MBIC PhD Education Programme

Directors

Dr. Giancarlo Valente

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GRADUATE SCHOOL

Welcome and Introduction

Welcome to the MBIC Graduate School!

The Maastricht Brain Imaging Center (MBIC) graduate school offers PhD students the opportunity to follow high-level courses on the different research areas and activities at the MBIC (and the Department of Cognitive Neuroscience (CN) at the Faculty of Psychology and Neuroscience (FPN)). A primary motivation is to offer education that will stimulate interest and provide a solid foundation in related research areas as well helping new PhD student to quickly get up to speed within their own field of research and facilitate their work. All new PhD students who join FPN-CN are automatically enrolled into the MBIC Graduate School.

Courses

The Graduate School offers appr. 12 courses that run over a 2-year course cycle. Courses are educational activities that a combination of lectures and practical sessions. A course can encompass one day of activities (short format) or multiple days with one or more educational sessions per day (long format). Many long-format courses are given over a 2-day period, although some courses may include shorter daily sessions given over multiple weeks.

Workshops

Next to courses, the Graduate School offers 4 Workshops. A workshop comprises one short 3-hour session in which students and the workshop host(s) actively interact to discuss relevant theoretical or practical topics (e.g., panel discussions), engage in a coding or programming exercise ("hackathon") or share statistical or coding examples to discuss scientific practices. For some workshops, participating students are strongly encouraged to bring their own coding, analysis or writing work or provide suggestions for topics of discussion prior to the meeting. Workshops explicitly require an engaging, open and constructive attitude to actively interact with participants and the workshop coordinator(s). Each workshop will be given at multiple times throughout the 2-year course cycle.

Mentoring

For CN PhD students at FPN the Graduate School is also an organization that aims at providing *mentoring* as well as help in managing progress during the PhD. Next to following formal lecture courses and workshops, the participation in the Graduate School involves active engagement in the activities of the school and the MBIC.

Up-to-date information on the MBIC Graduate School course programme can be found on the website (https://www.maastrichtuniversity.nl/research/m-bic/m-bic-graduate-school). For more information, please contact the MBIC graduate school via email (FPN-Mbic-school@maastrichtuniversity.nl).

GRADUATE SCHOOL

Contact information:

Dr. Giancarlo Valente (co-director): g.valente@maastrichtuniversity.nl

Dr. Vincent van de Ven (co-director): v.vandeven@maastrichtuniversity.nl

Shirley Frijns (administrative support): shirley.frijns@maastrichtuniversity.nl

Anna Razafindrahaba (CN PhD student representative):

anna.razafindrahaba@maastrichtuniversity.nl

Applicable fees

MBIC Graduate School courses are accessible without any fee for **all FPN PhD students.**
For **external PhD students** (non-FPN within UM, or outside of UM) we ask an administration fee:

- 50 euro for 1day course
- 75 euro for 2day course (or longer)

Payment of the administration cost is done via Online Payment Platform (OBP). We will send the information with payment link after registration.

Course registration and cancellation

- **Registration**: To be able to participate, students must register for a course **at least 1 week** before the start of that course by sending an email to FPN-Mbic-school@maastrichtuniversity.nl. It is possible to register for multiple courses with one email.

- **Cancellation**: When you are unable to attend a course, please cancel your registration by sending an email to FPN-Mbic-school@maastrichtuniversity.nl at least 1 week before the start of each course. When we receive the cancellation on time, the Graduate School will refund the administration fee. In case the cancellation is communicated later than a week before the start of a course or in case of a now show, the administration costs will not be refunded.

Updated information on the MBIC Graduate School course program can be found under the following link: https://www.maastrichtuniversity.nl/research/institutes/m-bic/m-bic-education

mbic GRADUATE SCHOOL

Overview courses 2025-2027

TrackRhythm:

Tracking Brain Rhythms and Timing: Common and advanced analysis of EEG time-series

Coordinators: Sanne Ten Oever and Lars Hausfeld

November 2025

Oscillations:

Introduction to analysis of neuronal oscillation frequency, dynamics and coupling

Coordinator: Mark Roberts

December 2025

MultiNIBS:

Combining TMS/TES with EEG and fMRI in Human Brain Research

Coordinator: Inge Leunissen

December 2025

STATS1:

Statistical models Part I

Coordinator: Parisa Naseri

May 2026

NeuroTheory:

Current theories neuroscience

Coordinator: Mario Senden

May-June 2026

Connectivity:

Brain Connectivity

Coordinator: Alard Roebroeck and Sven Hildebrand

October 2026

HemoBCI:

