סילבוס לקורס מבוא לחישוביות עצבית

Course syllabus: Introduction to computational neuroscience

The aim of the course is to introduce modern quantitative methods for the modeling of complex neural systems. The course particularly reviews single-neuron and neural network models. Part of the course is devoted to acquiring basic mathematical tools required for understanding the models. Students will apply their knowledge in participating in a computer simulation laboratory every week.

Syllabus:

1. Artificial Neural Networks: The Perceptron Learning Algorithm, Multilayer Perceptron, the Back-Propagation algorithm, Deep Convolutional Networks, Recurrent Neural Networks, and the Hopfield model.
2. Neural networks and information theory.
3. Modeling of individual neurons: Integrate-and-Fire, Hodgkin-Huxley, FitzHugh-Nagumo and Morris-Lecar Models, synaptic information transfer and propagations of action potential along axons, with foundations of non-linear dynamics and dynamical systems: phase-space analysis, fixed points and stability analysis, bifurcation theory.
4. Network and Graph Theory: (random, small word and scale-free networks), the Strogatz-Watts model, and the Barabasi-Albert model.

Final grade:
Homework assignments 50%
Final project 50%