Course Code: CGSC5005 W
Title: Cognitive Neuroscience
**Instructor**: John Anderson, PhD
Term: Winter 2024
Email: johnanderson3@cunet.carleton.ca | *Please include the course code in the title of every email you send, I will filter for these emails.*
Office Hours: By appointment in Dunton Tower 2202A (John's office)
Course website: Brightspace
Textbook: Research Methods for Cognitive Science by Aaron Newman. Four copies of this text are available for use in the library. This text offers an excellent background into each of the neuroimaging techniques, and it is **strongly recommended** that you review this text prior to your presentation week.
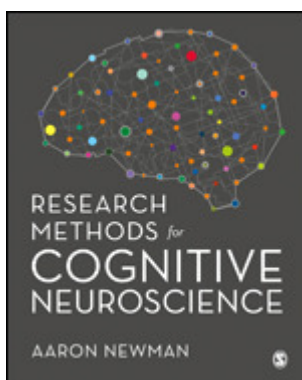
Location: Southam Hall 408 - Teaching and Learning Services **in person**
Day/Time: Mondays 11:35 AM – 2:35 PM January 8-April 9

Course Description:

This course will cover **theories and methods** of cognitive neuroscience. While the course is a seminar and will involve presenting and discussing key papers from the field that highlight theoretical, or methodological advances, there is also a practical component. Students will be expected to become familiar with some of the tools used in modern neuroimaging analysis. A capstone project will involve analyzing an existing open-source dataset from OpenNeuro in small groups (e.g., 3-4 people).

The **aims** of this course is for students to gain an idea of some of the problems motivating research in cognitive neuroscience, and approaches that they might take to gain insights.

Note: this course outline is a living document, as such, we will discuss it and edit it collectively the first time we meet. Students will also be tagged directly next to each week to indicate they are responsible for presenting. Groups will also be tagged here as well as being designated on Brightspace.

Evaluation:

Item	Weight	Due Date
In-class participation	10%	*ongoing*
In-class presentation of research paper and method (15% each)	30%	*TBD*
Group proposal for the Final Project	20%	February 12, 2024
Revision of Group proposal for the Final Project	10%	February 26, 2024
Group final research project	30%	April 9, 2024

Groups:

Group	**Topic** (attention, memory, perception, motor, etc)	**Method** (MRI, fNIRS, EEG, or other)
1		
2		
3		

Tentative Schedule and Key Dates:

January 8 (Week 1): Introduction to Cognitive Neuroscience Overview of field, key concepts, and methods. Practical: NeuroDesk orientation. John Anderson

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January 15 (Week 2): Neural Basis of Perception Focus on visual, auditory systems, and plasticity. Practical: fNIRS workshop on visual perception.

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January 22 (Week 3): Attention and Consciousness Mechanisms and theories of attention. Practical: EEG workshop focusing on attention-related brain activity.

- Reading 1: "The relationship between attention and consciousness: an expanded taxonomy and implications for 'no-report' paradigms" PubMed
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January 29 (Week 4): Memory and Learning Neural substrates of memory formation and retrieval. Practical: Structural MRI (VBM) workshop on hippocampal structures.

- Reading 1: "Focus on learning and memory" Nature Neuroscience (*1-2 articles from this special issue*)
- Reading 2: "London taxi and bus drivers" PNAS and Hippocampus

February 5 (Week 5): Language and Cognition Brain regions involved in language processing. Practical: Lesion network mapping in aphasia.

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February 12 (Week 6): Executive Functions and Control Prefrontal cortex and decision making. Practical: fNIRS in executive function tasks.

- Reading 1: "The role of prefrontal cortex in cognitive control and executive function" Nature

February 19 (Week 7): Winter Break (No Meeting)

February 26 (Week 8): Emotion and Social Neuroscience Neural circuits in emotion and social interactions. Practical: EEG on emotion recognition tasks.

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March 5 (Week 9): Developmental Cognitive Neuroscience Brain development and plasticity. Practical: TBSS (Tract-Based Spatial Statistics) on developmental data.

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March 12 (Week 10): Motor Control and Learning Neural basis of movement. Practical: fNIRS in motor task studies.

- https://github.com/rob-luke/BIDS-NIRS-Tapping

March 19 (Week 11): Cognitive Disorders and Neuropsychology Study of brain injury and diseases. Practical: Lesion network mapping for various disorders.

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March 26 (Week 12): Neuroimaging Techniques In-depth look at MRI, fMRI, DTI, etc. Practical: Advanced Structural MRI and VBM analyses.

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April 2 (Week 13): Advanced Topics in Cognitive Neuroscience Current research and future directions. Practical: Integrating multiple neuroimaging methods in research.

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April 9 (Week 14): Seminar Conclusion and Project Presentations Students present their seminar projects. Discussion on integrating Cognitive Neuroscience and practical skills.

Proposal:
A rubric will be posted on BrightSpace, however, as a general guide, you should identify a general cognitive neuroscience problem or area you would like to concentrate on that can be answered with an open-access neuroimaging dataset (i.e., on OpenNeuro or otherwise). Each group will write an introduction, a methods section, and a proposed analysis section. We will be using the Perusall app to leave feedback as peer reviewers on each other's proposals.

Revision:
Groups will be asked to address each of the comments from their peers in a letter and make changes to the proposal. In a second round, if the class agrees that the changes have addressed the issues identified in the first round, the proposal can move forward.

To register for a free Perusall account, go here: https://app.perusall.com/ For info on how to use it, The course can be found at ANDERSON-HCJKX. Alternatively, we may use a Google Document with comments enabled.

