



Blind Source Separation: Theory and Applications

Xianchuan Yu, Dan Hu, Jindong Xu

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A systematic exploration of both classic and contemporary algorithms in blind source separation with practical case studies

The book presents an overview of Blind Source Separation, a relatively new signal processing method. Due to the multidisciplinary nature of the subject, the book has been written so as to appeal to an audience from very different backgrounds. Basic mathematical skills (e.g. on matrix algebra and foundations of probability theory) are essential in order to understand the algorithms, although the book is written in an introductory, accessible style.

This book offers a general overview of the basics of Blind Source Separation, important solutions and algorithms, and in-depth coverage of applications in image feature extraction, remote sensing image fusion, mixed-pixel decomposition of SAR images, image object recognition fMRI medical image processing, geochemical and geophysical data mining, mineral resources prediction and geoanomalies information recognition. Firstly, the background and theory basics of blind source separation are introduced, which provides the foundation for the following work. Matrix operation, foundations of probability theory and information theory basics are included here. There follows the fundamental mathematical model and fairly new but relatively established blind source separation algorithms, such as Independent Component Analysis (ICA) and its improved algorithms (Fast ICA, Maximum Likelihood ICA, Overcomplete ICA, Kernel ICA, Flexible ICA, Non-negative ICA, Constrained ICA, Optimised ICA). The last part of the book considers the very recent algorithms in BSS e.g. Sparse Component Analysis (SCA) and Non-negative Matrix Factorization (NMF). Meanwhile, in-depth cases are presented for each algorithm in order to help the reader understand the algorithm and its application field.

- A systematic exploration of both classic and contemporary algorithms in blind source separation with practical case studies
- Presents new improved algorithms aimed at different applications, such as image feature extraction, remote sensing image fusion, mixed-pixel decomposition of SAR images, image object recognition, and MRI medical image processing
- With applications in geochemical and geophysical data mining, mineral resources prediction and geoanomalies information recognition
- Written by an expert team with accredited innovations in blind source separation and its applications in natural science
- Accompanying website includes a software system providing codes for most of the algorithms mentioned in the book, enhancing the learning experience

Essential reading for postgraduate students and researchers engaged in the area of signal processing, data mining, image processing and recognition, information, geosciences, life sciences.

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