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Joint Blind Source Separation: Applications in Medical Image Analysis

Svečana sala (prvi sprat), četvrtak, 20.09.2012, 11:00

Abstract:

Blind source separation (BSS) is based on a simple generative model and hence minimizes the assumptions on the nature of data. It provides a promising alternative to the traditional model-based approaches in many applications where the underlying dynamics are hard to characterize. Independent component analysis (ICA), in particular, has been a popular BSS approach and an active area of research. By imposing the constraint of statistical independence on the underlying components, ICA recovers linearly mixed components subject to only a scaling and permutation ambiguity, and has been successfully applied to numerous problems in areas as diverse as biomedicine, communications, finance, geophysics, and remote sensing.

Blind separation of multiple datasets simultaneously, i.e., joint BSS, is becoming increasingly important in most of these application areas, for example in medical image analysis where data from multiple subjects need to be analyzed for subject-level or group inferences.

This talk reviews the fundamentals and properties of ICA, and then introduces the generalization of ICA for joint BSS, independent vector analysis (IVA). Several key problems for achieving a successful ICA and IVA decomposition, such as the use of diversity and density matching are discussed as well, along with examples of application to medical image analysis.

Predavač

Prof. Dr. Tulay Adali, Fellow IEEE

Department of Computer Science and Electrical Engineering
University of Maryland Baltimore County, Baltimore, MD 21250 (USA)

<http://csee.umbc.edu/~adali>

Presenter's bio:

Prof. Tülay Adali received the Ph.D. degree in electrical engineering from North Carolina State University, Raleigh, in 1992 and joined the faculty at the University of Maryland Baltimore County (UMBC), Baltimore, the same year. She is currently a professor in the Department of Computer Science and Electrical Engineering at UMBC. She worked in the organization of a number of international conferences and workshops including the IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), the IEEE International Workshop on Neural Networks for Signal Processing (NNSP), and the IEEE International Workshops on Machine Learning for Signal Processing (MLSP). She was the general co-chair for the NNSP workshops 2001--2003 and the technical chair of the MLSP workshops 2004--2006. She is the past chair and current member of the MLSP Technical Committee, and is serving on the IEEE publications board and the IEEE Signal Processing Society conference board. Her research interests are in the areas of statistical signal processing, machine learning for signal processing, biomedical data analysis (functional MRI, MRI, PET, CR, ECG, and EEG), bioinformatics, and signal processing for optical communications. Dr. Adali is the recipient of a 1997 National Science Foundation CAREER Award

Branimir Reljin, Senior Member IEEE
IEEE S&M CAS-SP Chair