PSYC S410: Computational Psychology

Spring 2024

(Photo by The Ian on Unsplash)

1 Course information

Class schedule	M/T/Th/F 3:00 pm–3:50 pm J206
Instructor	Alan Jern Office: A202D Email: jern@rose-hulman.edu
Open meeting time	Thursdays, 2:00–2:50 pm (On Microsoft Teams)

2 Overview and objectives

One of the limitations of psychological science is that many theories are qualitative: They can make general predictions about things like whether people are more likely to take one action or another or remember one word or another, but they can't make precise quantitative predictions. For example, exactly how *much* more likely is it that someone will take an action or what is the precise mathematical relationship between how many times someone sees a word and how well they remember it? The goal of computational psychology is to develop theories of cognition and behavior that are precise enough that they can be implemented as computer programs and make precise quantitative predictions.

In this course, you will learn how to think like a computational psychologist. You will also learn how mathematical and computational tools from probability, statistics, and machine learning can

be used to develop models of human learning and reasoning. By the end of this course, you should be able to:

- Explain the similarities and differences between machine learning / AI and computational psychology.

- Read, understand, and critique an academic journal article describing a computational model.

- Implement a computational model from a specification in a published journal article.

- Interpret the predictions of a computational model.

- Design and build a simple behavioral experiment and compare the data you collect to model predictions.

3 Assessment

Component	Points
Syllabus quiz	10
Homeworks (5)	350
Project	340
Reading responses (6)	100
Paper presentation	100
Participation	100
Total	1000

3.1 Homework

Homework assignments will consist of coding assignments and experiment data collection. They will generally be based on material you learned in the preceding week.

3.2 Reading responses

You will learn about most of the specific models in this class by reading published papers that we will discuss in class. To encourage you to come to class prepared for discussion, you must submit reading responses for some of these readings. For each paper, I will post a couple questions online that guide your reading. You will submit a response to these questions before class on the specified date. Your total response does not need to be longer than 2–3 paragraphs.

There are 13 assigned readings, but **you only need to submit 6 reading responses of your choosing**. Your lowest of the 6 scores will be dropped. If you submit more than 6, I will only accept your first 6 submissions.

3.3 Paper presentation

You will be randomly assigned to a group that will lead one paper discussion. On your group's assigned day, you will summarize the main questions raised by the paper, the methods used in

the paper, the results, and come prepared with some discussion questions for the rest of the class. On the class day before your assigned day, I will spend half of the class period meeting with your group to clarify details of the paper, answer your questions, and help guide your presentation. Therefore, you are required to attend on the day **before** your scheduled presentation day having already thoroughly read through your assigned paper (even if you didn't understand every part of it).

3.4 Project

At the end of the quarter, you will complete a group project. More details about the scope and expectations for this project will be posted on Moodle.

Assignment	Points
Project proposal	40
Presentation	50
Report	250
Total	340

3.5 Participation

Because this course involves lots of discussion, I expect you to be an active participant, both asking and answering questions in class, though not necessarily every day. I also expect you to have good attendance and to show up to class on time.

Your participation score will be self-assigned using a rubric I will provide you. At two points in the quarter, you will use the rubric to determine what participation score you have earned for that half of the quarter. I will review these scores and may make adjustments if I feel they are wildly off the mark.

3.6 Final grade

Grades will be assigned as follows.

Points	Grade
≥ 900	A
870–899	B+
800–869	B
770–799	C+
700–769	C
670–699	D+
600–660	D
< 600	F

4   Course policies

4.1   Late assignments

Late assignments (including the self-assigned participation scores) will receive a point penalty that doubles for each additional day they are late. Specifically:

- 1 day late: 1% deduction

- 2 days late: 2% deduction

- 3 days late: 4% deduction

- 4 days late: 8% deduction

- 5 days late: 16% deduction

- 6 days late: 32% deduction

- 7 days late: 64% deduction

- 8+ days late: No credit

An assignment counts as 1 day late as soon as the deadline for that assignment has passed. If you submit an assignment late, you do not need to notify me. Just submit the assignment on Moodle. It will be automatically timestamped and I will deduct the appropriate number of points when I grade it.

There will be no exceptions made to this late policy and no assignments will be accepted later than 7 days after their deadlines. You should plan to submit your assignments before the deadline. The purpose of this policy is that if something unexpected comes up, you can submit one or two days late with minimal penalty.

Note: The late policy does not apply to the final project report.

4.2   Anonymous grading

Do not include your name on anything (including file name) you submit on Moodle, unless I say otherwise. The reason for this is because I use an anonymous grading feature on Moodle that lets me grade your assignments without seeing your names. Your names are revealed after I've finished grading the assignment. I do this to keep my grading as impartial as possible. If you put your name on the assignment, it undermines the process for everyone.

4.3   Asking for help

I highly encourage you to contact me if you ever need help in this course. That's what I'm here for! But I also want to encourage you to be self-sufficient. So if you ever ask me a question that can be easily answered on this syllabus or the Moodle page (a due date, a page limit, a detail about the late policy), **I will deduct 1 point from your grade total**.

The corollary of this policy is that if you ever find anything on this syllabus or the Moodle page that looks like a genuine mistake (the wrong date, inconsistent information) and you ask me about

it, **I will give you 1 point of extra credit**. (Only the first person to tell me gets the extra credit.)

You don't need to be afraid to contact me. The point of this policy is to incentivize you to try to find answers yourselves first. If you look for an answer and genuinely can't find it, I want to know that too. Just tell me you tried to find it on your own first and where you looked. You won't be penalized for this.

4.4   Academic integrity

Academic misconduct will be addressed according to the policies described in the Rose-Hulman student handbook. Academic misconduct includes: (1) submitting work that is not your own (including AI-generated work); (2) copying ideas, words, or graphics from any source without appropriate citation; (3) misrepresenting your work or yourself (i.e., deliberately submitting the wrong assignment or lying to explain a late assignment); (4) collaborating with other students when this is not permitted; and (5) submitting the same work for credit in two courses without prior consent of both instructors. If you are unsure whether something qualifies as academic misconduct, please check with me before doing it.

5   Course schedule

The course schedule, along with reading assignments and a list of tasks for each week will be posted on Moodle.