Braincomputer Interfacing

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Smart Wheelchairs and Brain-computer Interfaces Pablo Diez 2018-05-29 Smart Wheelchairs and Brain-Computer Interfaces: Mobile Assistive Technologies combines the fields of neuroscience, rehabilitation and robotics via contributions from experts in their field to help readers develop new mobile assistive technologies. It provides information on robotics, control algorithm design for mobile robotics systems, ultrasonic and laser sensors for measurement and trajectory planning, and is ideal for researchers in BCI. A full view of this new field is presented, giving readers the current research in the field of smart wheelchairs, potential control mechanisms and human interfaces that covers mobility, particularly powered mobility, smart wheelchairs, particularly sensors, control mechanisms, and human interfaces. Presents the first book that combines BCI and mobile robotics Focuses on fundamentals and developments in assistive robotic devices which are commanded by alternative ways, such as the brain Provides an overview of the technologies that are already available to support research and the development of new products
A Practical Guide to Brain–Computer Interfacing with BCI2000 Gerwin Schalk 2010-04-03 What Is BCI2000? BCI2000 is a general-purpose software platform for brain–computer interface (BCI) research. It can also be used for a wide variety of data acquisition, stimulus p- sentation, and brain monitoring applications. BCI2000 has been in development since 2000 in a project led by the Brain–Computer Interface R&D Program at the Wadsworth Center of the New York State Department of Health in Albany, New York, USA, with substantial contributions by the Institute of Medical Psychology and Behavioral Neurobiology at the University of Tübingen, Germany. In addition, many laboratories around the world, most notably the BrainLab at Georgia State University in Atlanta, Georgia, and Fondazione Santa Lucia in Rome, Italy, have also played an important role in the project's development. Mission The mission of the BCI2000 project is to facilitate research and the development of applications in all areas that depend on real-time acquisition, processing, and feedback of biosignals. Vision Our vision is that BCI2000 will become a widely used software tool for diverse areas of research and development.
Brain-Computer Interfacing Rajesh P. N. Rao 2013-09-30 The idea of interfacing minds with machines has long captured the human imagination. Recent advances in neuroscience and engineering are making this a reality, opening the door to restoration and augmentation of human physical and mental capabilities. Medical applications such as cochlear implants for the deaf and neurally controlled prosthetic limbs for the paralyzed are becoming almost commonplace. Brain-computer interfaces (BCIs) are also increasingly being used in security, lie detection, alertness monitoring, telepresence, gaming, education, art, and human augmentation. This introduction to the field is designed as a textbook for upper-level undergraduate and first-year graduate courses in neural engineering or brain-computer interfacing for students from a wide range of disciplines. It can also be used for self-study and as a reference by neuroscientists, computer scientists, engineers, and medical practitioners. Key features include questions and exercises in each chapter and a supporting website.
Brain-Computer Interfaces: Lab Experiments to Real-World Applications Damien Coyle 2016-08-31 Brain-Computer Interfaces: Lab Experiments to Real-World Applications, the latest volume in the Progress in Brain Research series, focuses on new trends and developments. This established international series examines major areas of basic and clinical research within the neurosciences, as well as popular and emerging subfields. Explores new trends and developments in brain research Enhances the literature of neuroscience by further expanding this established, ongoing international series Examines major areas of basic and clinical research within the field
Brain-Computer Interfaces 2 Maureen Clerc 2016-08-16 Brain–computer interfaces (BCI) are devices which measure brain activity and translate it into messages or commands, thereby opening up many possibilities for investigation and application. This book provides keys for understanding and designing these multi-disciplinary interfaces, which require many fields of expertise such as neuroscience, statistics, informatics and psychology. This second volume, Technology and Applications, is focused on the field of BCI from the perspective of its end users, such as those with disabilities to practitioners. Covering clinical applications and the field of video games, the book then goes on to explore user needs which drive the design and development of BCI. The software used for their design, primarily OpenViBE, is explained step by step, before a discussion on the use of BCI from ethical, philosophical and social perspectives. The basic notions developed in this reference book are intended to be accessible to all readers interested in BCI, whatever their background. More advanced material is also offered, for readers who want to expand their knowledge in disciplinary fields underlying BCI.
Brain-Computer Interfaces: Lab Experiments to Real-World Applications 2016-08-27 Brain-Computer Interfaces: Lab Experiments to Real-World Applications, the latest volume in the Progress in Brain Research series, focuses on new trends and developments. This established international series examines major areas of basic and clinical research within the neurosciences, as well as popular and emerging subfields. Explores new trends and developments in brain research Enhances the literature of neuroscience by further expanding this established, ongoing international series Examines major areas of basic and clinical research within the field
Brain-Computer Interfacing Rajesh P. N. Rao 2013-09-30 The idea of interfacing minds with machines has long captured the human imagination. Recent advances in neuroscience and engineering are making this a reality, opening the door to restoration and augmentation of human physical and mental capabilities. Medical applications such as cochlear implants for the deaf and neurally controlled prosthetic limbs for the paralyzed are becoming almost commonplace. Brain-computer interfaces (BCIs) are also increasingly being used in security, lie detection, alertness monitoring, telepresence, gaming, education, art, and human augmentation. This introduction to the field is designed as a textbook for upper-level undergraduate and first-year graduate courses in neural engineering or brain-computer interfacing for students from a wide range of disciplines. It can also be used for self-study and as a reference by neuroscientists, computer scientists, engineers, and medical practitioners. Key features include questions and exercises in each chapter and a supporting website.
Brain Computer Interface Narayan Panigrahi 2022-07-29 Brain Computer Interface: EEG Signal Processing discusses electroencephalogram (EEG) signal processing using effective methodology and algorithms. This book provides a basic introduction to EEG and a classification of different components present in EEG. It also helps the reader to understand the scope of processing EEG signals and their associated applications. Further, it covers specific aspects such as epilepsy detection; exploitation of P300 for various applications; design of an EEG acquisition system; and detection of saccade, fix, and blink from EEG and EOG data. Key Features: Explains the basis of brain computer interface and how it can be established using different EEG signal characteristics Covers the detailed classification of different types of EEG signals with respect to their physical characteristics Explains detection and diagnosis of epileptic seizures from the EEG data of a subject Reviews the design and development of a low-cost and robust EEG

