Radboud Universiteit

2026 DONUT Workshop on Brain-Computer Interfacing

Location
Radboud University
Maria Montessori Building
Room MM 02.610

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Organizers

The DONUT Workshop 2026 on Brain-Computer Interfacing is organized by the Radboud University (Michael Tangermann and Jordy Thielen) and Freiburg University (Joana Pereira), specifically the Data-Driven Neurotechnology lab: https://neurotechlab.socsci.ru.nl/.

DONUT Consortium

The DONUT (European Doctoral Network for Neural Prostheses and Brain Research) project aims to address various challenges in the field of brain-computer interface (BCI) research through the education and training of doctoral candidates (DCs). The areas of training include improving the quality of life of locked-in patients, post-stroke rehabilitation, development of commercial products based on BCI and EEG technologies, early detection of Alzheimer‘s disease using EEG brain recordings, and BCI research for everyday use.

For more information about DONUT, please visit our website: https://donut-project.eu/.

The Radboud University is one of the academic partners in the DONUT consortium. This year, the Radboud University organizes the DONUT workshop. While it is a DONUT event, we like to grant access to anyone interested, both on-site as well as remotely.

Workshop Registration

On-site presence:
For those who are attending ***on-site***, please register using the following online form: https://forms.gle/hep7VqELTKENPWtC6.

Online presence:
For those who are attending ***online***, please register using the following link: https://uni-freiburg.zoom.us/meeting/register/FodO0h8HTFGLjZioYQPqxQ#/registration. For registration, use your institutional email address. After registration, you will receive a Zoom link on that address. Please, note that we will only livestream the lectures and talk series. The social events, DONUT meetings, demos and posters will not be live streamed.

Workshop Schedule

	Sunday June 21	Monday June 22	Tuesday June 23	Wednesday June 24
9:00		**Opening**	**DONUT PB**	**Walk** *Ooijpolder*
		DONUT PhD **DONUT Senior**		
10:00		**Lecture** *Marc van Hulle*	**Demos**	
11:00		**Lecture** *Florian Krause*	**Posters**	
12:00		**Lecture** *Kaare Mikkelsen*		
13:00		**Lunch** *De Refter*	**Lunch** *De Refter*	
14:00		**Lecture** *Richard van Wezel*	**Lecture** *Roman Rosipal*	
15:00		**Talk series** *Ceci Verbaarschot*	**Lecture** *Pierre Guetschel*	
16:00		*Matthias Dold*	**Lecture** *Joana Pereira*	
		Sena Er	**Closing**	
17:00				
18:00				
19:00		**Dinner** *De Waagh*	**Dinner** *Arsenaal 1824*	
20:00	**Reception** *De Hemel*			

Workshop Activities

Lecture Marc van Hulle

Title: Finger movement decoding from electrocorticography

Abstract: Electrocorticography (ECoG) has been widely recognized for providing high-fidelity brain signals suitable for a broad range of brain–computer interfacing tasks. Compared with microelectrode arrays implanted within the brain tissue, ECoG electrodes are placed on the cortical surface, thereby avoiding the irreversible vascular damage and fibrous scar tissue formation that can compromise signal stability and necessitate frequent decoder recalibration. Besides speech decoding, a major area of research in ECoG-based BCIs is finger movement decoding, which holds promise for the development of dexterous neuroprostheses capable of restoring activities of daily living in individuals with hand motor impairments. Motivated by this potential, a wide range of decoding algorithms has been proposed, spanning linear models, traditional machine learning approaches, and deep neural networks. However, most studies rely on the same two public datasets, while real-world demonstrations remain scarce. We provide an introduction to the topic, highlight several representative approaches, and conclude with an outlook on future developments.

Lecture Florian Krause

Title: Understanding and building stress resilience through ecological cognitive neuroscience

Abstract: Stress-related disorders have become one of the biggest global health challenges of our time. They are not only among the disorders with the highest disease burden, but also alarmingly common, making them a fast-progressing world-wide societal problem that needs urgent attention and new solutions. I will argue that those solutions lie in combining fundamental neurocognitive knowledge from advanced neuroimaging in the lab with real-life ecological mobile measures, in order to better understand and enhance resilience to stress in daily life. In particular, I will show how changes in stress and resilience can be monitored and predicted using Ecological Momentary Assessments as well as physiological data from wearables, how they are related to dynamic neural changes at the brain system level, and how we can use novel network-based real-time fMRI neurofeedback to train individuals to directly modulate these changes in response to real-life stressors.

