



NeurotechEU Winter School

Brain Architecture for NeuroAI and Neurotechnology: a Systems Neuroscience perspective



UMH, 8-12 December 2025

One of the main challenges in neuroscience is understanding how various brain systems work together as an integrated, embodied system situated in the real world. This means the brain's architecture must be mapped to the systems of the mind. This challenge has taken on a new character with the rise of neuroAI, where principles of brain organization inform the realization and analysis of avant-garde Artificial Intelligence systems. This Winter School will bring together experts in the evolution and development of the mammalian brain, brain systems underlying motivation, cognition, and consciousness, the modelling and analysis of artificial cognitive architectures, and bioethics, to discover common principles of the biological brain and how these can be emulated and elucidated in artificial ones. The results of the Winter School will be summarized in a position paper co-authored by the participants. All presentations will be made publicly available together with a podcast via the CSNetwork.eu podcast library.

The Winter School will feature lectures in the morning, followed by focused discussions and tutorials in the afternoon. It is designed for Master's, doctoral students, and early-career researchers.

Local organizers UMH, Elche, Spain

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In collaboration with the EU projects



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Speakers & Availability Map (for quick reference)

- **Luis Puelles** (U Murcia): **Mon 8 Dec**
- **Zoltán Molnár** (Oxford): **Mon 8–Tue 9 Dec**
- **Peter Dominey** (CNRS/INSERM): **Mon 8–Wed 10 Dec**
- **Jonathan Whitlock** (Kavli/NTNU): **Tue 9–Wed 10 Dec**
- **Stuart Wilson** (U Sheffield): **Tue 9–Thu 11 Dec**
- **Andreas Kardamakis** (CSIC-UMH): **Mon 8–Fri 12 Dec** (*assumed full week*)
- **Anna Mura** (UMH): **Mon 8–Fri 12 Dec** (*full week*)
- **Tony Prescott** (U Sheffield): **Mon 8–Fri 12 Dec** (*full week*)
- **Paul Verschure** (UMH): **Mon 8–Fri 12 Dec** (*full week*)





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School Program:

Mon 8 Dec (Day 1) — (Kick-off): **Anatomy; Language; Attention**

09:00–09:15 Welcome & orientation (chairs: P. Verschure & team)

09:15–10:45 Keynote: Neuroanatomy foundations — *Luis Puelles* (UMurcia)

10:45–11:00 Break

11:00–12:30 Cortical development & systems implications — *Zoltán Molnár* (Oxford)

12:30–14:00 Lunch

14:00–15:30 Keynote: Language, sequence & sensorimotor integration — *Peter Dominey*
(CNRS/INSERM)

15:30–16:00 Break

16:00–17:45 Architectures Tutorial I: Distributed Adaptive Control — *Ismael Freire* (U Sorbonne)

16:00–17:45 (parallel) LM Handbook Sprint Kick-off — Leads: *Paul Verschure, Anna Mura, Tony Prescott*

17:45–18:00 Wrap up

18:15–19:30 Welcome reception & Poster setup (Poster Session)





Tue 9 Dec (Day 2) — Social Learning and Architectures

09:00–10:30 Keynote: Motor behaviour & social learning — *Jonathan Whitlock* (Kavli/NTNU)
10:30–11:00 Break
11:00–12:30 Keynote: Mental Time Travel in Sequential Episodic Control — *Ismael Freire* (U Sorbonne)
12:30–14:00 Lunch /Poster Session
14:00–15:30 Keynote/Tutorial II: neuroAI, LLMs and Machine Learning — *Luca Menneschi*
15:30–16:00 Break
16:00–17:45 Mentoring Clinics (Whitlock, Molnár, Kardamakis)
16:00–17:45 Discussion
16:00–17:45 (parallel) LM Handbook: break-out groups, section editors.
17:45–18:30 Panel Language–Action–Social learning convergence — *Dominey, Whitlock, Wilson, Freire* (chair: Verschure)

Wed 10 Dec (Day 3) — Language × Action × Architectures

09:00–10:30 Keynote: The control of Nanobots — *Maria Guix* (U Barcelona)
10:30–11:00 Break
11:00–12:30 Keynote: The Distributed Adaptive Control of Volition — *Paul Verschure* (UMH)
12:30–14:00 Lunch
14:00–15:00 Keynote: The Control of the Self — *Alejandro Jimenez* (U Sheffield)
Tutorial
15:00–16:00 Architectures Tutorial III: From circuits to controllers — *Stuart Wilson* (U Sheffield)
16:00–16:30 Break
16:30–17:45 Discussion
16:30–17:45 LM Handbook: Sections and Roadmap drafting
17:45–18:00 Panel Brain Architectures and neuroAI — *Dominey, Verschure, Guix, Wilson* (chair: Prescott)



Thu 11 Dec (Day 4) — Architectures capstone & Translation

09:00–10:30 Constraint closure and Behavioral Control— *Stuart Wilson* (U Sheffield)
10:30–11:00 Break
11:00–12:30 The architecture of motivation and the self— *Tony Prescott* (U Sheffield)
12:30–14:00 Lunch
14:00–15:30 Translational Neurotechnology clinic (hardware-in-the-loop, BCIs, rehab pipelines) — panel incl. *Mura, Verschure, Kardamakis* (+ local labs/industry if available)
16:00–17:45 LM Handbook Editors' Review #1 — *Alejandro* leads; figures/QC sweep
17:45–18:00 Wrap up
Evening Optional social / site visit

Fri 12 Dec (Day 5) — Synthesis & Roadmap handoff

09:00–10:30 Keynote/Advanced: *From attention to behavior: integrative accounts* — *Kardamakis*
10:30–11:00 Break
11:00–12:00 Team Project Demos & Short Pitches (5–6 min + 2 Q&A)
12:00–12:30 Awards & Feedback (best poster, best demo)
12:30–13:00 Closing Roundtable: Next steps (summer school, collaborations)
14:00 Close / departures
09:00–12:30 (parallel) LM Handbook Final Sprint — *Luca + Alejandro*: lock Roadmap v0.9 & action list to v1.0



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Venue:

To Be Announced





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