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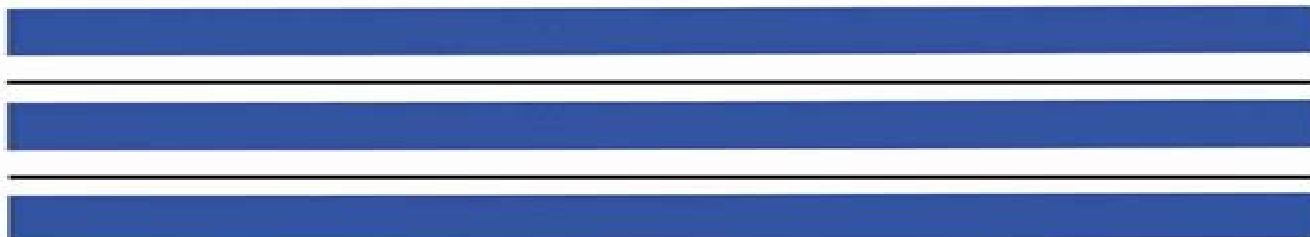
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# Robustness In Automatic Speech Recogniti

**Alex Acero**

**Robustness In Automatic Speech Recogniti:**

Robust Automatic Speech Recognition Jinyu Li,Li Deng,Reinhold Haeb-Umbach,Yifan Gong,2015-10-30 Robust Automatic Speech Recognition A Bridge to Practical Applications establishes a solid foundation for automatic speech recognition that is robust against acoustic environmental distortion It provides a thorough overview of classical and modern noise and reverberation robust techniques that have been developed over the past thirty years with an emphasis on practical methods that have been proven to be successful and which are likely to be further developed for future applications The strengths and weaknesses of robustness enhancing speech recognition techniques are carefully analyzed The book covers noise robust techniques designed for acoustic models which are based on both Gaussian mixture models and deep neural networks In addition a guide to selecting the best methods for practical applications is provided The reader will Gain a unified deep and systematic understanding of the state of the art technologies for robust speech recognition Learn the links and relationship between alternative technologies for robust speech recognition Be able to use the technology analysis and categorization detailed in the book to guide future technology development Be able to develop new noise robust methods in the current era of deep learning for acoustic modeling in speech recognition The first book that provides a comprehensive review on noise and reverberation robust speech recognition methods in the era of deep neural networks Connects robust speech recognition techniques to machine learning paradigms with rigorous mathematical treatment Provides elegant and structural ways to categorize and analyze noise robust speech recognition techniques Written by leading researchers who have been actively working on the subject matter in both industrial and academic organizations for many years *Robustness in Automatic Speech Recognition* Jean-Claude Junqua,Jean-Paul Haton,2012-12-06 Foreword Looking back the past 30 years we have seen steady progress made in the area of speech science and technology I still remember the excitement in the late seventies when Texas Instruments came up with a toy named Speak and Spell which was based on a VLSI chip containing the state of the art linear prediction synthesizer This caused a speech technology fever among the electronics industry Particularly applications of automatic speech recognition were rigorously attempt ed by many companies some of which were start ups founded just for this purpose Unfortunately it did not take long before they realized that automatic speech rec ognition technology was not mature enough to satisfy the need of customers The fever gradually faded away In the meantime constant efforts have been made by many researchers and engi neers to improve the automatic speech recognition technology Hardware capabilities have advanced impressively since that time In the past few years we have been witnessing and experiencing the advent of the Information Revolution What might be called the second surge of interest to com mercialize speech technology as a natural interface for man machine communication began in much better shape than the first one With computers much more powerful and faster many applications look realistic this time However there are still tremendous practical issues to be overcome in order for speech to be truly the most natural interface between humans and machines