acquisition system Provides mathematical analysis of EEGs, including MATLAB® codes for students to experiment with EEG data This book is aimed at graduate students and researchers in biomedical, electrical, electronics, communication engineering, healthcare, and cyber physical systems.

Guide to Brain-Computer Music Interfacing Eduardo Reck Miranda 2014-10-03 This book presents a world-class collection of Brain-Computer Music Interfacing (BCMI) tools. The text focuses on how these tools enable the extraction of meaningful control information from brain signals, and discusses how to design effective generative music techniques that respond to this information. Features: reviews important techniques for hands-free interaction with computers, including event-related potentials with P300 waves; explores questions of semiotic brain-computer interfacing (BCI), and the use of machine learning to dig into relationships among music and emotions; offers tutorials on signal extraction, brain electric fields, passive BCI, and applications for genetic algorithms, along with historical surveys; describes how BCMI research advocates the importance of better scientific understanding of the brain for its potential impact on musical creativity; presents broad coverage of this emerging, interdisciplinary area, from hard-core EEG analysis to practical musical applications.

Deep Learning in Brain-Computer Interface Minkyu Ahn 2022-06-06

Introduction to Non-Invasive EEG-Based Brain-Computer Interfaces for Assistive Technologies Teodiano Freire Bastos-Filho 2020-07-23 This book aims to bring to the reader an overview of different applications of brain-computer interfaces (BCIs) based on more than 20 years of experience working on these interfaces. The author provides a review of the human brain and EEG signals, describing the human brain, anatomically and physiologically, with the objective of showing some of the patterns of EEG (electroencephalogram) signals used to control BCIs. It then introduces BCIs and different applications, such as a BCI based on ERD/ERS Patterns in α rhythms (used to command a robotic wheelchair with an augmentative and alternative communication (AAC) system onboard it); a BCI based on dependent-SSVEP to command the same robotic wheelchair; a BCI based on SSVEP to command a telepresence robot and its onboard AAC system; a BCI based on SSVEP to command an autonomous car; a BCI based on independent-SSVEP (using Depth-of-Field) to command the same robotic wheelchair; the use of compressive technique in SSVEP-based BCI; a BCI based on motor imagery (using different techniques) to command a robotic monocycle and a robotic exoskeleton; and the first steps to build a neurorehabilitation system based on motor imagery of pedalling together an in immersive virtual environment. This book is intended for researchers, professionals and students working on assistive technology.

