Resting State Functional MRI: analysis, interpretation and applications

November 3-14, 2025

Centre of Behavioural and Cognitive Sciences

University of Allahabad

Prayagraj

Faculty

Prof. Bharat Biswal, New Jersey Institute of Technology, USA

Course Coordinators

Prof. Bhoomika R. Kar

Dr. Amrendra Pratap Singh

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Course Overview

Resting-state fMRI (rs-fMRI) has emerged as an alternative method to study brain function in human and animal models. In humans, it has been widely used to study psychiatric disorders including schizophrenia, bipolar disorder, autism spectrum disorders, and attention deficit hyperactivity disorders. In this course, rs-fMRI and its advantages over task activation, its currently used analysis methods, and its application in psychiatric diseases using different analysis methods will be discussed. Finally, several limitations and challenges of rs-fMRI applications will be discussed. This course is designed to teach users how to design, analyze, and interpret brain connectivity. Due to its increasing popularity, a large number of investigators are collecting data using brain imaging data from healthy and clinical subjects during rest. A novelty of this course will be that actual data from a large study will be shared with the students and used to show the user, all points of the study.

In the first part of the course, users will be taught how to design an experiment using fMRI. In the second part, pre-processing and post-processing steps their relative advantages and disadvantages will be demonstrated. During this process, their software implementation will also be demonstrated. In the third part, data integration with other clinical and connectivity measures will be shown. The course will involve a class project. At the end of the course, all students will be expected to make a 15-min group presentation (with slides) on a particular topic related to fMRI (either task or resting state). Students are expected to submit a written report on their project topic in addition to the presentation.

Objectives

- Demonstrate a strong grasp of the basic physical principles underlying several brain imaging methods including MRI.
- Demonstrate a solid understanding of the concepts of image acquisition, image formation, image quality and statistical processing methods.
- Apply the concepts learnt in class to solve problems in clinical and basic brain imaging problems particularly related to analyzing brain imaging data and processing and analysis.
- Demonstrate an appreciation for the strengths and weaknesses of various fMRI data both resting state and task activation and what kind of anatomical and physiological information can be obtained from them.

Course Details

Modules	Module1: Fundamentals of fMRI and MRI, 3 types of paradigms: Task, Rest, Movie Watching Module 2: Task activation, Designs, Paradigms Module 3: Resting fMRI: Preprocessing pipeline Module 4: fMRI analysis methods: Voxel wise methods, Group level methods (ICA, PCA, Graph Theoretical Methods) Module 5: Single subject analysis, Statistical methods Module 6: Clinical applications, functional connectivity analysis
You Should Attend If…	You are a young faculty, PhD student or MSc final year student from Cognitive Science, Computer science, Psychology, or related disciplines like Neuroscience with keen interest in brain imaging, fMRI and with some exposure and/or experience with fMRI methodology. You are keen to learn about brain imaging particularly resting state fMRI.
Registration details	Participants can register for the course by filling the google form https://forms.gle/mduV9U8MAXUk9uCVA Participants will be shortlisted based on the set norms. The shortlisted participants will be notified by October 1, 2025, after which the registration fee needs to be deposited online. The link for payment of the fee will be shared via email. For queries or any further details, please contact office@cbcs.ac.in Last date for submission of the google form: **September 15, 2025** Notification for selection: **October 1, 2025** Last data for the Registration fee payment: **October 10, 2025**
Fees	The registration fee for taking the course is as follows: Advanced Masters and PhD students: Rs. 2000/- Academic professionals: Rs. 4000/- Industry professionals: Rs. 8000/-

Note for Accommodation
Accommodation will be available on a payment basis. Detailed information and options will be provided upon registration. No TA DA will be provided to the participants.
Laptop Computers
Participants are advised to bring their own laptops to facilitate an effective learning process.

The Faculty

Prof. Bharat Biswal
Department of Biomedical Engineering
New Jersey Institute of Technology, USA

Dr. Bharat Biswal is a Professor in the Department of Biomedical Engineering at the New Jersey Institute of Technology. He obtained his PhD at the Medical College of Wisconsin in Biophysics under the mentorship of Prof James Hyde. He has worked in the field of brain imaging for 20 years and have developed a great deal of expertise in many aspects of brain imaging techniques, in particular, resting state functional connectivity (RSFC) which he originated. He has published more than 250 peer-reviewed papers which span from functional to structural fMRI to address brain functions. His research interests include calibration of fMRI signal, resting state functional connectivity, clinical applications of fMRI with emphasis on drug addiction, ADHD, depression, and traumatic brain injury.

Prof. Bhoomika Rastogi Kar
Course Coordinator, CBCS, UoA

Dr. Bhoomika Rastogi Kar is a Professor & Head, Centre of Behavioural and Cognitive Sciences (CBCS), University of Allahabad. She received her PhD at the National Institute of Mental Health and Neurosciences (NIMHANS), Bangalore, in 2003. Her research interests include cognitive development, cognitive control, neuroaesthetics and cognitive disorders.

Dr. Amrendra Pratap Singh
Course Co-Coordinator, CBCS, UoA

Dr. Amrendra Pratap Singh is an Assistant Professor at CBCS, University of Allahabad. He received his PhD in Cognitive Science from CBCS, University of Allahabad. He works in the area of attention, time perception and meditation. More specifically he studies visual awareness and subjective experience of time and how these processes are modulated through the practice of meditation using neuroimaging methods.

Course Coordinators

Dr. Bhoomika Rastogi Kar

Dr. Amrendra Pratap Singh

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