Prof. Georgios B. Giannakis
Prof. A. G. Marques

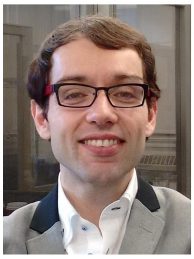
7月2日(星期一)
上午10:00-12:00
计算中心楼B415

Prof. Georgios B. Giannakis, ADC Chair in Wireless Telecommunications and McKnight Presidential Chair in ECE, University of Minnesotaand Optimal Designs

Biography: Georgios B. Giannakis (Fellow'97) received his Diploma in Electrical Engr. from the Ntl. Tech. Univ. of Athens, Greece, 1981. From 1982 to 1986 he was with the Univ. of Southern California (USC), where he received his MSc. in Electrical Engineering, 1983, MSc. in Mathematics, 1986, and Ph.D. in Electrical Engr., 1986. He was with the U. of Virginia from 1987 to 1998, and since 1999 he has been a professor with the U. of Minnesota, where he holds a Chair in Wireless Communications, a University of Minnesota McKnight Presidential Chair in ECE, and serves as director of the Digital Technology Center. His general interests span the areas of communications, networking and statistical signal processing – subjects on which he has published more than 400 journal papers, 700 conference papers, 25 book chapters, two edited books and two research monographs (h-index 131). Current research focuses on data science and network science with applications to social, brain, and power networks with renewables. He is the (co-) inventor of 32 patents issued, and the (co-) recipient of 9 best journal paper awards from the IEEE Signal Processing (SP) and Communications Societies. He also received Technical Achievement Awards from the SP Society (2000), from EURASIP (2005), and the inaugural IEEE Fourier Tech. Field Award (2015). He is a Fellow of EURASIP, and has served the IEEE in various posts including that of a Distinguished Lecturer.

Title: Adaptive Diffusions for Scalable and Robust Learning over Graphs

Diffusion-based classifiers such as those relying on the Personalized PageRank and the Heat kernel, enjoy remarkable classification accuracy at modest computational requirements. Their performance however is affected by the extent to which the chosen diffusion captures a typically unknown label propagation mechanism that can be specific to the underlying graph, and potentially different for each class. This talk will introduce a disciplined, data-efficient approach to learning class-specific diffusion functions adapted to the underlying network topology. The novel learning approach leverages the notion of "landing probabilities" of class-specific random walks, which can be computed efficiently, thereby ensuring scalability to large graphs. Furthermore, a robust version of the classifier will be developed for graph-aware learning even in noisy environments. Classification tests on real networks will demonstrate that adapting the diffusion function to the given graph and observed labels, markedly improves the performance over fixed diffusions; reaching – and many times surpassing – the classification accuracy of computationally heavier state-of-the-art competing methods, that rely on node embeddings and deep neural networks.



Prof. A. G. Marques (King Juan Carlos University, Spain)

Biography: Antonio G. Marques received the telecommunications engineering degree and the Doctorate degree, both with highest honors, from the Carlos III University of Madrid, Madrid, Spain, in 2002 and 2007, respectively. In 2007, he became a faculty in 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 2015, he held different visiting positions at the University of Minnesota, Minneapolis, MN, USA. In 2015 and 2016, he was a Visitor Scholar in the University of Pennsylvania, Philadelphia, PA, USA.

His research interests lie in the areas of signal processing, networking and communications. His current research focuses on stochastic optimization of wireless and power networks, signal processing for graphs, and nonlinear network optimization. He has served the IEEE in a number of posts, collaborating on the organization of more than 20 IEEE conferences and workshops. Currently, he is an Associate Editor of the SIGNAL PROCESSING LETTERS, a member of the IEEE Signal Processing Theory and Methods Technical Committee and a member of the IEEE Signal Processing for Big Data Special Interest Group. Dr. Marques' work has been awarded in several conferences and workshops, with recent best paper awards including Asilomar 2015, IEEE SSP 2016 and IEEE SAM 2016.

