



# ROLE OF PERSONALITY IN THE AWARENESS AND MEMORY OF VISUAL REPRESENTATIONS



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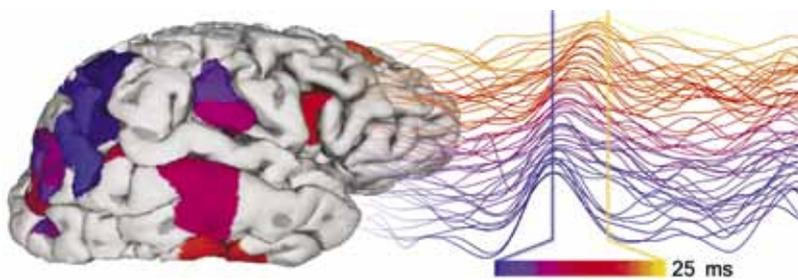
Systems neuroscience holds great promise for understanding the networks of biological mechanisms that give rise to human personality, mind, and behaviour. Inter-individual variability is large in these processes as well as in the very core cognitive operations, such as perception, attention, and working memory. Yet, while inter-individual variability in behavioural measures such as reaction times or accuracy is often exploited statistically in neuroimaging research, very few studies have explicitly addressed their neuronal basis and relationship with personality.

In this project, we aim to identify the systems-level neuronal mechanisms that causally underlie individual cognitive capabilities and moment-to-moment fluctuations in cognitive performance, and

thereby constitute the biological substrates of some facets of human personality. We investigate the neuronal correlates of personality and inter-individual variability by using human neuroimaging with magneto- and electroencephalography (MEG/EEG) and transcranial magnetic stimulation (TMS). We advance a multi-scale model of mental dynamics where the human consciousness at any moment comprises of numerous concurrent and nested mental states associated with distinct time scales from tens of milliseconds to hundreds of seconds, which emerge from multi-scale neuronal dynamics. Our framework bridges three physical and phenomenological scales of neuronal phenomena with the aim to discover how these processes may explain inter-individual variability, correlate with personality

traits, and directly underlie the fluctuations in task performance. We present a series of testable hypotheses and a research paradigm for identifying the specific subset of neuronal activity that is linked with the measurable momentary attributes of human mind. We pursue this aim with a series of behavioural, neuroimaging, and -stimulation experiments, computational modelling, and development of novel data-analysis and -sharing methods.

This project brings together two cross-disciplinary fields in the study of the human mind: personality psychology and the cognitive neuroscience. This approach and our novel methods have the potential to open up new directions for neuroscience and psychology, and contribute to a significant paradigm shift in the field.



*Neuronal avalanches are cascades of propagating (see colour scale) neuronal activity and may be observed in spontaneous source-reconstructed magneto- and electroencephalography (M/EEG) data. They reflect micro-scale (<< 1 s) neuronal communication and mental states that are directly correlated with individual-trait-like macro-scale (>> 1 s) behavioural and brain dynamics (Palva et al., 2013, PNAS).*

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