Brain-Computer Interface Research Christoph Guger 2017-08-21 This book presents compact and informative descriptions of the most promising new projects in brain-computer interface (BCI) research. As in earlier volumes in this series, the contributions come from many of the best-known groups in BCI research. Each of these chapters provides an overview of a project that was nominated for the most prestigious award in the BCI community: the Annual BCI Research Award. The book also contains an introduction and discussion with a review of major trends reflected in the awards. This volume also introduces a new type of contribution, namely a chapter"Trends in BCI Research" that summarizes a top trend in the BCI research community. This year's "Trends in BCI Research" addresses BCI technology to help patients with disorders of consciousness (DOC) and related conditions, including new work that goes beyond communication to diagnosis and even prediction.

Datasets for Brain-Computer Interface Applications Ian Daly 2021-11-25

Brain-Computer Interfaces Jonathan Wolpaw 2012-01-24 In the last 15 years, a recognizable surge in the field of Brain Computer Interface (BCI) research and development has emerged. This emergence has sprung from a variety of factors. For one, inexpensive computer hardware and software is now available and can support the complex high-speed analyses of brain activity that is essential is BCI. Another factor is the greater understanding of the central nervous system including the abundance of new information on the nature and functional correlates of brain signals and improved methods for recording these signals in both the short-term and long-term. And the third, and perhaps most significant factor, is the new recognition of the needs and abilities of people disabled by disorders such as cerebral palsy, spinal cord injury, stroke, amyotrophic lateral sclerosis (ALS), multiple sclerosis, and muscular dystrophies. The severely disabled are now able to live for many years and even those with severely limited voluntary muscle control can now be given the most basic means of communication and control because of the recent advances in the technology, research, and applications of BCI. This book is intended to provide an introduction to and summary of essentially all major aspects of BCI research and development. Its goal is to be a comprehensive, balanced, and coordinated presentation of the field's key principles, current practice, and future prospects.

Human Factors Studies of Brain-computer Interfaces Elizabeth Ann Felton 2007

Brain-Computer Interfaces 2020-03-10 Brain-Computer Interfacing, Volume 168, not only gives readers a clear understanding of what BCI science is currently offering, but also describes future expectations for restoring lost brain function in patients. In-depth technological chapters are aimed at those interested in BCI technologies and the nature of brain signals, while more comprehensive summaries are provided in the more applied chapters. Readers will be able to grasp BCI concepts, understand what needs the technologies can meet, and provide an informed opinion on BCI science. Explores how many different causes of disability have similar functional consequences (loss of mobility, communication etc.) Addresses how BCI can be of use Presents a multidisciplinary review of BCI technologies and the opportunities they provide for people in need of a new kind of prosthetic Offers a comprehensive, multidisciplinary review of BCI for researchers in neuroscience and traumatic brain injury that is also ideal for clinicians in neurology and neurosurgery

Toward Brain-computer Interfacing Guido Dornhege 2007 The latest research in the development of technologies that will allow humans tocommunicate, using brain signals only, with computers, wheelchairs, prostheses, and otherdevices.

Brain-Computer-Interfaces in their ethical, social and cultural contexts Gerd Grübler 2014-06-30 This volume summarizes the ethical, social and cultural contexts of interfacing brains and computers. It is intended for the interdisciplinary community of BCI stakeholders. Insofar, engineers, neuroscientists, psychologists, physicians, care-givers and also users and their relatives are concerned. For about the last twenty years brain-computer-interfaces (BCIs) have been investigated with increasing intensity and have in principle shown their potential to be useful tools in diagnostics, rehabilitation and assistive technology. The central promise of BCI technology is enabling severely impaired people in mobility, grasping, communication, and entertainment. Successful applications are for instance communication devices enabling locked-in patients in staying in contact with their environment, or prostheses enabling paralysed people in reaching and grasping. In addition to this, it serves as an introduction to the whole field of BCI for any interested reader.