Title: Convolutional neural network architectures for signals supported on graphs

Abstract: Convolutional neural networks (CNNs) are being applied to an increasing number of problems and fields due to their superior performance in classification and regression tasks. Motivated by the recent interest in processing signals defined in irregular domains, we investigate CNN architectures that operate on signals supported on graphs. This is challenging problem since two of the key operations that CNNs implement are convolution and pooling, which are implicitly defined to act on regular domains. In this talk, we describe two architectures that generalize CNNs for the processing of signals supported on graphs. The selection Graph Neural Network (GNN) replaces linear time invariant filters with linear shift invariant graph filters to generate convolutional features and reinterprets pooling as a possibly nonlinear subsampling stage where nearby nodes pool their information in a set of preselected sample nodes. A key component of the architecture is to remember the position of sampled nodes to permit computation of convolutional features at deeper layers. The aggregation GNN diffuses the signal through the graph and stores the sequence of diffused components observed by a designated node. This procedure effectively aggregates all components into a stream of information having temporal structure to which the convolution and pooling stages of regular CNNs can be applied. A multi-node version of aggregation CNNs is further introduced for operation in large scale graphs. An important property of selection and aggregation GNNs is that they reduce to conventional CNNs when particularized to time signals reinterpreted as graph signals in a circulant graph. Comparative numerical analyses are performed in a synthetic source localization application. Performance is evaluated for a text category classification problem using word proximity networks.

Prof. Geert Leus
Prof. Zhi Tian
7月2日(星期一)
下午2:00-4:00
计算中心楼B415

Prof. Geert Leus (Delft University of Technology, The Netherlands)

Biography:
Geert Leus received the M.Sc. and Ph.D. degree in Electrical Engineering from the KU Leuven, Belgium, in June 1996 and May 2000, respectively. Geert Leus is now an "Antoni van Leeuwenhoek" Full Professor at the Faculty of Electrical Engineering, Mathematics and Computer Science of the Delft University of Technology, The Netherlands. His research interests are in the broad area of signal processing, with a specific focus on wireless communications, array processing, sensor networks, and graph signal processing. Geert Leus received a 2002 IEEE Signal Processing Society Young Author Best Paper Award and a 2005 IEEE Signal Processing Society Best Paper Award. He is a Fellow of the IEEE and a Fellow of EURASIP. Geert Leus was a Member-at-Large of the Board of Governors of the IEEE Signal Processing Society, the Chair of the IEEE Signal Processing for Communications and Networking Technical Committee, a Member of the IEEE Sensor Array and Multichannel Technical Committee, and the Editor in Chief of the EURASIP Journal on Advances in Signal Processing. He was also on the Editorial Boards of the IEEE Transactions on Signal Processing, the IEEE Transactions on Wireless Communications, the IEEE Signal Processing Letters, and the EURASIP Journal on Advances in Signal Processing. Currently, he is the Vice-Chair of the EURASIP Special Area Team on Signal Processing for Multisensor Systems, an Associate Editor of Foundations and Trends in Signal Processing, and the Editor in Chief of EURASIP Signal Processing.

Title: Graph Signal Processing: Filters and Spectral Estimation

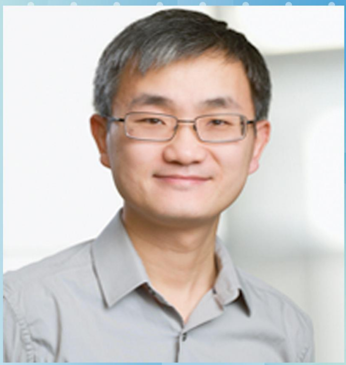
Abstract: One of the cornerstones of the field of graph signal processing are graph filters, direct analogues of time-domain filters, but intended for signals defined on graphs. In this talk, we give an overview of the graph filtering problem. More specifically, we look at the family of finite impulse response (FIR) and infinite impulse response (IIR) graph filters and show how they can be used for different applications. Next, the concepts of graph stationarity and the graph power spectrum are introduced, which facilitates the analysis and processing of random graph signals. This is a challenging task due to the irregularity of the underlying graph domain. However, it turns out that graph filters can be used to define stationary graph signals and their power spectrum. Methods for estimating the power spectrum are presented, which include nonparametric approaches as well as parametric approaches with as parameters the graph filter coefficients generating the random graph signal. Finally, graph spectral estimation from a limited set of nodes in the graph will be discussed. The presented methods are illustrated in synthetic and real-world graphs.

