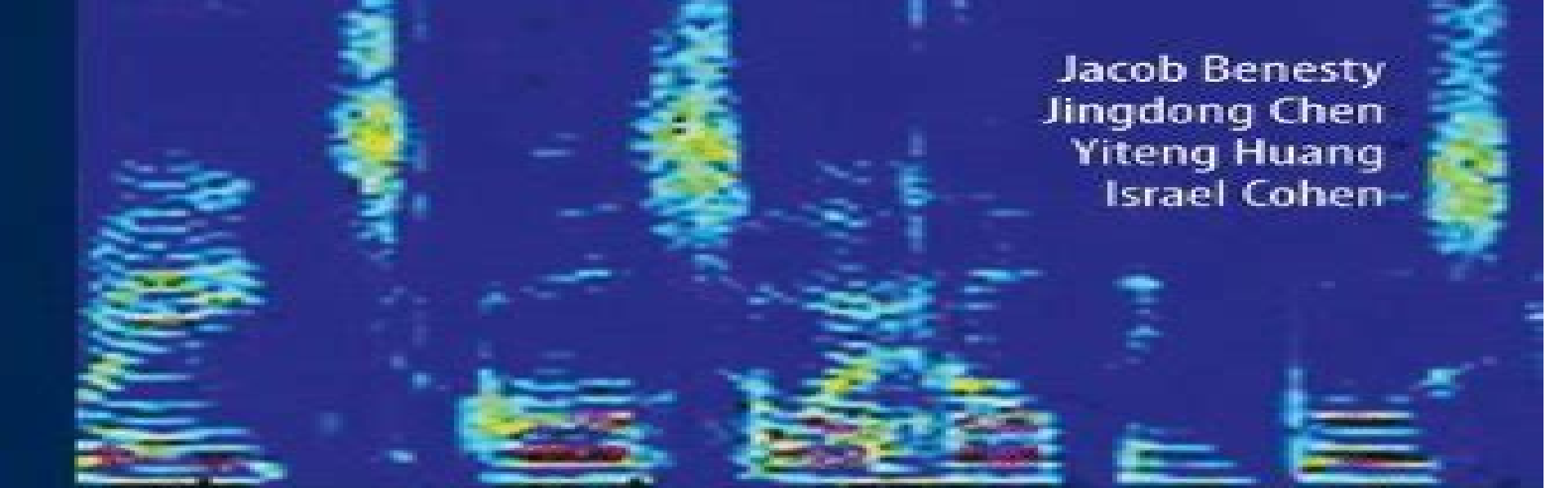


A spectrogram showing frequency components over time, with various colored lines (yellow, green, blue) on a dark background.

Jacob Benesty
Jingdong Chen
Yiteng Huang
Israel Cohen

SPRINGER TOPICS IN SIGNAL PROCESSING

Noise Reduction in Speech Processing

 Springer

Noise Reduction In Speech Processing Springer Topics In Signal Processing

Ben Gold, Nelson Morgan, Dan Ellis



Noise Reduction In Speech Processing Springer Topics In Signal Processing:

Noise Reduction in Speech Processing Jacob Benesty, Jingdong Chen, Yiteng Huang, Israel Cohen, 2009-04-28 Noise is everywhere and in most applications that are related to audio and speech such as human machine interfaces hands free communications voice over IP VoIP hearing aids teleconferencing telepresence telecollaboration systems and so many others the signal of interest usually speech that is picked up by a microphone is generally contaminated by noise As a result the microphone signal has to be cleaned up with digital signal processing tools before it is stored analyzed transmitted or played out This cleaning process is often called noise reduction and this topic has attracted a considerable amount of research and engineering attention for several decades One of the objectives of this book is to present in a common framework an overview of the state of the art of noise reduction algorithms in the single channel one microphone case The focus is on the most useful approaches i e filtering techniques in different domains and spectral enhancement methods The other objective of Noise Reduction in Speech Processing is to derive all these well known techniques in a rigorous way and prove many fundamental and intuitive results often taken for granted This book is especially written for graduate students and research engineers who work on noise reduction for speech and audio applications and want to understand the subtle mechanisms behind each approach Many new and interesting concepts are presented in this text that we hope the readers will find useful and inspiring

