

Blind Source Separation

Theory and Applications



XIANCHUAN YU | DAN HU | JINDONG XU

Blind Source Separation Theory And Applications

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Blind Source Separation Theory And Applications:

Blind Source Separation Ganesh R. Naik, Wenwu Wang, 2014-05-21 Blind Source Separation intends to report the new results of the efforts on the study of Blind Source Separation BSS. The book collects novel research ideas and some training in BSS, independent component analysis, ICA, artificial intelligence, and signal processing applications. Furthermore, the research results previously scattered in many journals and conferences worldwide are methodically edited and presented in a unified form. The book is likely to be of interest to university researchers. R. Dr. Wenwu Wang works at University of Surrey, UK.

Blind Source Separation Xianchuan Yu, Dan Hu, Jindong Xu, 2013-12-13 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. Blind Source Separation, 2005 *Principle and Application of*

Blind Source Separation Technology Weihong Fu, 2025-01-31 This book focuses on the principle of blind source separation BSS technology and its application in communication signal processing This book first introduces the basic knowledge of BSS technology and then introduces the whitening pre processing algorithm of BSS and the source signal number estimation technology The principles and implementation steps of various BSS algorithms are introduced in detail and the simulation results of various algorithms are given The application examples and experimental results of BSS technology in communication signal processing are given The detailed derivation and simulation results of BSS algorithm principles are the features of this book which is especially suitable for readers who are interested in learning BSS technology The book can benefit researchers engineers and graduate students in the fields of communications engineering and signal processing

Advances in Modern Blind Signal Separation Algorithms Kostas Kokkinakis, Philipos Loizou, 2010-01-01 With human computer interactions and hands free communications becoming overwhelmingly important in the new millennium recent research efforts have been increasingly focusing on state of the art multi microphone signal processing solutions to improve speech intelligibility in adverse environments One such prominent statistical signal processing technique is blind signal separation BSS BSS was first introduced in the early 1990s and quickly emerged as an area of intense research activity showing huge potential in numerous applications BSS comprises the task of blindly recovering a set of unknown signals the so called sources from their observed mixtures based on very little to almost no prior knowledge about the source characteristics or the mixing structure The goal of BSS is to process multi sensory observations of an inaccessible set of signals in a manner that reveals their individual and original form by exploiting the spatial and temporal diversity readily accessible through a multi microphone configuration Proceeding blindly exhibits a number of advantages since assumptions about the room configuration and the source to sensor geometry can be relaxed without affecting overall efficiency This booklet investigates one of the most commercially attractive applications of BSS which is the simultaneous recovery of signals inside a reverberant naturally echoing environment using two or more microphones In this paradigm each microphone captures not only the direct contributions from each source but also several reflected copies of the original signals at different propagation delays These recordings are referred to as the convolutive mixtures of the original sources The goal of this booklet in the lecture series is to provide insight on recent advances in algorithms which are ideally suited for blind signal separation of convolutive speech mixtures More importantly specific emphasis is given in practical applications of the developed BSS algorithms associated with real life scenarios The developed algorithms are put in the context of modern DSP devices such as hearing aids and cochlear implants where design requirements dictate low power consumption and call for portability and compact size Along these lines this booklet focuses on modern BSS algorithms which address 1 the limited amount of processing power and 2 the small number of microphones available to the end user Table of Contents Fundamentals of blind signal separation Modern blind signal separation algorithms Application of blind signal

processing strategies to noise reduction for the hearing impaired Conclusions and future challenges Bibliography

