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Keynote paper in session on "Future perspectives in statistical image analysis"

Spatio-temporal analysis including multi-objective orthogonalisation and independent component analysis

Allan Aasbjerg Nielsen

Informatics and Mathematical Modelling
Technical University of Denmark
Richard Petersens Plads, Building 321
DK-2800 Kongens Lyngby, Denmark
aa@imm.dtu.dk, http://www.imm.dtu.dk/~aa/

The talk will deal with a number of methods for (orthogonal) transformation of multivariate data including

- principal components,
- principal factors,
- (multi-set) canonical variates,
- maximum autocorrelation factors,
- minimum noise fractions,
- projection pursuit, and
- independent components.

All these methods are useful in exploratory multivariate data analysis where we consider the observed data as indirect measurements of underlying, latent structures or factors that cannot be observed directly. Some of the methods are specifically suited for data that vary spatially or temporally and some can be tailored to perform multi-objective orthogonalisation of for instance both spatial and temporal autocorrelation in spatio-temporal data. Recently, independent component analysis (ICA) has emerged. ICA can be seen as an interesting extension to principal component analysis (PCA) specifically suited for non-Gaussian latent factors. Similarities and differences between more classical methods such as PCA and ICA will be described. Application examples of the transformations will be given. The data used in the examples include

- global sea surface temperatures from satellite,
- spectral data from air- and space-borne optical scanners, and
- image data from scanning electron microscope energy dispersive spectroscopy also known as x-ray mapping.

Also, examples on application of some of the methods mentioned to change detection in bi-temporal, multivariate data will be given. Finally, non-linear extensions to some of the methods will be described very briefly.