PSY 359H Human Neuroimaging Laboratory — Fall 2021 Syllabus

Instructor
Professor Michael Mack
Office Hours: Fridays, 10:00-11:00am
Email: michael.mack@utoronto.ca

Teaching Assistant
Sagana Vijayarajah
Office Hours: Mondays, 4:00-5:00pm
Email: sagana.vijayarajah@mail.utoronto.ca

Lab Sessions
Thursdays 10:00am-1:00pm
In person sessions: Sidney Smith 560
Online sessions:
Zoom - https://tinyurl.com/psy359-fall2021
Gather - https://tinyurl.com/psy359-fall2021-gather

Course Description

This course serves as an introduction to the methodologies of human neuroimaging, specifically magnetic resonance imaging (MRI), used in cognitive, developmental, and social neuroscience. The topics that will be covered include key aspects of human brain imaging: experimental design, structural and functional MRI techniques, data preprocessing, univariate and multivariate statistical analysis, and the interpretation of MRI results. Instruction will focus heavily on tutorials and hands-on lab exercises wherein students will conduct analyses on actual MRI datasets.

Objectives
This laboratory course will survey current MRI methods and provide how-to instruction for implementing MRI data analyses. Learning objectives are:

1) To become an expert *consumer* of human MRI research.
2) To gain a familiarity with the tools of human neuroimaging and how these tools can be leveraged to answer questions about brain function.
3) To gain experience in conducting a wide range of MRI analyses.

Prerequisites: PSY202H1, PSY270H1 or PSY280H1, PSY210H1 or PSY220H1 or PSY230H1 or PSY240H1. 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. If you lack any prerequisites you will be removed. No waivers will be granted.

Lectures and Labs

This course will be delivered through a combination of online and in person sessions as permitted by the status of the COVID pandemic. At a minimum, the first two weeks of lecture (Sep. 9 and 16) will be conducted online with synchronous sessions over Zoom and Gather (see links above). Whether remaining sessions will be held in person or online will depend on the evolving state of the COVID pandemic, although the expectation is that we will return to in person sessions as suggested by U of T. The general structure of a course session is a 1-1.5 hour(s) lecture followed by lab time to complete a hands-on lab assignment related to the lecture content.

Details for in person sessions. All in person sessions will be held in Sidney Smith 560. This room has computers available for completing lab assignments and the group project. However, it is recommended that students, if possible, install the required software and resources on their personal computer to remotely access the course teaching server and perform analyses.

Written and video instructions for how to install and use the necessary software are provided on Quercus. For in person sessions, Dr. Mack will record lecture content and make the videos available for asynchronous viewing on Quercus.

Details for online sessions. The passwords for the Zoom and Gather sessions are available on Quercus. Segments of lab sessions may be recorded and made available for asynchronous viewing. It is important to note that any video or audio feed that occurs during the lab sessions may be included in recordings. The recordings will be posted to U of T's MS Stream service with links from Quercus, so only those students and instructors registered for the course will have access to the recordings. Chat windows will be monitored during the lab sessions, so feel free to ask questions there if using audio or video is unavailable or not preferred. Online lab sessions will include a Gather room to facilitate interaction between students (see Gather link above). Lab sessions will include the opportunity for Q&A about lecture content and to work on lab assignments and the group project during which students are encouraged to discuss solutions and help each other. Gather provides an informal online video/audio chat format to support these sorts of interactions. Dr. Mack will host both Zoom and Gather sessions and be available to answer questions and provide help with assignments on both platforms. Access to the Zoom and Gather sessions will be heavily moderated to prevent so-called "Zoom bombing". Students play an important role in prevent such unauthorized access. Please do not share or post the Zoom or Gather session links/passwords. This information will be available on Quercus. We reserve the right to block access to anyone who is not registered for the course.

This course, 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 the instructor, the University, and/or other sources 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. For questions about recording and use of videos in which you appear please contact Dr. Mack.

