EBRAINS WORKSHOP

BRAIN ACTIVITY ACROSS SCALES AND SPECIES: ANALYSIS OF EXPERIMENTS AND SIMULATIONS (BASSES)

13–15 JUNE 2022
ROME, ITALY AND ONLINE

SCIENTIFIC PROGRAMME
ABOUT THE EVENT

The study of brain rhythms and of spatio-temporal patterns of brain activation is an important test-bench for understanding connectivity and the mechanisms that determine cognitive systems in mammals.

The large variety of available experimental protocols and measurement techniques enable researchers to investigate new scientific questions. In addition, the input from experimental observations is used to design theoretical models able to emulate brain dynamics and cognitive mechanisms in in-silico experiments.

The goal of the BASSES Workshop (Brain Activity across Scales and Species: Analysis of Experiments and Simulations) is to provide an overview of the scientific topic of brain states and complexity, state transitions, and their connection with cognitive functions, and to demonstrate the achievements in this field obtained within the Human Brain Project thanks to the functionalities provided by the Ebrains research platforms.

Lectures will showcase the latest advancements in analysis strategies and whole-brain modelling tools. Hands-on Sessions will allow the participants to be actively engaged and test the Ebrains functionalities for data storage, curation, analysis, and modelling.

BASSES will allow people with different expertise, from experimental and theoretical neuroscientists to computer scientists, to share results and ideas and connect into a wider community.

Further information:
humanbrainproject.eu/en/education/ebrains-workshops/basses

Use the hashtag #BASSES to share your experiences at the workshop on social media!

Scientific Chairs & Local Hosts:
Anna Letizia Allegra Mascaro | CNR - National Research Council, Italy & LENS - European Laboratory for Non-Linear Spectroscopy, Firenze, Italy
Giulia de Bonis | INFN - National Institute of Nuclear Physics, Rome, Italy

Contact:
workshop.edu@humanbrainproject.eu

Organised by: In cooperation with:
MONDAY 13 JUNE 2022

Please note that all times are in CEST (=GMT/UTC+2)

12:30 – 14:00  Registration
14:00 – 14:15  Welcome & Introduction
14:15 – 16:30  PLENARY SESSION I: BRAIN STATES AND COMPLEXITY
               (Chairs: Anna Letizia Allegra Mascaro | CNR/LENS, Italy & Giulia de Bonis | INFN, Italy)
14:15 - 14:45  When Casualty meets Inference: complexity in neuroscience
               Viktor Jirsa | Aix Marseille Université, France
14:45 - 15:15  Models for bridging scales from neural circuits to the whole brain
               Alain Destexhe | CNRS, France
15:15 - 15:30  Student Flash Talk Session #1
15:30 - 16:00  Cortical Slow Waves: mechanisms, dynamics and modulation
               Mavi Sanchez-Vives | IDIBAPS, Spain
16:00 - 16:30  Measuring brain complexity across states and scales: a perturbational approach
               Mario Rosanova | University of Milan, Italy
16:30 – 17:00  Coffee break
17:00 – 18:55  PLENARY SESSION II: STATE TRANSITIONS AND THEIR COGNITIVE ROLE (Chair: Giulia De Bonis | INFN, Italy)
17:10 - 17:40  Cognitive and energetic benefits of awake/sleep cycles during incremental learning in multi-areal spiking neural networks
               Pier Stanislao Paolucci | INFN, Italy
17:40 - 18:10  A simple account of the complexity of slow wave activity
               Maurizio Mattia | ISS, Italy
18:10 - 18:30  Student Flash Talk Session #2
18:30 - 18:55  A comprehensive neural simulation of slow-wave sleep and highly responsive wakefulness dynamics
               Jennifer Goldman | CNRS, France
18:55 – 19:30  Informal discussions
TUESDAY 14 JUNE 2022

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09:00 – 10:45  PLENARY SESSION III: MULTI-SCALE APPROACHES TO INVESTIGATE THE BRAIN COMPLEXITY (I) - DATA ANALYSIS METHODS AND RESULTS (Chair: Mavi Sanchez-Vives | IDIBAPS, Spain)

09:05 - 09:35  Mechanisms of brain signaling and consciousness across scales, species, and conditions
Johan Storm | University of Oslo, Norway

09:35 - 10:00  State-dependent cortex-wide broadcasting of sensory information
Francesco Resta | LENS, Italy

10:00 - 10:25  Loss of differentiation and complexity in the sleeping human brain: a multi-scale analysis
Andrea Pigorini | University of Milan, Italy

