

PSY471H Computation in Psychology

Fall 2015 Syllabus

Instructor Professor Christopher Honey
Office: SS 4006
Office Hours: Thurs 4.30-5.30pm
honey@psych.utoronto.ca

Lecture Tuesdays from 10.00am to 12.00pm in University College 248.

Recommended Texts (Optional) **More basic:** Anderson, B. (2014). *Computational neuroscience and cognitive modelling: a student's introduction to methods and procedures*. SAGE.

More advanced: Sabharwal, A., & Selman, B. (2011). S. Russell, P. Norvig, *Artificial Intelligence: A Modern Approach*.

Prerequisites PSY202H1 (or its equivalent), PSY270H1/PSY280H1, plus any one PSY half-course at the 300/400-level in the cognitive stream. It is your responsibility to ensure that you have met *all* prerequisites listed in the Psychology section of the A&S Calendar for this course. Visiting students from other universities should have the equivalent prerequisites from their home institutions. If you lack any prerequisites you will be removed. No waivers will be granted.

Objectives This is a seminar surveying computational approaches to understanding mental processes, as well as computational tools for exploring psychological and neural data. *Objective One:* to understand how to build a quantitative model of processes of representation, categorization, and goal-directed judgment. *Objective Two:* to develop a familiarity with computational tools, such as matrix representations, numerical simulation, and data visualization, that can assist you in exploring and understanding data.

Blackboard & Lecture Notes Log in to Blackboard (<https://portal.utoronto.ca>) to view the course webpage. I will post a pdf of my lecture slides under Blackboard > Lecture Slides. *In most cases this will be done the night before the lecture at latest.* In order to facilitate critical thinking I will eliminate some slides from the pdfs. As such, regular attendance will be helpful for scoring a good grade. **You are responsible for announcements posted to Blackboard, so check this page regularly for updates.**

Email The instructors will not be able to respond to emails regarding course content, but will attempt to respond to short questions posted on the Blackboard Discussion Board in the forum "Questions on Course Content". If the question requires a response greater than 1-2 sentences, please discuss it during office hours, or before, during, or after class. We encourage you to answer questions from other students. If you have extremely urgent questions about assignments, or questions related illness or emergency, please email Dr. Honey.
Place the text [PSY471] in the subject line of all course-related emails.

Grade Assignment Breakdown	Assignment	Grade Proportion	Date
	In-Class Presentation	20%	Varies by Student
	Questions for In-Class Presentations	10% (1% each)	Each Monday, 5pm
	Term Test	25%	November 10
	Python Homework 1	5%	Oct 6
	Python Homework 2	5%	Oct 27
	Final Project	25%	December 1
	Final Project Draft	5%	November 24
	Final Project Peer Assessment	5%	November 24

Evaluation

In-Class Presentation Students will prepare a 20 minute in-class presentation which summarizes the main ideas from a primary article related to that week's topic. Presentations are to be made using a graphical tool such as Powerpoint, Keynote or Prezi. Students may team up in pairs, presenting a single article and receiving a shared grade.

Questions for In-Class Presentations Each week, by Monday 5pm each student must email Dr. Honey 2 questions one for each presentation article, to pose to that week's in-class presenters.

Term Test The emphasis will be on material covered during lectures, but the test may contain any material including readings, homeworks or in-class practicals. As the lectures will always cover some information not contained in the texts (and vice versa), it is important that you both attend the lectures and do the readings.

Python Homeworks These homeworks will be completed within Jupyter Notebooks that are hosted on the Sage Math Cloud platform, and should be completed on the Sage Math Cloud platform by 9.40am on the date that they are due.

Final Project Final Project Draft Peer Assessment The final project for this course will be to develop an iPython notebook exploring a particular computational method learned in the course. Details regarding the final project are available on Blackboard > Important Documents > 471FinalProject.pdf. Students should submit a **complete draft** of their project via Sage Math Cloud and via email before December 1 at 9.40am. Late submissions will receive 0% of the available 5% of the grade. Students should submit the **final version** of their project via Sage Math Cloud and via email before Dec 8 at 9.40am. Late submissions are subject to a 20% late penalty per day or part thereof. The penalty is a flat deduction, such that if you score 75% on the report that is 1 day late, your final grade will be 55%.