11. Kolloquium Mobilhydraulik : Karlsruhe, 10. September 2020 Geimer, Marcus, Synek, Peter-Michael, 2020-09-15 Der Tagungsband 11 Kolloquium Mobilhydraulik enth lt die gesammelten Beitr ge zu den geplanten Vortr gen der aufgrund von Covid 19 abgesagten gleichnamigen Veranstaltung im September 2020 in Karlsruhe In neun Artikeln wird ber den Stand der Forschung und neue Entwicklungen auf dem Gebiet der Mobilhydraulik berichtet Die Themenfelder lauten Daten eine Bereicherung f r die Hydraulik Antriebe mit Potential Elektrik trifft Hydraulik Auslegung hydraulischer Systeme The conference volume 11th Colloquium Mobile Hydraulics contains the collected contributions to the planned lectures of the event of the same name in Karlsruhe o1 September 2020 which was cancelled due to Covid 19 Nine articles report on the state of research and new developments in the field of mobile hydraulics The topics are Data an enrichment for hydraulics Drives with potential Electrics meets hydraulics Design of hydraulic systems **Speech**

Processing in Modern Communication Israel Cohen, Jacob Benesty, Sharon Gannot, 2009-12-18 Modern communication devices such as mobile phones teleconferencing systems VoIP etc are often used in noisy and reverberant environments Therefore signals picked up by the microphones from telecommunication devices contain not only the desired near end speech signal but also interferences such as the background noise far end echoes produced by the loudspeaker and reverberations of the desired source These interferences degrade the fidelity and intelligibility of the near end speech in human to human telecommunications and decrease the performance of human to machine interfaces i e automatic speech recognition systems The proposed book deals with the fundamental challenges of speech processing in modern

communication including speech enhancement interference suppression acoustic echo cancellation relative transfer function identification source localization dereverberation and beamforming in reverberant environments Enhancement of speech signals is necessary whenever the source signal is corrupted by noise In highly non stationary noise environments noise transients and interferences may be extremely annoying Acoustic echo cancellation is used to eliminate the acoustic coupling between the loudspeaker and the microphone of a communication device Identification of the relative transfer function between sensors in response to a desired speech signal enables to derive a reference noise signal for suppressing directional or coherent noise sources Source localization dereverberation and beamforming in reverberant environments further enable to increase the intelligibility of the near end speech signal

Managerial Perspectives on Intelligent Big Data

Analytics Sun, Zhaohao,2019-02-22 Big data analytics and artificial intelligence are revolutionizing work management and lifestyles and are becoming disruptive technologies for healthcare e commerce and web services However many fundamental technological and managerial issues for developing and applying intelligent big data analytics in these fields have yet to be addressed Managerial Perspectives on Intelligent Big Data Analytics is a collection of innovative research that discusses the integration and application of artificial intelligence business intelligence digital transformation and intelligent big data analytics from a perspective of computing service and management While highlighting topics including e commerce machine learning and fuzzy logic this book is ideally designed for students government officials data scientists managers consultants analysts IT specialists academicians researchers and industry professionals in fields that include big data artificial intelligence computing and commerce

Earth Observation Data Cubes Gregory Giuliani,Gilberto Camara,Brian

Killough,Stuart Minchin,2020-03-16 Satellite Earth observation EO data have already exceeded the petabyte scale and are increasingly freely and openly available from different data providers This poses a number of issues in terms of volume e g data volumes have increased 10 in the last 5 years velocity e g Sentinel 2 is capturing a new image of any given place every 5 days and variety e g different types of sensors spatial spectral resolutions Traditional approaches to the acquisition management distribution and analysis of EO data have limitations e g data size heterogeneity and complexity that impede their true information potential to be realized Addressing these big data challenges requires a change of paradigm and a move away from local processing and data distribution methods to lower the barriers caused by data size and related complications in data management To tackle these issues EO data cubes EODC are a new paradigm revolutionizing the way users can store organize manage and analyze EO data This Special Issue is consequently aiming to cover the most recent advances in EODC developments and implementations to broaden the use of EO data to larger communities of users support decision makers with timely and actionable information converted into meaningful geophysical variables and ultimately unlock the information power of EO data

