Distributed Estimation in Limited-Communication Environments

Chinwendu Enyioha¹

¹ Department of Electrical and Computer Engineering, University of Central Florida, Orlando, Florida

One of the key elements in multi-agents systems operation is communication, since after sensing and locally processing, the agents need to share information with neighboring agents or the base station to collectively accomplish the set objective. As sensor networks are used for more applications in spatially distributed, large-scale and complex networked autonomous systems, the need for high precision cooperative sensing algorithms is an even more important problem, especially in safety-critical systems. In the talk, I will discuss the problem of estimation with a set of spatially distributed autonomous sensors and present a distributed and optimal state estimator over a network of sensors operating in a communication-constrained environment. The approach is for agents to share compressed state estimates with neighboring agents. In such problems, since a focus on the measure of confidence in the estimates, I will show how estimation error covariances are computed in a fully distributed manner by leveraging the strongly connected network and independence of state estimation from the estimation error covariance computation. This approach enables a fully distributed implementation of the optimal consensus-based filter. The talk will highlight utility of the algorithm for mission planing and discuss the associated effects of information compression amongst other parameters on performance.

Bio: Dr. Enyioha's research focuses on distributed decision-making and limitedcommunication control of networked autonomous systems. He leads the Autonomous and Intelligent Systems Lab at University of Central Florida (UCF). Prior to arriving UCF as an Assistant Professor of ECE, he was a Postdoctoral Fellow at Harvard and Tufts Universities, and a Postdoctoral Researcher in the GRASP Lab at University of Pennsylvania (Penn). He received the B.Sc. degree in Mathematics from Gardner-Webb University and the PhD degree in Electrical Engineering from Penn. Dr. Enyioha is a Fellow of the Ford Foundation, was named a William Fontaine Scholar at Penn.