

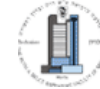


The Lorry I. Lokey Interdisciplinary Center  
for Life Sciences and Engineering

NETWORK BIOLOGY RESEARCH LABORATORIES



TECHNION Department of Electrical Engineering



Technion - Israel Institute of Technology  
The Ruth and Bruce Rappaport Faculty of Medicine

## Constructing a neuronal network of spatial perception from video images

### Background:

It is known that the brain contains special neurons called *grid cells*, which represent the environment using a hexagonal lattice. These cells are part of the hippocampal formation brain neural network, which is related to the construction of an internal *cognitive map*. Other types of nerve cells in this region include head-direction cells, border cells and place cells. The hypothesis is that the brain can read out information from the population of grid cells for use during navigation. Prominent theories related to the formation of grid cells rely either on attractor networks or on summation of multiple oscillators.

### Project Description:

We will use video images collected during a random foraging task in a room in order to feed into a multiple-layered neural network. Our aim will be to see if we can construct grid cell hexagonal patterns from such input. We will research how sensory input can be used in order to form a reconstruction of the spatial environment.

### Prerequisites:

- Matlab programming skills
- Familiarity with neural networks and/or willingness to self study relevant aspects
- The course Introduction to Biological Signals and Systems 046326
- Interest in real brain systems

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