Graph Signal Processing: Filterbanks, Sampling and Applications to Machine Learning and Video Coding

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Chair: Helen Meng, *The Chinese University of Hong Kong (Hong Kong)*

Abstract

Graphs have long been used in a wide variety of problems, such analysis of social networks, machine learning, network protocol optimization, decoding of LDPCs or image processing. Techniques based on spectral graph theory provide a "frequency" interpretation of graph data and have proven to be quite popular in multiple applications. In the last few years, a growing amount of work has started extending and complementing spectral graph techniques, leading to the emergence of "Graph Signal Processing" as a broad research field. A common characteristic of this recent work is that it considers the data attached to the vertices as a "graph-signal" and seeks to create new techniques (filtering, sampling, interpolation), similar to those commonly used in conventional signal processing (for audio, images or video), so that they can be applied to these graph signals.

In this talk, we first introduce some of the basic tools needed in developing new graph signal processing operations, with a brief overview of our design of wavelet filterbanks of graphs. We then present our recent work on sampling of graph signals, which extends familiar signal processing concepts to a new context. Finally, we discuss how this graph signal processing perspective can be used for two applications: semi-supervised learning and video coding.

Biography

Professor Antonio Ortega received the Telecommunications Engineering degree from the Universidad Politecnica de Madrid, Madrid, Spain in 1989 and the Ph.D. in Electrical Engineering from Columbia University, New York, NY in 1994. In 1994 he joined the Electrical Engineering department at the University of Southern California (USC), where he is currently a Professor and where he has served as Associate Chair. He is also a visiting Professor at National Institute of Informatics, Tokyo, Japan. He is a Fellow of the IEEE since 2007, and a member of ACM and APSIPA. He has served as associate editor for several IEEE journals, was chair of the Image and Multidimensional Signal Processing (IMDSP) technical committee, a member of the Board of Governors of the IEEE Signal Processing Society (SPS), technical program co-chair of ICIP 2008 and PCS 2013, and currently chairs the SPS SIG on Big Data. He is the inaugural Editor-in-Chief of the APSIPA Transactions on Signal and Information Processing, launched by APSIPA and Cambridge University Press in 2012. He has received several paper awards, including most recently at ICIP 2011 and Globecom 2012, and was a plenary speaker at ICIP 2013. His recent research work is focusing on distributed compression, multiview coding, error

tolerant compression, wavelet-based signal analysis, information representation in wireless sensor networks and graph signal processing. Close to 40 PhD students have completed their PhD thesis under his supervision at USC and his work has led to over 300 publications in international conferences and journals, as well as several patents.