Lecture Kaare Mikkelsen

Title: Wearable EEG: state-of-the-art homegrown hardware

Abstract: In this 1-hour lecture we will give a short introduction to our in-lab developed 'hyperscanner' recording platform, as well as present an extensive 100+ research dataset which has been recorded with it. The hardware introduction will serve as a teaser for a hands-on demonstration on Tuesday.

Lecture Richard van Wezel

Title: Neurotechnology for visually impaired persons

Abstract: In this presentation neurotechnologies for visually impaired persons will be discussed, from a haptic belt to brain computer interfaces for blind people. During this presentation NeuroTechEU, the European University for Brain and Technology, will also be discussed.

Lecture Ceci Verbaarschot

Title: Developing intuitive bidirectional intracortical brain-machine interfaces for the restoration of sensation and movement in people with severe paralysis.

Abstract: While we move, we experience thoughts, feelings and desires about our actions and environment. At the Mind to Motion Lab of the University of Texas Southwestern Medical Center, I study the neuroscientific relation between consciousness and action via the real-time analysis of ongoing brain activity. I apply this knowledge to the development of intuitive brain-machine interfaces (BMIs) that assist or restore sensory and motor abilities in the arms and hands of people with severe paralysis. In this talk, I will (1) explain how intracortical microelectrodes can provide a bidirectional interface between the brain and a person's environment, providing a sense of touch via brain stimulation, and translating thought into action via the real-time decoding of single-neuron and multi-unit activity. I will (2) demonstrate the state-of-the art capabilities of such BMIs via videos and participant statements, and (3) discuss the importance of sensory feedback for intuitive motor control.

Lecture Matthias Dold

Title: BCI methods for adaptive deep brain stimulation

Abstract: Adaptive Deep Brain Stimulation (aDBS) represents a promising evolution of conventional DBS for the treatment of neurodegenerative disorders such as Parkinson’s disease. By dynamically adjusting stimulation intensity, aDBS aims to minimize stimulation-induced side effects and optimize therapeutic efficacy in response to a patient's fluctuating clinical state. The realization of effective aDBS relies heavily on identifying robust neural biomarkers. While current approaches often depend on coarse, group-level statistics, Brain-Computer Interface (BCI) methodologies offer a powerful framework for data-driven, personalized neural decoding. In this talk, I will present two behavioural paradigms specifically designed to probe hand-motor and cognitive symptoms. By coupling these paradigms with simultaneous electrophysiological recordings, we demonstrate how BCI approaches can be used to identify highly patient-specific biomarkers. Finally, I will discuss how these personalised neural signatures can be translated into downstream, closed-loop aDBS control strategies.

Lecture Sena Er

Title: Closed-loop optimization of stimulus parameters for BCIs

Abstract: Designing effective brain-computer interfaces requires careful selection of stimulus parameters that shape the strength and reliability of evoked neural responses. In my PhD work, I investigate how these parameters can be optimized for individual users instead of selected using one-size-fits-all settings.

The presentation will cover preliminary work on contrast-dependent decoding performance in classic and textured c-VEP stimuli, where trial-level evidence metrics and Gaussian process modelling are used to characterize the relationship between stimulus design and BCI performance. It will also introduce ongoing work on closed-loop Bayesian optimization to guide personalized stimulus design online.

Lecture Roman Rosipal

Title: Novel Concepts in Sleep Process Modeling

Abstract: It remains a challenging research question to what extent polysomnographic recordings of nocturnal human sleep can provide objective and clinically meaningful information about sleep quality. Since the introduction of the standardized sleep-scoring manual in 1958, conventional sleep staging, with only modest modifications, has remained the foundation of clinical sleep assessment. Although this framework captures the general dynamics of the sleep process, it is limited in its ability to quantify sleep quality in a way that reliably reflects daytime behavior, cognitive performance, and neurophysiological functioning.
To address these limitations, we introduced and validated a novel probabilistic framework for sleep process modeling. The proposed approach operates with an arbitrary number of sleep microstates and enables high temporal resolution characterization of sleep dynamics beyond conventional staging.
In this talk, I will summarize our research efforts in this field, including healthy sleep modeling, the search for objective markers of sleep quality, and their relationship to daytime neurophysiological and cognitive performance. I will also present our developments in advanced functional data analysis methods for sleep quality profiling in post-stroke patients.

Lecture Pierre Guetschel

Title: EEG Foundation Models: pretrained representations to boost decoding when labeled data is scarce

Abstract: Brain–computer interfaces are bottlenecked by the cost of labeled EEG: each new subject or paradigm typically requires a fresh calibration. Following the trajectory of NLP and computer vision, EEG foundation models — large networks pre-trained on unlabeled EEG and reused as off-the-shelf feature extractors — have emerged as a promising answer. This talk gives an introductory tour of the field: what these models are, how they are built and evaluated, what they actually deliver compared to task-specific baselines, and practical guidance for BCI practitioners considering adopting them today.

