

Interdisciplinary Workshop on Computational Neurology: from Novice to Neurostar!

Dates: 5.6 - 19.6 - 3.7 - 17.7 - 7.8 (optional)

Time: 15:00-18:00

Work load: 3 CP

Venue: Building MB, Floor 6, Seminar Room (ring the bell "Worldfactory"), Ruhr University Bochum, Universitätsstraße 150, 44801 Bochum

Course syllabus:

First day (5.6): Intro to fMRI and Neuroanatomy (1) and Intro to Python (2).

The first day will be divided into two consecutive tracks. The first track is designed to provide students with a limited background in neuroscience a comprehensive introduction to fMRI and neuroanatomy. This session will cover what fMRI is, what it measures, and (some of) its various applications. The second track, on the other hand, is tailored for students with little or no prior experience in programming. This track will introduce fundamental concepts related to using Jupyter Notebooks and the basics of some widely used Python libraries (e.g., Numpy and Pandas), as well a small introduction to loading and plotting images. It serves as a gentle entry point for those who are new to programming. You are welcome to follow both tracks (Intro to Python from 15:00-16:30, Intro to fMRI & Neuroanatomy from 16:45-18:00).

Second day (19.6): Single Node Neural Mass Models.

On the second day, we will use different types of models, i.e., neural mass (e.g., Jansen-Rit) and phenomenological (e.g., Hopf) models, to simulate the activity of a single brain region. We will evaluate its dynamics (e.g., oscillations) and their change according to the different model parameters. Through hands-on exercises, you will have the opportunity to work with these models and gain practical experience in their application.

Third day: Whole Brain Neural Mass Modeling of Healthy Subjects.

On the third day, we will create a real brain simulation. We will connect neural masses into a network, and we will fit this network to real empirical data so that the simulated brain activity resembles the real empirical one. We will also delve deeper into model fitting, and we will learn how to use both static and dynamic functional connectivity to make our brain simulations more realistic.

Fourth day: Whole Brain Neural Mass Modeling of Neurological Disorders.

The fourth and last day will be focused on developing a group project. You will be divided into small groups and given empirical timeseries of real patients (e.g., Alzheimer's disease, stroke, epilepsy, etc.). You will be asked to develop some hypotheses on disease-related changes in brain activity and you will be able to test them on the provided data.

Final day (virtual outro session with optional presentations for those requiring a graded assessment of the course): As an output of the work, we ask you to prepare short presentations of the group work and reflections on interdisciplinary team work and modeling of diseases.

Why attend?

This is a perfect starter course to understand more about modeling and computational concepts in neurology. Hands-on guidance and practice ensure mastery of critical concepts in neuroscience, while we correct different levels of previous knowledge in the first two sessions. Our group projects help you to develop real

life experience and your own ideas into models! The course is open to students from various disciplines and thus gives an opportunity for interdisciplinary team work.

If you read until here and you are ready to embark on a journey from "Novice to Neurostars", we've got a little surprise for you! While this workshop will indeed boost your neuroscience skills, becoming a "Neurostar" doesn't happen overnight. In fact, "Neurostar" here refers to a [website](#) where you'll be posting questions related to your work for years to come 😊 This workshop will nonetheless empower you to ask the right questions!

Further Information:

Additional details regarding software to be installed before the workshop will be provided in due course.

Registration Information:

For registration (and inquiries), please send us an email with your university, full name, field of study + semester, 1 sentence about why you want to attend and 1 sentence on your previous knowledge in neuroscience + programming and which tracks you want to attend on the first day to: mail@computationalneurology.com