



## PSYC03: Computers in Psychological Research: Advanced Topics

University of Toronto, Scarborough, Winter 2021

Instructor: Prof. Adrian Nestor  
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TA/Email: Shouyu Ling, shouyu.ling@mail.utoronto.ca

Office Hours: Please see “Announcements” on Quercus for this information.

Prior to contacting the instructor or the TA please read the **e-mail policy** (p. 3) and note that **we will not respond to Quercus messages!**

### 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 Pschtoolbox.

### 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 are small 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 7 (out of 8) assignments. [If you only submit 7 assignments, the grade will be the average of those 7 assignments.]

#### **Midterm exam (36%)**

The Midterm Examination will cover materials from weeks 1-6 (see course schedule on the last page of this syllabus). Term tests dates and times are scheduled by the Office of the Registrar.

#### **Final term paper/project (36%)**

The final project will require you to submit a completed Matlab script. The script can involve running an experimental paradigm, analyzing and visualizing a complex dataset etc. Topics must be approved by the TA before the end of Week 11. Approval should be obtained through email (please email a short statement regarding the goal of your script for approval).

All exams will be conducted in Quercus. Administrative details will be provided prior to the exams. 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 exam.

**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. Course policies

#### **Lecture slides**



For your convenience, lecture slides and associated materials will be posted each week (i.e., usually by Wednesday each week).

You should know that lecture slides are not a suitable substitute for watching and understanding the lecture. 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.

Instructional materials are only for the purpose of learning in this course and must not be distributed or used for any other reason whatsoever.

### **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 below). 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: Question about 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 48 hours of receipt (not including weekends).

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).

### **Taking an examination**

All examinations will be held online using Quercus, and the dates/times of these exams will be set by the Office of the Registrar.

### **Notice of video recording and sharing (Download permissible; re-use prohibited)**

This course (potentially including your participation) will be recorded on video and will be available to students in the course for viewing remotely and after each session. Course videos and 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 session videos and 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.**

### **AccessAbility**

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 as soon as possible.

AccessAbility Services staff (located in Rm SW302, Science Wing) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations [416-287-7560](tel:416-287-7560) or email [ability@utsc.utoronto.ca](mailto: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.

### **Academic Integrity**

Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, 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/Assets/Governing+Council+Digital+Assets/Policies/PDF/ppjun01\\_1995.pdf](http://www.governingcouncil.utoronto.ca/Assets/Governing+Council+Digital+Assets/Policies/PDF/ppjun01_1995.pdf)) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:

In papers and assignments:

- 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:

- Receiving aid of any form from another person in the context of an examination
- Using or possessing unauthorized aids;
- Looking at someone else's answers during an exam or test;
- Misrepresenting your identity; and
- When you knew or ought to have known you were doing it.

In academic work:

- Falsifying institutional documents or grades;
- Falsifying or altering any documentation required by the University, including (but not limited to) doctor's notes; and
- When you knew or ought to have known you were doing so.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If students have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, they are expected to seek out additional information on academic integrity from their instructors or from other institutional resources.

Note that you may see advertisements for services offering grammar help, essay editing and proof-reading. Be very careful. If these services take a draft of your work and significantly change the content and/or language, you may be committing an academic offence (unauthorized assistance) under the *Code of Behaviour on Academic Matters*.

It is much better and safer to take your draft to the Writing Centre as early as you can. They will give you guidance you can trust. Students for whom English is not their first language should go to the English Language Development Centre.

If you decide to use these services in spite of this caution, you must keep a draft of your work and any notes you made before you got help and be prepared to give it to your instructor on request.