10:25 - 10:45  Multiscale dynamical characterization of cortical brain states: integrating experimental and computational research in EBRAINS
Arnau Manasanch Berengué | IDIBAPS, Spain

10:45 - 11:15  Coffee break

11:15 – 12:40  PLENARY SESSION IV: INTRODUCTION TO EBRAINS RESOURCES (Chair: Pier Stanislao Paolucci | INFN, Italy)

11:20 - 11:50  The transformative impact of the EBRAINS research infrastructure on research on brain structure, activity and cognitive function: Why - What - How
Jan Bjaalie | University of Oslo, Norway

11:50 - 12:20  EBRAINS Modeling and Simulation Workflows
Michele Migliore | Institute of Biophysics, CNR, Italy

12:20 – 12:30  Student Flash Talk Session #3

12:30 – 13:30  Posters and Lunch
TUESDAY 14 JUNE 2022

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13:30 – 15:15  PLENARY SESSION V: MULTI-SCALE APPROACHES TO INVESTIGATE THE BRAIN COMPLEXITY (II) - DATA ANALYSIS METHODS AND RESULTS (Chair: Arnau Manasanch Berengué | IDIBAPS, Spain)

13:35 - 14:00  Brain-state dependence of functional connectivity in a mouse model of autism

Elena Montagni | LENS, Italy

14:00 - 14:30  Local changes in brain oscillations after stroke

Eric Landsness | Washington University in St. Louis, United States

14:30 - 15:00  Blocks instead of puzzles pieces - analyzing cortical wave activity across scales in an adaptable framework

Robin Gutzen | Forschungszentrum Jülich, Germany

15:00 – 15:15  Student Flash Talk Session #4

15:15 – 15:45  Coffee break

15:45 – 17:15  Hands-on Session 1: Handling EBRAINS Data

Lyuba Zehl | Forschungszentrum Jülich, Germany

17:15 – 18:45  Hands-on Session 2: Running analysis in EBRAINS

Michael Denker, Robin Gutzen & Moritz Kern | Forschungszentrum Jülich, Germany
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<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Topic</th>
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<tr>
<td>09:00 – 11:10</td>
<td>PLENARY SESSION VI: FROM DATA TO MODELS AND SIMULATIONS:</td>
<td>A. MEAN FIELD SIMULATIONS (Chair: Alain Destexhe</td>
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<td>09:05 - 09:30</td>
<td>Computational approaches to study cortical dynamics at</td>
<td>multiple scales</td>
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<td>Alessandra Camassa</td>
<td>IDIBAPS, Spain</td>
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<td>09:30 - 09:55</td>
<td>Cortical Slow Waves in Inferred Models of the Whole</td>
<td>Hemisphere of Mouse</td>
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<td>Chiara de Luca</td>
<td>INFN/Sapienza University of Rome, Italy</td>
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<td>09:55 - 10:20</td>
<td>A general theory of cortical columns from first principle: out-of-equilibrium dynamics</td>
<td>Gianni Valerio Vinci</td>
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<td>10:20 - 10:45</td>
<td>Burst-dependent plasticity and dendritic amplification</td>
<td>support target-based learning and hierarchical imitation learning</td>
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<td>Cristiano Capone</td>
<td>INFN, Italy</td>
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<td>10:45 - 11:10</td>
<td>A multi-class logistic regression algorithm to reliably</td>
<td>infer network connectivity from cell membrane potentials</td>
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<td>Thierry Nieus</td>
<td>University of Milan, Italy</td>
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<td>11:10 – 11:40</td>
<td>Coffee break</td>
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<td>11:40 – 13:30</td>
<td>PLENARY SESSION VII: FROM DATA TO MODELS AND SIMULATIONS:</td>
<td>B. SPIKING SIMULATIONS (Chair: Cristiano Capone</td>
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<td>11:45 - 12:10</td>
<td>High resolution wide-field spiking simulations of mouse</td>
<td>cortical hemisphere</td>
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<td>Elena Pastorelli</td>
<td>INFN, Italy</td>
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<td>12:10 - 12:20</td>
<td>Student Flash Talk Session #5</td>
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Multi-area full-density spiking network models of monkey and human cortices: from anatomy to resting-state dynamics  
Sacha van Albada | Forschungszentrum Jülich, Germany

Simulation of large-scale spiking network models on GPU systems: recent advances  
Bruno Golosio | University of Cagliari, Italy

Student Flash Talk Session #6

Posters and Lunch

Hands-on Session 3: Simulating spatially organised networks with NEST  
Johanna Senk & Jasper Albers | Forschungszentrum Jülich, Germany

Hands-on Session 4: Validating models against data in EBRAINS  
Andrew Davison & Shailesh Appukuttan | CNRS, France

Closing remarks
LIST OF POSTERS

Posters marked with * will be presented in a flash talk during the main programme.