Microphone Array Signal Processing Jacob Benesty,Jingdong Chen,Yiteng

Huang,2008-03-11 In the past few years we have written and edited several books in the area of

acoustic and speech signal processing. The reason behind this endeavor is that there were almost no books available in the literature when we first started while there was and still is a real need to publish manuscripts summarizing the most useful ideas, concepts, results, and state of the art algorithms in this important area of research. According to all the feedback we have received so far, we can say that we were right in doing this. Recently, several other researchers have followed us in this journey and have published interesting books with their own visions and perspectives. The idea of writing a book on Microphone Array Signal Processing comes from discussions we have had with many colleagues and friends. As a consequence of these discussions, we came up with the conclusion that again there is an urgent need for a monograph that carefully explains the theory and implementation of microphone arrays. While there are many manuscripts on antenna arrays from a narrowband perspective, narrowband signals, and narrowband processing, the literature is quite scarce when it comes to sensor arrays explained from a truly broadband perspective. Many algorithms for speech applications were simply borrowed from narrowband antenna arrays. However, a direct application of narrowband ideas to broadband speech processing may not be necessarily appropriate and can lead to many misunderstandings.

A Perspective on Single-channel Frequency-domain Speech Enhancement Jacob Benesty, Yiteng Huang, 2011. This book focuses on a class of single channel noise reduction methods that are performed in the frequency domain via the short time Fourier transform (STFT). The simplicity and relative effectiveness of this class of approaches make them the dominant choice in practical systems. Even though many popular algorithms have been proposed through more than four decades of continuous research, there are a number of critical areas where our understanding and capabilities still remain quite rudimentary, especially with respect to the relationship between noise reduction and speech distortion. All existing frequency domain algorithms, no matter how they are developed, have one feature in common: the solution is eventually expressed as a gain function applied to the STFT of the noisy signal only in the current frame. As a result, the narrowband signal-to-noise ratio (SNR) cannot be improved, and any gains achieved in noise reduction on the fullband basis come with a price to pay, which is speech distortion. In this book, we present a new perspective on the problem by exploiting the difference between speech and typical noise in circularity and interframe self-correlation, which were ignored in the past. By gathering the STFT of the microphone signal of the current frame, its complex conjugate, and the STFTs in the previous frames, we construct several new multiple observation signal models similar to a microphone array system. There are multiple noisy speech observations, and their speech components are correlated but not completely coherent, while their noise components are presumably uncorrelated. Therefore, the multichannel Wiener filter and the minimum variance distortionless response (MVDR) filter, which were usually associated with microphone arrays, will be developed for single channel noise reduction in this book. This might instigate a paradigm shift geared toward speech distortionless noise reduction techniques.

[Artificial Intelligence and Bioinformatics Applications for Omics and Multi-Omics Studies](#) Angelo Facchiano, Margherita Mutarelli, Dominik Heider, 2024-02-07 [Disease Ecology: Novel](#)

Concepts and Methods to Track and Forecast Disease Emergence, Transmission, Spread, and Endemization Vincent Obanda, Kimberly VanderWaal, Michel De Garine-Wichatitsky, Nicholas M. Fountain-Jones, Olivia Wesula Lwande, 2022-10-14