Hemodynamic brain-computer interface

Coordinator: Bettina Sorger

November 2026

MachineLearn:

Machine Learning

Coordinator: Federico De Martino

December 2026

DNNImaging:

Deep neural networks and brain imaging

Coordinator: Rainer Goebel and Mario Senden

January 2027

GRADUATE SCHOOL

Math:

Mathematical Methods
Coordinator: Giancarlo Valente
February & March 2027

BehavExp:

Behavioral experimentation and analysis
Coordinator: Fren Smulders and Lars Hausfeld
April 2027

STATS2 (to be developed):

Statistical models Part II
Coordinator: Parisa Naseri
May 2027

Overview workshops 2025-2027

VersionControl:

Version control for PhD students
Coordinator: Luke Edwards
April 2026

LaTeX:

LaTeX for PhD students
Coordinator: Luke Edwards
April 2026

DataVis:

Data visualization for understanding and communicating neuroscience data
Coordinator: Darinka Trübutschek & Omer Faruk Gulban
23 April 2026

TestTest:

Testing your test: checking the validity of your analyses
Coordinator: Giancarlo Valente
Fall 2026

GRADUATE SCHOOL

Course descriptions

Tracking Brain Rhythms and Timing: Common and advanced analysis of EEG time-series

Code: **TrackRhythm**
Location: UNS40 & OXF55
Structure: 2 days - two lectures and one practical sessions per day
Date: 19 and 20 November 2025
Coordinators: Lars Hausfeld & Sanne ten Oever, Cognitive Neuroscience (FPN)
Extra speakers: Fren Smulders & Kirsten Petras
Email: lars.hausfeld@maastrichtuniversity.nl, sanne.tenoever@maastrichtuniversity.nl

Objective(s)

This course focusses on common and advanced analysis of EEG data. Our aim is that at the end of the course students have gained valuable knowledge about different possibilities on how to analyze EEG data. Specifically, students should be able to correctly interpret results acquired from the various methods as well as apply these techniques to their own data.

Key words

EEG, time-frequency analysis, phase, multivariate analysis, time-series, synchronization, travelling waves.

Description of the Course

Electroencephalography (EEG) is a tool commonly used in neuroscientific research. In this course we provide various tools to analyze your EEG data. The course will be divided into two days. During the first day, lectures will provide an overview i) on the properties of the EEG signal and choosing an experimental design and ii) on time-frequency decompositions. On the second day, we will focus on using EEG i) to assess travelling wave patterns and ii) as input to machine-learning techniques (classification and multivariate regression). Hands-on practicals after the lunch break on time-frequency analyses (day 1) as well as machine learning and travelling waves (day 2) will ensure a better comprehension. During the practical session you are also allowed to bring your own data and ask questions about analysis specific to your own data.

Instructional Approach

The course is a combination of lectures and practical sessions. The lectures will cover theoretical background and examples. Two practical sessions provide the possibility to gain hands-on experience on some of the analyses covered during lectures.

Introduction to analysis of neuronal oscillation frequency, dynamics and coupling

Code: **Oscillations**
Location: UNS40 & OXF55
Structure: Two half days of mixed lectures and data analysis practical sessions
Date: Tuesday 2 & Wednesday 3 December, 9.00-13.00
Coordinator: Mark Roberts, Cognitive Neuroscience (FPN)
Email: mark.roberts@maastrichtuniversity.nl

Objectives

This workshop will introduce the scientific importance of neuronal oscillations and a foundation in the signal processing theorems and techniques that can be applied to the analysis of oscillations.

Key Words

Invasive Electrophysiology, Data analysis, Gamma, Neuronal action potentials

Description of the course

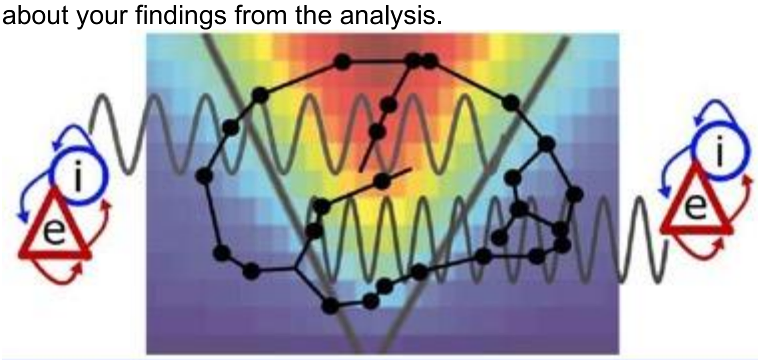
The day will start with a lecture giving an overview of the value of studying neuronal oscillations in the context of cognitive neuroscience, and the fundamental mathematical and signal-processing theorems that underlie this analysis. We will then start a hands-on session in which you will have the opportunity to implement in MATLAB the concepts discussed in the lecture. You will analyse model data to answer specific questions about neuronal processes. At each step, there will be short lectures and discussions about the practical work. The major topics will include Fourier transform, wavelets and time-frequency analysis, coherence and spike-field coherence analysis, the Hilbert transform, instantaneous frequency and phase analysis.

