ΙΝΣΤΙΤΟΥΤΟ ΜΟΡΙΑΚΗΣ ΒΙΟΛΟΓΙΑΣ ΚΑΙ ΒΙΟΤΕΧΝΟΛΟΓΙΑΣ INSTITUTE OF MOLECULAR BIOLOGY AND BIOTECHNOLOGY

SEMINAR

Region-specific transformations enable distributed computations of flexible decisions

Cognitive flexibility is thought to rely on the prefrontal cortex controlling other regions. However, recent evidence shows that information required to compute flexible decisions is distributed across multiple regions ("everything is everywhere", 2025; International Brain Laboratory, 2025). This shift raises some questions: is 'everything is everywhere' compatible with different task variables being first computed within specific regions and then broadcasted? If so, how to identify which information is communicated across specific regions to ultimately enable flexible decisions? Here, we tackle these questions by analyzing the dynamics within and between six brain regions of the monkey brain engaged in a context-dependent decision-making task (Mante & Susillo et al., 2013).

Dr. Joao Barbosa

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Joao Barbosa is a group leader at the Neuromodulation Institute (INM) and NeuroSpin (Paris). He has been an independent researcher at INM since 2024 and INSERM researcher since 2025. For over a decade, he has built biologically grounded models of cognition using electrophysiology from rodents, monkeys, and humans. His group develops interpretable machine-learning methods, especially neurally constrained, low-rank RNNs, to infer how information flows across brain regions during complex behavior. Central to this work is neural geometry: analyzing low-dimensional dynamics, manifolds, and shape metrics of population activity to reveal distributed architectures beyond single-region accounts. By extracting distributed architectures from large-scale, multi-modal recordings, he moves beyond single-region explanations toward causal network mechanisms of behavioral flexibility.

http://jbarbosa.org/

THURSDAY 11/12/2025

13:00

Costas Fotakis room

Host: Yiota Poirazi

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