Speech and Audio Signal Processing Ben Gold, Nelson Morgan, Dan Ellis, 2011-08-23 When Speech and Audio Signal Processing published in 1999 it stood out from its competition in its breadth of coverage and its accessible intuition based style This book was aimed at individual students and engineers excited about the broad span of audio processing and curious to understand the available techniques Since then with the advent of the iPod in 2001 the field of digital audio and music has exploded leading to a much greater interest in the technical aspects of audio processing This Second Edition will update and revise the original book to augment it with new material describing both the enabling technologies of digital music distribution most significantly the MP3 and a range of exciting new research areas in automatic music content processing such as automatic transcription music similarity etc that have emerged in the past five years driven by the digital music revolution New chapter topics include Psychoacoustic Audio Coding describing MP3 and related audio coding schemes based on psychoacoustic masking of quantization noise Music Transcription including automatically deriving notes beats and chords from music signals Music Information Retrieval primarily focusing on audio based genre classification artist style identification and similarity estimation Audio Source Separation including multi microphone beamforming blind source separation and the perception inspired techniques usually referred to as Computational Auditory Scene Analysis CASA

Basic Quantitative Research Methods for Urban Planners Reid Ewing, Keunhyun Park, 2020-02-24 In most planning practice and research planners work with quantitative data By summarizing analyzing and presenting data planners create stories and narratives that explain various planning issues Particularly in the era of big data and data mining there is a stronger demand in planning practice and research to increase capacity for data driven storytelling Basic Quantitative Research Methods for Urban Planners provides readers with comprehensive knowledge and hands on techniques for a variety of quantitative research studies from descriptive statistics to commonly used inferential statistics It covers statistical methods from chi square through logistic regression and also quasi experimental studies At the same time the book provides fundamental knowledge about research in general such as planning data sources and uses conceptual frameworks and technical writing The book presents relatively complex material in the simplest and clearest way possible and through the use of real world planning examples makes the theoretical and abstract content of each chapter as tangible as possible It will be invaluable to students and novice researchers from planning programs intermediate researchers who want to branch out methodologically practicing planners who need to conduct basic analyses with planning data and anyone who consumes the research of others and needs to judge its validity and reliability

Integration dezentraler Speicher in private Haushalte mit Stromerzeugung aus Photovoltaik Tobias Lühn, 2017-04-19 Der Ausbau der Photovoltaik PV stellt Verteilnetzbetreiber in Deutschland vor die Herausforderung das zul ssige Spannungsband im Niederspannungsnetz

einzuhalten und thermische belastungen von Netzkomponenten zu verhindern In Zeiten hoher PV Erzeugung können zur Einhaltung der Netzeinspeisebegrenzung die Wirkleistung der PV Anlage reduziert oder die Solar überschüssige in Batterien zwischengespeichert werden Eigenverbrauchsmaximierende Betriebsstrategien für Speicher reduzieren die Einspeisespitzen nur unwesentlich sodass die PV Anlage weiterhin abgeregelt werden muss Daher wird in dieser Arbeit eine sogenannte netzdienliche Betriebsstrategie für Speicher auf Basis eines Fuzzy Controllers entwickelt die die Einspeisespitzen und damit die Abregelungsverluste reduziert Der Fuzzy Controller verwendet als Inputdaten sowohl die Solar überschüssige als auch den Speicherfüllstand Um zufriedenstellende Ergebnisse zu erhalten werden die Zugehörigkeitsfunktionen des Fuzzy Controllers mithilfe evolutionärer Algorithmen optimiert Die energetische Bewertung zeigt dass bereits kleine Speicher 5 kWh die Abregelungsverluste deutlich reduzieren wenn diese netzdienlich betrieben werden Die Wirtschaftlichkeitsanalysen zeigen dass im Jahr 2016 PV stand alone Anlagen höhere Renditen als PV Speichersysteme realisieren Dennoch können mit

Investitionen in PV Speichersysteme mit großen PV Anlagen 8 kWp und kleinen Speichern