Prof. Zhi Tian, George Mason University

Biography:
Dr. Zhi Tian has been a Professor in the Electrical and Computer Engineering Department of George Mason University since 2015. Previously she was on the faculty of Michigan Technological University. Her research interests lie in statistical signal processing, wireless communications, and decentralized network optimization. She is an IEEE Fellow. She is Chair of the IEEE Signal Processing Society Big Data Special Interest Group. She was General Co-Chair of the IEEE GlobalSIP Conference in 2016. She served as an IEEE Distinguished Lecturer, and Associate Editor for the IEEE Transactions on Wireless Communications and IEEE Transactions on Signal Processing.

Title: Sparse Signal Processing for Communications

Abstract: Sparse signal processing has demonstrated its usefulness in wireless communications over recent years. In the emerging era of data deluge, wireless systems such as 5G and Internet of Things (IoT) have to be able to sense and process an unprecedentedly large amount of data in real time, which render traditional communication and signal processing techniques inefficient or inapplicable. Meanwhile, there are exciting new developments on the theory and algorithms of sparse signal processing and compressive sensing, which offer powerful tools to effectively deal with high-dimensional signals, large-size problems, and big-volume data. This talk presents recent development on sparse signal processing principles and techniques as applied to various wireless applications where signal and information acquisition costs are high, such as wideband spectrum sensing in cognitive radios and sparse channel estimation using large-antenna arrays in both millimeter-wave communication systems and IoT applications.



Prof. Wei Yu

7月3日(星期二)
上午9:30-11:30
计算中心楼B415

Title :Hybrid Beamforming and One-Bit Precoding for Massive MIMO Systems

Abstract: Massive multiple-input multiple-output (MIMO) systems have the potential to significantly improve the spectral efficiency of wireless communication systems, but a fully digital baseband implementation of massive MIMO, which requires a separate high-resolution radio-frequency (RF) chain for each antenna, is likely to be impractical due to the cost and power consumption reasons. The first part this talk briefly discusses a two-stage hybrid beamforming structure to reduce the number of RF chains. The overall beamforming matrix consists of analog RF beamforming implemented using phase shifters and baseband digital beamforming of much smaller dimension. The second part of this talk considers the use of low-resolution digital-to-analog converters (DACs) for transmit precoding. We formulate a quadrature amplitude modulation (QAM) constallation range and one-bit symbol-level precoding design problem for minimizing the average symbol error rate. It is shown that a reasonable choice for constellation range with 1-bit symbol-level precoding is that of the infinite-resolution precoding with instantaneous power constraint reduced by a factor of 0.8, which translates to about 2dB performance gap. Further, for both single-user and multi-user systems, the proposed one-bit zero-forcing precoding scheme can achieve the same performance as conventional zero-forcing precoding with infinite resolution precoding by using about 50% more antennas.

Biography: Wei Yu received the B.A.Sc. degree in Computer Engineering and Mathematics from the University of Waterloo, Waterloo, Ontario, Canada in 1997 and M.S. and Ph.D. degrees in Electrical Engineering from Stanford University, Stanford, CA, in 1998 and 2002, respectively. Since 2002, he has been with the Electrical and Computer Engineering Department at the University of Toronto, Canada, where he is now Professor and holds a Canada Research Chair in Information Theory and Wireless omunications. Prof. Wei Yu currently serves on the IEEE Information Theory Society Board of Governors. He is currently the Chair of the Signal Processing for Communications and Networking Technical Committee of the IEEE Signal Processing Society. He is an Area Editor for the IEEE Transactions on Wireless Communications (2017-20). Prof. Wei Yu was an IEEE Communications Society Distinguished Lecturer (2015-16). He received the IEEE Communications Society Best Tutorial Paper Award in 2015, the IEEE Signal Processing Society Best Paper Award in 2008 and 2017, and the Journal of Communications and Networks Best Paper Award in 2017. Prof. Wei Yu is a Fellow of IEEE, a member of the College of New Scholars, Artists and Scientists of the Royal Society of Canada, and a Fellow of Canadian Academy of Engineering.