Instructional Approach

You will read basic papers as preparation for the course. The workshop includes lectures given by the coordinator and group discussion. The practical sessions will be based on working with provided data and matlab code, which you will adapt to answer a worksheet of questions. The coordinator will instruct you and be on hand to provide support.

Form of assessment

Assessment will be based on completion of the worksheet which will include short written descriptions about your findings from the analysis.



GRADUATE SCHOOL

Combining TMS/TES with EEG and fMRI in Human Brain Research

Code:	**MultiNIBS**
Location:	UNS40 & OXF55
Structure:	2-days with lectures and practical sessions
Date:	Tuesday 9 and Thursday 11 December 2025
Coordinator:	Inge Leunissen, Cognitive Neuroscience (FPN) Oxfordlaan55, Room 1.016
E-mail:	inge.leunissen@maastrichtuniversity.nl

Objective(s)
This workshop covers state-of-the-art multimodal applications of non-invasive brain stimulation with a particular focus on the experimental and simultaneous combination of transcranial magnetic and electric brain stimulation (TMS/TES) with neuroimaging tools such as functional magnetic resonance imaging (fMRI) and electroencephalography EEG). Participants will learn how to combine brain stimulation and brain imaging techniques in fundamental empirical brain research. Concrete applications, protocols, and experimental designs are discussed in the context of breakthrough literature from recent years.

Key Words
Non-invasive brain stimulation, neuromodulation, neuroimaging, multimodal, TMS, TDCS, tACS

Description of the Course
Cognitive neuroscience boasts various, complementary research tools. Most are neuroimaging methods, which reveal activity in the human brain as volunteers or patients perform different perceptual, cognitive, behavioral tasks. Non-invasive brain stimulation techniques (NIBS) add something unique to this field. Rather than measuring brain activity passively, while participants perform a task, NIBS approaches *manipulate* brain activity, to see what effect this has on that task. Or, in the case of multimodal approaches; what effect brain stimulation has on brain activity measured immediately afterwards or even simultaneously. In recent years, the range of NIBS approaches has expanded rapidly. Techniques such as transcranial magnetic stimulation (TMS), transcranial direct current stimulation (tDCS), alternating current stimulation (tACS), and random noise stimulation (tRNS) have become widely used. More advanced implementations now allow researchers to probe specific neural mechanisms, including the causal role of distinct brain oscillation parameters. Whereas early NIBS studies asked whether a brain region was causally involved in a given task, modern approaches investigate whether particular neural dynamics within that region are. Increasingly, NIBS is being integrated with neuroimaging, not only to enhance the precision and efficacy of stimulation, but also to visualize its effects on the brain.

Instructional Approach
The course consists of 4 sessions in 2 days. Two sessions will consist of lectures focusing on providing an overview of all the NIBS techniques out there, and the latest applications and approaches, with a particular focus on the multi-modal approaches of NIBS. You get hands-on experience with brain stimulation equipment in lab sessions and demonstrations of combined TMS/TES and fMRI/EEG applications.

Form of Assessment
Active participation

Advanced statistical analysis and modelling 1

Code:	**Stat1**
Location:	UNS40 & OXF55
Structure:	2-days with lectures and practical sessions
Date:	May 2026
Coordinator:	Parisa Naseri, Cognitive Neuroscience (FPN) Oxfordlaan55
E-mail:	p.naseri@maastrichtuniversity.nl

Objective(s)

This course aims to provide a broad introduction to mixed effects modeling, covering both theoretical foundations and practical implementation. Participants will learn how to model data with complex dependency structures, including longitudinal data, by combining fixed and random effects, progressing from basic concepts to more advanced modeling strategies.

Key Words

Mixed effects models, hierarchical models, fixed effects, random effects, variance components, model estimation, statistical inference, model comparison, data modeling, longitudinal data.

Description of the Course

Mixed effects models are widely used in cognitive neuroscience, psychology, and related fields for the analysis of data characterized by structured variability and dependence, such as grouped, repeated, hierarchical, or longitudinal observations. This two-part course introduces mixed effects modeling as a general statistical framework, emphasizing conceptual understanding, methodological flexibility, and practical data analysis.

