MASTER 2 Computational Neurosciences

Internship proposal 2025-2026

(internship from January to June 2026)

Host laboratory: *Center for Neuroscience Research of Lyon*

Host team : *Adaptive Control group / COPHY team* https://www.adaptivecontrol.org/

Internship supervisors : *Romain Ligneul / Chargé de recherche – Principal Investigator*

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Project title : *Neuromodulatory control of regime-switching dynamics in a foraging task*

Project summary :

Computational models have advanced our understanding of the algorithmic basis of behavior, allowing quantification of how nervous systems predict, act, and learn. However, a key challenge is the non-stationarity of behavior: even in simple tasks, organisms switch between distinct behavioral states (e.g., engaged/disengaged) characterized by different neural activity, attentional focus, and decision-making strategies. This Master's project addresses this challenge by developing state-space models (ARHMM and GLM-HMM) to segment behavior during a foraging task designed to test specific hypotheses regarding the roles of dopamine and serotonin in regulating neurobehavioral regimes across species. Existing datasets from human and mouse studies are available for candidates interested primarily in modeling and theoretical analysis. A willingness to learn experimental systems neuroscience techniques (optogenetics, calcium imaging, and/or electrophysiology) would be a plus.

Related publications :

Ligneul, Romain, et al. "Stress-sensitive inference of task controllability." *Nature Human Behaviour* 6.6 (2022): 812-822.
Ligneul, Romain. "Prediction or causation? Towards a redefinition of task controllability." *Trends in Cognitive Sciences* 25.6 (2021): 431-433.
Ligneul, Romain, and Zachary F. Mainen. "Serotonin." *Current Biology* 33.23 (2023): R1216-R1221.

Please send your proposal to matteo.divolo@univ-lyon1.fr for publication on the Master of Neuroscience website.