



UC San Diego

## COGS 180: Decision Making (in the Brain) 🧠

Summer Session 1, 2024

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### Course Information

|               |                                                                                           |
|---------------|-------------------------------------------------------------------------------------------|
| Dates         | July 1 – August 3, 2024                                                                   |
| Location      | UC Zoom 🗣️ Link on course Canvas                                                          |
| Lectures      | Monday, Tuesday, Wednesday, & Thursday from 5-6:20pm PDT                                  |
| Discussion    | Tuesday & Thursday, 1-1:50pm (Optional, but at least 1 required)                          |
| Office Hours  | Monday & Wednesday after class until 7pm, or by appointment                               |
| Prerequisites | COGS 17 (or instructor permission)                                                        |
| Credits       | 4.00                                                                                      |
| Website       | <a href="https://cogs180.github.io/su24">cogs180.github.io/su24</a>                       |
| Canvas        | <a href="https://canvas.ucsd.edu/courses/57867">https://canvas.ucsd.edu/courses/57867</a> |

### Course Description

Are you fascinated by how we make decisions and what drives our choices? “Decision Making (in the Brain)” is a new (revamped), interdisciplinary course that aims to unravel the complexities behind human decision making by integrating insights from psychology, economics, neuroscience, psychiatry, design, and machine learning. In this course, we will explore everything from the cognitive biases and heuristics that shape our everyday decisions, to how decision making is impaired in various psychiatric disorders. We will discuss why it's so hard to make rational decisions, and how we can use AI to improve our decision making.

This could be a good course for you if you are interested in learning about decision science from an interdisciplinary perspective. The course will rely heavily on interactive discussion and collaboration, and will offer a chance to hone your research, presentation, and communication skills!

### Course Goals

By the end of this course, you will be able to (course-specific):

1. Identify and describe key theories and concepts related to decision making, such as common cognitive biases and heuristics, expected utility theory, prospect theory, Bayesian decision theory, etc.
2. Apply decision making models to analyze behavioral or neural data
3. Critically evaluate models of decision making and their applicability in different domains
4. Design an original study to investigate a specific aspect of decision making

You will also be able to (domain-general skills):

5. Evaluate the rigor of a research study and identify its strengths and weaknesses
6. Effectively communicate primary research to an interdisciplinary audience
7. Contribute to a collaborative and interactive learning environment
8. Set personal, achievable, learning goals and cite evidence of your achievement of these goals

## Course Schedule

\*Section dates

☐ Office hours after class

### Week 1 – Psychology

| Date                           | Topic                                   | Assignments                        |
|--------------------------------|-----------------------------------------|------------------------------------|
| Monday, July 1 <sup>☐</sup>    | Course introduction and overview        | Pre-course survey due              |
| Tuesday, July 2                | Cognitive biases and heuristics         |                                    |
| Wednesday, July 3 <sup>☐</sup> | NO CLASS                                | Syllabus quiz & learning goals due |
| Thursday, July 4               | NO CLASS – Enjoy July 4 <sup>th</sup> ! | HW 1 due Fri, 7/5                  |

No section this week

### Week 2 – Economics & Neuroscience

| Date                            | Topic                                       | Assignments                                   |
|---------------------------------|---------------------------------------------|-----------------------------------------------|
| Monday, July 8 <sup>☐</sup>     | Rational choice and expected utility theory |                                               |
| Tuesday, July 9*                | Behavioral economics and prospect theory    |                                               |
| Wednesday, July 10 <sup>☐</sup> | Neural correlates of decisions              |                                               |
| Thursday, July 11*              | Neuroeconomics                              | Group presentations begin, HW 2 due Fri, 7/12 |

### Week 3 – Neuroscience (con't) & Psychiatry

| Date                            | Topic                                                                                                     | Assignments        |
|---------------------------------|-----------------------------------------------------------------------------------------------------------|--------------------|
| Monday, July 15 <sup>☐</sup>    | Noisy decision making:<br>Drift diffusion model & Bayesian decision theory                                |                    |
| Tuesday, July 16*               | Learning from our mistakes:<br>Reinforcement learning and dopamine<br>(TD learning & actor-critic models) |                    |
| Wednesday, July 17 <sup>☐</sup> | Disorders of decision making                                                                              |                    |
| Thursday, July 18*              | Computational psychiatry                                                                                  | HW 3 due Fri, 7/19 |

## Week 4 – Design, ML, and AI

| Date                            | Topic                                       | Assignments        |
|---------------------------------|---------------------------------------------|--------------------|
| Monday, July 22 <sup>📅</sup>    | Nudging and choice architecture             |                    |
| Tuesday, July 23 <sup>*</sup>   | Human-centered design and computing         |                    |
| Wednesday, July 24 <sup>📅</sup> | Machine learning and decision making        |                    |
| Thursday, July 25 <sup>*</sup>  | Making decisions with AI...and in real life | HW 4 due Fri, 7/26 |