Lecture Joana Pereira

Title: DBS-evoked potentials: effective connectivity and... more?

Abstract: The use of single-pulse electrical brain stimulation to probe brain connectivity traces its origins to the work of Matsumoto and colleagues, who demonstrated that stimulation of one cortical site reliably elicits potentials at remote cortical brain regions, providing a direct electrophsyiological measure of effective connectivity between brain areas. In the decades since, this methodology has been refined into a tool for electrophysiological brain mapping, which can be done with invasive or non-invasive recordings and stimulation techniques. Evoked potentials following deep brain stimulation (DBS) follow similar principles, but instead interrogate the connectivity of subcortical brain areas.
In this talk, I will review work on DBS-evoked cortical potentials, which occur on the timescale of milliseconds following single stimulation pulses, and show how they have contributed to probing network connectivity in Parkinson's Disease. I will further present early evidence that these signls can be used to inform stimulation parameters programming, and help identify the cirtcuits underlying symptom treatment. I will then present our most recent work in Freiburg on DBS to the superolateral medial forebrain bundle, a white matter pathway connecting prefrontal brain areas to the ventral tegmental area, which is modulated by DBS in patients with treatment-resistant major depressive disorder and obsessive-compulsive disorder. Lastly, I will suggest that such readouts might carry information about the current state of the patient, information that could prove valuable for closed-loop neuromodulation approaches.

Demos

Various live demos will be presented in parallel at several locations:

- AMUSE (Yang Man): MM 00.426
- Screen- and laser-based c-VEP (Amar Enkhbat): MM 00.456
- Dareplane 101, kick-start a Dareplane project (Matthias Dold): MM 02.610
- Electrophysiological recordings with dry-contact electrodes (Kaare Mikkelsen & Simon Lind Kappel): MM 02.610

Posters

Various posters will be presented in MM 02.610:

- DONUT DC1 (Milan Fodor): Brain-Computer Interfaces via Code-Modulated Imperceptible Carriers
- DONUT DC2 (Hanneke Scheppink): Advancing Code-Modulated Visual Evoked Potentials through Novel Motion and Hybrid Stimulation
- DONUT DC3 (Ayas Kiser): Development of an EEG based biometric system
- DONUT DC4: (Amar Enkhbat): Scene-based BCI: An alternative user interface for Visual BCIs
- DONUT DC5 (Yang Man): Self-introspection in ERP-based BCI training
- DONUT DC6 (Mani Mirsaeedi): Connectivity Between Scalp EEG and Intracranial Recordings During 40 Hz Visual Stimulation
- DONUT DC7 (Yash Bhambhani): From Open Loop EEG Decoder Development to Real-Time Closed Loop Ankle Exoskeleton Control

- DONUT DC8 (Arman Ghouchani): Combining Bio-Impedance and EEG for reliable mobile EEG
- DONUT DC9 (Ali Amini): Multi-Scale Spatiotemporal EEG and Self-Supervised Audio Fusion: A Mixture-of-Experts Approach to Continuous Affect
- DONUT DC10 (Nina Evetovic): Towards Adaptive Brain-Computer Interface and Head-Mounted Virtual Reality System for Post-Stroke Neurorehabilitation
- (Lucas Benoit): Towards In-Vehicle Brain-Computer Interfaces: SSVEP and Auditory ERP Responses Under Static and Dynamic Driving Conditions

DONUT Activities

The following meetings are only for DONUT partners:

- PhD Meeting: MM 02.610
- Senior Meeting: MM 04.304
- PB Meeting: MM 02.610

Social Activities

Please make sure to have registered for the social activities via the online form (see registration). Please note that participation in each activity (e.g., dinners) is at **own costs**.

Reception at De Hemel

https://restaurantdehemel.nl/

Lunch at De Refter

https://www.ru.nl/en/services/food-and-beverage/the-refter

Dinner at de Waagh

https://dewaaghnijmegen.nl/

Dinner at the Arsenaal 1824

We will enjoy a 3 course dinner of about 41,50 Euros per person, excluding drinks.
https://arsenaal1824.nl/en/view-cafe/

Walk in the Ooijpolder

Meeting point under the Waal bridge, opposite to Opoe Sientje (Lindenberghaven 1).
https://www.visitnijmegen.com/locaties/1958305519/ooijpolder