Provisional Course Overview

Wk	Lec	Date	Lecture Topic	Second Session	Assigned Reading	Due
1	1	Sept 15	Intro to Computation in Psychology	Python Intro		
2	2	Sept 22	Perceptual Spaces in the Mind: I	Lists, Loops and Plotting	Shepard, R. N. (1987). Toward a universal law of generalization for psychological science. <i>Science</i> , 237, 1317-1323. Tversky, A. (1977). Features of similarity. <i>Psychological Review</i> , 84, 327-352.	Tutorial Zero
3	3	Sept 29	Perceptual Spaces in the Mind: II	In-Class Presentations	Shepard, R. N. (1980). Multidimensional scaling, tree-fitting, and clustering. <i>Science</i> , 210, 390-398. Reed, S. K. (1972). Pattern recognition and categorization. <i>Cognitive Psychology</i> , 3, 382-407	
4	4	Oct 6	Perceptual Spaces in the Brain: I	In-Class Presentations	Kriegeskorte, N., et al, Bandettini, P. A. (2008). Matching categorical object representations in inferior temporal cortex of man and monkey. <i>Neuron</i> , 60(6), 1126-1141. Serre, T., Oliva, A., & Poggio, T. (2007). A feedforward architecture accounts for rapid categorization. <i>Proceedings of the National Academy of Sciences</i> , 104(15), 6424-6429.	Homework 1
5	5	Oct 13	Perceptual Spaces in the Brain: II	Arrays, Matrices, Rotations		
6	6	Oct 20	Conceptual Spaces and Learning: I	Perceptrons and Hebbian Learning	Quiroga, R. Q., Kreiman, G., Koch, C., & Fried, I. (2008). Sparse but not 'grandmother-cell' coding in the medial temporal lobe. <i>Trends in cognitive sciences</i> , 12(3), 87-91.	
7	7	Oct 27	Conceptual Spaces and Learning: I	Hopfield Network	Hopfield, J. J. (1982). Neural networks and physical systems with emergent collective computational abilities. <i>Proceedings of the national academy of sciences</i> , 79(8), 2554-2558.	Homework 2

8	8	Nov 3	Conceptual Spaces in the Mind	In-Class Presentations	Collins, A. M., & Loftus, E. F. (1975). A spreading-activation theory of semantic processing. <i>Psychological Review</i> , 82, 407-428. Griffiths, T. L., Steyvers, M., & Firl, A. (2007). Google and the mind: Predicting fluency with PageRank. <i>Psychological Science</i> , 18, 1069-1076.	
9		Nov 10	FALL BREAK			
10		Nov 17	TERM TEST			
11	9	Nov 24	Learning via Reinforcement	In-Class Presentations	Schultz, W., Dayan, P., & Montague, P. R. (1997). A neural substrate of prediction and reward. <i>Science</i> , 275(5306), 1593-1599. Mnih, V., Kavukcuoglu, K., Silver, D., Rusu, A. A., Veness, J., Bellemare, M. G., ... & Hassabis, D. (2015). Human-level control through deep reinforcement learning. <i>Nature</i> , 518(7540), 529-533.	
12		Dec 1	In-Class Peer Assessment & Workshopping of Final Projects			Final Project Draft
13	10	Dec 8	Summary	In-Class Presentations	Griffiths, T. L., Chater, N., Kemp, C., Perfors, A., & Tenenbaum, J. B. (2010). Probabilistic models of cognition: Exploring representations and inductive biases. <i>Trends in cognitive sciences</i> , 14(8), 357-364. McClelland, J. L., Botvinick, M. M., Noelle, D. C., Plaut, D. C., Rogers, T. T., Seidenberg, M. S., & Smith, L. B. (2010). Letting structure emerge: connectionist and dynamical systems approaches to cognition. <i>Trends in cognitive sciences</i> , 14(8), 348-356.	Final Project

Drop date: November 2, 2015 (last day to drop courses from academic record and GPA. After this deadline a mark is recorded for each course, whether course work is completed or not (a 0 is assigned for incomplete work), and calculated into the GPA.)