## Week 5 – The future of decision making research...starts with you!

| Date                            | Topic                                           | Assignments                                                                      |
|---------------------------------|-------------------------------------------------|----------------------------------------------------------------------------------|
| Monday, July 29 <sup>📅</sup>    | Last 2 group paper presentations                |                                                                                  |
| Tuesday, July 30                | Final project presentations                     |                                                                                  |
| Wednesday, July 31 <sup>📅</sup> | Final project presentations                     |                                                                                  |
| Thursday, Aug 1                 | Final project presentations<br>& final thoughts | Final paper due Sat, 8/3<br>HW 5 due Sun, 8/4<br>Post-course survey due Mon, 8/5 |

No section this week

## Assignments & Grading

I design my courses upon the belief that college is for developing domain-general critical thinking skills, for facilitating interaction, and for discussing interesting and novel ideas. If you just wanted to learn about a particular subject, you could simply read about it on the internet, watch some videos, or read a textbook. But because you have chosen to learn about this topic through taking a college course, I believe that it's my *responsibility* as your instructor to craft a richer, more engaging learning experience that goes beyond simply putting facts into your brain. That is what I hope to channel through the structure of assignments in this course, as well as the way "grading" is broken down.

### Assignments

I've designed several key assignments to help you engage with the material and achieve your own learning goals (more on that later). We will go into more detail for what is required of each assignment later on in the course, but for now, here's a brief overview:

1. Pre-course survey
  - Purpose: For me to gauge your specific interests, and to help organize and finalize some aspects of the course!
2. Syllabus quiz and learning goals
  - Purpose: The syllabus quiz will be for you to familiarize yourself with the syllabus and the way I approach teaching (which may be different from professors you've had in the past). This will go hand-in-hand with the learning goals assignment, where you will tell me what knowledge or skills you are most interested in cultivating through taking this course (Course Goal 8)
3. Weekly homeworks (5 total)
  - Purpose: To understand seminal studies in decision making research by reading and evaluating academic papers (Course Goals 1, 2, 3, 5), and to reflect on what you have been learning each week (Course Goal 8).
4. Group presentation (15 mins)

- Purpose: This will be an opportunity for you to collaborate with your peers in creating an effective presentation to communicate the findings of a research paper to an interdisciplinary audience (Course Goals 1, 2, 3, 5, 6, 7). You will go to 1 mandatory discussion section to get feedback on your presentation from our TA, Janet!
- 5. Final project paper (2-3 pages) and presentation (5 mins)
  - Purpose: To dive deeper into one aspect of decision making research and propose new questions and/or approaches to study it (Course Goals 2, 4, 8). This will also be another opportunity to hone your presentation skills, this time striving for clarity and succinctness (Course Goal 6).
- 6. Post-course survey
  - Purpose: To give me feedback on anything and everything, since this is the first time I'm teaching this course (and at UCSD!)

## List of assignment due dates

For convenience, here's a summary of the assignment due dates (all assignments are due by 11:59pm anywhere in the world on that date):

| Due Date                              | Assignment                       |
|---------------------------------------|----------------------------------|
| Monday, Jul 1                         | Pre-course survey                |
| Wednesday, Jul 3                      | Syllabus quiz and learning goals |
| <i>Dates vary</i>                     | Group presentation               |
| Friday, Jul 5                         | HW 1 due                         |
| Friday, Jul 12                        | HW 2 due                         |
| Friday, Jul 19                        | HW 3 due                         |
| Friday, Jul 26                        | HW 4 due                         |
| Tuesday - Thursday,<br>Jul 30 - Aug 1 | Final project presentation       |
| Saturday, Aug 3                       | Final project paper due          |
| Sunday, Aug 4                         | HW 5 due                         |
| Monday, Aug 5                         | Post-course survey due           |

## My philosophy on grades

Over this course, I hope that you will quickly realize that my teaching philosophy departs from that of many other professors—this includes my opinion on the utility of grades. Grades are a form of extrinsic motivation—they push students towards the specific achievements required to obtain the grade they desire. Once goals are identified, it is human nature that we attempt to meet them with the smallest possible effort.

Recognizing that grades are still required by UCSD, I choose to design “grades” in my courses to reflect your *learning* rather than *performance*, and to reward intrinsic effort. This is why I have you set your own learning goals at the beginning of the course, and why I ask you to regularly reflect on whether you are making progress towards your goals in your weekly homework. This process allows you to identify the aspects of the course that you resonate most with and that best serve your personal and professional growth.

Your final “grade” should therefore reflect whether you have achieved the learning goals you set for yourself, and the course assignments are simply opportunities for you to move towards your goals by facilitating interaction with the material in different ways. In short, your learning and growth is directly proportional to your invested effort.

If you are interested in how I ended up with this particular teaching philosophy, I encourage you to read the book *Ungrading: Why Rating Students Undermines Learning (and What to Do Instead)* edited by Susan D. Blum.

