

## Cognitive Science: A Multidisciplinary Introduction

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### Course Objectives

This course is an introduction to the nascent field of Cognitive Science. To capture the interdisciplinary nature of this field, we will address a range of topics and research programs from a variety of disciplines, including philosophy, computer science, cognitive psychology, neuroscience, linguistics, and artificial intelligence. The goals of this course are to introduce you to the foundations of Cognitive Science, help you appreciate the development of this field over the years, and allow you to explore the investigations and lively debates that have taken place within and across the disciplines that make up the field.

After completing this course students should:

- Appreciate the interdisciplinary nature of cognitive science, the diversity of viewpoints, the controversies, and the areas of emerging consensus.
- Be able to read and discuss research papers from multiple disciplines and be able to make appropriate connections and comparisons in research fields across disciplines.
- Know various definitions of the foundational concepts of computation and representation and be able to discuss them from multiple points of view.
- Have basic familiarity with brain anatomy and physiology.
- Understand how the cognitive architecture of perception, memory, language, and so forth come together to produce behavior.
- Be aware of contemporary social debates in cognitive science, including social cognition, moral psychology, and decision making.

### Lectures & Recitations

Lectures will be uploaded on the My Media section of Canvas Sunday night and Tuesday night. This course will be run *asynchronously* so you can watch the lectures on your own time. Recitations will be run synchronously through Canvas Conferences, so make sure to attend your assigned recitations. We aim to record all recitations and upload to Canvas for students who miss them due to family conflicts. We also encourage you to come to our office hours (especially now that everything is online) to talk through the course material with us.

### Reading

There is no required textbook for this course. I will provide a reading pack consisting of peer-reviewed academic journal articles, book chapters, and textbook chapters. You will have access to them through Canvas. Read all required readings thoroughly—anything in the readings is fair game on the exams.

*Note:* even though required readings were chosen to be accessible to an introductory audience, some of the readings will probably strike you as tough, so I suggest reading slowly and looking up phrases you are unfamiliar with. By this point you will have discerned one thing that makes cognitive science different than other fields (but perhaps more exciting!)—it's interdisciplinarity! But, this means that even if you are very comfortable reading, say, psychology articles you might find yourself struggling

with philosophy or artificial intelligence articles if these are new fields for you. This feeling is entirely *normal*—reading papers for the first time in a new field feels daunting for everyone (we want to avoid feelings of *imposture syndrome*). So, take a deep breath, read slowly, attend all lectures, and ask myself (or Ryan) questions you have during our office hours.

### **Assessment**

#### *40% Weekly Reactions*

Each Monday I will post two questions, which relate to the material in the reading and lecture. Through Canvas you will submit a response to **one** of the questions before 5 pm on Friday. Responses need not be long (shoot for a couple paragraphs or so) but should engage with the material beyond mere summarization. The lowest two weekly responses will be dropped.

#### *60% Exams*

There will be two take home exams, which will cover material in the required reading and lectures. So, anything in the readings or lecture is fair game on the exam! The exams will consist of short answer questions and essay questions.

*Note:* all your grades will be available through the gradebook feature on Canvas. It is your responsibility to monitor your grades and follow your progress during the course.

### **Plagiarism**

Plagiarism will not be tolerated. Familiarize yourself with the University's extensive academic integrity policy at [academicintegrity.rutgers.edu](http://academicintegrity.rutgers.edu). All instances of plagiarism will be reported to the Office of Student Judicial Affairs.

### **Disability Services**

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where they are officially enrolled, participate in an intake interview, and provide documentation. For more information visit the Rutgers Office of Disability Services: <https://ods.rutgers.edu>.

### **Join the Rutgers Cognitive Science Club!**

The Rutgers Cognitive Science Club hosts a guest speaker series, socials, and movie nights. To find out more information go to: [rucogsciclub.com](http://rucogsciclub.com)

### **Schedule**

#### **Week 1:** Intro to Cog Sci and Types of Representation

*Reading:* Friedenberg, Jay & Silverman, Gordon (2006). "(Chapter 1) Introduction: Exploring Inner Space," In *Cognitive Science: An Introduction to the Study of Mind*, London: Sage Publications, pp. 1-27.

#### **Week 2:** Marr and Explanatory Levels of Representation

*Reading:* Marr, David (1982). "(Chapter 1) The Philosophy and the Approach (**ONLY PAGES 19-29**)," In *Vision*, Cambridge: MIT Press, pp. 19-29.

#### **Week 3:** (February 5<sup>th</sup>): Computation

Reading: Clark, Andy (2001). "(Chapter 1) Meat Machines: Mindware as Software," In *Mindware*, pp. X-X.

**Week 4: Connectionism**

Reading: Bruckner, Cameron & Garson, James (2019). "Connectionism," In *The Stanford Encyclopedia of Philosophy*, (ed.) E. Zalta.

**Week 5: Perception**

Reading: Beaumont, J. (1988). "Sensation and Perception", In *Understanding Neuropsychology*, (ed.) J. Beaumont & G. Rogers, London: Blackwells.

**Week 6: Development**

Readings: Talbot, Margaret (2006). "The Baby Lab: How Elizabeth Spelke Peers into the Infant Mind," *The New Yorker*, September 4, 2006.

Stahl, Aimee & Feigenson, Lisa (2015). "Cognitive Development: Observing the Unexpected Enhances Infants' Learning and Exploration," *Science*, 348(6230), 91-94.

**Week 7: Exam 1**

**Week 8: Memory**

Reading: Brady, Tim, Konkle, Talia, & Alvarez George. (2011). "A Review of Visual Memory Capacity: Beyond Individual Items and Toward Structured Representations," 11(4), 1-34.

**Week 9: Phonology (guest speaker: **Ryan Rhodes**, RuCCS)**

Reading: Jackendoff, Ray. (1994). "Phonological Structure" in *Patterns in the Mind: Language and Human Nature*, New York: Basic Books, pp. 53-65.

**Week 10: Syntax & Semantics (guest speaker: **Morgan Moyer**, Rutgers Linguistics)**

Reading: Everaert, Martin et al. (2015). "Structure, Not Strings: Linguistics as Part of the Cognitive Sciences," *Trends in Cognitive Science*, 19(12), P729-743.

**Week 11: Bias & Social Cognition**

Reading: Dovidio, John, Hewstone, Miles, Glick, Peter, & Esses Victoria (2010). "Stereotyping and Discrimination: Theoretical and Empirical Overview," In *The SAGE Handbook of Prejudice, Stereotyping and Discrimination*, London: SAGE Publications Ltd., 3-28.

**Week 12: Decision Making**

Reading: Tversky, Amos & Kahneman, Daniel (1974). "Judgment under Uncertainty: Heuristics and Bias," *Science*, 165(4157), 1124-1131.

**Week 13: Neuroimaging: fMRI & EEG**

Reading: Kanwisher, Nancy (2017). "The Quest for the FFA and Where it Led," *The Journal of Neuroscience*, 37(5), 1056-1061.

**Week 14: Exam 2**