COGS3030

Human Neuroimaging

Session 2, Weekday attendance, North Ryde 2021

Department of Cognitive Science

Contents

Session 2 Learning and Teaching Update

The decision has been made to conduct study online for the remainder of Session 2 for all units WITHOUT mandatory on-campus learning activities. Exams for Session 2 will also be online where possible to do so.

This is due to the extension of the lockdown orders and to provide certainty around arrangements for the remainder of Session 2. We hope to return to campus beyond Session 2 as soon as it is safe and appropriate to do so.

Some classes/teaching activities cannot be moved online and must be taught on campus. You should already know if you are in one of these classes/teaching activities and your unit convenor will provide you with more information via iLearn. If you want to confirm, see the list of units with mandatory on-campus classes/teaching activities.

Visit the MQ COVID-19 information page for more detail.

General Information

Unit convenor and teaching staff
Paul Sowman
paul.sowman@mq.edu.au

Bianca De Wit
bianca.dewit@mq.edu.au

Credit points
10

Prerequisites
130cp including (COGS2000 or COGS202) and (COGS2020 or BIOL2610 or STAT2170 or STAT2371 or PSYU2248)

Corequisites

Co-badged status

Unit description
The human brain is among the most complex and powerful information processing systems known. Since the emergence of cognitive neuroscience as a field several decades ago, an impressive range of methods have been developed to investigate the structure and function of the human brain. In this unit, students will learn key principles of a range of functional neuroimaging techniques including functional magnetic resonance imaging (fMRI), electroencephalography (EEG), magnetoencephalography (MEG), and functional near infrared spectroscopy (fNIRS). The unit focuses on conceptual and methodological issues surrounding these techniques, giving students the opportunity to think critically about the advantages and disadvantages of each technique for addressing research questions in the field of cognitive neuroscience. The unit will also cover clinical applications of neuroimaging such as its use for investigating autism and schizophrenia.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://students.mq.edu.au/important-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

ULO1: Demonstrate advanced knowledge of neuroimaging methods and their application to the investigation of human brain function.

ULO2: Explain the strengths and limitations of various neuroimaging methods and be able to identify the optimal method for a particular research question.
ULO3: Discuss key concepts and theories in relation to research findings obtained through different neuroimaging methods.
ULO4: Interpret and critically evaluate the results of neuroimaging studies.

Assessment Tasks

Name	Weighting	Hurdle	Due
Presentation	10%	No	Week 6
Data analysis write-up 1	20%	No	Week 9
Data analysis write-up 2	30%	No	Week 13
Final exam	40%	No	S2 Exam Period

Presentation

Assessment Type [1]: Presentation
Indicative Time on Task [2]: 5 hours
Due: **Week 6**
Weighting: **10%**

Contribution to a group presentation contrasting two neuroimaging approaches to the same research question (5%) and individual written summary (5%; max. 300 words)

On successful completion you will be able to:

- Discuss key concepts and theories in relation to research findings obtained through different neuroimaging methods.
- Interpret and critically evaluate the results of neuroimaging studies.

Data analysis write-up 1

Assessment Type [1]: Quantitative analysis task
Indicative Time on Task [2]: 15 hours
Due: **Week 9**
Weighting: **20%**

Analysis of curated dataset and write-up of methods and results (max. 1000 words)

On successful completion you will be able to:

- Demonstrate advanced knowledge of neuroimaging methods and their application to the

investigation of human brain function.
- Explain the strengths and limitations of various neuroimaging methods and be able to identify the optimal method for a particular research question.

Data analysis write-up 2

Assessment Type [1]: Quantitative analysis task
Indicative Time on Task [2]: 25 hours
Due: **Week 13**
Weighting: **30%**

Analysis of curated dataset and write-up of methods and results (max. 1500 words)

On successful completion you will be able to:
- Demonstrate advanced knowledge of neuroimaging methods and their application to the investigation of human brain function.
- Explain the strengths and limitations of various neuroimaging methods and be able to identify the optimal method for a particular research question.

