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Input driven consensus algorithm for distributed estimation and classification in sensor networks

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Abstract:

This seminar deals with the problem of simultaneously (a) classifying sensors and (b) estimating hidden parameters in a network with communication constraints. In particular, we consider a network where sensors measure a common parameter with different precision rank. The goal of each unit is (a) to determine its own specific type and (b) to estimate the unknown parameter through local communication and computation. We present a decentralized version of the centralized maximum likelihood estimator. Each sensor computes local sufficient statistics by using its own observations and transmits its local information to its neighbors. By exploiting an input driven consensus algorithm, the local information can be gradually propagated through the entire network, allowing the estimation of the global parameter. We prove the convergence of the proposed algorithm and we show that the relative classification error converges to that of the centralized ML, as the network dimension goes to infinity. Moreover, we numerically compare this strategy with an implementation of the expectation-maximization (EM) algorithm.

Biography:

Chiara Ravazzi received the B.Sc., M.Sc., and Ph.D. degrees in applied mathematics from Politecnico di Torino, Italy, in 2005, 2007, and 2011, respectively. In 2010, she was a visiting scholar at the Laboratory for Information and Decision Systems, Massachusetts Institute of Technology, Cambridge. She is currently a post-doctoral scholar at Politecnico di Torino. Her research interests encompass coding theory (turbo and LDPC codes), distributed estimation and classification in sensor networks, graphical models, and compressed sensing.