Seminar series of
Enabling Advances in Technology (EAT) @ DIET

Seminar Announcement

May 14th, 2015 - DIET Dept. Room 206, 1:15 p.m.

Distributed Optimization and Learning over Networks
Speaker: Dr. Paolo Di Lorenzo

Abstract: Nowadays, large-scale networks are ubiquitous (e.g., Heterogeneous 5G Nets, Internet, Sensor Nets, Social nets, etc.), and there is a growing interest from several research communities in doing inference over networks, performing resource allocation distributively, optimizing utility functions over graphs, diffusing information among agents, etc. Many of the aforementioned network tasks lead naturally to mathematical formulations where agents need to solve nonconvex optimization problems over graphs, such that agents (a) have only local knowledge about the problem, and (b) exchange information according to a sparse (possibly time-varying) topology. Up to day, there are no optimization algorithms capable to solve nonconvex problems under these general settings. In the first part of the talk, we introduce a novel algorithmic framework for nonconvex distributed optimization over graphs, termed as NEXT. To cope with nonconvexity and lack of global information, NEXT builds on successive convex approximation techniques while using consensus as a mechanism for distributing the computations among the agents. NEXT represents the first algorithmic framework available in the literature with provable convergence to (stationary) solutions of general distributed nonconvex problems. The framework is very flexible and can be customized for several potential applications in signal processing, machine learning, communications, and control. The second part of the talk considers the problem of how nodes can infer information about the topology (or topology-related properties) of the network, based on in-network distributed learning. In particular, we focus on some key concepts from the established field of spectral graph theory, such as eigenvector centrality, algebraic connectivity, and the Fiedler vector, which allow for a simple and efficient distributed implementation. From these concepts, densely-connected node clusters and their sparse cross connections can be identified, as well as the most central and/or important nodes. We also highlight how this knowledge can be exploited in several network tasks.

Bio: Paolo Di Lorenzo received the M.Sc. degree in 2008 and the Ph.D. degree in electrical engineering in 2012, both from University of Rome "La Sapienza," Italy. He is currently a postdoctoral researcher in the Department of Information, Electronics and Telecommunications, University of Rome, "La Sapienza." During 2010 he held a visiting research appointment in the Department of Electrical Engineering, University of California at Los Angeles (UCLA). He has participated in the European research project FREEDOM, on femtocell networks, and SIMTISYS, on moving target detection through satellite constellations. He is currently involved in the European research project TROPIC, on distributed computing, storage and radio resource allocation over cooperative femtocells. His primary research interests are in statistical signal processing, distributed optimization algorithms for communication and sensor networks, graph theory, game theory, and adaptive filtering. Dr. Di Lorenzo received three best student paper awards, respectively at IEEE SPAWC'10, EURASIP EUSIPCO'11, and IEEE CAMSAP'11, for works in the area of signal processing for communications and synthetic aperture radar systems. He is recipient of the 2012 GTTI (Italian national group on telecommunications and information theory) award for the Best Ph.D. Thesis in information technologies and communications.