**Poster 01**  Mean field model of resting state cortical dynamics in prodromic phases of Alzheimer's disease
Lorenzo Gaetano Amato (University of Pisa)

**Poster 02**  In premotor cortex functional connected populations are hierarchically organized during movement planning. Canceling a programmed movement requires a network reshuffle
Giampiero Bardella (INFN & Sapienza University of Rome)

**Poster 03**  Hierarchical Optimal Sampling (HOS): a tool for managing and manipulating wide-field imaging datasets
Irene Bernava (INFN)

**Poster 04**  A multiscale network model to investigate the basal ganglia and cerebellum interplay in Parkinson's Disease
Marco Biasizzo (Scuola Superiore Sant'Anna, Pisa)

**Poster 05**  The effects of synaptic plasticity and membrane potential on neural synchronization
Rahmi Elibol (Middle East Technical University)

**Poster 06**  Investigating the impact of cortical lesions on brain complexity in silico
Gianluca Gaglioti (University of Milan)

**Poster 07**  One Fractional Anisotropy in one scan minutes: a generalised deep neural network for clinical applications
Marta Gaviraghi (University of Pavia)

**Poster 08**  NMDA spike dynamics under Timed Synaptic Inhibition
Dhruva Priyan Gowri Mariyappan (University of Montreal)

**Poster 09**  Exploring Student Engagement in a Classroom Setting Using EEG Based Brain-to-Brain Synchrony Analysis
Iqbal Hassan (Advanced Intelligent Multidisciplinary Systems Lab, Institute of Advanced Research, United International University, Dhaka, Bangladesh)

**Poster 10**  Standardised scientific computational workflows as introduced at EBRAINS Research Infrastructure
Sofia Karvounari & Eleni Mathioulaki ("Athena" Research and Innovation Center in Information, Communication and Knowledge Technologies)

**Poster 11**  The role of input on phase transitions in brain networks
Sheida Kazemi (Tarbiat Modares University, Iran)
Poster 12* Multi-layer cerebellar Mean-Field Model for improving BOLD signal simulations
Roberta Lorenzi (University of Pavia)

Poster 13* Burst-dependent plasticity and dendritic amplification support target-based learning and hierarchical imitation learning
Cosimo Lupo (INFN)

Poster 14 An Intelligent Neuromarketing System for Predicting Consumers’ Choice from Electroencephalography Signals and Eye Tracking
Fazla Rabbi Mashrur (United International University)

Poster 15* Venturing into multiple brain sub-networks excitatory/inhibitory balance
Anita Monteverdi (IRCCS Mondino Foundation)

Poster 16 Ethanolic E.tapos yoghurt mitigates transgenerational inheritance of obesity and cognitive deficit in F1 generation of maternal obese dams
Ruth Naomi (Department of Human Anatomy, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia)

Poster 17 Effects of the ethanolic root bark extract of Stachytarpheta Indica on the histology of the cerembrum of adult albino wistar rats
Enobong Edoabasi Obong (University of Ibadan, Nigeria)

Poster 18* Machine learning of diversified sex features across mental disorders
Andreea Prisecaru & Zuzanna Onderko (King’s College London)

Poster 19* In silico brain-inspired meta-learning framework for task-specific action suppression
Federica Robertazzi (The BioRobotics Institute, Sant'Anna School of Advanced Studies, Pisa)

Poster 20* EEG-based Major Depressive Disorder (MDD) Identification through Functional Connectivity Analysis
Jannatul Ferdous Srabonee (Advanced Intelligent Multidisciplinary Systems (AIMS) Lab, Bangladesh)

Leonardo Tonielli (INFN)

Poster 22* Inferring E/I (im)balance in Alzheimer’s disease from large-scale neuronal signal variability and functional connectivity using a symbol dynamics approach
Anne van Nifterick (Amsterdam UMC)
This project has received funding from the European Union’s Horizon 2020 Framework Programme for Research and Innovation under the Specific Grant Agreement No. 945539 (Human Brain Project SGA3).

humanbrainproject.eu/education