

S. Courellis

Neural Networks with Physiological Applications

The course will focus on various traditional and emerging neural network topologies and their application to solve problems in physiology and medicine. The audience need not have any prior knowledge of Neural Networks, as an introductory session will be dedicated to basic neural network concepts (e.g., neuron types, connectivity, learning rules, and so on) and architectures (e.g., feed-forward, recursive, feed-forward with lateral inhibition, and so on). Subsequently, focus will shift on specific Neural Network concepts and topologies associated mainly with Multi-Layer Perceptrons (MLPs), Hopfield Networks, Self-Organizing Maps (SOMs), Cellular Neural Nets (CNNs), Radial Basis Function Neural Networks (RBFNNs), Support Vector Machines (SVMs), Bayesian Neural Networks (BNNs), and Spiking Neural Networks (SNNs). The category of applications each topology addresses and guidelines in selecting and adjusting the size of a network and in establishing good training and testing protocols will be discussed throughout the course. Case studies will be presented and discussed from a number of areas in physiology and medicine including neurophysiology (with emphasis in neuroprosthetics), cardiology, vision, biosensors, and so on. The course will involve the participants in individual and group class activities. Several class activities will involve running software (demo and simulation tools) distributed during class. Bring your laptop, install, and take with you most of the software we will use in class.