**Robustness in Automatic Speech Recognition** Jean-Claude Junqua,Jean-Paul Haton,2013-09-11 Foreword Looking back the past 30 years we have seen steady progress made in the area of speech science and technology I still remember the excitement in the late seventies when Texas Instruments came up with a toy named Speak and Spell which was based on a VLSI chip containing the state of the art linear prediction synthesizer This caused a speech technology fever among the electronics industry Particularly applications of automatic speech recognition were rigorously attempt ed by many companies some of which were start ups founded just for this purpose Unfortunately it did not take long before they realized that automatic speech rec ognition technology was not mature enough to satisfy the need of customers The fever gradually faded away In the meantime constant efforts have been made by many researchers and engi neers to improve the automatic speech recognition technology Hardware capabilities have advanced impressively since that time In the past few years we have been witnessing and experiencing the advent of the Information Revolution What might be called the second surge of interest to com mercialize speech technology as a natural interface for man machine communication began in much better shape than the first one With computers much more powerful and faster many applications look realistic this time However there are still tremendous practical issues to be overcome in order for speech to be truly the most natural interface between humans and machines *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 **Noise Robustness in Automatic Speech Recognition** Chia-Ping Chen,2004 **Acoustical and Environmental Robustness in Automatic Speech Recognition** Alex Acero,1992-11-30 The need for automatic speech recognition systems to be robust with respect to changes in their acoustical environment has become more widely appreciated in recent years as more systems are finding their way into practical applications Although the issue of environmental robustness has received only a small fraction of the attention devoted to speaker independence even speech

recognition systems that are designed to be speaker independent frequently perform very poorly when they are tested using a different type of microphone or acoustical environment from the one with which they were trained The use of microphones other than a close talking headset also tends to severely degrade speech recognition performance Even in relatively quiet office environments speech is degraded by additive noise from fans slamming doors and other conversations as well as by the effects of unknown linear filtering arising reverberation from surface reflections in a room or spectral shaping by microphones or the vocal tracts of individual speakers Speech recognition systems designed for long distance telephone lines or applications deployed in more adverse acoustical environments such as motor vehicles factory floors oroutdoors demand far greaterdegrees ofenvironmental robustness There are several different ways of building acoustical robustness into speech recognition systems Arrays of microphones can be used to develop a directionally sensitive system that resists intelference from competing talkers and other noise sources that are spatially separated from the source of the desired speech signal

   **Speech Recognition Over Digital Channels** Antonio Peinado,Jose Segura,2006-08-04 Automatic speech recognition ASR is a very attractive means for human machine interaction The degree of maturity reached by speech recognition technologies during recent years allows the development of applications that use them In particular ASR shows an enormous potential in mobile environments where devices such as mobile phones or PDAs are used and for Internet Protocol IP applications Speech Recognition Over Digital Channels is the first book of its kind to offer a complete system comprehension addressing the topics of distributed and network based speech recognition issues and standards the concepts of speech processing and transmission and system architectures and robustness Describes the different client server architectures for remote speech recognition systems by means of which the client transmits speech parameters through a digital channel to a remote recognition server Focuses on robustness against both adverse acoustic environments in the front end and bit errors packet loss Discusses four ETSI standards for distributed speech recognition the understanding of the standards and the technologies behind them Provides the necessary background for the comprehension of remote speech recognition technologies This book will appeal to a wide ranging audience engineers using speech recognition systems researchers involved in ASR systems and those interested in processing and transmitting speech such as signal processing and communications communities It will also be of interest to technical experts requiring an understanding of recognition over mobile and IP networks and postgraduate students working on robust speech processing    *Robustness in Automatic Speech Recognition* Hang Shun Lee,1997    **Environmental and Speaker Robustness in Automatic Speech Recognition with Limited Learning Data** Xiaodong Cui,2005    *Toward Robustness in Isolated-word Automatic Speech Recognition* Jean-claude Junqua,1989    Acoustical and environmental robustness in automatic speech recognition Alejandro Acero,1990    *Robust Automatic Speech Recognition* Jinyu Li,Li Deng,Yifan Gong,Reinhold Hab-Umbach,2015-10-15 Robust Automatic Speech Recognition A Bridge to Practical Applications establishes a solid and

