Contribution ID: **13** Type: **Talk**

Unified Framework for Perceptual Decision Making

Tuesday, July 19, 2022 2:50 PM (20 minutes)

Perceptual memories are the storage of our experiences; they are the basis for understanding the external world and guiding our decisions. Despite fast-paced research, behavioural and cognitive constructs tend to be custom built around a preferred task and general principles across tasks seem to be missing.
To address these issues, we aim to build a computational model comprised of interconnected functional units, each performing a specific task-independent operation; the interaction between units and the readout of the system is controlled in a top-down manner according to behavioural requirements. We aim to relate this model to neural activity in brain regions involved in perceptual decision making.
We trained each rat to perform two different tasks requiring the elaboration of whisker stimuli: (I) a categorization task, where a single stimulus must be judged ("strong"or "weak") according to an implicit boundary, and (II) a delayed comparison task, where a base stimulus must be stored in short-term memory for comparison to a successive stimulus.
We find that several aspects of history, such as recent stimuli and recent choice outcomes, factor into the choice of the current trial. We use this information to produce a single model accounting for both tasks. We correlate the model with neural recordings during the execution of both tasks and find that cortical activity can fill in the model's terms to produce behavioural output. Additionally, we perturb neural activity by optogenetic stimulation, seeing a causal link between activity in frontal and parietal regions and our model's cognitive units.

Primary author: GIANA, Davide (SISSA)

Co-authors: PULECCHI, Francesca (SISSA); GUGLIETTI, Annachiara (SISSA); Prof. DIAMOND, Mathew (SISSA)

Presenter: GIANA, Davide (SISSA)

Session Classification: Perceptual Decision Making

Track Classification: Predictive Processes and Statistical Learning