tailor my class presentation, (2) it is a chance for you to show your understanding of the material in a low-pressure setting.

The post can be a paragraph or even a sentence, if the sentence makes a clear point. Longer posts are also fine.

Your posts can respond to other students’ posts or they can be stand-alone.

These posts will count towards your participation grade.

2 Class schedule

This schedule of readings and assignments is subject to change – updates will be posted on Canvas. You should read the posted readings in advance of class they are listed under.

Tu 6/23 Reverse-engineering human intelligence

- Nilsson, "Human-level AI? Be serious!"

Th 6/25 Bodies, minds and machines

- Flanagan, “Minds and bodies” (selections) (Canvas)
- Clark, “Meat Machines” (Canvas)

Tu 6/30 From embodied to abstract machines

- Hillis, Ch. 1, 2, 4 from The Pattern on the Stone (Stanford book store)
- Ch. 3 strongly recommended for those without programming background
- Watch course video, “Automata and Computation”

Th 7/2 What is intelligence?

- Turing, “Computing machinery and intelligence” (Canvas)
- Newell and Simon, “Computer science as empirical inquiry” (Canvas)

Optional:

- Dennett, “Why the law of effect will not go away”
Tu 7/7 Arguments against machine intelligence

- Searle, “Minds, Brains and Programs” (Canvas)
- Dennett, “Fast thinking” (Canvas)

Note that the Searle reading, and a couple of the later readings, are Behavioral and Brain Sciences target articles, that is, articles that are published together with commentary from other professionals. You are only required to read the target articles, although you may find the commentary and responses interesting. (The PDFs look long, but most of the length is the commentary and responses.)

Th 7/9 Consciousness: the “hard problem”

- Nagel, “What is it like to be a bat?” (Canvas)

Tu 7/14 Consciousness: qualia skepticism

- Dennett, “Quining qualia” (Canvas)
- Bernard Baars, “Global Workspace Theory of Consciousness” (Canvas)

Th 7/16 Consciousness and decision

- Libet (1985), “Unconscious Cerebral Initiative and the Role of Conscious Will in Voluntary Action” (Canvas)
- Dennett and Kinsbourne, “Time and the observer” (Canvas)

Tu 7/21 Vision: basics

- Palmer, Chapter 1 from Vision Science (Canvas)
- Watch course videos, “The Brain” and “Perception”

Optional:

- Lettvin et al., “What the frog's eye tells the frog's brain”
- Shepard and Metzler, “Mental rotation of three dimensional objects”
- Wolpert and Ghahramani, “Bayes' rule in perception action and cognition”

Th 7/23 Visual attention and consciousness
• Simons and Rensink, “Change Blindness: Past, Present, and Future,” 2005
• Cowey and Stoerig “The neurobiology of blindsight.” 1991 Trends in Neurosciences

Optional:

• Chun and Wolfe, textbook chapter on visual attention (Canvas)
• Sperling, (1960). The information available in brief visual presentations
• Dehaene et al., “Conscious preconscious and subliminal processing a testable taxonomy” 2006

Short paper due today.

Tu 7/28 Language and behavior

• Grice, “Logic and conversation”

Th 7/30 Rationality, choice and learning

• Christian and Griffiths, “Explore / Exploit”
• Watch course video, “Decision Theory”

Exam topics / study questions distributed.

Tu 8/4 Bounded rationality

• Kahneman, “Maps of bounded rationality”
• Gigerenzer and Brighton, “Homo Heuristicus: Why Biased Minds Make Better Inferences”
• Watch course video, “Probability”

Th 8/6 tbd

Exam distributed today; due 8/11.

Tu 8/11 AI challenges

• Dreyfus and Dreyfus, “Making a Mind versus Modeling the Brain” (Canvas)
• Levesgue, “On our best behavior” (Canvas)
• Watch course video, “Human Cognition”
Also recommended:

- Course videos, "Intro to Machine Learning," "Neural Nets Pt I" and "Neural Nets Pt II"
- Dennett, "Cognitive wheels"
- Dreyfus, *What Computers Can't Do*

Exam due today.

Th 8/13 **Machine learning: triumphs and challenges**

- Lake, Ullman, Tenenbaum and Gershman, “Building machines that learn and think like people”
- Watch course videos, “Bayesian Cognitive Development” and “Are Humans Bayesian”