

## **Distributed Coordination and Consensus in Multi-agent Systems: Consensus, Flocking, and Social Learning**

Over the past few years there has been a rapidly growing interest in analysis, design and optimization of various types of collective behaviors in networked dynamic systems. In this talk, I will present some of the work that has been going on in my group over the past 10 years on collective phenomena such as flocking, schooling, rendezvous, synchronization, and motion coordination in multi-vehicle systems. The main underlying theme is to study emergence of agreement and consensus in various contexts. Next, I will present a dynamic model of information aggregation and social learning in which heterogeneous agents in a network would like to learn a true state of the world using a stream of private information and opinion exchanges with their neighbors. The information required for learning an unknown state of the world may not be at the disposal of any single agent and individuals engage in communication with their neighbors in order to learn from their experiences. Motivated by the practical difficulties of Bayesian updating of beliefs in a network setting, I will present a simple update mechanism in which instead of incorporating the views of their neighbors in a fully Bayesian manner, agents use a simple updating rule that combines their personal experience and the views of their neighbors. I will characterize bounds on the rate of learning of this model and discuss the relationship between the rate of learning and the quality of observations as well as the location and influence of agents. Finally I will show the implications of the network topology and existence of influential agents on the rate of learning.