University of Rochester
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Stationary graph processes and applications to network topology inference

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Computer Studies Building (CSB) 523

Abstract: Advancing a holistic theory of networks necessitates fundamental breakthroughs in modeling, identification, and controllability of distributed network processes – often conceptualized as signals defined on the vertices of a graph. Under the assumption that the signal properties are related to the topology of the graph where they are supported, the goal of graph signal processing (GSP) is to develop algorithms that fruitfully leverage this relational structure. After a quick review of the fundamentals of GSP, the talk will have a twofold focus. We first generalize the concepts of stationarity and power spectral density (PSD) to signals defined in irregular graph domains, and discuss the implications in terms of PSD estimation. We then leverage the proposed definitions to address the problem of network topology inference from graph signal observations. It is assumed that the unknown graph encodes direct relationships between signal elements, which we aim to recover from observable indirect relationships generated by a diffusion process on the graph. Leveraging results from GSP and sparse recovery, efficient topology inference algorithms with theoretical guarantees are put forth. We also show that established methods that infer edge weights based on the correlation or partial correlation of the observed signals can be viewed as particular cases of our approach.

Bio: Antonio G. Marques received the Telecommunications Engineering degree and the Doctorate degree, both with highest honors, from the Carlos III University of Madrid, Spain, in 2002 and 2007, respectively. In 2007, he became a faculty of the Department of Signal Theory and Communications, King Juan Carlos University, Madrid, Spain, where he currently develops his research and teaching activities as an Associate Professor. From 2005 to 2012, he held different visiting positions at the University of Minnesota, Minneapolis. In 2015 and 2016 he was a Visiting Scholar at the University of Pennsylvania. His research interests lie in the areas of communication theory, signal processing, and networking. His current research focuses on stochastic resource allocation wireless networks and smart grids, nonlinear network optimization, and signal processing for graphs. Dr. Marques has served the IEEE and the EURASIP in a number of posts (currently, he is an Associate Editor of the IEEE Signal Process. Letters and of the EURASIP J. on Advances in Signal Process.), and his work has been awarded in several conferences and workshops.

Pizza and soda will be provided.