

Distinguished Lecturer Series “Leon the Mathematician” at the Department of Informatics, Aristotle University of Thessaloniki Greece (<http://dls.csd.auth.gr>) - IEEE Greece Section (www.theieee.gr), CIS011 Greek Computational Intelligence Chapter, SP01 Signal Processing Chapter



INVITED LECTURE

Gonzalo R. Arce (IEEE Fellow, Fulbright-Nokia Distinguished Chair in Information and Communication Technologies, Charles Black Evans Professor of Electrical and Computer Engineering, University of Delaware, USA) is going to lecture on

Compressed sensing in spectral imaging

at the **Auditorium of the Central Library** of the Aristotle University of Thessaloniki on **Tuesday October 19th, 2010 at 12:00.**

ABSTRACT

The new field of compressive sensing (CS) is providing a fresh approach to fundamental tasks in broad areas of signal processing. Rather than following the basic Nyquist sampling principle, compressive sampling dictates that the number of measurements needed to reconstruct a signal depends on its sparsity rather than its bandwidth. Sparsity in CS thus measures signal complexity in roughly the same manner that bandwidth does in the classical Shannon-Nyquist theory. This principle could have a profound impact in practice since many signals encountered in nature have inherent sparse representations. Unlike the samples produced by traditional analog-to-digital converters, CS measurements require a series of inner products of the underlying signal against different, possibly random, waveforms. Signal recovery then reduces to a linear inverse problem where the signal of interest can be recovered even when there are far fewer measurements than unknowns. In this talk, the key mathematical concepts underlying this new theory will be presented. Compressive spectral imaging systems will be described.

Y. Wu, P. Ye, G. R. Arce, and D. W. Prather, “A single-pixel optical-sectioning programmable array microscope (SP-PAM),” in Proc. *SPIE*, vol. 7596, no. 75960D, 2010.

Z. Wang and G. R. Arce, “Variable density compressed image sampling,” *IEEE Trans. Image Processing*, vol. 19, no. 1, pp. 264-270, January 2010.

Y. Wu, C. Chen, P. Ye, G. R. Arce, and D. W. Prather, “Development of a compressive programmable array microscope,” in Proc. *2009 Conf. Lasers and Electro-Optics/Quantum Electronics and Laser Science*.

P. Ye, J. L. Paredes, G. R. Arce, Y. Wu, C. Chen and D. W. Prather, “Compressive Confocal Microscopy”, in Proc. *2009 IEEE Int. Conf. Acoustics, Speech, and Signal Processing*, pp. 429-432.

Y. Wu, C. Chen, P. Ye, Z. Wang, G. R. Arce, and D. W. Prather, “Optical calibration of a Digital Micromirror Device (DMD)-based Compressive imaging (CI) system,” in Proc. *SPIE*, vol. 7210, no. 72100F, 2009.

P. Ye, J. L. Paredes, Y. Wu, C. Chen, G. R. Arce, and D. W. Prather, “Compressive Confocal Microscopy: 3D reconstruction algorithms,” in Proc. *SPIE*, vol. 7210, no. 72100G, 2009.

About the Speaker:

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Gonzalo R. Arce. After receiving the PhD degree from Purdue University, Dr. Arce joined the University of Delaware where he is the Charles Black Evans Distinguished Professor of Electrical and Computer Engineering. He served as department Chairman from 1999 to 2009. He holds the 2010 Fulbright-Nokia Distinguished Chair in Information and Communications Technologies at the Aalto University in Helsinki, Finland. He has held visiting professor appointments at the Tampere University of Technology and the Unisys Corporate Technology Center. His research interests include statistical signal processing, nonlinear signal processing, and computational imaging. His research is supported by the several agencies of the Department of Defense, by the National Science Foundation, and by Industry. He is a Fellow of the IEEE and is the recipient of several awards including the DuPont Young Investigator Award, the NSF Research Initiation Grant, and a fellowship from the Center for Advanced Studies at the University of Delaware. He has supervised four Colburn Price Award winning PhD Dissertations at the University of Delaware. He is the author or co-author of the books *Nonlinear Signal Processing*, Wiley & Sons 2004, *Modern Digital Halftoning*, CRC Press 2008, and *Computational Lithography* Wiley & Sons 2010. He has served as Associate Editor for several journals of the IEEE and the Optical Society of America. He is a frequent consultant to industry in the areas of communications and imaging. Dr. Arce holds 12 US patents.