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Thesis Title	*Synchronization phenomena in neural networks*
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Summary	We investigate a system of coupled neurons to understand synchronization phenomena in the human brain. For the simulation of dynamics of neurons we used the Leaky Integrate-and-Fire (LIF) model. The LIF model approximates the dynamics of neurons viewed as capacitors with leakage current. When the neuron potential reaches a threshold it discharges thus generating a spike. The neural network used is a 2D square lattice network with periodic boundary conditions. The main phenomenon that we investigate is chimera states. Chimera states are characterized by simultaneous existence of spatiotemporal synchronized and unsynchronized regions within the same system. We investigate the following control parameters: (a) number of interacting neurons, (b) coupling constant. We also investigate how the initial conditions affect the formation of chimera states. Our results lead to the following conclusions: We have multistability, which means that different stable states arise by only changing the initial conditions. We observe that symmetric chimera states arise with their unsynchronized regions forming the nodes of a square lattice. In the corresponding frequency diagrams we observe that frequency wells appear in the same positions where the unsynchronous regions are formed. The stability and depth of these frequency wells increases with the coupling constant.
Key words	Neural networks, coupled oscillators, synchronization, chimera states, Leaky Integrate-and-Fire model
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