INSTITUTO CAJAL

SEMINARIO PRESENCIAL

Jueves, 8 de Junio de 2023
12:00 h. Instituto Cajal - CSIC

DR. JUAN ALVARO GALLEGO
Imperial College London

UNDERSTANDING HOW EMERGENT NEURAL POPULATION ACTIVITY CONTROLS BEHAVIOUR

Abstract

The analysis of neural population activity during behaviour consistently uncovers low-dimensional mathematical structures that capture a large fraction of neural variability. We refer to these structures as “neural manifolds”.
In this talk, I will present ongoing work to understand how the brain generates behaviour by combining this theoretical framework with neural recordings from mice and monkeys as well as computational models. I will primarily focus on a recent study where we asked how different individuals from the same species can produce the same behaviours even if their brains are unique. I will show that, presumably due to the preserved higher-order organisation of neural circuits across individuals, different animals from the same species that perform the same covert of overt behaviour share preserved latent dynamics. I will also discuss ongoing work focusing on another landmark of behaviour: our ability to learn to adapt our movements after a few attempts.
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Affiliation and short bio

Juan A. Gallego is a Lecturer (UK equivalent to Associate Professor) and research group leader in the Department of Bioengineering at Imperial College London, which he joined in January 2020. Prior to that, he was awarded a PhD from CSIC and University Carlos III in 2013, and worked as Postdoctoral Fellow in the Spanish National Research Council (CSIC) and Northwestern University.
Dr Gallego’s research focuses in understanding how the brain generates behaviour using a combination of behavioural experiments, large-scale neural recordings, data analysis techniques, and computational models. He is also interested in translating these findings to neuroprosthetics that restore function to people with movement disorders. During his career, he has published twenty-nine journal papers on these various topics, and has received funding from the EU Commission, the UK Research and Innovation, and the European Research Council.

Related publications with the topic

JA Gallego, MG Perich, LE Miller, SA Solla. Neural Manifolds for the Control of Movement. Neuron 94 (5), 978-984, 2017.

M Safaie, JC Chang, J Park, LE Miller, JT Dudman, MG Perich, JA Gallego. Preserved neural population dynamics across animals performing similar behaviour bioRxiv, 2022.09. 26.509498, 2022.

MG Perich, JA Gallego, LE Miller. A neural population mechanism for rapid learning. Neuron 100 (4), 964-976.e7, 2018.

B Feulner, MG Perich, LE Miller, C Clopath, JA Gallego. Feedback-based motor control can guide plasticity and drive rapid learning. bioRxiv, 2022.10. 06.511108, 2022.

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