

Recognition Of Sleep Stages Based On A Combined Neural

The two volumes LNCS 10337 and 10338 constitute the proceedings of the International Work-Conference on the Interplay Between Natural and Artificial Computation, IWINAC 2017, held in Corunna, Spain, in June 2017. The total of 102 full papers was carefully reviewed and selected from 194 submissions during two rounds of reviewing and improvement. The papers are organized in two volumes, one on natural and artificial computation for biomedicine and neuroscience, addressing topics such as theoretical neural computation; models; natural computing in bioinformatics; physiological computing in affective smart environments; emotions; as well as signal processing and machine learning applied to biomedical and neuroscience applications. The second volume deals with biomedical applications, based on natural and artificial computing and addresses topics such as biomedical applications; mobile brain computer interaction; human robot interaction; deep learning; machine learning applied to big data analysis; computational intelligence in data coding and transmission; and applications.

The paper presents the development of a computer algorithm for the detection of K-complexes in the normal human sleep electroencephalogram (EEG). The detection scheme applies time and frequency domain pattern recognition techniques to a single channel (central area recording site) of digitized EEG data to identify waveforms as K-complexes. The detection of K-complexes resulted in an accuracy of 62.5% (7.3% miss error and 30.2% false detections). The primary source of false detections was the identification of Delta wave activity as K-complexes. The detection scheme is also used for scoring sleep EEG data as K-complex (Stage 2) or non-K-complex (Stages 1 and REM) sleep stages. Results of the sleep scoring effort provide an accuracy of 94% when compared to the usually scored EEG. (Author). In this paper we describe a waveform recognition method that extracts characteristic parameters from waveforms and a method of automated sleep stage scoring using decision tree learning that is in practice regarded as one of the most successful machine learning methods. In our method, first characteristics of EEG, EOG and EMG are compared with characteristic features of alpha waves, delta waves, sleep spindles, K-complexes and REMs. Then, several parameters that are necessary for sleep stage scoring are extracted. We transform these extracted parameters into a few discrete variables using canonical discriminant analysis and the discretization method based on a random walk, and then a committee that consists of several small decision trees is formed from a small number of training instances. Furthermore final sleep stages are decided by a majority decision of the committee. Our method was applied to the digitized PSG chart data, provided by the Japan Society of Sleep Research and we carried out an evaluation experiment. The experiment indicated that our method can quickly execute learning and classification and precisely score sleep stages. This book includes the original, peer-reviewed research articles from the International Conference on Computational Intelligence and Computing (ICCIC 2020), held in September 2020 on a virtual platform jointly organized by SR Group of Institutions, Jhansi, India, IETE, Kolkata Centre, India, and Eureka Sciencetech Research Foundation, Kolkata India. It covers the latest research in image processing, computer vision and pattern recognition, machine learning, data mining, big data and analytics, information security and privacy, wireless and sensor networks and IoT applications, artificial intelligence, expert systems, natural language processing, image processing, computer vision, artificial neural networks, fuzzy logic, evolutionary optimization, rough sets, web intelligence, intelligent agent technology, virtual reality, and visualization.

This book constitutes the thoroughly refereed proceedings of the 15th International Conference on Image Analysis and Recognition, ICIAR 2018, held in Póvoa de Varzim, Portugal, in June 2018. The 91 full papers presented together with 15 short papers were carefully reviewed and selected from 179 submissions. The papers are organized in the following topical sections: Enhancement, Restoration and Reconstruction, Image Segmentation, Detection, Classification and Recognition, Indexing and Retrieval, Computer Vision, Activity Recognition, Traffic and Surveillance, Applications, Biomedical Image Analysis, Diagnosis and Screening of Ophthalmic Diseases, and Challenge on Breast Cancer Histology Images.

This volume presents the proceedings of the Fourth International Conference on the Development of Biomedical Engineering in Vietnam which was held in Ho Chi Minh City as a Mega-conference. It is kicked off by the Regenerative Medicine Conference with the theme "BUILDING A FACE" USING A REGENERATIVE MEDICINE APPROACH", endorsed mainly by the Tissue Engineering and Regenerative Medicine International Society (TERMIS). It is followed by the Computational Medicine Conference, endorsed mainly by the Computational Surgery International Network (COSINE) and the Computational Molecular Medicine of German National Funding Agency; and the General Biomedical Engineering Conference, endorsed mainly by the International Federation for Medical and Biological Engineering (IFMBE). It featured the contributions of 435 scientists from 30 countries, including: Australia, Austria, Belgium, Canada, China, Finland, France, Germany, Hungary, India, Iran, Italy, Japan, Jordan, Korea, Malaysia, Netherlands, Pakistan, Poland, Russian Federation, Singapore, Spain, Switzerland, Taiwan, Turkey, Ukraine, United Kingdom, United States, Uruguay and Viet Nam.

This book features research papers presented at the International Conference on Emerging Technologies in Data Mining and Information Security (IEMIS 2018) held at the University of Engineering & Management, Kolkata, India, on February 23–25, 2018. It comprises high-quality research work by academicians and industrial experts in the field of computing and communication, including full-length papers, research-in-progress papers, and case studies related to all the areas of data mining, machine learning, Internet of Things (IoT) and information security.