Handbook of Blind Source Separation Pierre Comon, Christian Jutten, 2010 Edited by the people who were forerunners in creating the field together with contributions from 34 leading international experts this handbook provides the definitive reference on Blind Source Separation giving a broad and comprehensive description of all the core principles and methods numerical algorithms and major applications in the fields of telecommunications biomedical engineering and audio acoustic and speech processing Going beyond a machine learning perspective the book reflects recent results in signal processing and numerical analysis and includes topics such as optimization criteria mathematical tools the design of numerical algorithms convolutive mixtures and time frequency approaches This Handbook is an ideal reference for university researchers R algebraic identification of under determined mixtures time frequency methods Bayesian approaches blind identification under non negativity approaches semi blind methods for communications Shows the applications of the methods to key application areas such as telecommunications biomedical engineering speech acoustic audio and music processing while also giving a general method for developing applications *Unervised Adaptive Filtering, Blind Source Separation* Simon Haykin, 2000-04-14 A complete one stop reference on the state of the art of unsupervised adaptive filtering While unsupervised adaptive filtering has its roots in the 1960s more recent advances in signal processing information theory imaging and remote sensing have made this a hot area for research in several diverse fields This book brings together cutting edge information previously available only in disparate papers and articles presenting a thorough and integrated treatment of the two major classes of algorithms used in the field namely blind signal separation and blind channel equalization algorithms Divided into two volumes for ease of presentation this important work shows how these algorithms although developed independently are closely related foundations of unsupervised adaptive filtering Through contributions by the foremost experts on the subject the book provides an up to date account of research findings explains the underlying theory and discusses potential applications in diverse fields More than 100 illustrations as well as case studies appendices and references further enhance this excellent resource Topics in Volume I include Neural and information theoretic approaches to blind signal separation Models concepts algorithms and performance of blind source separation Blind separation of delayed and convolved sources Blind deconvolution of multipath mixtures Applications of blind source separation Volume II Blind Deconvolution continues coverage with blind channel equalization and its relationship to blind source separation

Handbook of Blind Source Separation Pierre Comon, Christian Jutten, 2010-02-17 Edited by the people who were forerunners in creating the field together with contributions from 34 leading international experts this handbook provides the definitive reference on Blind Source Separation giving a broad and comprehensive description of all the core principles and methods numerical algorithms and major applications in the fields of telecommunications biomedical engineering and audio acoustic and speech processing Going beyond a machine learning perspective the book reflects recent results in signal

processing and numerical analysis and includes topics such as optimization criteria mathematical tools the design of numerical algorithms convolutive mixtures and time frequency approaches This Handbook is an ideal reference for university researchers R algebraic identification of under determined mixtures time frequency methods Bayesian approaches blind identification under non negativity approaches semi blind methods for communications Shows the applications of the methods to key application areas such as telecommunications biomedical engineering speech acoustic audio and music processing while also giving a general method for developing applications Audio Source Separation and Speech Enhancement Emmanuel Vincent,Tuomas Virtanen,Sharon Gannot,2018-07-24 Learn the technology behind hearing aids Siri and Echo Audio source separation and speech enhancement aim to extract one or more source signals of interest from an audio recording involving several sound sources These technologies are among the most studied in audio signal processing today and bear a critical role in the success of hearing aids hands free phones voice command and other noise robust audio analysis systems and music post production software Research on this topic has followed three convergent paths starting with sensor array processing computational auditory scene analysis and machine learning based approaches such as independent component analysis respectively This book is the first one to provide a comprehensive overview by presenting the common foundations and the differences between these techniques in a unified setting Key features Consolidated perspective on audio source separation and speech enhancement Both historical perspective and latest advances in the field e g deep neural networks Diverse disciplines array processing machine learning and statistical signal processing Covers the most important techniques for both single channel and multichannel processing This book provides both introductory and advanced material suitable for people with basic knowledge of signal processing and machine learning Thanks to its comprehensiveness it will help students select a promising research track researchers leverage the acquired cross domain knowledge to design improved techniques and engineers and developers choose the right technology for their target application scenario It will also be useful for practitioners from other fields e g acoustics multimedia phonetics and musicology willing to exploit audio source separation or speech enhancement as pre processing tools for their own needs

Proceedings of International Conference on Intelligent Vision and Computing (ICIVC 2022) Harish Sharma,Apu Kumar Saha,Mukesh Prasad,2023-04-30 The conference proceedings book is a collection of high quality research articles in the field of intelligent vision and computing It also serves as a forum for researchers and practitioners from both academia and industry to meet and share their expertise and experience It provides opportunities for academicians and scientists along with professionals policymakers and practitioners from various fields in a global realm to present their research contributions and views on one forum and interact with members inside and outside their own particular disciplines

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