Minds and Machines

SYMSYS 1

Stanford University - Fall 2024

Questions? Email: symsys1staff@gmail.com

WHAT IS THIS COURSE ABOUT?

This course provides 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.

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.

LEARNING GOALS

Analyze formal and natural systems at multiple levels of abstraction and from multiple intellectual perspectives

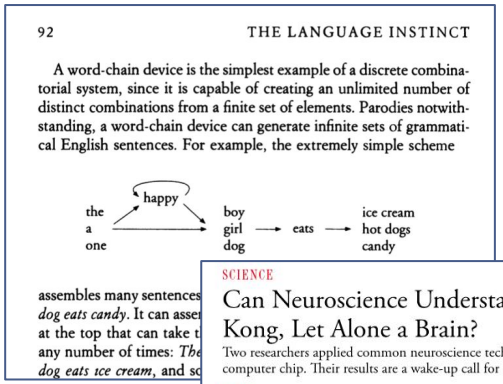
Develop key analytic and computational skills that are widely used in cognitive science and beyond

Understand and articulate connections among the numerous, superficially distant fields of study that comprise ‘cognitive science’

Prepare yourself to uncover surprising & useful connections in your future studies in SymSys, computer science, psychology, linguistics, philosophy, and beyond

HOW you'll be learning

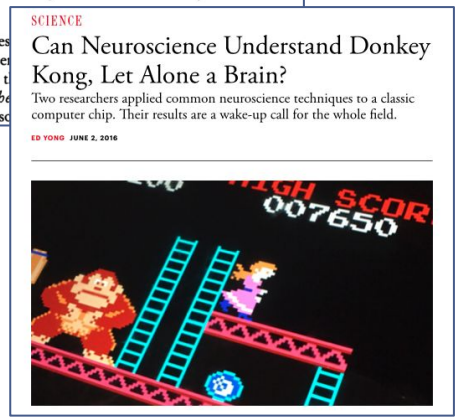
Readings



92 THE LANGUAGE INSTINCT

A word-chain device is the simplest example of a discrete combinatorial system, since it is capable of creating an unlimited number of distinct combinations from a finite set of elements. Parodies notwithstanding, a word-chain device can generate infinite sets of grammatical English sentences. For example, the extremely simple scheme

assembles many sentences
dog eats candy. It can asse
at the top that can take t
any number of times: *The*
dog eats ice cream, and so



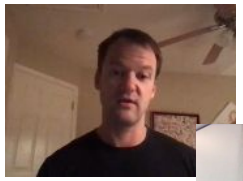
SCIENCE

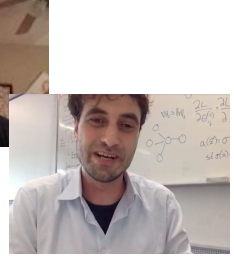
Can Neuroscience Understand Donkey Kong, Let Alone a Brain?

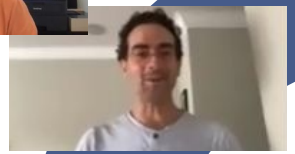
Two researchers applied common neuroscience techniques to a classic computer chip. Their results are a wake-up call for the whole field.

ED YONG JUNE 2, 2016

Lecture videos (by various faculty from Stanford and outside!)

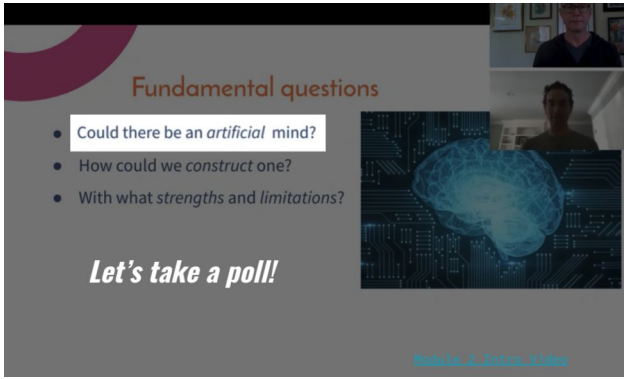




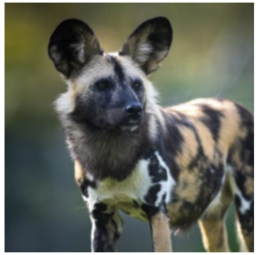


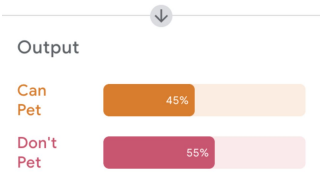
HOW you'll be learning

Sections & Friday Seminars



Weekly Responses, Problem Sets, & Module Projects





Nearley Parser Playground now with moo support

Experiment with Hardmath123's incredible Nearley Parser! Nearley will parse anything you throw at it (
or going into a ~~sulk~~ infinite loop. You can find the Nearley syntax spec here, more example grammars h
playgrounds and stuff, consider following me on twitter!

