Decoding visible and memorized stimulus features from neuronal ensembles in the prefrontal and visual cortices

Sunday, May 23, 3:00 - 5:00 pm MSK

View Poster **Visit me in Gather.Town**

Panagiotis Sapountzis[1,2] (pasapoyn@iacm.forth.gr), Sofia Paneri[1,2], Sotirios Papadopoulos[1], Georgia Gregoriou[1,2]; [1]University of Crete, Faculty of Medicine, [2]Foundation for Research & Technology, Hellas (FORTH)

A long-standing question in neuroscientific research is how sensory information is encoded and maintained in working memory (WM). Although converging evidence has suggested that activity in the prefrontal cortex (PFC) is critical for WM, the contribution of distinct regions within the PFC in the retention of behaviorally relevant visual features is unknown. Furthermore, it has been recently suggested that PFC processes higher-order information, whereas feature-specific information is rather retained in visual areas. To address these questions, we performed simultaneous extracellular recordings from the ventral prearcuate area (VPA), the frontal eye field (FEF) and visual area V4 in two monkeys engaged in a cued attention task. In each trial, information about the location or color of the upcoming target was provided by a spatial/color cue that had to be memorized. To estimate the location/color information carried by neuronal ensembles in the different areas, we applied machine learning approaches to spiking and local field potential (LFP) activity. Our results suggest that PFC neuronal ensembles encode and retain in WM spatial and color information in an anatomically-specific manner. Higher decoding accuracies were obtained from the FEF population for spatial information, whereas color information was decoded more robustly from VPA during the cue and delay periods. Moreover, we found that the population code for color identity changed during the delay period in VPA. Interestingly, a subset of V4 neurons with non-central RFs also carried spatial and color information in their firing patterns during the delay. An LFP analysis indicated that spatial information can be robustly decoded from both areas from high-gamma and beta LFP bands, whereas color information can be reliably decoded from VPA only. Altogether, our results shed light into the functional anatomy of WM in the prefrontal and visual cortices.

Acknowledgements: Funded by Greece and European Union (European Social Fund), Operational Programme "Human Resources Development, Education and Lifelong Learning 2014-2020" (project MIS 5048179) and by Hellenic Foundation for Research and Innovation and General Secretariat for Research and Technology (grant 1199)

< Back