Invited | Timing & Time Perception

Fri. Oct 17, 2025 11:00 AM - 12:00 PM JST | Fri. Oct 17, 2025 2:00 AM - 3:00 AM UTC Venue 1(Room 1)

[K1] Keynote : Kalanit Grill-Spector

Chair:Domenica Bueti(International School for Advanced Studies (SISSA))

A key goal of cognitive neuroscience is to generate an understanding of the functional neuroanatomy of cortical systems. fMRI and computational modeling have transformed our understanding of the human brain. In the visual system, modeling population receptive fields (pRF) led to discoveries of multiple maps of pRF eccentricity, polar angle, and size as well as explained cognitive phenomena like spatial attention and the face inversion effect. However, due to the low temporal resolution of fMRI and the low spatial resolution of EEG/MEG it is unknown what is the nature of spatiotemporal computations in the human brain
Using computational encoding models and the visual system as a model system, I will describe recent empirical and computational innovations that have advanced understanding of key cognitive neuroscience questions. Specifically, I will describe a new empirical and computational framework for estimating from fMRI data the spatiotemporal population receptive field (st-pRF) of each voxel in the visual system in units of visual degrees and milliseconds. I will start by showing how we tested and validated the sp-pRF framework vs. ground truth data. Then, we use this framework to elucidate the spatiotemporal computations across the human visual system for the first time, finding that spatial and temporal windows as well as compressive nonlinearities increases systematically across the visual hierarchy. With this understanding in hand, we then assess how simple, bottom-up computations by st-pRFs may affect visual capacity and explain elusive phenomena like why neural responses are suppressed when multiple visual stimuli are presented at once compared to one after the other in sequence. I will end by the discussing the relevance of this powerful spatiotemporal pRF framework for understanding other sensory and cognitive systems in the brain.

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[K1-01]

Understanding cognitive processing in the human visual system using spatiotemporal population receptive fields

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Keywords: Computational Modeling, Human Visual System, Spatiotemporal Population Receptive Fields