Sample × Tab 3 × + Add Tab

```
MAIN -> SENTENCE "." | QUESTION "?"
_ -> " "
QUESTION -> QUESTIONWORD _ "is" _ OBJ | "Where is" _ OBJ _ "when you need it" | "How many" _ THINGS _ "are
you" _ GERUND
QUESTIONWORD -> "How" | "What"
SENTENCE -> SUB _ VERB _ MOD | "Oh" _ OBJ _ "..."
SUB -> "I" | "you"
VERB -> "cry" | "love" | "tweet" | "stayed up all night" | "missed" _ OBJ
GERUND -> "loving" | "seeing" | "drowning in" | "taking"
MOD -> "with" _ OBJ | "while thinking about" _ OBJ | "more than" _ OBJ | "aggressively" | "but" _ SENTENCE
| ".."
OBJ -> "your startup" | "that pset" | "their VC" | "the weather" | "my roommate" | "ML/AI" | "sleep" |
"the Stanford Missed Connections post" | "that Google form" | "the when2meet" | "imposter syndrome" | "the
Linkedin update" | "Huang basement"
THINGS -> "psets" | "startups" | "classes" | "when2meets" | "units"
```

Sections: Wednesdays / Thursdays
Friday seminar: Friday 1:30 - 2:50pm Hewlett 201

WEEKLY SCHEDULE

Tuesday

Finish asynchronous videos and readings;

Submit weekly response

Wednesday/Thursday

Attend your discussion section (starting in Week 2)

Friday afternoon

Attend Friday seminar at 1:30pm

Friday evening

Submit your Problem Set / Module Project;

Start next week's readings and videos

COURSE SCHEDULE

See all the videos, readings, and assignments on Canvas

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If you have any questions about the course, please contact Bonnie at symsys1staff@gmail.com

Course schedule:

Topic	Lecture videos and readings	Thursday seminar	Assignment
Module 1: What is a mind?	Videos: • 0: **Watch me first:** Course info • 1: Module 1 overview		
Week 1: Meaning of a mind			
Topic 1: Bodies, minds, and machines	Reading 1: Minds and Bodies (Flanagan) Video 2: Bodies, minds, and machines Optional: They're made out of meat! (Bisson)		
Topic 2: From embodied to abstract machines	Reading 2: Pattern on the stone (Hillis), Ch. 1-2 Video 3: From embodied to abstract machines Optional (to learn more about Turing machines): Pattern on the stone (Hillis),		Week 1 Response due: **Tues 10/1**

TEACHING TEAM

INSTRUCTOR

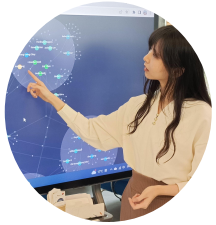
Bonnie Krejci

Lecturer & Teaching Coordinator
Symbolic Systems Program, Stanford University

SECTION LEADERS

Chuqi Hu
SymSys MS student

Puyin Li
SymSys MS student



Junyi Tao
SymSys MS student

Questions? Email: symsys1staff@gmail.com

OFFICE HOURS

It’s a homework party space: Collaborate with peers and/or ask your questions for section leaders and instructors!

It’s a place for symsys-related questions: We’re happy to talk to you about anything related to the course or major.

Office hours start in Week 2

EVALUATION

WEEKLY RESPONSES (10%)

Answer open-ended questions on the readings and videos for the current week.

Due Tuesday at 11:59pm

The Week 1 Response won't be due until Tues the following week (10/1)

The Week 7 Response won't be due until Thurs 11/7

PROBLEM SETS (30%)

Due every Friday (except for weeks that Module Projects are due) at 11:59pm

Week 1 p-set: 10/1

SEMINAR & SECTION PARTICIPATION (25%)

You are expected to attend Friday seminar and your discussion section and participate in both

MODULE PROJECTS (35%)

Due Friday of the week after each module, at 11:59pm

Questions? Email: symsys1staff@gmail.com

COURSE POLICY

Problem Sets:

- Late problem sets incur a penalty of 10% per day off of the total score, based on the timestamp of the submitted assignment. E.g. an assignment with a score of 90 turned in 24 hours and 1 minute late is considered two days late, and would be given a score of 70.
- The **one** problem set with the lowest score is dropped.

Module Projects:

- Late Module Projects incur a 10% penalty per day, just as outlined above for problem sets. The final Module Project must be submitted by **Monday, Dec. 9th** at the latest.

Weekly Responses:

- Weekly responses will be accepted only until the deadline; you won't be able to make a submission after that time. Do not submit via email or submission comment.
- The **one** weekly response with the lowest grade is dropped.

Questions? Email: symsys1staff@gmail.com

COURSE POLICY

Attendance and participation in discussion section and Friday seminar is critical to maximize your learning for this course, as they are designed to help you use concepts and interact with your fellow students. Because research indicates that learning happens most effectively when students actively engage rather than passively watch, attendance and participation in class is a major part of your grade.

Section attendance policy:

- If you have a short-term/one-time scheduling conflict, and you need to miss your section, you can make it up by attending an alternate section
  - This is the only way to make up section
  - Otherwise, you must attend the section that you are enrolled in
- If you attend an alternate section, make sure the TA whose section you attend counts you present.
- The **one** section participation score with the lowest grade is dropped.

Friday seminar attendance policy:

- Your **two** lowest grades for Friday seminar participation are dropped.

Questions? Email: symsys1staff@gmail.com

COURSE POLICY

Students with Documented Disabilities: Stanford is committed to providing equal educational opportunities for disabled students. Disabled students are a valued and essential part of the Stanford community. We welcome you to our class. If you experience disability, please register with the Office of Accessible Education (OAE). Professional staff will evaluate your needs, support appropriate and reasonable accommodations, and prepare an Academic Accommodation Letter for faculty. To get started, or to re-initiate services, please visit oae.stanford.edu. If you already have an Academic Accommodation Letter, we invite you to share your letter with us. Academic Accommodation Letters should be shared at the earliest possible opportunity so we may partner with you and OAE to identify any barriers to access and inclusion that might be encountered in your experience of this course.

Please send your OAE letters to Bonnie at symsys1staff@gmail.com.

Student-athletes: We are participating the in pilot to help student-athletes more easily attend Friday seminar. The only way to make up a section absence is to attend a different section.

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COURSE POLICY

***Collaboration & plagiarism policy*:** All work submitted should be exclusively your own. You may discuss homework concepts aloud, but **you may not share any written documents** pertaining to homework questions, including emails, draft answers, etc. If you need more details, refer to the Collaboration Policy document. 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.

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