Informatics Research
Institute of Toulouse

Within the framework of
ERC FACTORY

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14h00 – 15h30
INP-ENSEEIHT, Salle des thèses

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Diversity and uniqueness in coupled decompositions

Seminar

Abstract: Matrices and higher-order arrays, also known as tensors, are natural structures for data representation, and their factorizations are fundamental tools in data analysis. In many applications, the data (observations, measurements) consist of a sum of contributions from several sources, and the goal is to recover these latent contributions as accurately as possible. Indeed, in the last decades, much effort has been dedicated to methods that guarantee a unique and interpretable factorization of a single matrix or tensor in a sum of rank-1 terms. The first part of my talk will discuss some of these methods, with focus on independent component analysis (ICA) and CANDECOMP/PARAFAC. Through these two frameworks, I will demonstrate the role of diversity in achieving a unique and interpretable factorization in matrix and tensor-based decompositions.

In recent years, there has been increasing interest in more elaborate data structures and coupled decompositions that provide more efficient ways to exploit the various types of diversity and structure in a single dataset, or in an ensemble of possibly heterogeneous linked datasets. Such data arise in biomedical signal processing, astrophysics, and metabolomics, to name a few. These models involve, for example, relaxing the rank-1 constraint, and exploiting links among several datasets-- for example, between several ICA mixtures. As a guiding example, in the second part of my talk, I will focus on joint independent subspace analysis (JISA), a recently-introduced flexible model that can be used for the analysis of multiple heterogeneous datasets. I will explain how JISA is associated with a new type of a coupled decomposition of several matrices, or tensors, in a sum of low-rank block terms, and present some new results on the uniqueness and identifiability of this model.

Short bio: Dana Lahat received the Ph.D. in Electrical Engineering from Tel Aviv University, Israel, in 2013. She is currently a post-doctoral researcher at the Grenoble Images, Speech, Signals and Control Lab (GIPSA-lab), Grenoble, France. She has been awarded the Chateaubriand Fellowship of the French Government for the academic year 2007--2008. Her research interests include statistical and deterministic methods for signal and data processing, blind source separation, linear and multilinear algebra.

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