DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

The George Washington University | School of Engineering and Applied Science

COLLOQUIUM SERIES

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SEAS Conference Room/Tompkins Hall of Engineering
725 23 St NW
Washington DC 20052

BLIND SEPARATION OF STATISTICALLY DEPENDENT SOURCES

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Abstract

Blind source separation is a field developed within signal processing and neural network communities over the last 15-20 years. It has found numerous applications in science and engineering such as acoustics, biomedical signal analysis, communications, image segmentation and deconvolution, spectroscopy, bioinformatics, and finance. The basic static linear blind source separation problem is efficiently solved by means of independent component analysis under standard assumptions: sources are statistically independent and non-gaussian, and the column-rank of the unknown basis or mixing matrix equals the unknown number of sources. However, in a number of applications the statistical independence assumption does not hold. Examples include biomedical data sets such as EEG and fMRI. A methodology will be presented to address this issue. Novel algorithms will be presented for single channel blind image and signal deconvolution, as exemplified by blind separation of images of human faces. Application to unsupervised decomposition of low-dimensional multispectral images will be discussed.

Biography

Ivica Kopriva received the Ph.D. degree in electrical engineering from the Faculty of Electrical Engineering and Computing, Zagreb, Croatia in 1998. Currently, he is Senior Scientist at the Rudjer Boskovich Institute. His current research activities focus on algorithms for blind signal and image processing, and non-negative matrix factorisation with application to unsupervised segmentation of multispectral and hyperspectral images. Dr. Kopriva spent four years, 2001-2005, at the Department of Electrical and Computer Engineering, The George Washington University, Washington DC, USA, where he carried out pioneering research in signal processing with application to imaging problems such as single frame and multiframe blind image deconvolution, and unsupervised decomposition of multispectral and hyperspectral images. Dr. Kopriva's research at the George Washington University included signal processing for direction finding array antennas. In particular, he played a pivotal role in the design, construction and evaluation of a passive emitter range estimation system for localization of cell phone emitters. This research also led to the development of novel covariance and quadri-covariance based direction finding algorithms. In co-authorship with Te-Ming Huang and Vojislav Kecman, Dr Kopriva wrote a research monograph *Kernel Based Algorithms for Mining Huge Data Sets: Supervised, Semi-supervised and Unsupervised Learning*, published in the Springer Series: Studies in Computational Intelligence, 2006.