Part I focuses on foundational concepts, including the motivation for mixed effects models, the distinction between fixed and random effects, and basic model specification. Core topics include variance components, linear mixed effects models, parameter estimation, and interpretation of model outputs.

Part II builds on these foundations and introduces more advanced topics, such as extended model structures, model comparison and selection, diagnostic tools, and extensions beyond basic linear models. Depending on the background and interests of participants, applications may include different data types and experimental designs.

Throughout both parts, emphasis will be placed on practical implementation and hands-on data analysis using commonly used statistical software (e.g., R/ Python), enabling participants to translate theoretical concepts into applied modeling workflows.

Instructional Approach

The course is a combination of lectures and self-study exercises consisting of pen and paper as well as R/Python tasks.

Form of Assessment

Attendance

Current theories in neuroscience

Code: **NeuroTheory**
Location: UNS40 & OXF55
Structure: eight weeks, with one session (2 hours) per week
Date: May-June 2026
Coordinator: Mario Senden, Cognitive Neuroscience (FPN) Oxfordlaan55
E-mail: m.senden@maastrichtuniversity.nl

Objective(s)

The primary goal of this course is to equip participants with the conceptual tools and practical skills to critically engage with neuroscientific theories. This overarching goal is achieved through three interconnected learning outcomes. First, participants will gain a foundational understanding of scientific theory, enabling them to articulate the structure of scientific theories from syntactic, semantic, and pragmatic viewpoints and to distinguish between the roles of theory and model. Second, participants will collaboratively formulate a clear, normative set of criteria for assessing a theory's quality. Finally, participants will apply this new analytical lens to the field of neuroscience, learning to systematically deconstruct and critically evaluate a selection of influential theories to develop a sophisticated understanding of the theoretical landscape of their own discipline.

Key Words

Scientific Theory, Philosophy of Science, Models in Science, Theoretical Neuroscience, Cognitive Neuroscience, Critical Thinking, Theory Evaluation

Description of the Course

In day-to-day research, PhD students constantly engage with scientific theories; they test hypotheses derived from them, use models based on them, and cite them to frame their work. Yet, a formal understanding of what constitutes a "theory" and what separates a "good" theory from a weak one is often assumed rather than taught. This course provides a foundational and practical exploration of scientific theory applied to the field of neuroscience begins with a foundational exploration of scientific theory from a philosophy of science perspective.

We will first explore the structure of scientific theories (syntactic, semantic, and pragmatic views), the role of models, and the relationship between theory and model. Based on this, participants will collaboratively develop a normative framework, defining the essential criteria for something to be considered a scientific theory and the desirable characteristics of a *good neuroscientific theory*.

Finally, participants will be invited to introduce theories they have encountered in their own research or find particularly influential (e.g., Predictive Coding, Communication Through Coherence, the Free Energy Principle). Applying the normative framework they developed, we will work together to deconstruct each theory, clarify its core claims, and critically evaluate its strengths and weaknesses. By the end of the workshop, participants will leave with a practical toolkit for theory evaluation and a more critical, informed perspective on the theoretical landscape of modern neuroscience.

Instructional Approach

Interactive lectures and group discussions.

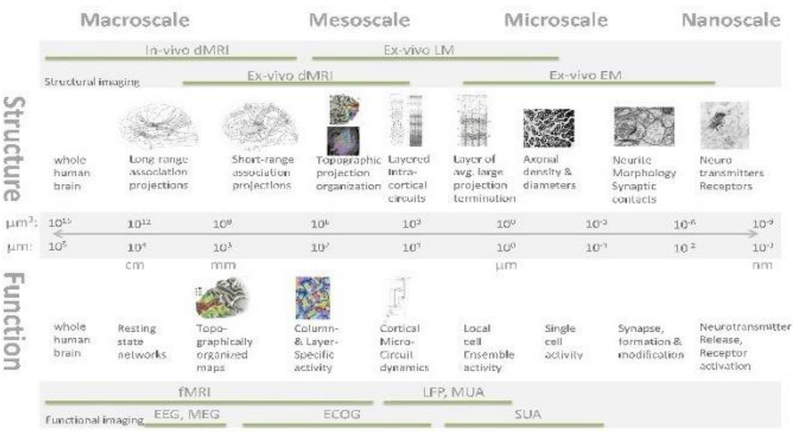
Form of Assessment

Active participation in the discussions.

