Offre de stage de Master / Master Internship offer

Date of the offer: June2024

Tuteur du stage et Laboratoire d'accueil / Internship supervisor and Host laboratory:

Laboratoire / Lab : Lyon Neuroscience Research Centre (PsyR2)

Duration: 2-6 months

Encadrant du stage / Supervisor for the internship: Jacqueline Scholl, CRCN Inserm, jacqueline.scholl@inserm.fr

Adresse du stage / Address of the internship: CRNL (CH Le Vinatier, 95 Bd Pinel, 69500 Bron)

Site internet de l'équipe / Team Website : https://sites.google.com/view/jacqueline-scholl/home and https://www.psyr2team.com

Langues parlées dans l'équipe / Languages spoken in the lab: English and French

Project descriptions

Project 1: Emotions and brain networks during foraging under threat

Background

In research on how people learn and make decisions, a very widely used and fruitful design is the n-alternatives forced choice task, an experiment structured into trials in which participants choose between several options. However, this framework cannot capture all important aspects of decision-making. Of relevance here, this approach does not capture how people prioritize behaviour in a self-determined way, deciding what to do when for how long. This has been addressed in cognitive neuroscience in a new approach over the last decade, the 'neuro-ecological framework' (Kolling & Scholl 2024, Scholl & Klein-Flügge 2018). Here, tasks are designed inspired by evolutionary considerations of 'naturalistic' behaviours the brain has evolved to solve. We have used this framework to address how people plan, see through their plans in a self-determined way and how this is affect by individual differences in apathy (Scholl et al. 2022) (people with apathy were less flexible in stopping a course of action that was no longer fruitful). We have also used this framework to understand how threat and stress affects self-determined behaviour and how this is affected by clinical dimensions like anxiety, anhedonia or compulsivity (Trier et al. 2023a). Examining the brain areas underlying this (Trier et al. 2023b) revealed wide-spread cortical and subcortical networks.

Project:

In the present project, we will build on our previous work, analysing already acquired FMRI data (Trier et al. 2023b) to ask: How do emotions change brain activity during foraging under threat? Do they change brain network compositions and/or their temporal dynamics? To answer this, we will use

computational modelling, including graph theory and hidden Markov models (HMMs) of the brain imaging data. Graph theory models allow assessing how central different nodes (brain areas) are to larger brain networks and how this changes with conditions of the task or emotions. HMMs can be applied to behaviour or to brain activity. When applied to behaviour (HMM-GLM), they reveal global states that change how participants process information (e.g. in a state that could be labelled 'stressed', participants might pay more attention to possibilities of escape and hide more). When applied to the brain, they allow assessing the stability of brain networks over time, to test for example whether when stressed brain states are less stable, analogous to the subjective experience of the mind jumping from one idea to the next.

This proposal is well suited for a student with either a computational background or prior experience with coding and a strong interest in learning advanced brain imaging methods.

References:

Kolling N, Scholl J (2024) On the role of behavioural modes during temporally extended decision making and their neural substrates. Current Opinion in Behavioral Sciences 58: 101404 doi: 10.1016/j.cobeha.2024.101404

Scholl J, Klein-Flügge MC (2018) Understanding psychiatric disease by capturing ecologically relevant features of learning and decision-making. Behavioural Brain Research 355, 56-75. Doi: 10.1016/j.bbr.2017.09.050

Trier HA, O'Reilly J, Spiering L, Ma SM, Kolling N, Rushworth MFS*, Scholl J* (in revision) Emotions and individual differences shape foraging under threat. Preprint: 10.31234/osf.io/v6u3y

Trier HA, Khalighinejad N, Priestley L, Hamilton S, Harbison C, Laubach M, Scholl J*, Rushworth MFS* (in submission) An ancient subcortical circuit regulates the switching and re-orienting of behaviour to threat in humans. Preprint: 10.1101/2023.10.24.563636