Final exam

Assessment Type [1]: Examination
Indicative Time on Task [2]: 40 hours
Due: **S2 Exam Period**
Weighting: **40%**

Multiple-choice and short answer questions

On successful completion you will be able to:
- Demonstrate advanced knowledge of neuroimaging methods and their application to the investigation of human brain function.
- Explain the strengths and limitations of various neuroimaging methods and be able to identify the optimal method for a particular research question.
- Discuss key concepts and theories in relation to research findings obtained through different neuroimaging methods.
- Interpret and critically evaluate the results of neuroimaging studies.

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[1] If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the Learning Skills Unit for academic skills support.

[2] Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

Delivery and Resources

Lectures

- Lectures are held weekly, starting in Week 1.
- Lecture time: **Tuesdays 9:30am - 11:00am**
- Lecture location: Online

Lecture slides will be uploaded just before the lecture date under the lecture link in the relevant week below. Lecture recordings will be available through Echo360, accessible through the iLearn page.

Tutorials

- Tutorials are held weekly, starting in Week 1 of Session 1. Please check eStudent for the time and location of your tutorial. Changes to tutorials need to be made online via eStudent only (neither the unit convenor nor the tutor can make changes to your tutorial enrolment). After week 2, no further changes will be allowed unless supporting documentation about the reason for changing is provided and there is space in the tutorial you wish to enrol in.

Readings

- All required and optional readings are available through the Unit Readings (Leganto) link on the COGS2030 iLearn page.

Unit Schedule

S2 Week	Lecture Topic	Readings	Tutorial Topic
1	Introduction and Overview	Chapter 1, Op de Beeck (2019*) Introduction to Human Neuroimaging*. Cambridge University Press	- Overview to lab tutorial structure. - Download data and scripts ready to go for the beginning of class. - Guidance on how to get MATLAB working - Intro to MATLAB
2	MRI Physics & Structural Imaging Methods	Chapter 2/3, Op de Beeck	- Tutorial exploring structural MRI data using Mango

3	MRI Physics & Structural Imaging Methods	Chapter 2/3, Op de Beeck	- Critical discussion of papers for presentation
4	Hemodynamic Imaging Methods, Designing a Hemodynamic Imaging Experiment	Chapter 4/5, Op de Beeck	- Group presentations for assessment task 1
5	Basic and Advanced Statistical Analysis	Chapter 7/8, Op de Beeck	- fMRI pre-processing tutorial
6	fNIRS	Chapter 4.4 + Luke et. al. 2021	- fMRI GLM estimation and stats tutorial
7	EEG and ERPs	Chapter 9, Op de Beeck	- fNIRS Group data tutorial
8	MEG	Chapter 10, Op de Beeck	- Preparation for Assignment 2
9	Basic Data Analysis	Chapter 11, Op de Beeck	- Demos/tour of fNIRS, MEG and EEG facilities **TBA**
10	Advanced Data Analysis	Chapter 12, Op de Beeck	- M/EEG analysis tutorial
11	Causal Methods to Modulate Brain Activity	Chapter 14, Op de Beeck	- TMS/EEG tutorial
12	Motor evoked responses	TBA	- Preparation for Assignment 3
13	Review	None	- Class discussion on methodological issues and inferences we can make about brain function and behaviour

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Grade Appeal Policy
- Complaint Management Procedure for Students and Members of the Public
- Special Consideration Policy

Students seeking more policy resources can visit Student Policies (https://students.mq.edu.au/support/study/policies). It is your one-stop-shop for the key policies you need to know about

throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit Policy Central (https://policies.mq.edu.au) and use the search tool.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/admin/other-resources/student-conduct

Results

Results published on platform other than eStudent, (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit ask.mq.edu.au or if you are a Global MBA student contact globalmba.support@mq.edu.au

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to help you improve your marks and take control of your study.

- Getting help with your assignment
- Workshops
- StudyWise
- Academic Integrity Module

The Library provides online and face to face support to help you find and use relevant information resources.

- Subject and Research Guides
- Ask a Librarian

Student Enquiry Service

For all student enquiries, visit Student Connect at ask.mq.edu.au

If you are a Global MBA student contact globalmba.support@mq.edu.au

Equity Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources Policy. The policy applies to all who connect to the MQ network including students.