PSYC03: Computers in Psychological Research: Advanced Topics

University of Toronto, Scarborough, Winter 2024

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Office Hours: Please see "Announcements" on Quercus for this information.
Prior to contacting the instructor/TA please note that: **we will not respond to Quercus messages**; **the email subject should include the course name and nature of the inquiry** (i.e., "PSYC03: PCA") and **emails should be sent from your UofT email account** – for more details please read the e-mail policy (p. 3).

I.   Your instructor

Dr. Nestor is an Associate Professor of Cognitive Neuroscience. He received his Ph.D. in Cognitive Science from Brown University and completed his postdoctoral training at Carnegie Mellon University. His research and teaching interests revolve around the neuroscience of visual cognition, computational modeling, neuroimaging methodology and neurotechnology.

II.   Course description, pre-requisites and learning goals

The course aims to shape critical thinking in approaching scientific research with the aid of modern-day computer technologies while appreciating their extensive range of strengths along with the constraints that they pose. The course aims to provide students with advanced knowledge and concrete skills regarding computer-based implementations of experimental testing, data analysis and result visualization. More generally, the course encourages and allows students to conceptualize and evaluate experimental research from a practical computational perspective. The research issues examined cover seminal topics and problems in cognitive psychology and neuroscience, best suited to exploiting and revealing the benefits of a computational approach as well as its challenges.

Prerequisites: PSYB03

The goals of the course target a broad set of skills related to:

(i) implementing behavioral testing paradigms, including stimulus construction, manipulation and display as well as experimental data recording;
(ii) exploring data structure via statistical tests and basic computational models;
(iii) visualizing and interpreting results using suitable graphical representations of data structure;
(iv) evaluating if and how specific research issues can benefit when approached from a computational implementation-driven perspective.

More generally, this course will be instrumental in developing critical and creative thinking skills as involved in the implementation and the evaluation of alternative solutions to complex problems in psychological research. Also, the course will deepen and expand the students' mastery of programming methods and techniques relevant to empirical and computational research in psychology. Last, the course

aims to sharpen quantitative reasoning skills related to the implementation of specific algorithms / computations as well as to improve on graphical communication skills as involved in the plotting of complex data sets.

The topics covered will include visual stimulus design, fixed and adaptive stimulus presentation, behavioral data recording, practical implementation and assessment of univariate / multivariate statistical tests, data exploration via basic computational models, graphical representation of data structure and result interpretation. Training relies on, and further develops, programming skills of broad relevance and utility for psychological research – computer implementations involve the Matlab computing environment with the addition of specific toolboxes: Statistics, Image processing, Bioinformatics, and Psychtoolbox.

III. Course resources
Course readings: Links to readings, resources, and software (provided through Quercus).
The student version of Matlab (ver 9.0, 2016 or higher) is recommended.
Online resources: Quercus

IV. Course grading

Assignments (28%)
Assignments consist of small sets of exercises that are assigned multiple times throughout the term as a way for you to demonstrate your knowledge of course content. They may require you to write code or provide short answers to questions. This component of the grade will be based on the best 6 (out of 7) assignments. [If you only submit 6 assignments, the grade will be the average of those 6 assignments.]

Midterm exam (36%)
The Midterm Examination will cover materials from weeks 1-6 (see course schedule on the last page of this syllabus).

Final exam (36%)
The exam will cover material from all lectures, labs, and activities. Final exam dates and times are scheduled by the Office of the Registrar

Administrative details will be provided prior to the exams/final project. To give you an opportunity to prepare for the examinations, practice questions will be made available for you prior to the midterm and the final project.

While exams will essentially be "open notes and open book," you are absolutely NOT permitted to work with or obtain any pertinent information from any other person – a student in this course or anyone otherwise – during examinations!

V. Department of Psychology Missed Term Work Policy

For missed term work (assignments and term tests) due to illness, emergency, or other mitigating circumstances, please follow the procedure outlined below.

Procedure:
1. Complete the Request for Missed Term Work Accommodations Form ("MTW Form").

2. Email **BOTH** your MTW Form and Supporting Documentation to arijit.de@mail.utoronto.ca according to the instructions specified below.

Supporting Documentation Requirements and Deadlines:

Reason for Missed Work	Documentation required for a *first absence* in the term	Documentation required for *subsequent absences* in the term	Deadline for submitting MTW form and supporting documentation
Illness or Injury	ACORN Absence Declaration	UofT Verification of Illness Form	**WITHIN 2 BUSINESS DAYS** of the missed work
Bereavement	ACORN Absence Declaration	A death certificate or funeral announcement	**WITHIN 2 BUSINESS DAYS** of the missed work
University-sponsored athletic or artistic obligation at the varsity/provincial/national level	ACORN Absence Declaration	A note from a university staff member (advisor, coach, residence staff, etc.) who can substantiate the obligation, sent directly to the course email	**10 BUSINESS DAYS IN ADVANCE** of the missed deadline
Disability-related reasons for students registered with AccessAbility Services	For missed **TERM TESTS,** - **Contact your AccessAbility consultant** and have them write to the course email detailing the accommodations needed. For missed **ASSIGNMENTS,** - If your desired accommodation is **within the scope** of your Accommodation Letter (e.g. your letter includes "extensions of up to 7 days" and you need 3 days), send your **Accommodation Letter** to the course email and specify how many days extension you are requesting. - If your desired accommodation is **outside the scope** of your Accommodation Letter (e.g. your letter includes "extensions of up to 7 days" but you need more time than that), **contact your AccessAbility consultant** and have them write to the course email detailing the accommodations needed.		**PREFERABLY IN ADVANCE OF THE MISSED WORK, OR AS SOON AS POSSIBLE**

