Invited Talk

Challenges in Source Separation

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Abstract

Separation/extraction of sources are wide concepts in information sciences, since sensors provide signal mixing and an essential step consists in separating/extracting useful information from unuseful one, the noise. In this talk I will discuss about three challenges in the domain. In many areas like brain imaging, hyperspectral imaging, due to various kinds of sensors, there are many ways for recording the same physical phenomenon leading to sets of multimodal data. Multimodality has been studied in human-computer interface or in data fusion, and many works have been done based on source separation extension, but I believe that fundamental issue and a general framework is still missing. There exist a few cases where the mixtures are essentially nonlinear, e.g. with chemical sensors. However, up to now, most of the source separation/extraction results and methods are restricted to linear mixtures. I believe that a second challenge is to enlarge theoretical results on identifiability and algorithms in *nonlinear source separation*, especially for new classes of nonlinearities (e.g. multilinear) and priors on sources. In high-dimension data (e.g. EEG or MRI in brain imaging), separating all the sources is neither tractable nor relevant, and one would like to only extract the useful sources. Conversely, for a small number of sensors, especially smaller than the number of sources, it is again necessary to only focus on the useful signals. The third challenge is to develop generic framework for only *extracting useful signals*, based on coarse reference signals or priors. In this talk, I will discuss around these three challenges, based on already published works and on open questions that seem challenging to investigate.

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