SUPERVISOR MODULE

ALGORITHMS AND TOOLBOX FOR TENSOR-BASED SIGNAL PROCESSING AND DATA ANALYSIS

Higher-order tensors are "matrices in more than two dimensions". We have recently developed Tensorlab, a Matlab toolbox for tensor computations (www.tensorlab.net). The algorithms in Tensorlab are algebraically well-founded and they are the current computational state-of-the-art.

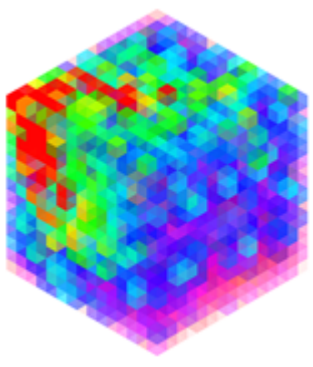
Higher-order tensor methods nowadays are intensively studied in many disciplines nowadays. One of the core problems in signal processing consists of splitting data into meaningful components. The most well-known instance of this is probably the cocktail party problem: at a party we succeed in understanding the words spoken to us, while actually several people are speaking at the same time. Signal separation is of importance in application areas as audio, image processing, telecommunications (OFDM, CDMA, . . .), array processing, biomedical problems (EEG, ECG, fMRI, . . .), data mining, chemometrics, econometrics, bioinformatics, astrophysics, and so on. Signal separation is just one of the problems for which tensor techniques are better suited than matrix techniques. The transition from matrix to tensor is actually pivotal over a broad spectrum of problems in signal processing, data analysis and artificial intelligence.

This thesis aims at the development of state-of-the-art algorithms for tensor-based signal processing and data analysis, using the numerical tools in Tensorlab, and their implementation in a Matlab toolbox. The algorithms can be made available via a Graphical User Interface.

Contact moments are both possible on Campus Leuven (ESAT) and Campus Kortrijk (Kulak).



Alex Katz, The Cocktail Party.



Tensor visualized in Tensorlab.

Bijlagen

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Information Systems and Signal Processing

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1 - 2

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