Final Project:
Based on the revised proposal, groups should go ahead and run their study using a neuroscience technique of their choice (e.g., fNIRS, EEG, OR MRI). Final projects should be written up in APA style.

In-class presentations and discussions:
Each week a presenter will be selected to review one of the readings (the class will have read all the readings) and give a brief overview of one neuroscience method. Where topics are very complex or lengthy, they may be split across multiple sessions.

Policy on the use of Large Language Models (LLMs):
Students may use large language models to **edit** their work and to help with idea generation. If you decide to use LLMs, you will need to secure the buy-in of your group members, and you will need to turn in transcripts from whichever LLM you use along with your assignment.

Policy for missed or late assignments:
Late assignments will be penalized at a rate of 10% of the assignment value per day or part day. In the interest of being fair to all students, there will be no grace period. Therefore, a document submitted 1 minute after the deadline will be considered late. Therefore, it is strongly recommended that you upload and submit the document prior to the last few minutes before the deadline. A doctor's note or other medical documentation must be provided within two working days after the due date in order to avoid late penalties. In order to be considered official, all extensions must be obtained in writing from the instructor. If you are running into trouble, it is vital to approach me as soon as possible.

University Boilerplate:

PLAGIARISM

The University Academic Integrity Policy defines plagiarism as "presenting, whether intentionally or not, the ideas, expression of ideas or work of others as one's own." This includes reproducing or paraphrasing portions of someone else's published or unpublished material, regardless of the source, and presenting these as one's own without proper citation or reference to the original source. Examples of sources from which the ideas, expressions of ideas or works of others may be drawn from include but are not limited to: books, articles, papers, literary compositions and phrases, performance compositions, chemical compounds, artworks, laboratory reports, research results, calculations and the results of calculations, diagrams, constructions, computer reports, computer code/software, material on the internet and/or conversations.

Examples of plagiarism include, but are not limited to:

- any submission prepared in whole or in part, by someone else, including the **unauthorized use of generative AI tools (e.g., ChatGPT)**;
- using ideas or direct, verbatim quotations, paraphrased material, algorithms, formulae, scientific or mathematical concepts, or ideas without appropriate acknowledgment in any academic assignment;
- using another's data or research findings without appropriate acknowledgement;
- submitting a computer program developed in whole or in part by someone else, with or without modifications, as one's own; and
- failing to acknowledge sources through the use of proper citations when using another's work and/or failing to use quotations marks.

Plagiarism is a serious offence that cannot be resolved directly by the course's instructor. The Associate Dean of the Faculty conducts a rigorous investigation, including an interview with the student, when an instructor suspects a piece of work has been plagiarized. Penalties are not trivial. They can include a final grade of "F" for the course.

Statement on Student Mental Health

As a University student you may experience a range of mental health challenges that significantly impact your academic success and overall well-being. If you need help, please speak to someone. There are numerous resources available both on- and off-campus to support you. Here is a list that may be helpful:

Emergency Resources (on and off campus):
https://carleton.ca/health/emergencies-and-crisis/emergency-numbers/

Carleton Resources:
- Mental Health and Wellbeing: https://carleton.ca/wellness/
- Health & Counselling Services: https://carleton.ca/health/
- Paul Menton Centre: https://carleton.ca/pmc/
- Academic Advising Centre (AAC): https://carleton.ca/academicadvising/
- Centre for Student Academic Support (CSAS): https://carleton.ca/csas/

• Equity & Inclusivity Communities: https://carleton.ca/equity/

Off Campus Resources:
• Distress Centre of Ottawa and Region: (613) 238-3311 or TEXT: 343-306-5550,
https://www.dcottawa.on.ca/
• Mental Health Crisis Service: (613) 722-6914, 1-866-996-0991, http://www.crisisline.ca/
• Empower Me: 1-844-741-6389,
https://students.carleton.ca/services/empower-me-counselling-services/
• Good2Talk: 1-866-925-5454, https://good2talk.ca/
• The Walk-In Counselling Clinic: https://walkincounselling.com

Requests for Academic Accommodations
ACADEMIC ACCOMMODATION
You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:
Pregnancy obligation: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For accommodation regarding a formally-scheduled final exam, you must complete the Pregnancy Accommodation Form (click here).
Religious obligation: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details click here.
Academic Accommodations for Students with Disabilities: The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, please request your accommodations for this course through the Ventus Student Portal at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). Requests made within two weeks will be reviewed on a case-by-case basis. For final exams, the deadlines to request accommodations are published in the University Academic Calendars. After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (if applicable).

Survivors of Sexual Violence
As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and where survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: https://carleton.ca/equity/sexual-assault-support-services

Accommodation for Student Activities

Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation will be provided to students who compete or perform at the national or international level. Write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf

Important Information

- Students must always retain a hard copy of all work that is submitted.
-Standing in a course is determined by the course instructor subject to the approval of the Faculty Dean. This means that grades submitted by the instructor may be subject to revision. No grades are final until they have been approved by the Dean
- For us to respond to your emails, we need to see your full name, CU ID, and the email must be written from your valid CARLETON address. Therefore, in order to respond to your inquiries, please send all email from your Carleton CMail account. If you do not have or have yet to activate this account, you may wish to do so by visiting http://carleton.ca/ccs/students/
-November 23, 2023: Last day for academic withdrawal from full fall and late fall classes
-March 15, 2024: Last day for academic withdrawal from full winter, late winter and fall/winter courses.
For a list of dates and deadlines, including holidays and exam dates, please visit: https://calendar.carleton.ca/academicyear/