



Development of a model for complex neural activity

Requirements:

044202 - Random signals

046326 - Introduction to biological signals and systems

Project require also knowledge of dynamical system behavior, and use of Matlab (or other mathematical simulation software if preferred)

Introduction:

Complex dynamics, long-range correlations and multiplicity of time scales are a prominent characteristic of neural activity. A common approach in neural modeling to reproduce this behavior is by complicating the model and plugging of more and more temporal scales into it. Recently, an alternative approach was suggested that generates activity dynamics at multiple time-scales using a relatively simple underlying mechanism.

Project Description:

The project objective is to generalize the above mentioned approach to a more realistic model neuron, such as a modification of the Hodgkin-Huxley model. This will enable an exploration of the different dynamic properties of the extended model and comparison to real data from neurons recorded in the lab.

Project Requirements:

- Investigating a mathematical model developed in the lab for neural excitability
- Using this model as a basis for a spiking neuron model (e.g. HH model)
- Investigating the properties of this model
- Compare the behavior of the model with real neuron behavior. Understanding of what the model explains, and where it fails.
- Suggesting and designing of experiments to validate further the model and its predictions.

Project Duration:

One semester, with an optional extension

Contact:

Asaf Gal (04-829)-5074 asafg1@gmail.com

Danny Eytan (04-829)-5074 dannye@technion.ac.il