Computational Neuroanatomy and Neuroimaging

Instructor: Mallar Chakravarty, PhD
Time: Monday 1-4 pm
Room: Birks Building in room 004A
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Email: mallar@cobralab.ca
Office Hours: By appointment

The goal of the unit is to introduce neuroimaging principles, their applications and their relationship to the understanding of basic principles of neuroscience and investigations of neuropsychiatric disorders. The students will be evaluated on their ability to critically appraise the articles that they are tasked to read and on their ability to integrate novel techniques into a grant application that is removed from their primary area of research. Technical knowledge on the basis of magnetic resonance imaging or imaging, in general, is not considered to be required for this course, but would be beneficial.

By the end of this course students should:

1) Understand the basis for experimental design in neuroimaging
2) Be able to successfully design their own experiments
3) Design experiments and understand the principles for appropriate computational tools for neuroimaging analyses.

Each class takes the form of a discussion of research articles. Review articles are provided for contextual purposes only.

Over the course of the semester:
Students need to pick 3 research articles over the course of the semester and provide a 2 page short review (see end of syllabus for expectations).

Guidelines:

Page limit 2 pages

Content A ½ page summary of article
Followed by up to a maximum of 1½ pages of critique of strengths and weaknesses of the work

Submission To be emailed to the professor before the beginning of the class where the article will be discussed

Double check if you have clearly printed:
● Your name ● Student ID number ● Title for the article (on top of the page)
Before each class:
The student will email the professor 2 “big questions” regarding each paper (i.e. 4 questions in total per class). These are meant to help form a basis for discussion during each class. Please submit these before 11 am on the day of the class so the instructor has time to amalgamate and review the questions.

During each class:
The two papers assigned for each class will be discussed each week. Students are expected to have thoroughly read both papers.

1. **Paper 1**: One student is required to lead the discussion for one of the assigned papers.
   
   **Guidelines:**
   
   Time limit 40 minutes
   
   Visual aids: A powerpoint or google slide document would be beneficial to help the presentation and discussion of the paper
   
   Other notes: The student should demonstrate an understanding of the paper presented, the technical and scientific background. The student should also attempt to identify limitations and strengths of the paper.

2. **Paper 2**: The other paper assigned for the class will be jointly presented by all students. (All students are expected to have read the second paper prior to the class)
   
   **Guidelines:**
   
   Prep time ~ 30 minutes
   
   Group formation 4 Groups will be formed by those who are present in the class
   
   Assignment Each group will be randomly assigned one section of the paper (e.g. introduction, methods, results, discussion etc.)
   
   Prepare a succinct summary of the paper and then present and discuss strengths and weaknesses of the paper with the rest of the class.
Mark Breakdown:

- Article Summaries: 20%
- Class presentation of manuscript: 20%
- Class participation based on preparedness, contributions, critical thinking, and leadership: 10% (Mark out of 10 awarded for each class)
- Written Grant Proposal: 25% (due October 29 at the beginning of class).
- Grant Oral Presentation: 25%

See the end of this document for the marking grid on class attendance and participation, summaries, and in-class presentations.

Class 1 (September 13, 2021): Image Segmentation
Lead Teaching Assistant: Swapna Premasiri (swapna.premasiri@gmail.com)

Review Articles:


Articles:

- For student presentation:
- For group presentation:

Class 2 (September 20, 2021): Cortical Thickness, Confounds of Movement, Structural Image Quality

Review Articles:


Articles:

- For student presentation:

For group presentation:

Class 3 (September 27, 2021): Diffusion MRI
Lead Teaching Assistant: Etienne St-Onge (Etienne.St-Onge@usherbrooke.ca)

Review Article:


Articles:

- For student presentation:
- For group presentation:

Class 4 (October 4, 2021): Resting State fMRI and the Confounds of Movement
Lead Teaching Assistant: Gabriel Desrosiers-Gregoire (gabriel.desrosiers-gregoire@mail.mcgill.ca)

Review Article:


Articles:

- For student presentation:
- For group presentation:
⚠ NO CLASS (October 11) – due to Thanksgiving

Class 5 (October 18, 2021): Multi-Modal Brain Atlases
Lead Teaching Assistant: Aurelie Bussy (aureliee.bussy@gmail.com)

Review Article:


Articles:

- For student presentation:

- For group presentation:

Class 6 (October 25, 2021): Structural covariance

Review Article:


Articles:

- For student presentation:

- For group presentation:
Thursday, October 28, 2020
Deadline: Grant Submission Due!

Class 7 (November 1, 2021): Quantitative MRI
Lead Teaching Assistant: Aurelie Bussy (aureliee.bussy@gmail.com)

Review Articles:


Papers:

- For student presentation:

- For group presentation

⚠ NO CLASS November 8 - Society for Neuroscience

Class 8 (November 15, 2021): Multi-Modal Integration
Lead Teaching Assistant: Gabriel Desrosiers-Gregoire (gabriel.desrosiers-gregoire@mail.mcgill.ca)

- For student presentation:

- For group presentation:
Class 9 (November 22, 2021): Small Animal Imaging
Lead Teaching Assistants:
Lani Cupo (lani.r.cupo@gmail.com) and Lizette Herrera Portillo
(lizette.herreraportillo@mail.mcgill.ca)

Review Articles:


Articles:

- For student presentation:
- For group presentation:

Class 10 (November 29, 2021): Small animal imaging applications
Neonatal Imaging
Lead Teaching Assistants:
Lani Cupo (lani.r.cupo@gmail.com) and Lizette Herrera Portillo
(lizette.herreraportillo@mail.mcgill.ca)

Review Article:


Articles:
• For student presentation:

• For group presentation:

Final Class (December 06, 2021): - Final class presentation!

Assignment marking rubric

Class participation (each class, mark provided out of 10)
• Attendance (/2)
• Were the 4 questions provided? (/2)
• Active Participation (/2)
• Provides commentary demonstrating knowledge of both papers (/2)
• Provides critical commentary useful to improving understanding and contextualizing the paper in the context of the literature (/2)

Article Reviews (3 for the term, mark provided out 10)
• Effective summary of the paper background (/2)
• Effective summary of the methods and main findings (/3)
• Effective criticism of methods, findings, and interpretations (/3)
• Grammar/Spelling (/2)

Article Presentation (1 for the term, mark provided out of 20; feedback given at the end of the class)
• Effective summary of the paper (/4)
• Useful background provided to help others understand methods and context (/4)
• Effective presentation of the main findings (/4)
• Effective criticism of methods, findings, and interpretations (/4)
• Quality presentation. Was it well-rehearsed, organized, and easy to understand (/4)