## VI. Course policies on time zone conflicts and missed term work

### **Psychology Department Missed Term Work Policy, WINTER 2021**

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

Notes:

- The following reasons are not considered sufficient for missed term work: travel for leisure, weddings, personal commitments, work commitments, human error.
- Missed Final Exams are handled by the Registrar's Office and should be declared on eService: <http://www.utoronto.ca/registrar/missing-examination>



- Instructors cannot accept term work any later than five business days after the last day of class. Beyond this date, you would need to file a petition with the Registrar's Office:  
<https://www.utsc.utoronto.ca/registrar/term-work>

### **Accommodations for Illness or Emergency:**

For missed work due to ILLNESS OR EMERGENCY, please complete the following **two-step** process:

1. Complete the **Request for Missed Term Work Accommodations Form** (<http://uoft.me/PSY-MTW>) and email it to Keely Hicks at [keely.hicks@utoronto.ca](mailto:keely.hicks@utoronto.ca) ,  
**\*and\***
2. **Declare your absence** on [ACORN](#) (Profile & Settings > Absence Declaration)

**Deadline:** You must complete the above steps **within 3 business days** of the missed work.

*Note: For this semester, we do not require any additional supporting documentation (ex. medical notes) to support your missed term work accommodation request.*

### **Accommodations for Academic Conflicts:**

For missed term work due to an ACADEMIC CONFLICT (i.e. two quizzes or tests scheduled at the same time), please complete the following process:

1. Complete the **Request for Missed Term Work Accommodations Form** (<http://uoft.me/PSY-MTW>), choosing "Other" as your reason for missed work and explaining the conflict in the space provided.
2. Take screenshots of your course homepages that demonstrate the conflict.
3. Email the form and screenshots to Keely Hicks ([keely.hicks@utoronto.ca](mailto:keely.hicks@utoronto.ca)).

**Deadline:** You should report the conflict to Keely Hicks ([keely.hicks@utoronto.ca](mailto:keely.hicks@utoronto.ca)) **at least two weeks (10 business days) before the date of the activity**, or as soon as possible if it was not possible to identify the conflict earlier.

*Note: Multiple assignments due on the same day are not considered conflicts. Accommodations may only be possible in the case of quizzes and tests that are both scheduled during the same discrete period. Back-to-back tests/quizzes are not considered conflicts.*

*Note: Students are responsible for keeping their course timetables conflict-free. Students who choose to register in two synchronous courses with overlapping lecture/tutorial/lab schedules may not necessarily be accommodated.*

### **Accommodations for Religious Conflicts:**

For missed term work due to a RELIGIOUS CONFLICT, please complete the following process:

1. Complete the **Request for Missed Term Work Accommodations Form** (<http://uoft.me/PSY-MTW>), choosing "Other" as your reason for missed work and noting "Religious conflict" in the space provided.
2. Email the form to Keely Hicks ([keely.hicks@utoronto.ca](mailto:keely.hicks@utoronto.ca)).



**Deadline:** You should report the conflict to Keely Hicks ([keely.hicks@utoronto.ca](mailto:keely.hicks@utoronto.ca)) **at least two weeks (10 business days) before the date of the activity**, or as soon as possible if it was not possible to identify the conflict earlier.

#### **Accommodations for Time Zone Conflicts:**

**If** you are physically in a different time zone and a quiz or midterm is scheduled outside of 7:00am to midnight in your local time, please complete the following process:

1. Complete the **Time Zone Conflict Form** (<https://uoft.me/PSY-TimeZone>), and
2. Email the form to Keely Hicks ([keely.hicks@utoronto.ca](mailto:keely.hicks@utoronto.ca))

**Deadline:** You should report the conflict to Keely Hicks ([keely.hicks@utoronto.ca](mailto:keely.hicks@utoronto.ca)) **at least two weeks (10 business days) before the date of the activity**, or as soon as possible, if it was not possible to identify the conflict earlier.

#### **Accommodations for Students Registered with AccessAbility Services:**

For missed **TERM TESTS** due to ACCESSABILITY REASONS:

- **Contact your AccessAbility consultant** and have them email Keely ([keely.hicks@utoronto.ca](mailto:keely.hicks@utoronto.ca)) detailing accommodations required.

For missed **ASSIGNMENTS** due to ACCESSABILITY REASONS:

- If your desired accommodation is **within the scope** of your Accommodation Letter (ex. your letter includes “extensions of up to 7 days” and you need 3 days):
  1. Complete the **Request for Missed Term Work Accommodations Form** (<http://uoft.me/PSY-MTW>).
  2. Email the form and your **Accommodation Letter** to Keely Hicks ([keely.hicks@utoronto.ca](mailto:keely.hicks@utoronto.ca)).
- If your desired accommodation is **outside the scope** of your Accommodation Letter (ex. your letter includes “extensions of up to 7 days” but you need more time than that):
  1. **Contact your AccessAbility consultant** and have them email Keely Hicks ([keely.hicks@utoronto.ca](mailto:keely.hicks@utoronto.ca)) detailing the accommodations required.