Brain connectivity

Code: **BrainConn**
Location: UNS40 & OXF55
Structure: Two-day course
Date: October 2026
Coordinator: Alard Roebroeck, Cognitive Neuroscience (FPN) Oxfordlaan55
E-mail: a.roebroeck@maastrichtuniversity.nl

Objective(s)



This workshop aims to give an overview of methods for modelling and measuring brain connectivity and their applications. After attending the workshop, the participant should be familiar with the different ways in which 'brain connectivity' can be defined, the different methods by which it can be measured or modeled and how each could be used in answering neuroscientific questions.

Key Words
spatial scales of connectivity; connectomics; functional connectivity; effective connectivity; diffusion MRI; diffusion tensor imaging; tractography; independent component analysis; Granger causality; dynamic causal modelling; EEG/MEG coherence; Connectivity by TMS interference

Description of the Course
This workshop will give an overview of commonly used methods for modelling and measuring brain connectivity. Both the structural aspect (i.e. white matter pathways) and the functional and processing aspects (i.e. communication or interaction between brain structures) will be discussed, with attention to the different spatial scales at which connectivity can manifest itself. The course will touch upon theoretical considerations of inferring causality, interference and information transfer. It will focus, in turn, on a few of the most used methods investigate connectivity and communication in the human brain: fMRI functional connectivity approaches; fMRI effective connectivity modelling; DTI, crossing fiber models and fiber tracking; EEG/MEG coherence measurement; and connectivity inference by TMS interference. For each of the methods the basic principles, strengths and shortcomings, and likely applications are discussed.

Instructional Approach
Lectures and literature suggestions.

Form of Assessment
Active participation in the discussions.

GRADUATE SCHOOL

Hemodynamic brain-computer interfacing

Code:	**HemoBCI**
Location:	OXF55
Structure:	2-days with lectures and practical sessions
Date:	November 2026
Coordinator:	Bettina Sorger, Cognitive Neuroscience (FPN) Oxfordlaan55
E-mail:	b.sorger@maastrichtuniversity.nl

Objective(s)
This workshop will introduce the participants to the methodology and application possibilities of brain-computer interfacing based on brain hemodynamics.

Key Words
Brain-computer interface (BCI), neurofeedback, functional magnetic resonance imaging (fMRI), functional near-infrared spectroscopy (fNIRS), real-time data analysis.

Description of the Course
Analyzing functional brain data online allows for brain-computer interfacing and therewith opens up novel possibilities in fundamental and clinical neuroscience. This course will focus on using hemodynamic functional neuroimaging methods (fNIRS and fMRI) for BCI purposes. Following introducing fNIRS and technical and methodological requirements and challenges of hemodynamic brain-computer interfacing, the course will review previously realized hemodynamic-BCI research projects (neurofeedback training/therapy studies and brain-based communication experiments) as well as discuss further potential application possibilities. Participants will be given also a BCI demonstration (performed by the course coordinator) and will finally perform a BCI experiment themselves (as both BCI user and operator). In this way, the course participants will get 'hands-on' BCI experience.

Instructional Approach
As a preparation, students will read selected literature provided beforehand. The course will start with an overview lecture given by the course coordinator. Then, seminal hemodynamic-BCI projects (fundamental and clinical) will be discussed by the course participants. An example hemodynamic BCI experiment will be performed and the data will be analyzed in real-time and in simulated real-time *post hoc*. Then, students can get their own practical BCI experience by running an fNIRS-based BCI experiment themselves. At the end, novel ideas for useful applications of hemodynamic BCIs will be discussed (*e.g.*, how students could implement BCI technology in their own PhD or follow-up work).

Form of Assessment
Writing assignment:

a) Report about performed BCI experiment or
b) Research proposal about novel hemodynamic-BCI research idea

Machine learning

Code:	**MachineLearn**
Location:	OXF55
Structure:	2-days with lectures and practical sessions
Date:	December 2026
Coordinator:	Federico De Martino, Cognitive Neuroscience (FPN) Oxfordlaan55
E-mail:	f.demartino@maastrichtuniversity.nl

Objective(s)

