Multidimensional Data Analysis with MATLAB

Prof. Gerwald Lichtenberg (Hochschule für Angewandte Wissenschaften, Hamburg, Germany)

Scientific computation tools support 2D data as a standard because data analysis and visualisation algorithms often are defined for matrices. But in a lot of research fields and applications, data is naturally structured along more than two axes and 3D, 4D, or in general multidimensional arrays are appropriate. Elements of these are stored and accessed by three or more indices, which reflects neighbourhood relations that might be lost in matrix representation.

Moreover, tensor decomposition methods are available for multidimensional arrays which are intensively studied in many disciplines: independent component analysis, blind source separation, signal processing, data mining, system modelling, audio and image processing, biomedical applications, bio-informatics, and many more. In contrast to machine learning algorithms, tensor decompositions can lead to interpretable factors as results. These methods have mathematical roots in multilinear algebra, algebraic geometry and optimization.

The workshop will introduce modern methods and tools for multidimensional data analysis as *Tensorlab* and the *Tensor Toolbox* based on MATLAB. Examples will be given and participants are encouraged to bring own data samples.

Prerequisites for attending the lecture:
Linear algebra basics
MATLAB basics