Academic Conflict (e.g. two midterms at the same time)	Screenshot from Quercus demonstrating the conflict.	**10 BUSINESS DAYS IN ADVANCE** of the missed work
Religious Conflict	None required	

Notes:

- The following reasons are not considered sufficient for missed term work: social activities, recreational travel, technological issues, avoidance of assessments or deadlines, work commitments
- Missed Final Exams are handled by the Registrar's Office and should be declared on eService.
- For ACORN absence declarations, the date you declare the absence is required to fall within the seven-day declaration period (i.e.) the absence cannot be submitted proactively or retroactively.
- Instructors cannot accept term work any later than five business days after the last day of class. Beyond this date, accommodations are only possible via the Registrar's Office petition process.
- If you are unable to submit your request within the specified number of business days, you must still email your instructor within that window to explain the nature of the delay. Exceptions to the deadlines are made only under exceptional circumstances.
- Multiple assignments due on the same day are <u>not</u> considered academic conflicts. Students are expected to manage their time effectively to meet assignment deadlines.
- Back-to-back tests/quizzes are <u>not</u> considered academic conflicts. Only overlapping activities are conflicts.
- Students are responsible for keeping their course timetables conflict-free. Students who register in two courses with overlapping lecture/tutorial/lab schedules will not be accommodated.

Next Steps:

After submitting your documentation, you will receive a response from your instructor or TA. The course instructor reserves the right to decide what accommodations will be made. Failure to adhere to any aspect of this policy may result in a denial of your request. **You are responsible for checking your official U of T email and Quercus course announcements daily**, as accommodations may be time-critical.

For missed assignments, **do not wait for the instructor's response to resume work on your assignment.** Extensions may be as short as one business day, depending on the nature of the illness/emergency. Complete your assignment as soon as you're able, and email it to your instructor.

If an accommodation is granted but a continued illness/emergency prevents you from meeting its requirements, you must <u>repeat</u> the missed term work procedure to request additional accommodations. **Please make it clear in your subject line that you are requesting a second accommodation.** Examples: If you were granted an extension for a paper but are still unable to meet the new deadline, or if you miss a <u>make-up</u> term test, you must submit *another* MTW form and supply documentation according to the "subsequent absences" column in the chart above. *Note: In the case of a missed make-up test, an opportunity to write a second make-up test may not necessarily be provided.

VI. <u>Other course policies</u>

Lecture slides & notice of course material sharing

For your convenience, lecture slides and associated materials will be posted at each week (i.e., before the lecture). You should know that lecture slides are not a suitable substitute for attending and understanding lectures. Lecture slides are not exhaustive and we will regularly cover important material that extends beyond them during lecture. You are responsible for this material with respect to testing.

Recording or photographing any aspect of a university course - lectures, presentations, discussions etc. – without prior approval of all involved and without written approval from the instructor is not permitted. Instructional materials are only for the purpose of learning in this course and must not be distributed or used for any other reason whatsoever.

Course materials belong to your instructor, the University, and/or other sources depending on the specific facts of each situation, and are protected by copyright. In this course, you are permitted to download materials for your own academic use, but **you should not copy, share, or use them for any other purpose without the explicit permission of the instructor**.

Late assignments
A penalty of 10% will be deducted for each 24-hour period that an assignment is late.
Extensions will only be granted with proper documentation (see Missed term work above). Please note that Instructors cannot accept term work any later than five business days after the last day of class**.**

E-mail policy

The email subject should include the course name and nature of the inquiry (i.e., "PSYC03: PCA"). **Emails should be sent from your UofT email account**. The start of your email should include your full name and student ID number so that we know who you are. An email should contain no more than one question and you should try to explain your current understanding of the concept in the email (which will be affirmed or corrected).
In most cases, e-mails will be answered within 2 business days.
If you are not used to writing emails in an academic context, I encourage you to review this online resource so that you adopt proper email etiquette now and in the future: <https://tinyurl.com/kysxwtx>

Office hours

You should consider visiting Prof. Nestor's office hours if you would like to (1) discuss course content, (2) if you have an issue with course performance or progress, (3) contest a question on a midterm, or (4) you would like to discuss the field of psychology/neuroscience and how to get more involved. With respect to Point 3, contesting a question must occur within two weeks of releasing the exam marks or it will not be considered.

