

Title: Independent Component Analysis for image separation

Short Abstract: Independent component analysis (ICA) is a statistical and computational technique for revealing hidden factors that underlie sets of random variables, measurements or signals. ICA can be seen as an extension to principal component analysis (PCA). What distinguishes ICA from other methods is that it looks for components that are both statistically independent, and non-Gaussian. Its applications are wide and varied and the data analysed by ICA could originate from many different application fields, including digital images and document databases, as well as economic indicators and psychometric measurements. The primary focus of this project will be the application of ICA in the context of digital image separation. The method proposed here is to separate two images relies on reversing the action of the singular value decomposition (SVD) method on two statistically independent images.

Aims: This project is suitable for students who are interested in data analysis methods and mathematical programming and their use in image analysis applications. This project allows the student to understand the mathematical background of singular value decomposition (SVD) method and how it can be coded in MATLAB. SVD will be applied as a tool for the aim of separating two statistically independent images.

References

- [1] J. Nathan Kutz, "Data-driven modelling & scientific computing: methods for complex systems & big data", Oxford university Press, 2013.
- [2] Aapo Hyvärinen, Juha Karhunen, Erkki Oja, "Independent Component analysis", John Wiley & sons, 2001.