Minds, Brains, & Intelligent Behavior
An Introduction to Cognitive Science

COGS/PSYC/PHIL 222, Autumn 2021
Monday & Wednesday, 7pm-8:15pm | Classroom: Physics 114

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FROM THE COURSE CATALOG

This course will emphasize interdisciplinary approaches to the study of intelligent systems, both natural and artificial. Cognitive science synthesizes research from cognitive psychology, computer science, linguistics, neuroscience, and contemporary philosophy. Special attention will be given to the philosophical foundations of cognitive science, information theory, symbolic and connectionist architectures, the neural basis of cognition, perception, learning and memory, language, action, reasoning, expert systems, and artificial intelligence.

REQUIRED TEXTS

All required readings are available in the course reading packet as well as electronically on GLOW. Please pick up the reading packet at 51 Park Street.

GRADING

All work will be marked anonymously, so should be turned in with student IDs only.

Anonymous grading is one way of assuring that our collegiality does not cloud my assessment of your work. One disadvantage to anonymous grading is that I will not know when your work is inadequate and will typically not approach you with concerns. As a result, there is an additional responsibility on your shoulders. You must elect to visit office hours to seek out opportunities to improve your writing and research.

1. Weekly assignments, 35% of final grade
   On most Wednesdays you will receive an assignment to be turned in by the beginning of class one week later. These will sometimes be primarily qualitative and sometimes primarily quantitative. There will be 10 weekly assignments in total.

   Weekly assignments will be graded on a 1 to 10 scale, and will be penalized 1 point if not turned in by the beginning of class but still on the day it is due. They will be penalized 3 points if turned in the next day, and 7 points if turned in two days later (days end at 11:59pm). Weekly assignments will be collected at the beginning of class on the day that they are due.

2. Midterm exam, 25% of final grade
   The in-class midterm will consist of short essays (which may include quantitative elements) drawn from study material to be distributed at least two weeks in advance of the exam.

3. Final exam, 30% of final grade
   The self-scheduled final exam will consist of short essays (which may include quantitative elements) drawn from study material to be distributed at least two weeks in advance of the exam. This exam will emphasize material covered after the midterm.

4. Participation, 10% of final grade
   Discussion is essential to the vitality of the class and your thoughtful participation is one indicator that you are reading carefully. Every effort will be made to ensure that the class is a welcoming forum for sharing serious ideas. Being attentive and engaged in class, asking clarificatory questions, and discussing aspects of the course with the instructor informally or during office hours all fall under the heading of participation.

CLASS RESOURCES

In person office hours are Mondays 2:30-4 and Wednesdays 1:30-3 in Sawyer 504. I am also available for remote office hours on Zoom via a sign up schedule. See GLOW under announcements for details.

Students with disabilities who may need disability-related classroom accommodations for this course are encouraged to set up an appointment to meet with me as soon as possible and to contact the Dean's Office (at extension 4262) to better insure that accommodations are provided in a timely manner. Students who miss class due to covid-19 quarantine may request an audio recording of the missed meeting(s).

SCHEDULE OF READINGS

All readings are to be done in advance of the class meeting

No laptops or food in class, College policy requires masks whenever indoors

September

13 Hofstadter, D. (1981) excerpt from *Gödel, Escher, Bach: An Eternal Golden Braid*, Prelude...Ant Fugue; Reflections.

15 Turing, A. (1950) Computing Machinery and Intelligence.
WEEKLY ASSIGNMENT #1 DUE

20 Newell, A. and Simon, H. (1963) GPS, a program that simulates human thought.

22 Davis, R. et al (1993) What is a Knowledge Representation?
WEEKLY ASSIGNMENT #2 DUE

27 Lehman, J. et al. (2006) A gentle introduction to SOAR, an architecture for human cognition: 2006 update.

29 Dneprov, A. (1961) The Game.
Searle, J. (1983) Minds, Brains, and Programs.
WEEKLY ASSIGNMENT #3 DUE

October

4 Dennett, D. (1984) Cognitive Wheels: The Frame Problem for AI.

6 McClelland, J. (1981) Retrieving General and Specific Information from Stored Knowledge of Specifics.
Cruz, J. (manuscript) Connectionism.
WEEKLY ASSIGNMENT #4 DUE

11 READING PERIOD, NO CLASS

13 Goodfellow, I., Bengio, Y., and Courville, A. (2016) from *Deep Learning* Chapter 1
WEEKLY ASSIGNMENT #5 DUE

18 Marcus, G. (2017) Deep Learning: A Critical Appraisal.

20 Pinker, S. and Ullman, M. (2002) The past and future of the past tense.
McClelland, J. and Patterson, K. (2002) 'Words or Rules' cannot exploit the regularity in exceptions.
McClelland, J. and Patterson, K. (2002) Rules or connections in past-tense inflections: What does the evidence rule out?
Pinker, S. and Ullman, M. (2002) Combination and structure, not gradedness, is the issue.

25 Gallistel, C. (1998) Symbolic processes in the brain: The case of insect navigation.

27 IN CLASS MIDTERM

November

1 Roitblat, H. (1995) Comparative approaches to cognitive science.

3 Brooks, R. (1991) Intelligence without representation.
WEEKLY ASSIGNMENT #6 DUE

8 Resnick, M. (1994) Learning About Life.
Bedau, M. (2007) Artificial Life.

10 Anderson, M. (2005) How to study the mind: An introduction to embodied cognition.
Chiel, H. and Beer, R. (1997) The brain has a body: adaptive behavior emerges from interactions of nervous system, body and environment.
WEEKLY ASSIGNMENT #7 DUE

15 Thelen, E. (1995) Time-Scale Dynamics and the Development of Embodied Cognition.

17 Clark, A. (1997) The Dynamical Challenge.
WEEKLY ASSIGNMENT #8 DUE

22 Mitchell, M. (2020) On Crashing the Barrier of Meaning in Artificial Intelligence.

24 THANKSGIVING BREAK, NO CLASS

29 Clark, A., and Chalmers, D. (1998) The Extended Mind.
Fodor, J. (2009) Where is my mind?

December

1 Hutchins, E. (2010) Enaction, Imagination, and Insight.
WEEKLY ASSIGNMENT #9 DUE

6 Chalmers, D. (2010) Facing Up to the Problem of Consciousness (excerpt).

8 Dennett, D. (1988) Quining Qualia.
WEEKLY ASSIGNMENT #10 DUE