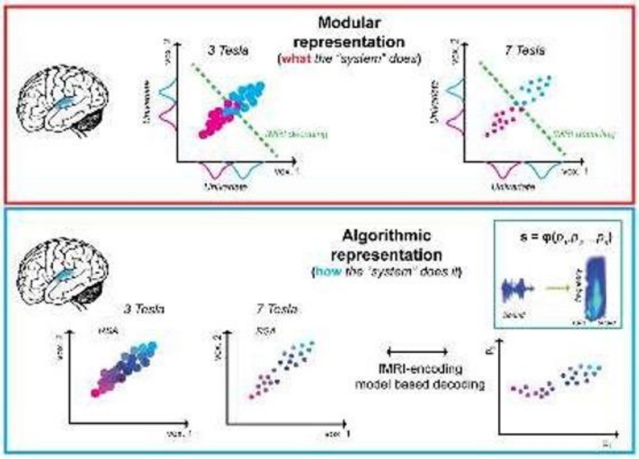
This workshop focuses on theoretical aspects underlying the use of machine learning techniques in neuroimaging (with a focus on fMRI). We will discuss relevant topics using a series of lectures and practical sessions. The lectures will cover theoretical aspects and highlight key applications (e.g. multivoxel pattern analysis, model-based fMRI analysis, population receptive field modelling). Practical sessions (Matlab or Python) will be oriented towards analyzing some of the fundamental aspects in detail.

Key Words

Machine Learning; pattern recognition; fMRI; distributed patterns; brain reading; encoding, decoding; pRF modelling, noise ceiling

Description of the Course

Machine learning algorithms (classification and regression) are being increasingly used for the analysis of neuroimaging data. Such methods have been shown to be more sensitive than conventional statistical techniques for the detection of functionally specialized patterns of activity. Furthermore pattern recognition algorithms have received increasing interest for their ability to "predict" presented stimuli and/or subjects' behaviour from the neuroimaging activity ("brain reading"). These techniques have also been used to link computational models of stimulus processing to neurophysiological measures (e.g. population receptive field modelling, encoding, model based decoding). The course starts from applications (decoding, encoding, population receptive field modelling, representational similarity) and then introduces fundamental theoretical concepts (regularization, cross-validation and statistics and noise-level estimation) and ends with more advanced topics (canonical correlation analysis, partial least squares).



Instructional Approach

Each topic is treated with a combination of a lecture and either a discussion session (journal-club) or practical session.

Form of Assessment

Attendance

Modelling neuroimaging data with convolutional deep neural networks

Code: **NeuroDNN**
Location: OXF55
Structure: 2-days with lectures and practical sessions
Date: January 2027
Coordinator: Rainer Goebel & Mario Senden, Cognitive Neuroscience (FPN) Oxfordlaan55
E-mail: r.goebel@maastrichtuniversity.nl, m.senden@maastrichtuniversity.nl

Objective(s)

This workshop introduces participants to deep convolutional networks, discusses their role in neuroscience, and introduces methods for evaluating their predictions and parameters against neuroimaging data.

Key Words

Convolutional networks, deep learning, connectionism, neuroimaging, representational similarity analysis, common brain space.

Description of the Course

Understanding how the human brain achieves cognitive tasks is a question of fundamental importance in cognitive neuroscience. There has been impressive progress over the last years in creating neurobiologically inspired multi-layer ("deep") models of visual tasks such as invariant object recognition. The object recognition performance of the most recent approaches, convolutional deep learning networks, even matches that of humans (LeCun et al. 2015; Szegedy, 2013). This course teaches principles of convolutional deep neural networks and how these networks learn to perform challenging visual and cognitive tasks. The course then focuses on approaches attempting to relate the operation of deep networks to measured brain imaging data, including representational similarity analysis and direct linking of columnar-level network nodes to vertices of cortex meshes allowing to test detailed spatiotemporal model predictions. Furthermore, limitations of deep networks are identified and discussed, including the role of feedback connections, more realistic learning rules and biologically better motivated cognitive architectures.

Instructional Approach

The course consists of morning and afternoon sessions over two days. On both days, the morning sessions consist of lecture series introducing deep learning architectures and learning algorithms [day 1] as well as techniques to evaluate their performance/parameters against neuroimaging data [day 2]. The afternoon session of both days consists of computer exercises with neural networks in Python. The course ends with a discussion on the aptitude of neural networks as a model of the brain.

Form of Assessment

Computer exercises and active participation in the discussion.

GRADUATE SCHOOL

From basic to more advanced math and signal processing

Code: **Math**
Location: OXF55
Structure: Eight week course with lectures and practical sessions
Date: February-March 2027
Coordinator: Giancarlo Valente, Cognitive Neuroscience (FPN) Oxfordlaan55
E-mail: giancarlo.valente@maastrichtuniversity.nl

Objective(s)
This course will teach the mathematical and statistical foundations for cognitive neuroscience research, taking participants from the basic to more advanced topics in math and signal processing.

