Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad – 500 046

Seminar

Emergence of structure in cortical circuits through bottom-up dynamical principles

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Modularity and hierarchy are fundamental and functionally critical features of neural circuits. However, their developmental emergence remains unclear. In this talk, I will demonstrate how simple bottom-up dynamical rules can give rise to structure in the cortex, with emphasis on modularity in grid cells and hierarchy in the visual cortex.

For grid cells, I will introduce a novel principle called "peak selection", explaining how local interactions can form modules through topological quantisation, leading to numerical predictions that yield the best match to data till date. For the visual cortex, I will show how competitive synaptic growth driven by spontaneous retinal waves can lead to the emergence of a spatially arranged visual cortical hierarchy with primate-like retinotopy.

The formulation of these simple dynamical principles governing neurodevelopment results in diverse testable hypotheses for future developmental, connectomic and physiology studies.

Monday, Apr 8th 2024

16:00 Hrs (Tea / Coffee 15:45 Hrs)

Auditorium, TIFR-H