Research Topics

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Created 5/15/2015
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Yoram Burak’s group investigates how neural circuits in the brain perform biologically relevant computations, such as: sensory inference, maintenance of short-term memory, and generation of motor output.

Topics of current interest include:

Short-term memory in noisy neural networks

How does neural activity in the brain maintain, and represent, short term memories? What are the constraints posed by neural processing and by neural stochasticity?? We are interested especially in the representation of continuous variables, such as orientation, eye position, location in space, or accumulated evidence.

Sequence generation and learning

How do local plasticity rules in the brain shape the global structure of a neural circuit? Under what conditions can they give rise to neural networks that generate precisely timed sequences of neural activity? ?

Invariant sensory perception

How does the brain infer the structure of the external world from sensory inputs, while remaining insensitive to transformations such as translation and rotation? A particular area of interest is fixational eye motion, and the consequences of this motion for high-acuity vision.

Spatial coding and computation in the brain

What are the mechanisms that underly the dynamical properties of grid cells in the entorhinal cortex? Are there fundamental principles that explain the structure of the grid cell code for position?

Funding

Our research is currently supported by the Israel Science Foundation, and by the Gatsby Charitable Foundation.
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