Host laboratory: *CRNL*

Host team : *Cophy team*

Internship supervisors :

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Project title : *Investigating Predictive Coding Mechanisms with MEG Data*

Project summary : *5-10 lines*

Predictive coding is a fundamental framework in computational neuroscience that posits the brain as a hierarchical system, constantly generating and updating predictions about incoming sensory inputs. Despite the popularity of this approach, the mechanisms behind it are still the subject of scientific debate. Magnetoencephalography (MEG) offers a unique opportunity to study predictive coding due to its excellent temporal resolution and ability to capture dynamic brain activity patterns. Recent advancements in MEG technology, such as optically pumped magnetometers (OPM-MEG), further expand the possibilities for studying neural activity with increased flexibility and spatial resolution. The goal of this internship is to apply machine learning methods to decode predictions and prediction errors in sensory processing tasks in an existing MEG dataset and combine these results with behavioral data.

Related publications :

Millidge, B., Seth, A., & Buckley, C. L. (2021). Predictive coding: a theoretical and experimental review. arXiv preprint arXiv:2107.12979

Vinck M, Uran C, Spyropoulos G, Onorato I, Broggini AC, Schneider M, Canales-Johnson A (2023). Principles of large-scale neural interactions. Neuron 111 (7), 917-1164. Brookes, M. J., Leggett, J., Rea, M., Hill, R. M., Holmes, N., Boto, E., & Bowtell, R. (2022). Magnetoencephalography with optically pumped magnetometers (OPM-MEG): the next generation of functional neuroimaging. Trends in Neurosciences, 45(8), 621-634. > Danila Gutteling, T. P., Bonnefond, M., Clausner, T., Daligault, S., Romain, R., Mitryukovskiy, S., ... & Schwartz, D. (2023). A new generation of OPM for high dynamic and large bandwidth MEG: the 4He OPMs—first applications in healthy volunteers. Sensors, 23(5), 2801. > Danila Tavoosi, P., Azemi, G., & Sowman, P. F. (2024). Decoding of auditory surprise in adult magnetoencephalography data using Bayesian models. Digital Signal Processing, 148, 104450.

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