Internship proposal 2022-2023

(internship from January to June 2023)

Host laboratory: Lyon Neuroscience Research Centre, Centre Hospitalier Le Vinatier, 95 Boulevard Pinel, 69500 Bron

Host team : PsyR2 https://www.crnl.fr/en/equipe/psyr2 , Centre Hospitalier Le Vinatier, 95 Boulevard Pinel, 69500 Bron

Internship supervisors : Jacqueline Scholl, CRCN INSERM, Jacquie.scholl@gmail.com

Project title : Reinforcement learning in dysphoria – a behavioural and neural investigation

Project summary : *approx 10 lines*
Depression is the most common mental illness, with a lifetime prevalence between 10 and 20%. Despite increasing research efforts to tackle this problem, a lot is still unknown about the psychological and brain mechanisms underlying this debilitating disorder. Understanding these underlying mechanisms is crucial for finding novel treatments and diagnostic tools. For example, recently, we have shown that antidepressants change neural markers of learning (Scholl et al., 2017, Scholl and Kolling et al., 2015). However, it is not known whether the same processes are actually affected by depression. The aim of this project is therefore to elucidate whether and if so how learning is affect in depression, both in terms of behavioural and neural measures.
We want to address this question using a computational psychiatry approach (Scholl and Klein-Flügge, 2017). We have designed a computerized learning and decision-making task. We have collected behavioural and neural (FMRI) data from 20 healthy participants and 20 participants with dysphoria. We will analyse participants' data using computational models. The aim is to measure aspects of behaviour that might lie close to the heart of the basic neural mechanisms of choice and learning, affected by depression.
The hope is that understanding more about the mechanisms underlying depression will ultimately lead to the development of new treatments directly targeting these mechanisms, such as for example better targeted non-invasive transcranial stimulation.

Student involvement
The data for this project has already been collected. The focus of this project will be on developing the data analysis in R, Stan and FSL. The student will learn to code computational

learning models, ranging from simple ones (with R) to more complex hierarchical ones in a Bayesian framework (with Stan). The student will also learn to use computational modelling to interrogate neuroimaging data (with FSL and R). A keen interest in learning to code is therefore crucial. Prior experience with coding might be helpful, but is not required.

3-5 recent publications :

Scholl J., Trier H.A., Rushworth MFS, Kolling N (in press) Should I stick with it or move on? The effect of apathy and compulsivity on planning and stopping in sequential decision making. PLoS Biology

Scholl, J., Kolling, N., Nelissen, N., Browning, M., Rushworth, M. F., & Harmer, C. J. (2017). Beyond negative valence: 2-week administration of a serotonergic antidepressant enhances both reward and effort learning signals. PLoS biology, 15(2), e2000756

Scholl, J., Kolling, N., Nelissen, N., Wittmann, M. K., Harmer, C. J., & Rushworth, M. F. (2015). The good, the bad, and the irrelevant: neural mechanisms of learning real and hypothetical rewards and effort. Journal of Neuroscience, 35(32), 11233-11251

Scholl, J., & Klein-Flügge, M. (2017). Understanding psychiatric disease by capturing ecologically relevant features of learning and decision-making. Behavioural brain research.