Contesting a grade

All requests for a re-grade must be submitted in writing within two weeks of the day that the grade is posted. Only requests based on adequate written justification regarding an error in the original grading will be considered. Arbitrary requests for grade increases (e.g., 'I need to get into grad school') will be

dismissed.
Please note that a legitimate request will entail a re-grading of the entire assignment. Hence, your grade may be raised, lowered or left intact.

Syllabus changes

There may be minor changes to the syllabus during the term. You will be notified of these changes ASAP and no changes will be instituted that dramatically affect your ability to properly prepare for an examination (e.g., reading an extra chapter the week before the midterm).

Accommodations

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office as soon as possible.
AccessAbility Services staff (located in Rm AA142, Arts and Administration Building) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations 416-287-7560 or email ability.utsc@utoronto.ca. The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.

Use of Generative Artificial Intelligence Tools

Students may use artificial intelligence tools, including generative AI, in this course as learning aids or to help produce assignments. However, students are ultimately accountable for the work they submit. Students may not use artificial intelligence tools for taking tests, writing research papers, creating computer code, or completing major course assignments. However, these tools may be useful when gathering information from across sources and assimilating it for understanding.
The known use of generative artificial intelligence tools, including ChatGPT and other AI writing and coding assistants, for the completion of, or to support the completion of, an examination, term test, assignment, or any other form of academic assessment, may be considered an academic offense in this course.

University's Plagiarism Detection Tool

Normally, students will be required to submit their course essays to the University's plagiarism detection tool for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the tool's reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of this tool are described on the Centre for Teaching Support & Innovation website (https://uoft.me/pdt-faq).

Academic Integrity

The University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters (http://www.governingcouncil.utoronto.ca/policies/behaveac.htm) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences.

Potential offences in papers and assignments include using someone else's ideas or words without appropriate acknowledgement, submitting your own work in more than one course without the permission of the instructor, making up sources or facts, obtaining or providing unauthorized assistance on any assignment.

On tests and exams, cheating includes using or possessing unauthorized aids, looking at someone else's answers during an exam or test, misrepresenting your identity, or falsifying or altering any documentation required by the University.

Equity, Diversity, Inclusion

The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. U of T does not condone discrimination or harassment against any persons or communities. The University of Toronto is a richly diverse community and as such is committed to providing an environment free of any form of harassment, misconduct, or discrimination. In this course, I seek to foster a civil, respectful, and open-minded climate in which we can all work together to develop a better understanding of key questions and debates through meaningful dialogue. As such, I expect all involved with this course to refrain from actions or behaviours that intimidate, humiliate, or demean persons or groups or that undermine their security or self-esteem based on traits related to race, religion, ancestry, place of origin, colour, ethnic origin, citizenship, creed, sex, sexual orientation, gender identity, gender expression, age, marital status, family status, disability, receipt of public assistance or record of offences.

University Land Acknowledgement

I wish to acknowledge this land on which the University of Toronto operates. For thousands of years, it has been the traditional land of the Huron-Wendat, the Seneca, and the Mississaugas of the Credit. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.

Note about Quercus

This course uses the University's learning management system, Quercus, to post information about the course. This includes posting materials required to complete class activities and course assignments, as well as sharing important announcements and updates. The site is dynamic and new information and resources will be posted regularly as we move through the term, so please make it a habit to log in to the site on a regular, even daily, basis. To access the course website, go to the U of T Quercus log-in page at https://q.utoronto.ca. Once you have logged in to Quercus using your UTORid and password, you should see the link or "card" for PSYC03, Computers in Psychological Research: Advanced Topics. You may need to scroll through other cards to find this. Click on the PSYC03, Computers in Psychological Research: Advanced Topics link to open our course area, view the latest announcements and access your course resources. There are Quercus help guides for students that you can access by clicking on the "?" icon in the left side column.

SPECIAL NOTE ABOUT GRADES POSTED ONLINE: Please also note that any grades posted are for your information only, so you can view and track your progress through the course. No grades are considered official, including any posted in Quercus at any point in the term, until they have been formally approved and posted on ACORN at the end of the course. Please contact me as soon as possible if you think there is an error in any grade posted on Quercus.

PSYC03: Course Schedule

May be subject to minor revisions with advance notice from the instructor

Week 1 (Jan 12): Introduction and review
Week 2 (Jan 19) Template matching / Numeric types, randomness
Week 3 (Jan 26): Filtering
Week 4 (Feb 2): Filtering (cont'd)
Week 5 (Feb 9): Introduction to signal detection
Week 6 (Feb 16): Introduction to Psychtoolbox
■   **Feb 19-23:** NO CLASS (Reading week)
Week 7 (Mar 1): MIDTERM EXAM (No class)
Week 8 (Mar 8): Psychtoolbox - applications
Week 9 (Mar 15): Introduction to principal component analysis (PCA)
Week 10 (Mar 22): PCA (cont'd)
Mar 29: NO CLASS (Good Friday)
Week 11 (Apr 5): Introduction to multidimensional scaling (MDS)
Week 12 (Apr 8): Applications and review (makeup class for Good Friday)