Reading Material and Texts

Textbook: Poldrack, R.A., Mumford, J.A., Nichols, T.E. (2011). *Handbook of functional MRI data analysis.* Cambridge University Press. ISBN: 9780521517669
Access eBook via U of T: http://ebooks.cambridge.org/ebook.jsf?bid=CBO9780511895029

Research articles: Readings for some topics will also include research articles. Web links to specific research articles will be posted on Quercus.

Quercus

Log in to Quercus (http://q.utoronto.ca/) to view the course webpage. Lecture videos and slides will be posted and available in the current week's module. *In most cases these materials will be posted on Monday each week.* Weekly lab assignments will also be posted to Quercus. All course assignments should be handed in on Quercus. **Note:** Students are responsible for all announcements posted to Quercus, so check this page regularly.

Office Hours, Email, and Course Discussion Board

Use office hours! Dr. Mack's office hours will be held virtually on the course Zoom session linked above. If you cannot make office hours, please request a meeting time with Dr. Mack using the message system on Quercus (make sure to send only to Dr. Mack and not the entire class).

Please do not use email to contact Dr. Mack. Unfortunately, the spam filter on the UTmail+ system often confuses good emails as spam and student emails are often lost. Instead, use the Quercus message system to directly contact Dr. Mack and the TA about illness, emergencies, or any questions about course policies.

For all questions about course content, please post to a discussion on Quercus. There will be separate discussion threads each week for questions about that week's lecture and lab assignment. There will also be a separate discussion thread for the project. These discussions will be the fastest way to reach Dr. Mack and the TA.

Course Assignments and Evaluation

Assignment	Grade Proportion	Due Date*
Weekly lab reports (10 total)	50%	each Wednesday
Research article summary 1	5%	October 15
Research article summary 2	5%	November 5
Project subset analysis + draft	5%	November 19
Project presentation	10%	December 2
Project final paper	25%	December 16

* all assignments due at 11:59pm unless noted otherwise

Evaluation Details

Lab reports
Most weeks, we will have a laboratory exercise related to the lecture/tutorial. A lab report will be due the following Wednesday at 11:59pm. Completed lab reports will be submitted via Quercus.

Research article summaries
You will write two summaries of recent fMRI-based scientific articles. You will choose the article and after getting it OK'd by Dr. Mack, write up a summary. The first summary will focus on a univariate fMRI analysis and the second will focus on an MVPA analysis. Papers selected for the summaries should be published no earlier than 2015. Your summary should be *no longer than 1 page* and will be expected to include the central research question, a description of the MRI scans performed, the nature of the analyses conducted, and how the central findings were supported by the neural measures. Summaries will be submitted via Quercus.

Final project
You will conduct a full analysis of an existing fMRI dataset from the NARPS project: https://www.narps.info/. The end goal of the project will be a brief research paper in APA style that focuses on the methods you leveraged to analyze the data. Projects will be assigned to teams of 2-3 students. Although the data analysis and project presentation are expected to be a group effort, each student will write their own paper. More details for the final project are available on Quercus. Briefly, the project will consist of the following items:

- ***Subset analysis and paper draft (5pts):*** Your group will be assigned a subset of the full dataset to analyse. You will perform all of the analysis steps for this data subset. The results of your subset analyses will be shared with everyone else (and their subset analyses will be shared with you) for the final group level analysis that will include the full dataset. Thus, the success of everyone's final project depends on how well you perform analyses for your subset of participants. You will write a paper draft based on the results of your subset analysis.
- ***Project presentation (10pts):*** Each project team will give a 15-minute presentation on their project. The presentation should be created with presentation software (e.g., PowerPoint, Keynote, Google Slides) and presented during the last lab session.
- ***Project final paper (25pts):*** The final paper should be at least 15 pages, double spaced, in APA format, with references and figures. The final paper should include the project motivation, experimental and analysis methods, results, and a discussion of implications/suggestions for future studies.