Key Words
Algebra, Calculus, Signal analysis, Probability theory, Information Theory, Optimization, Multivariate data representation.

Description of the Course
Mathematical methods are a fundamental tool for conducting research in Cognitive Neuroscience. This course aims at providing the basic concepts and instruments to deal with data analysis, covering a range of selected topic which may be adapted based on participants' preferences and needs, and include: Calculus and Algebra, Probability theory, Signal Analysis, multivariate techniques and Optimization, Information Theory. Large emphasis will be given to practical MATLAB/Python implementation of the concepts discussed in the course.

Instructional Approach
The course is a combination of lectures, and self-study exercises consisting of pen and paper as well as Matlab/Python tasks.

Form of Assessment
Attendance

GRADUATE SCHOOL

Behavioral experimentation and analysis

Code:	**BehavExp**
Location:	OXF55
Structure:	2-days with lectures and practical sessions
Date:	April, 2027
Coordinator:	Fren Smulders, Lars Hausfeld, Cognitive Neuroscience (FPN) Oxfordlaan55
E-mail:	f.smulders@maastrichtuniversity.nl; lars.hausfeld@maastrichtuniversity.nl

Objective(s)
The best (and perhaps only) way to measure brain function is through measurement of behavioural performance when the brain is given a task. The best way to isolate specific functions is to carefully manipulate the given task so that differences in performance reflect that function. The course aims to teach students how to optimize this manipulation and measurement. Example functions are perception and decision making; example measures are speed and accuracy of behaviour,.

Key Words
Task design, reaction time analysis, outlier analysis, statistical diagnostics, signal detection theory, simulation of data, fitting model parameters, Matlab practicals

Description of the Course
TBA

Instructional Approach
On Day 1 of the course, in a slide-based lecture, we will discuss response time analysis and parameters to design behavioral experiments that maximize the use of response times. In a Matlab practical, students can collect their own reaction time data and practice with various options for analysis.

Day 2 starts with a lecture about signal detection theory (SDT), with response accuracy as the main measure. In a Matlab practical, the SDT approach is applied to stimulus detection, again with students collecting their own data. Then, an individual and group analysis are done.

Form of Assessment
TBA

Workshop descriptions

Version control for PhD students

Code:	**VersionControl**
Location:	UNS40 & OXF55
Structure:	1 3-hour session
Format:	Interactive session, class-based discussion of cases, software
Date:	April 2026
Coordinators:	Luke Edwards, Cognitive Neuroscience (FPN)
Email:	luke.edwards@maastrichtuniversity.nl

Workshop description

Version control tools such as git, mercurial and subversion allow you to store a history of code or documents in a "repository", so that you can make changes and test out new developments without having to worry about losing previous work. On top of storing history, version control also enables easy collaboration, as people can make local changes to documents or code and then "push" them to the "main" repository in a controlled way.

This course will introduce you to the widely used version control tool git, which is integrated in online collaborative environments such as Github, GitLab and Codeberg, allowing documents and code to be shared and worked on with collaborators from around the world. The first half of the course will be a gentle introduction to git and GitLab, and the second half will be a discussion of specific use-cases contributed by students before the class.

Key words

Version control, code sharing, collaborative coding, online repositories, git, github.

Actions to take

- Participants are encouraged to submit a brief description (minimally 100 words) of a task they would like to achieve using version control at least a week before the workshop takes place. Think about backing up (part of) a thesis chapter, sharing code or contributing to (other people's) online repositories.
- Bring your own laptop to the workshop
- Install git on your laptop (https://git-scm.com/install). The installer may ask you a lot of questions about optional settings; these can be left at their defaults for now, as we will update the important ones during the class.
- Log-in to https://gitlab.maastrichtuniversity.nl/ so that a UM gitlab account is created for you.

Instructional Approach

The 3-hour workshop comprises introductory slides (appr. 15-30 minutes), completing group exercises and discussing one or more cases from participants.

LaTeX for PhD students

Code:	**LaTeX**
Location:	UNS40 & OXF55
Structure:	1 3-hour session
Format:	Interactive session, class-based discussing of cases, software
Date:	April 2026
Coordinators:	Luke Edwards, Cognitive Neuroscience (FPN)
Email:	luke.edwards@maastrichtuniversity.nl

Workshop description

Unlike "what-you-see-is-what-you-get" (WYSIWYG) editors like Microsoft Word or LibreOffice Writer, LaTeX (commonly pronounced as "LAY-Tek" or "LAH-tek") is a type-setting system that separates text, handles formatting and visualization. LaTeX is very powerful, especially for long documents (e.g., theses) and writing mathematical formulas, but starting with LaTeX can be daunting for beginners.