Brain-Computer Interfacing for Assistive Robotics Vaibhav Gandhi 2014-09-24 Brain-computer interface (BCI) technology provides a means of communication that allows individuals with severely impaired movement to communicate with assistive devices using the electroencephalogram (EEG) or other brain signals. The practicality of a BCI has been possible due to advances in multi-disciplinary areas of research related to cognitive neuroscience, brain-imaging techniques and human-computer interfaces. However, two major challenges remain in making BCI for assistive robotics practical for day-to-day use: the inherent lower bandwidth of BCI, and how to best handle the unknown embedded noise within the raw EEG. Brain-Computer Interfacing for Assistive Robotics is a result of research focusing on these important aspects of BCI for real-time assistive robotic application. It details the fundamental issues related to non-stationary EEG signal processing (filtering) and the need of an alternative approach for the same. Additionally, the book also discusses techniques for overcoming lower bandwidth of BCIs by designing novel use-centric graphical user interfaces. A detailed investigation into both these approaches is discussed. An innovative reference on the brain-computer interface (BCI) and its utility in computational neuroscience and assistive robotics Written for mature and early stage researchers, postgraduate and doctoral students, and computational neuroscientists, this book is a novel guide to the fundamentals of quantum mechanics for BCI Full-colour text that focuses on brain-computer interfacing for real-time assistive robotic application and details the fundamental issues related with signal processing and the need for alternative approaches A detailed introduction as well as an in-depth analysis of challenges and issues in developing practical brain-computer interfaces.

Brain-Computer Interfaces for Human Augmentation Riccardo Poli 2019-11-28 The field of

Brain–Computer Interfaces (BCIs) has grown rapidly in the last few decades, allowing the development of faster and more reliable assistive technologies based on direct links between the brain and an external device. Novel applications of BCIs have also been proposed, especially in the area of human augmentation, i.e., enabling people to go beyond human limitations in sensory, cognitive and motor tasks. Brain-imaging techniques, such as electroencephalography, have been used to extract neural correlates of various brain processes and transform them, via machine learning, into commands for external devices. Brain stimulation technology has allowed to trigger the activation of specific brain areas to enhance the cognitive processes associated to the task at hand, hence improving performance. BCIs have therefore extended their scope from assistive technologies for people with disabilities to neuro-tools for human enhancement. This Special Issue aims at showing the recent advances in BCIs for human augmentation, highlighting new results on both traditional and novel applications. These include, but are not limited to, control of external devices, communication, cognitive enhancement, decision making and entertainment.

Brain-Computer Interfaces Bernhard Graimann 2010-10-29 A brain-computer interface (BCI) establishes a direct output channel between the human brain and external devices. BCIs infer user intent via direct measures of brain activity and thus enable communication and control without movement. This book, authored by experts in the field, provides an accessible introduction to the neurophysiological and signal-processing background required for BCI, presents state-of-the-art non-invasive and invasive approaches, gives an overview of current hardware and software solutions, and reviews the most interesting as well as new, emerging BCI applications. The book is intended not only for students and young researchers, but also for newcomers and other readers from diverse backgrounds keen to learn about this vital scientific endeavour.

Brain-Computer Interface Research Christoph Guger 2019-07-08 Each year, the Annual BCI Research Award recognizes the top new projects in brain-computer interface (BCI) research. This book contains summaries of these projects from the 2017 BCI Research Award. Each chapter is written by the group that submitted the BCI project that was nominated, and introduction and discussion chapters provide supporting information and explore trends that are reflected in the annual awards each year. One of the prominent trends in recent years has been BCIs for new patient groups, and many chapters in this book present emerging research directions that might become more prevalent in the near future.

Electrocorticographic Brain-Computer Interfaces Mikhail Lebedev 2022-02-22 Topic Editor Christoph Guger is the CEO of Guger Technologies. All other topic editors declare no competing interests with regards to the Research Topic subject.

Brain-Computer Interface 2022-05-18 Brain-computer interfacing (BCI) with the use of advanced artificial intelligence identification is a rapidly growing new technology that allows a silently commanding brain to manipulate devices ranging from smartphones to advanced articulated robotic arms when physical control is not possible. BCI can be viewed as a collaboration between the brain and a device via the direct passage of electrical signals from neurons to an external system. The book provides a comprehensive summary of conventional and novel methods for processing brain signals. The chapters cover a range of topics including noninvasive and invasive signal acquisition, signal processing methods, deep learning approaches, and implementation of BCI in experimental problems.