Techniques for Noise Robustness in Automatic Speech Recognition Tuomas Virtanen, Rita Singh, Bhiksha Raj, 2012-09-19 Automatic speech recognition ASR systems are finding increasing use in everyday life Many of the commonplace environments where the systems are used are noisy for example users calling up a voice search system from a busy cafeteria or a street This can result in degraded speech recordings and adversely affect the performance of speech recognition systems As the use of ASR systems increases knowledge of the state of the art in techniques to deal with such problems becomes critical to system and application engineers and researchers who work with or on ASR technologies This book presents a comprehensive survey of the state of the art in techniques used to improve the robustness of speech recognition systems to these degrading external influences Key features Reviews all the main noise robust ASR approaches including signal separation voice activity detection robust feature extraction model compensation and adaptation missing data techniques and recognition of reverberant speech Acts as a timely exposition of the topic in light of more widespread use in the future of ASR technology in challenging environments Addresses robustness issues and signal degradation which are both key requirements for practitioners of ASR Includes contributions from top ASR researchers from leading research units in the field

Parametric Time-Frequency Domain Spatial Audio Ville Pulkki, Symeon Delikaris-Manias, Archontis Politis, 2017-12-26 A comprehensive guide that addresses the theory and practice of spatial audio This book provides readers with the principles and best practices in spatial audio signal processing It describes how sound fields and their perceptual attributes are captured and analyzed within the time frequency domain how essential representation parameters are coded and how such signals are efficiently reproduced for practical applications The book is split into four parts starting with an overview of the fundamentals It then goes on to explain the reproduction of spatial sound before offering an examination of signal dependent spatial filtering The book finishes with coverage of both current and future applications and the direction

that spatial audio research is heading in Parametric Time frequency Domain Spatial Audio focuses on applications in entertainment audio including music home cinema and gaming covering the capturing and reproduction of spatial sound as well as its generation transduction representation transmission and perception This book will teach readers the tools needed for such processing and provides an overview to existing research It also shows recent up to date projects and commercial applications built on top of the systems Provides an in depth presentation of the principles past developments state of the art methods and future research directions of spatial audio technologies Includes contributions from leading researchers in the field Offers MATLAB codes with selected chapters An advanced book aimed at readers who are capable of digesting mathematical expressions about digital signal processing and sound field analysis Parametric Time frequency Domain Spatial Audio is best suited for researchers in academia and in the audio industry

Advances in Digital Speech Transmission
Prof Rainer Martin, Prof Ulrich Heute, Prof Christiane Antweiler, 2008-02-28 Speech processing and speech transmission technology are expanding fields of active research New challenges arise from the anywhere anytime paradigm of mobile communications the ubiquitous use of voice communication systems in noisy environments and the convergence of communication networks toward Internet based transmission protocols such as Voice over IP As a consequence new speech coding new enhancement and error concealment and new quality assessment methods are emerging Advances in Digital Speech Transmission provides an up to date overview of the field including topics such as speech coding in heterogeneous communication networks wideband coding and the quality assessment of wideband speech Provides an insight into the latest developments in speech processing and speech transmission making it an essential reference to those working in these fields Offers a balanced overview of technology and applications Discusses topics such as speech coding in heterogeneous communications networks wideband coding and the quality assessment of the wideband speech Explains speech signal processing in hearing instruments and man machine interfaces from applications point of view Covers speech coding for Voice over IP blind source separation digital hearing aids and speech processing for automatic speech recognition Advances in Digital Speech Transmission serves as an essential link between the basics and the type of technology and applications prospective engineers work on in industry labs and academia The book will also be of interest to advanced students researchers and other professionals who need to brush up their knowledge in this field

Applied Speech Processing
Nilanjan Dey, 2021-01-19 Applied Speech Processing Algorithms and Case Studies is concerned with supporting and enhancing the utilization of speech analytics in several systems and real world activities including sharing data analytics related information creating collaboration networks between several participants and the use of video conferencing in different application areas The book provides a well standing forum to discuss the characteristics of the intelligent speech signal processing systems in different domains The book is proposed for professionals scientists and engineers who are involved in new techniques of intelligent speech signal processing methods and systems It provides an outstanding