#### **After submitting your documentation:**

Within approximately one to five business days, you will receive a response from your instructor detailing the accommodations to be made (if any).

**You are responsible for checking your official U of T email and Quercus course announcements daily, as accommodations may be time-critical.**

You should continue to work on your assignments to the best of your ability, as extension accommodations may be as short as one business day, depending on the nature of the illness/emergency.

If an accommodation has been granted but you are unable to meet the conditions of the accommodation (ex. you need a longer extension, or you missed a make-up test), you will need to repeat the missed term work procedure and submit additional forms to request further accommodation. Note that in the case of a missed make-up test, an opportunity to write a second make-up test may not be provided.





Completion of this form does not guarantee that accommodations will be made. The course instructor reserves the right to decide what accommodations (if any) will be made. Failure to adhere to any aspect of this policy may result in a denial of your request for accommodation.

### **Missed Accommodations**

If an accommodation is granted but a continued illness/emergency prevents you from meeting the requirements of your accommodation, you must repeat the missed term work procedure to request additional accommodations.

(E.g.) If you miss a make-up midterm, you would need to submit another Request for Missed Term Work Accommodations form and declare your extended absence on ACORN.

### **Importance of Three Business Day window:**

If you are unable to submit your documents within the three business day window, **you must email Keely (keely.hicks@utoronto.ca) within the three business day window** to explain the nature of the delay, and when you will be able to provide your documents. Exceptions to the documentation deadline will only be made under **exceptional circumstances**.

### **Questions?**

If you have any questions about this Missed Term Work policy, please contact Keely Hicks ([keely.hicks@utoronto.ca](mailto:keely.hicks@utoronto.ca)) **well before** the date of the test / assignment deadline to describe your circumstances and inquire about procedures.

## VII. Links you might find useful

UTSC Dates and Deadlines <https://www.utoronto.ca/registrar/dates-and-deadlines>

### Skill building, future planning

Academic Advising, Career Centre <http://www.utoronto.ca/aacc/>

Writing Services <http://www.utoronto.ca/twc/>

Presentation Skills <http://www.utoronto.ca/ctl/presentation-skills>

Co-op Program <http://www.utoronto.ca/askcoop/>

### Your well-being

AccessAbility <http://www.utoronto.ca/~ability/>

Health and Wellness <http://www.utoronto.ca/hwc/>

Test anxiety [https://www.anxietybc.com/sites/default/files/Test\\_Anxiety\\_Booklet.pdf](https://www.anxietybc.com/sites/default/files/Test_Anxiety_Booklet.pdf)

### The Department of Psychology

UTSC Psychology <http://www.utoronto.ca/psych/>

UTSC Psychology courses <http://www.utoronto.ca/psych/courses>

UTSC Experiential Learning <http://www.utoronto.ca/psych/experiential-learning>

Psychology lab opportunities <http://tinyurl.com/jjq25t7>

Psi Chi @ UTSC <https://www.utoronto.ca/projects/psichi/>





## PSYC03: Course Schedule

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

**Week 1 (Jan 11-15):** Introduction and review

**Week 2 (Jan 18-22)** Numeric types, randomness

**Week 3 (Jan 25-29):** Template matching

**Week 4 (Feb 1-5):** Introduction to signal detection

**Week 5 (Feb 8-12):** Filtering

■ **Feb 15-19:** NO CLASS (Reading week)

**Week 6 (Feb 22-26):** Introduction to Psychtoolbox

**Week 7 (Mar 1-5):** Study space for MIDTERM EXAM (No class)

**Week 8 (Mar 8-12):** Psychtoolbox - applications

**Week 9 (Mar 15-19):** Introduction to principal component analysis (PCA)

**Week 10 (Mar 22-26):** PCA (cont'd)

**Week 11 (Mar 29-Apr 2):** Introduction to multidimensional scaling (MDS)

**Week 12 (Apr 5 - 9):** Applications and review