## Grading

All of the above being said, we will now go into the grading breakdown of this course. While some of the assignments will have official scoring rubrics (particularly the group presentation and final project), the main idea here is that everyone can earn an A if they:

- Attend class, unless you have discussed your absence with me
- Contribute to a respectful, supportive academic environment
- Provide thoughtful, specific feedback to your peers
- Complete all assignments with a genuine effort
- Demonstrate thoughtful reflection about your learning goals and whether they were achieved in the course

| Assignment                                 | Percentage      |
|--------------------------------------------|-----------------|
| Attend class and participate in discussion | 30%             |
| Pre-course survey                          | 5%              |
| Syllabus quiz and learning goals           | 5%              |
| Weekly HW                                  | 5*5% each = 25% |
| Group presentation                         | 15%             |
| Final project paper and presentation       | 15%             |
| Post-course survey                         | 5%              |

For all of the assignments except for the group presentation and final project, you will simply earn the full % by completing the assignment with a “genuine” effort—meaning that you demonstrated meaningful engagement with the material. The group presentation and final project will be graded via a rubric that I will share later on in the course, and your grade on these assignments will be partly determined by yourself as well as your peers! (More on this later).

Finally, you will notice that attendance and participation is a whopping 30% of your course grade! Why is this so important to me? As I mentioned before, I firmly believe that if you just wanted to learn about a topic on your own, you could just find what you needed from searching the internet or reading a textbook. The real value of taking a course lies in the opportunity to engage, debate, and learn with and from others. Therefore, a large part of our class time will be devoted to collaborative discussion (Course Goal 7). I promise that taking this course on Zoom does not automatically mean that “lectures” will be unengaging or boring (lectures are in quotations because I almost never lecture for more than 20 mins). If you need more convincing, you can refer to [these student evaluations](#) for a course I taught on Zoom during COVID (scroll to the very end).

## In and out-of-class components

To summarize, below are the in and out-of-class components of the course that I am asking of you:

|              |               |
|--------------|---------------|
| During class | Outside class |
|--------------|---------------|

|                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>1. Attending class and actively participating in discussions with your classmates</li> <li>2. Group presentation (15 mins)</li> <li>3. Final presentation (5 mins)</li> <li>4. Exit tickets (e.g., What is one thing you learned today? Can help you write weekly reflections)</li> </ol> | <ol style="list-style-type: none"> <li>1. Syllabus quiz &amp; learning goals</li> <li>2. Weekly homeworks (5 total)</li> <li>3. Prepare 15 min group presentation</li> <li>4. Do research for final and write a 2-3 page paper</li> <li>5. Prepare 5 min final presentation</li> </ol> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Policies and FAQ

### Can I turn in an assignment late?

All weekly homework assignments should be turned in by 11:59p (anywhere in the world) on the due date (Fridays). Any assignment that is turned in late will be deducted 1 point per late (remember that homeworks are only worth 5 points each). You get 1 "free pass" for late homework (up to 3 days). However, this late policy does not apply to other assignments (group presentation, final project, and post-course survey).

### Can I use ChatGPT or other forms of AI to help complete my assignments?

I am *very* positive about the use of AI in the modern age, and therefore encourage its free use in this course. In my opinion, anyone who does not learn to use AI effectively in the next few years will fall behind those who do. Therefore, learning to use AI to your benefit is a "meta" learning goal in this course. Throughout the course, I will provide examples of how you can use AI as a tool to distill information from papers, clarify your understanding of a topic, give feedback on your work, and more.

All this being said, I strongly discourage "copy pasta" work, in which one copies the exact output of an AI chatbot and submits it as their own work (in many cases, you can still easily distinguish this from human writing). If you are feeling stressed about completing something on time and are tempted to use AI just to "submit something," I would much rather you be honest about your circumstances in your weekly reflection and try to invest some genuine effort into completing at least one part of the homework, or asking for an extension (and that honesty will earn you the credit you deserve).

### What if I need to miss class?

Success in the course relies heavily on class participation and attendance (please see earlier section for why). If you must miss a class for a legitimate excusable reason (serious illness, emergency such as death of a family member, etc.), please let me know at some point (it doesn't need to be in advance) and it will of course not count against you. I trust you to not abuse this policy!

## Do I need to have my camera on during class?

As part of the course culture of interaction and participation, I strongly encourage everyone to have their cameras on during class, or at least when you are participating in discussion with your classmates! We have a small class size (~30), so I would love it if everyone could get to know each other by name and face. This is not a course where you can just open Zoom and multitask on something else during class with your camera off (if you expected this, then maybe you should reconsider taking the course!). As your instructor, I will take the responsibility of cultivating a fun dynamic in class that will hopefully make you *want* to participate with cameras on 😊

## Finally...

Because this is the first time I am teaching this course, anything in this syllabus could change at my discretion (of course, not without good reason). And because you are students in the first rendition of this course, everything is up for negotiation as well! If there's a course policy you feel that is unfair, or a homework assignment that wasn't quite what you expected, I would love to hear your feedback as you experience the course. If you'd like to remain anonymous, [this form](#) (also located at the top right corner of the course website) is always open for you to submit feedback at any time during or after the course!