This workshop will introduce you to the basics of LaTeX using the online platform Overleaf, which is provided and supported by Maastricht University. We will focus on your own writing case studies. You are therefore very much encouraged to submit a writing case to the workshop coordinator before the workshop starts. The workshop will be offered twice a year, and alternate between two different use-cases. The first workshop (April 2026) will focus on how to write theses and scientific articles with LaTeX, the second workshop (later in the year) will focus on CVs, posters and presentations.

Key words

LaTeX, Overleaf, writing theses, making presentations.

Actions to take

- Participants are encouraged to submit a brief description (minimally 100 words) of a task they would like to achieve using LaTeX at least a week before the workshop takes place. Think about (part of) a thesis chapter, scientific manuscript, poster or presentation.
- Bring your own laptop to the workshop
- Create a web account for Overleaf (https://www.overleaf.com/) using your university email, so that you have access to all the paid features.

Instructional Approach

The 3-hour workshop comprises introductory slides (appr. 15-30 minutes), completing group exercises and discussing one or more cases from participants.

MBIC GRADUATE SCHOOL

Data visualization for understanding and communicating neuroscience data

Code: **DataVis**
Location: UNS40 & OXF55
Structure: 1 3-hour session
Format: Interactive session, class-based discussing of cases, software
Date: 23 April 2026
Coordinators: Darinka Trübutschek (Cognitive Neuroscience, FPN) and Omer Faruk Gulban (Brain Innovation)
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Objectives
This workshop aims to foster a deliberate and critical approach to scientific data visualization by highlighting how design choices shape interpretation, confidence, and communication of our figures.

Workshop description
A picture is worth a thousand words. In neuroscience, figures are central to how we communicate complex data in papers, posters, and presentations. Scientific figures are often the first (and sometimes the only) part of a paper that readers engage with. Yet, despite extensive training in data acquisition and analysis, comparatively little emphasis is placed on how visualization choices shape interpretation, confidence, and scientific conclusions. The absence of shared principles for effective figure design can obscure structure in neuroscientific data and limit the impact of otherwise rigorous results.

This workshop aims to address this gap by focusing on visualization as a process of decision-making, not merely aesthetics. Through guided discussions and interactive exercises, participants will develop critical thinking skills for choosing how data are mapped, summarized, and displayed. The workshop introduces foundational visualization principles, practical heuristics, and key references that enable participants to both create clearer figures and critically evaluate existing ones. In addition, contributions from a professional graphic designer will provide an external perspective on common design pitfalls in scientific figures and demonstrate how visual design choices influence perception and interpretation in neuroscience.

Key words
Scientific communication, data visualization, scientific figures, quantitative information data distributions, variability, multidimensional data, uncertainty, computer graphics

Actions to take

- If you are interested in taking this workshop, please take 5 minutes to fill out this short pre-workshop survey: https://forms.gle/MA6BNgP17wjmiHEW8

Instructional Approach
The workshop is highly interactive and discussion-driven. Participants are expected to engage in hands-on figure redesign exercises. The session combines conceptual reflection with concrete examples, creating space for participants to rethink their own figures and leave with ideas they can immediately apply.

GRADUATE SCHOOL

Testing your test: checking the validity of your analyses

Code: **TestTest**
Location: UNS40 & OXF55
Structure: 1 3-hour session
Format: Interactive session, class-based discussing of cases, software
Date: Fall 2026
Coordinators: Giancarlo Valente
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Objectives
This workshop aims at enabling students to determine the (statistical) validity and soundness of their analyses, by means of simulation and resampling approaches.

Workshop description
Studies in Cognitive Neuroscience are often conducted using sophisticated analysis pipelines, tailored to the data at hand. This increased flexibility in the analysis approaches comes with the risk of not performing inference in a proper way, especially if one has not had a formal training in statistics/data analysis.
In this workshop you will learn how to evaluate the soundness of your analysis by using resampling approaches and simulations. We will first discuss what makes a good analysis or a bad analysis pipeline, and then learn how to set up a simulation that matches (as close as possible) your problem, and how to evaluate its results. We will work with a selection of problems proposed by the students, and on cases of general interest.

Key words:
Computational statistics, simulations, resampling, validity and power of a statistical test.

Actions to take:
- Participants are encouraged to submit a case study/problem that is relevant for them at least one week prior to the start of the workshop.

Instructional Approach
The workshop will consist of a short introductory lecture (approx. 30 minutes) followed by hands-on training, on cases of general interest, ideally coming from students' own problems.