Brain Art Anton Nijholt 2019-05-25 This is the first book on brain-computer interfaces (BCI) that aims to explain how these BCI interfaces can be used for artistic goals. Devices that measure changes in brain activity in various regions of our brain are available and they make it possible to investigate how brain activity is related to experiencing and creating art. Brain activity can also be monitored in order to find out about the affective state of a performer or bystander and use this knowledge to create or adapt an interactive multi-sensorial (audio, visual, tactile) piece of art. Making use of the measured affective state is just one of the possible ways to use BCI for artistic expression. We can also stimulate brain activity. It can be evoked externally by exposing our brain to external events, whether they are visual, auditory, or tactile. Knowing about the stimuli and the effect on the brain makes it possible to translate such external stimuli to decisions and commands that help to design, implement, or adapt an artistic performance, or interactive installation. Stimulating brain activity can also be done internally. Brain activity can be voluntarily manipulated and changes can be translated into computer commands to realize an artistic vision. The chapters in this book have been written by researchers in human-computer interaction, brain-computer interaction, neuroscience, psychology and social sciences, often in cooperation with artists using BCI in their work. It is the perfect book for those seeking to learn about brain-computer interfaces used for artistic applications.

Brain–Computer Interfaces Handbook Chang S. Nam 2018-01-09 Brain–Computer Interfaces Handbook: Technological and Theoretical Advances provides a tutorial and an overview of the rich and multi-faceted world of Brain–Computer Interfaces (BCIs). The authors supply readers with a contemporary presentation of fundamentals, theories, and diverse applications of BCI, creating a valuable resource for anyone involved with the improvement of people’s lives by replacing, restoring, improving, supplementing or enhancing natural output from the central nervous system. It is a useful guide for readers interested in understanding how neural bases for cognitive and sensory functions, such as seeing, hearing, and remembering, relate to real-world technologies. More precisely, this handbook details clinical, therapeutic and human-computer interfaces applications of BCI and various aspects of human cognition and behavior such as perception, affect, and action. It overviews the different methods and techniques used in acquiring and pre-processing brain signals, extracting features, and classifying users’ mental states and intentions. Various theories, models, and empirical findings regarding the ways in which the human brain interfaces with external systems and environments using BCI are also explored. The handbook concludes by engaging ethical considerations, open questions, and challenges that continue to face brain–computer interface research. Features an in-depth look at the different methods and techniques used in acquiring and pre-processing brain signals, extracting features, and classifying the user's intention Covers various theories, models, and empirical findings regarding ways in which the human brain can interface with the systems or external environments Presents applications of BCI technology to understand various aspects of human cognition and behavior such as perception, affect, action, and more Includes clinical trials and individual case studies of the experimental therapeutic applications of BCI Provides human factors and human-computer interface concerns in the design, development, and evaluation of BCIs Overall, this handbook provides a synopsis of key technological and theoretical advances that are directly applicable to brain–computer interfacing technologies and can be readily understood and applied by individuals with no formal training in BCI research and development.

Brain-Computer Interfaces Desney S. Tan 2010-06-10 For generations, humans have fantasized about the ability to create devices that can see into a person’s mind and thoughts, or to communicate and interact with machines through thought alone. Such ideas have long captured the imagination of humankind in the form of ancient myths and modern science fiction stories. Recent advances in cognitive neuroscience and brain imaging technologies have started to turn these myths into a reality, and are providing us with the ability to interface directly with the human brain. This ability is made possible through the use of sensors that monitor physical processes within the brain which correspond with certain forms of thought. Brain-Computer Interfaces: Applying our Minds to Human-Computer Interaction broadly surveys research in the Brain-Computer Interface domain. More specifically, each chapter articulates some of the challenges and opportunities for using brain sensing in Human-Computer Interaction work, as well as applying Human-Computer Interaction solutions to brain sensing work. For researchers with little or no expertise in neuroscience or brain sensing, the book provides background information to equip them to not only appreciate the state-of-the-art, but also ideally to engage in novel research. For expert Brain-Computer Interface researchers, the book introduces ideas that can help in the quest to interpret intentional brain control and develop the ultimate input device. It challenges researchers to further explore passive brain sensing to evaluate interfaces and feed into adaptive computing systems. Most importantly, the book will connect multiple communities allowing research to leverage their work and expertise and blaze into the future.