There is nothing scheduled for this class during exam week.

Course Policies

Final Project Extension & Sick Policy Extensions on the final project are extremely unlikely and will be granted only under rare and exceptional circumstances, and only if you have documentation. In the event that you are too sick to submit your term paper on the due date, you will have 3 days to submit. Late penalties will be applied until you have submitted acceptable documentation (see policy below).

Missed Test/Quiz Policy I expect students to make every effort to take required exams. Missed or unexcused exams will be treated as zeros for the given exam. There will be no make-up exams. If you are unable to attend class on the exam day and you have a legitimate excuse, your marking scheme will be reweighted entirely at the instructor's discretion. This will be based on the student's performance and the class averages for the remaining elements. Legitimate excuses include a documented family emergency, or a documented severe illness making it impossible to take the exam.

Acceptable Documentation If you miss the exam due to the illness or loss of a close relative, you must provide documentation (e.g., in the form of a hard copy letter from your registrar). Contact me as soon as you are aware of the conflict. I must receive all documentation in hard copy (emails are easily lost) delivered to the Psychology reception on the 4th floor of Sidney Smith within a week of the exam or assignment due date.

Acceptable medical documentation must use the official Verification of Student Illness or Injury (<http://www.illnessverification.utoronto.ca/>), and must establish that the patient was examined and diagnosed at the time of illness, *not after the fact*. Documentation may not be acceptable if it is submitted longer than one week after the test or assignment due date; if the certificate indicates that the affliction is mild or negligible; or if the certificate is deemed invalid for any reason.

Students who miss the term test or submit a late assignment for reasons other than medical should contact me directly, and will probably be required to meet with their College Registrar to provide documentation for extenuating circumstances.

Academic Misconduct & Plagiarism The University of Toronto's *Code of Behavior on Academic Matters* outlines the behaviors that constitute academic misconduct, the processes for addressing academic offences, and the penalties that may be imposed. You are expected to be familiar with the contents of this document. Please visit <http://utoronto.ca/academicintegrity/> for more information on your responsibilities as a student.

Plagiarism is the unacknowledged borrowing (or "stealing") of another writer's words and ideas, and minor changes in the wording here and there are not sufficient to avoid plagiarism. Self-plagiarism is also strictly forbidden. To better

understand plagiarism, please refer to the following websites:

<http://www.utoronto.ca/writing/plagsep.html>

<http://www.plagiarism.org/>

These websites will be used as the standard for identifying cases of plagiarism. If after consulting these websites you are still in doubt about whether what you are doing is inappropriate, consult your instructor or TA. Claims such as "you didn't know it was wrong" will not be accepted as an excuse.

Appeals

Students who have a complaint about the way a piece of term work was marked can write an appeal letter to Dr. Honey. All requests for a re-grade must be submitted with specific justification, in writing, within 7 days of the exam or assignment being made available for student viewing. For the final project, you must also complete a marking rubric for your own report and justify any differences between your completed rubric and that assigned by Dr. Honey. A legitimate request will result in the **entire exam or assignment** being re-graded. Think carefully about appeals; marking errors go in both directions, and I will be looking for all errors in marking, not just those that will increase your grade. Your overall grade may be raised, lowered, or it may stay the same. **Please do not ask for special treatment – e.g., “I need to get into grad school, so could you please change my grade?” – as it is unfair to your classmates.**

Students who would like further feedback on their research report (without the possibility of a grade change) should contact Dr. Honey after the April exam period to set up an appointment.

Access & Diversity

Students with diverse learning styles and needs are most welcome. If you have a disability/health consideration that may require accommodations, please contact Accessibility Services at (416) 978 8060; accessibility.utoronto.ca .