consistent foundation for noise robust automatic speech recognition ASR and provides a thorough overview of modern noise robust techniques which have been developed over the past 30 years The book emphasizes practical methods that are proven to be successful also discussing those that are likely to be developed further for future applications In addition the pros and cons of using noise robust ASR techniques for different applications are given providing users with a practical guide to selecting the best methods for future applications Connects noise robust speech recognition methods to machine learning technologiesContains a unified state of the art survey of successful noise robust speech recognition technologiesProvides several ways to classify noise robust speech recognition technologies into different categoriesAuthored by leading researchers at Microsoft *Robust Speech Recognition in Embedded Systems and PC Applications* Jean-Claude Junqua,2000-05-31 Robust Speech Recognition in Embedded Systems and PC Applications reviews the problems of robust speech recognition summarizes the current state of the art of robust speech recognition provides perspective on the state of the art and reviews the complementary technologies i e dialog and user interface necessary to build an application <u>Techniques for Noise Robustness in Automatic Speech Recognition</u> Tuomas Virtanen,Rita Singh,Bhiksha Raj,2012-11-28 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 *Emulating Human Speech Recognition* Andre Coy,2014-05-14 **On Robustness to Fast Speech in Automatic Speech Recognition** Naghmeh Nikki Mirghafori,1995 *Robust Speech Recognition of Uncertain or Missing Data* Dorothea Kolossa,Reinhold Haeb-Umbach,2014-11-12 Automatic speech recognition suffers from a lack of robustness with respect to noise reverberation and interfering speech The growing field of speech recognition in the presence of missing or uncertain input data seeks to ameliorate those problems by using not only a preprocessed speech signal but also an estimate of its reliability to selectively focus on those segments and features that are most reliable for recognition This book presents the state of the art in recognition in the presence of uncertainty offering examples that utilize uncertainty

information for noise robustness reverberation robustness simultaneous recognition of multiple speech signals and audiovisual speech recognition The book is appropriate for scientists and researchers in the field of speech recognition who will find an overview of the state of the art in robust speech recognition professionals working in speech recognition who will find strategies for improving recognition results in various conditions of mismatch and lecturers of advanced courses on speech processing or speech recognition who will find a reference and a comprehensive introduction to the field The book assumes an understanding of the fundamentals of speech recognition using Hidden Markov Models **Robust Adaptation to Non-Native Accents in Automatic Speech Recognition** Silke Goronzy,2002-12-19 Speech recognition technology is being increasingly employed in human machine interfaces A remaining problem however is the robustness of this technology to non native accents which still cause considerable difficulties for current systems In this book methods to overcome this problem are described A speaker adaptation algorithm that is capable of adapting to the current speaker with just a few words of speaker specific data based on the MLLR principle is developed and combined with confidence measures that focus on phone durations as well as on acoustic features Furthermore a specific pronunciation modelling technique that allows the automatic derivation of non native pronunciations without using non native data is described and combined with the previous techniques to produce a robust adaptation to non native accents in an automatic speech recognition system *Robustness in Language and Speech Technology* Jean-Claude Junqua,Gertjan van Noord,2001-02-28 In this book we address robustness issues at the speech recognition and natural language parsing levels with a focus on feature extraction and noise robust recognition adaptive systems language modeling parsing and natural language understanding This book attempts to give a clear overview of the main technologies used in language and speech processing along with an extensive bibliography to enable topics of interest to be pursued further It also brings together speech and language technologies often considered separately Robustness in Language and Speech Technology serves as a valuable reference and although not intended as a formal university textbook contains some material that can be used for a course at the graduate or undergraduate level

*New Era for Robust Speech Recognition* Shinji Watanabe,Marc Delcroix,Florian Metze,John R. Hershey,2017-10-30 This book covers the state of the art in deep neural network based methods for noise robustness in distant speech recognition applications It provides insights and detailed descriptions of some of the new concepts and key technologies in the field including novel architectures for speech enhancement microphone arrays robust features acoustic model adaptation training data augmentation and training criteria The contributed chapters also include descriptions of real world applications benchmark tools and datasets widely used in the field This book is intended for researchers and practitioners working in the field of speech processing and recognition who are interested in the latest deep learning techniques for noise robustness It will also be of interest to graduate students in electrical engineering or computer science who will find it a useful guide to this field of research

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