



PSYC03H3 - Computers in Psychological Research: Advanced Topics Winter 2015

Class meeting time: Friday 13:00-15:00, Room SW316

Instructor: Dr. Adrian Nestor

Office hours: Tuesday 14-16 pm

Office: SW410L

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***(*Please put PSYD50 in the subject line of any e-mails
and use your U of T e-mail account when contacting the course instructor)***

Teaching Assistants: Ronald Chu & Sol Sun

Office hours: Tuesday 16-17 (SW416) – Ron (for the first half of the semester)

Office hours: Thursday 14-15 (SW411A) - Sol (for the second half of the semester)

1. GENERAL COURSE INFORMATION

Calendar description: The course will provide advanced knowledge and hands-on training in computer-based implementations of experimental design, data processing and result interpretation in psychology. The course covers implementations of experimental testing paradigms, computational explorations of empirical data structure, and result visualization with the aid of specific programming tools (e.g., Matlab).

Prerequisite: PSYB07H3 and PSYB03H3

Online resources: Blackboard

Course reading: articles in the field (no textbook will be required)

2. COURSE DESCRIPTION

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.



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.

3. CLASS SCHEDULE

Week 1 (January 9): Introduction and review

Week 2 (January 16): Statistics and signal detection tools

Week 3 (January 23): Applications to image processing and stimulus design

Week 4 (January 30): Experimental paradigms (theory and implementation)

Week 5 (February 6): Introduction to Psychtoolbox

Week 6 (February 13): Applications of Psychtoolbox

February 20: NO CLASS (Reading week)

Week 7 (February 27): Mid-term exam

Week 8 (March 6): Adaptive stimulus designs

Week 9 (March 13): Introduction to unsupervised learning

Week 10 (March 20): Introduction to supervised learning

Week 11 (March 27): Applications of unsupervised and supervised learning

Week 12 (April 6): Introduction to pattern classification



4.0 EVALUATION

Lab activities: 20%

Class participation: 10%

Midterm exam: 30%

Final term project: 40%

Lab activities (20%)

Activities are small exercises that are assigned multiple times throughout the term (almost once a week) 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 in lab or online.

Class Participation (10%)

You are expected to participate actively in class (e.g., by contributing new ideas, by asking questions, by answering questions). Failure to engage in class discussions will result in losing a percentage of your final grade.

Midterm exam (30%)

The midterm test will take place during regular class time and will cover material from lectures, labs, and activities.

Final term paper (40%)

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 TAs 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).

5.0 COURSE POLICIES

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 (i.e. UTSC medical certificate).

Please note that, according to UTSC policy, I am not permitted to extend the deadline for any assignment past the last day of classes, so be sure to submit all materials by that time. If necessary, students may petition the Registrar's office for permission to submit assignments after the last day of classes. Such petitions are not automatically granted, and will likely be denied without a valid reason. Such petitions must be submitted by the last day of the final examination period of the term.



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.

Video and auditory recording

For reasons of privacy and protection of copyright, unauthorized video/audio recording in classrooms is prohibited. This is outlined in the Provost's *Guidelines on Appropriate Use Of Information And Communication Technology*. Note, however, that these guidelines include the provision that students may obtain consent to record lectures (e.g., in the case of private use by students with disabilities).

6.0 OTHER INFORMATION

Academic integrity

UTSC aims to ensure that a degree from the University of Toronto reflects clearly and adequately each student's academic achievement. As a result, the University takes issues of academic integrity very seriously. The Code of Behaviour on Academic Matters (<http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>) outlines behaviors that constitute academic dishonesty and the process for addressing academic offences.

Potential offences include, but are not limited to:

- Using someone else's ideas or words without appropriate acknowledgement.
- Making up sources or facts.
- Obtaining or providing unauthorized assistance on any assignment.
- Looking at someone else's answers during an exam or test.
- Misrepresenting your identity.
- Falsifying institutional documents or grades.
- Falsifying or altering any documentation required by the University, including (but not limited to) doctor's notes.

If you have questions or concerns about what constitutes appropriate academic behavior or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources (<http://www.utoronto.ca/academicintegrity/resourcesforstudents.html>).

AccessAbility

Students with any type of disability/health consideration that may require specific accommodations are encouraged to contact the AccessAbility Services Office as soon as possible. After you have provided the appropriate documentation, the staff in this



office will assess your needs and will determine appropriate and reasonable accommodations. All enquiries and information that AccessAbility Services collects from students about their disabilities will be kept in strict confidence.

The UTSC AccessAbility Services (S302, 416-287-7560, ability@utsc.utoronto.ca) are available by appointment to assess specific needs, to provide referrals and to arrange appropriate accommodations.

Help with writing

If you do not feel comfortable with your writing abilities or if you intend to improve on them, the following resources are available to you:

The Centre for Teaching and Learning (<http://ctl.utsc.utoronto.ca/twc/>) offers students one-to-one appointments and supplementary materials to help improve upon their writing skills.

The English Language Development Centre (<http://ctl.utsc.utoronto.ca/eld/>) offers support and specialized writing programs for students who do not speak English as their primary language.

Additional advice on academic writing can be found at:
<http://www.writing.utoronto.ca/advice>

Literature searches

Students are encouraged to use the following resources when conducting literature searches:

The UTSC Library (<http://www.library.utoronto.ca/utsc/>)

Google Scholar (<http://scholar.google.ca/>)

PubMed (<http://www.ncbi.nlm.nih.gov/pubmed>)

PsychINFO (<http://www.apa.org/pubs/databases/psycinfo/index.aspx>)