foundation for undergraduate and post graduate students as well Includes basics of speech data analysis and management tools with several applications highlighting recording systems Covers different techniques of big data and Internet of Things in speech signal processing including machine learning and data mining Offers a multidisciplinary view of current and future challenges in this field with extensive case studies on the design implementation development and management of intelligent systems neural networks and related machine learning techniques for speech signal processing Multimodal Signal Processing Steve Renals,2012-06-07 A comprehensive synthesis of recent advances in multimodal signal processing applications for human interaction analysis and meeting support technology With directly applicable methods and metrics along with benchmark results this guide is ideal for those interested in multimodal signal processing its component disciplines and its application to human interaction analysis Handbook on Array Processing and Sensor Networks Simon Haykin,K. J. Ray Liu,2010-02-12 A handbook on recent advancements and the state of the art in array processing and sensor Networks Handbook on Array Processing and Sensor Networks provides readers with a collection of tutorial articles contributed by world renowned experts on recent advancements and the state of the art in array processing and sensor networks Focusing on fundamental principles as well as applications the handbook provides exhaustive coverage of wavelets spatial spectrum estimation MIMO radio propagation robustness issues in sensor array processing wireless communications and sensing in multi path environments using multi antenna transceivers implicit training and array processing for digital communications systems unitary design of radar waveform diversity sets acoustic array processing for speech enhancement acoustic beamforming for hearing aid applications undetermined blind source separation using acoustic arrays array processing in astronomy digital 3D 4D ultrasound imaging technology self localization of sensor networks multi target tracking and classification in collaborative sensor networks via sequential Monte Carlo energy efficient decentralized estimation sensor data fusion with application to multi target tracking distributed algorithms in sensor networks cooperative communications distributed source coding network coding for sensor networks information theoretic studies of wireless networks distributed adaptive learning mechanisms routing for statistical inference in sensor networks spectrum estimation in cognitive radios nonparametric techniques for pedestrian tracking in wireless local area networks signal processing and networking via the theory of global games biochemical transport modeling estimation and detection in realistic environments and security and privacy for sensor networks Handbook on Array Processing and Sensor Networks is the first book of its kind and will appeal to researchers professors and graduate students in array processing sensor networks advanced signal processing and networking **Unsupervised Signal Processing** João Marcos Travassos Romano,Romis Attux,Charles Casimiro Cavalcante,Ricardo Suyama,2018-09-03 Unsupervised Signal Processing Channel Equalization and Source Separation provides a unified systematic and synthetic presentation of the theory of unsupervised signal processing Always maintaining the focus on a signal processing oriented approach this book describes how the subject has evolved and assumed

a wider scope that covers several topics from well established blind equalization and source separation methods to novel approaches based on machine learning and bio inspired algorithms From the foundations of statistical and adaptive signal processing the authors explore and elaborate on emerging tools such as machine learning based solutions and bio inspired methods With a fresh take on this exciting area of study this book Provides a solid background on the statistical characterization of signals and systems and on linear filtering theory Emphasizes the link between supervised and unsupervised processing from the perspective of linear prediction and constrained filtering theory Addresses key issues concerning equilibrium solutions and equivalence relationships in the context of unsupervised equalization criteria Provides a systematic presentation of source separation and independent component analysis Discusses some instigating connections between the filtering problem and computational intelligence approaches Building on more than a decade of the authors work at DSPCom laboratory this book applies a fresh conceptual treatment and mathematical formalism to important existing topics The result is perhaps the first unified presentation of unsupervised signal processing techniques one that addresses areas including digital filters adaptive methods and statistical signal processing With its remarkable synthesis of the field this book provides a new vision to stimulate progress and contribute to the advent of more useful efficient and friendly intelligent systems

Adams Pech, die Welt zu retten Arto Paasilinna, 2009 Aatami Rym ttyl hat den Weg aus der drohenden lkrise gefunden einen winzigen Akku der Strom im berfluss liefern kann Um die umw lzende Erfindung zu vermarkten fehlt Aatami jedoch das Geld Zum Gl ck nimmt sich Eeva Kontupohja des vom Pech verfolgten Weltretters an Die neue Energiequelle st sst jedoch nicht nur auf Gegenliebe Die lmultis setzen einen sizilianischen Killer auf Aatami an

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