Provisional Course Overview

Week	Date	Topics	Laboratory	Chapter(s)
1	Sep. 9	Introduction and class overview, viewing MRI data, imaging formats	Converting MRI data to NIFTI format and visualizing the brain	1, 2
2	Sep. 16	MRI physics, registration, normalization, and parcellation	Aligning and dividing brains	2, 4
3	Sep. 23	BOLD preprocessing: motion correction, registration, temporal filtering, QA	Motion correction and BOLD QA	3, 4
4	Sep. 30	ToNI virtual field trip: safety lecture and demo scan session	MRI safety quiz and demo worksheet	
5	Oct. 7	First-level analysis, GLM, contrasts	Single subject analysis: finger taps	5
6	Oct. 14	Higher-level analyses	Group analysis: faces/objects/houses	6
7	Oct. 21	Inferences and multiple comparison correction	Voxel and cluster-based correction, Randomise	7
8	Oct. 28	Multi-voxel pattern analysis (MVPA)	Faces/objects/houses revisited	9
9	Nov. 5	Functional connectivity	A rhyming brain is a connected brain	8
10	Nov. 11	Reading week (no class)		
11	Nov. 18	Diffusion weighted imaging	Muse's The 2nd Law	
12	Nov. 25	Project workshop		
13	Dec. 2	Project presentations		

Notes

- *November 8 is the last day to drop a course* from your academic record and GPA.
- This course does not have a final exam during the final assessment period.

Course Policies

Acceptable Documentation: If you miss a deadline due to the illness or loss of a close relative, please declare an absence using the Absence Declaration Tool on ACORN as soon as possible. Students who submit a late assignment for reasons other than medical should contact Dr. Mack directly and will likely be required to coordinate with their College Registrar to provide documentation for extenuating circumstances.

Penalties for Lateness: Please make every effort possible to turn in all course assignments on time. Late submissions of the lab reports, assignments, project draft, and project peer reviews will receive 0% of the available grade. Late submissions for the final project paper will be subject to a 20% late penalty per day. The penalty is a flat deduction (e.g., a score of 85% on a report that is 1 day late will be marked as 65%).

Appeals: Students who have a complaint about the marks for a course assignment can write an appeal letter to Dr. Mack. All requests for a re-grade must be submitted with specific justification, in writing, within 14 days of the marks being made available for student viewing. A legitimate request will result in the entire exam or assignment being re-graded. Thus, your overall grade may be raised, lowered, or stay the same.

Plagiarism Detection Tools: Students will be required to submit their course papers 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 web site (https://uoft.me/pdt-faq).

Equity, Diversity, and 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.

Academic Resources

Accessibility Needs: Students with diverse learning styles and needs are welcome in this course. If you have an ongoing disability issue or accommodation need, you should register with Accessibility Services (AS) (accessibility.utoronto.ca) at the beginning of the academic year. Without registration, you will not be able to verify your situation with your instructors, and instructors will not be advised about your accommodation needs. AS will then assess your medical situation, develop an accommodation plan with you, and support you in requesting accommodation for your course work. Remember that the process of accommodation is private: AS will not share details of your condition with any instructor, and your instructors will not reveal that you are registered with AS. Contact Accessibility Services at (416) 978-8060; http://accessibility.utoronto.ca/.

Writing: As a student here at the University of Toronto, you are expected to write well. The university provides its students with a number of resources to help them achieve this. For more information on campus writing centres and writing courses, please visit http://www.writing.utoronto.ca/. Of specific use for this course, the writing centre provides online resources for appropriately using primary sources in your writing: https://advice.writing.utoronto.ca/using-sources/. The Faculty of Arts and Sciences also provides online writing centre support: https://writing.utoronto.ca/writing-centres/arts-and-science/

Academic Integrity and Plagiarism: All students, faculty and staff are expected to follow the University's guidelines and policies on academic integrity. For students, this means following the standards of academic honesty when writing assignments, citing and using source material appropriately, collaborating with fellow students, and writing tests and exams. Ensure that the work you submit for grading represents your own honest efforts. Plagiarism representing someone else's words as your own or submitting work that you have previously submitted for marks in another class or program is a serious offence that can result in sanctions. Speak to me or your TA for advice on anything that you find unclear. To consult the Code of Behaviour on Academic Matters for a complete outline of the University's policy and expectations, please visit http://www.governingcouncil.utoronto.ca/policies/behaveac.htm.