Brain-Computer Interface Reference Guide Lance Treaster 2016-09-14 This reference guide contains current information regarding brain-computer interfacing.

Brain-Computer Interfaces Theodore W. Berger 2008-09-18 We have come to know that our ability to survive and grow as a nation to a very large degree depends upon our scientific progress. Moreover, it is not enough simply to keep 1 abreast of the rest of the world in scientific matters. We must maintain our

leadership. President Harry Truman spoke those words in 1950, in the aftermath of World War II and in the midst of the Cold War. Indeed, the scientific and engineering leadership of the United States and its allies in the twentieth century played key roles in the successful outcomes of both World War II and the Cold War, sparing the world the twin horrors of fascism and totalitarian communism, and fueling the economic prosperity that followed. Today, as the United States and its allies once again find themselves at war, President Truman's words ring as true as they did a half-century ago. The goal set out in the Truman Administration of maintaining leadership in science has remained the policy of the U. S. Government to this day: Dr. John Marburger, the Director of the Office of Science and Technology (OSTP) in the Executive Office of the President, made remarks to that effect during his 2 confirmation hearings in October 2001. The United States needs metrics for measuring its success in meeting this goal of maintaining leadership in science and technology. That is one of the reasons that the National Science Foundation (NSF) and many other agencies of the U. S.

Deep Learning For Eeg-based Brain-computer Interfaces: Representations, Algorithms And Applications Xiang Zhang 2021-09-14 Deep Learning for EEG-Based Brain-Computer Interfaces is an exciting book that describes how emerging deep learning improves the future development of Brain-Computer Interfaces (BCI) in terms of representations, algorithms and applications. BCI bridges humanity's neural world and the physical world by decoding an individuals' brain signals into commands recognizable by computer devices.This book presents a highly comprehensive summary of commonly-used brain signals; a systematic introduction of around 12 subcategories of deep learning models; a mind-expanding summary of 200+ state-of-the-art studies adopting deep learning in BCI areas; an overview of a number of BCI applications and how deep learning contributes, along with 31 public BCI data sets. The authors also introduce a set of novel deep learning algorithms aimed at current BCI challenges such as robust representation learning, cross-scenario classification, and semi-supervised learning. Various real-world deep learning-based BCI applications are proposed and some prototypes are presented. The work contained within proposes effective and efficient models which will provide inspiration for people in academia and industry who work on BCI.

Artificial Intelligence-Based Brain-Computer Interface Varun Bajaj 2022-02-08 Artificial Intelligence-Based Brain Computer Interface provides concepts of AI for modelling of non-invasive modalities of medical signals such as EEG, MRI, and FMRI. These modalities and their AI-based analysis are employed in BCI and related applications. This can help to improve the healthcare system through detection, identification, predication, analysis and classification of disease, management of chronic conditions, and delivery of health services. Artificial Intelligence-Based Brain Computer Interface emphasizes the real challenges in non-invasive input due to the complex nature of the human brain and for a variety of applications for analysis, classification and identification of different mental states. Each chapter starts with a description of a non-invasive input example and the need and motivation of the associated AI methods, along with discussions to connect the technology through BCI. Major topics include different AI methods/techniques such as Deep Neural Networks and Machine Learning algorithms for different non-invasive modalities such as EEG, MRI, FMRI for improving the diagnosis and prognosis of numerous disorders of the nervous system, cardiovascular system, musculoskeletal system, respiratory system and various organs of the body. The book also covers applications of AI in management of chronic condition, databases and delivery of health services. Various brain image modalities are analyzed and capabilities of the human brain will be exploited in BCI applications and case studies. The book presents AI methods for solving real-world problems and challenges in BCI and healthcare systems with the help of appropriate case studies and research results. Provides readers with an understanding of the key applications of Artificial Intelligence to Brain-Computer Interface for acquisition and modelling of non-invasive biomedical signal and image modalities for various conditions and disorders Integrates recent advancements of Artificial Intelligence to the evaluation of large amounts of clinical data for early detection of disorders such as Epilepsy, Alcoholism, Sleep Apnea, motor-imagery tasks classification, and others Provides readers with illustrative examples of how Artificial Intelligence can be applied to Brain-Computer Interface, including a wide range of case studies in predicting and classification of neurological disorders

Neuroprosthetics and Brain-Computer Interfaces in Spinal Cord Injury Gernot Müller-Putz 2021-04-26 This book provides a comprehensive overview of the current state of the art of practical applications of neuroprosthesis based on functional electrical stimulation for restoration of motor functions lost by spinal cord injury and discusses the use of brain-computer interfaces for their control. The book covers numerous topics starting with basics about spinal cord injury, electrical stimulation, electrical brain signals and brain-computer interfaces. It continues with an overview of neuroprosthetic solutions for different purposes and non-invasive and invasive brain-computer interface implementations and presents clinical use cases and practical applications of BCIs. Finally, the authors give an outlook on cutting edge research with a high potential for clinical translation in the near future. All authors committed themselves to use easy-to-understand language and to avoid very specific information, focusing instead on the essential aspects. This makes this book an ideal choice not only for researchers and clinicians at all stages of their education interested in the topic of brain-computer interface-controlled neuroprostheses, but also for end users and their caregivers who want to inform themselves about the current technological possibilities to improve paralyzed motor functions.

Affective Computing and Regulation in Brain Computer Interface Zehong Jimmy Cao 2022-07-12

EEG-Based Brain-Computer Interfaces Dipali Bansal 2019-03-14 EEG-Based Brain-Computer Interface: Cognitive Analysis and Control Applications provides a technical approach to using brain signals for control applications, along with the EEG-related advances in BCI. The research and techniques in this book discuss time and frequency domain analysis on deliberate eye-blinking data as the basis for EEG-triggering control applications. In addition, the book provides experimental scenarios and features algorithms for acquiring real-time EEG signals using commercially available units that interface with MATLAB software for acquisition and control. Details techniques for multiple types of analysis (including ERP, scalp map, sub-band power and independent component) to acquire data from deliberate eye-blinking Demonstrates how to use EEGs to develop more intuitive BCIs in real-time scenarios Includes algorithms and scenarios that interface with MATLAB software for interactive use

Disorders of Consciousness, Volume 1157 Nicholas D. Schiff 2009-04-27 This volume is the result of a conference entitled Disorders of Consciousness, the 87th Annual Conference of the Association for Research in Nervous and Mental Disease, held on December 7-8, 2007 at the New York Academy of Medicine in New York City

Advanced Deep-Transfer-Leveraged Studies on Brain-Computer Interfacing Yizhang Jiang 2021-10-13

Towards Practical Brain-Computer Interfaces Brendan Z. Allison 2012-08-21 Brain-computer interfaces (BCIs) are devices that enable people to communicate via thought alone. Brain signals can be directly translated into messages or commands. Until recently, these devices were used primarily to help people who could not move. However, BCIs are now becoming practical tools for a wide variety of people, in many different situations. What will BCIs in the future be like? Who will use them, and why? This book, written by many of the top BCI researchers and developers, reviews the latest progress in the different components of BCIs. Chapters also discuss practical issues in an emerging BCI enabled community. The book is intended both for professionals and for interested laypeople who are not experts in BCI research.

Brain-Computer Interfaces for Non-clinical (Home, Sports, Art, Entertainment, Education, Well-being) Applications Anton Nijholt 2022-03-17

Brain-Computer Interfaces Aboul Ella Hassanien 2014-11-01 The success of a BCI system depends as much on the system itself as on the user's ability to produce distinctive EEG activity. BCI systems can be divided into two groups according to the placement of the electrodes used to detect and measure neurons firing in the brain. These groups are: invasive systems, electrodes are inserted directly into the cortex are used for single cell or multi unit recording, and electrocorticography (EcoG), electrodes are placed on the surface of the cortex (or dura); noninvasive systems, they are placed on the scalp and use electroencephalography (EEG) or magnetoencephalography (MEG) to detect neuron activity. The book is basically divided into three parts. The first part of the book covers the basic concepts and overviews of Brain Computer Interface. The second part describes new theoretical developments of BCI systems. The third part covers views on real applications of BCI systems.

Brain-Computer Interfaces Jonathan Wolpaw 2012-01-24 A recognizable surge in the field of Brain Computer Interface (BCI) research and development has emerged in the past two decades. This book is

intended to provide an introduction to and summary of essentially all major aspects of BCI research and development. Its goal is to be a comprehensive, balanced, and coordinated presentation of the field's key principles, current practice, and future prospects.