Review of Sleep Medicine, by Drs. Alon Avidan and Teri Barkoukis, prepares you for the ABSM exam with a comprehensive review-and-test format that includes figures, tables, and lists highlighting key points. With content revised to match the new exam and updated coverage of pharmacology and sleep medicine, insomnias, parasomnias, sleep-related breathing disorders, and

more, you'll stay current on recent developments in the field. Effectively prepare for the ABMS sleep exam using case-based multiple-choice and fact-testing questions that parallel those on the test. Identify the reasoning behind each answer with comprehensive explanations so you know how to think logically about the problems. Quickly review crucial material with succinct summaries of all aspects of working with the sleep disordered patient. Master the content tested on the exam through explanatory high-yield tables and charts, sleep stage scoring, and an artifacts and arrhythmias mini-atlas. Tap into the expertise of a multidisciplinary team of recognized leaders ranging from world-renowned sleep researchers to sleep clinicians and educators. Updated coverage of the latest advances in sleep medicine for pharmacology, tools in clinical sleep medicine, sleep disorders, and much more. Brand new chapters in: Sleep Breathing Disorders Cardiovascular Pathophysiology Evaluating Epilepsy Pearls of Pediatric Sleep Cardiopulmonary Disorders Neurological Sleep Disorders Sleep-Wake Disorders Clinical Case Studies II Knowing Practice Parameters

This book constitutes the refereed proceedings of the 8th International Conference on Health Information Science, HIS 2019, held in Xi'an, China, in October 2019. The 14 full papers and 14 short papers presented were carefully reviewed and selected from 60 submissions. The papers are organized in topical sections named: Medical Information System and Platform; Mining Medical Data; EEG and ECG; Medical Image; Mental Health; and Healthcare.

This book contains the refereed proceedings of the 14th International Conference on Knowledge Management in Organizations, KMO 2019, held in Zamora, Spain, in July 2019. The 46 papers accepted for KMO 2018 were selected from 109 submissions and are organized in topical sections on: knowledge management models and analysis; knowledge transfer and learning; knowledge and service innovation; knowledge creation; knowledge and organization; information systems and information science; data mining and intelligent science; social networks and social aspects of KM; big data and IoT; and new trends in IT.

This book gathers selected research papers presented at the AICTE-sponsored International Conference on IoT Inclusive Life (ICIIL 2019), which was organized by the Department of Computer Science and Engineering, National Institute of Technical Teachers Training and Research, Chandigarh, India, on December 19–20, 2019. In contributions by active researchers, the book presents innovative findings and important developments in IoT-related studies, making it a valuable resource for researchers, engineers, and industrial professionals around the globe.

A modified pattern recognition approach has been designed for use on a general purpose digital computer for all night epoch by epoch sleep stage scoring. Comparison with experienced human scorers indicates an overall average agreement, for five nights, of 85 percent. On the same records, the overall average agreement for the three human scorers was 91.3 percent. There are five primary programs involved in the computer classification: (1) analog-to-digital conversion; (2) spectral analysis; (3) delta measurement; (4) pattern recognition; and (5) REM logic to identify stage REM. The stages 3 and 4 classifications are assigned by the delta measurement program. The pattern recognition program consists of two decision networks which separate stage 2, awake, and stage 1 or stage REM patterns. The stage 1 vs. REM dichotomy is performed later by the REM logic program.

On behalf of the organizing committee of the 13 International Conference on Biomedical Engineering, I extend our warmest welcome to you. This series of conference began in 1983 and is jointly organized by the YLL School of Medicine and Faculty of Engineering of the National University of Singapore and the Biomedical Engineering Society (Singapore). First of all, I want to thank Mr Lim Chuan Poh, Chairman A*STAR who kindly agreed to be our Guest of Honour to give the Opening Address amidst his busy schedule. I am delighted to report that the 13 ICBME has more than 600 participants from 40 countries. We have received very high quality papers and inevitably we had to turn down some papers. We have invited very prominent speakers and each one is an authority in their field of expertise. I am grateful to each one of them for setting aside their valuable time to participate in this conference. For the first time, the Biomedical Engineering Society (USA) will be sponsoring two symposia, ie "Drug Delivery Systems" and "Systems Biology and Computational Bioengineering". I am thankful to Prof Tom Skalak for his leadership in this initiative. I would also like to acknowledge the contribution of Prof Takami Yamaguchi for organizing the NUS-Tohoku's Global COE workshop within this conference. Thanks also to Prof Fritz Bodem for organizing the symposium, "Space Flight Bioengineering". This year's conference proceedings will be published by Springer as an IFMBE Proceedings Series.

We present a novel approach to combining artificial intelligence components for biomedical signal processing. The modular algorithm mimics the step-by-step type procedure of a human expert and includes the two assessment steps most important for sleep stage scoring, pattern recognition in electrophysiological signal channels and rule evaluation for classifying the current sequence of patterns. The application of sleep stage scoring is a complex task in medical informatics. The ARTISANA (artificial intelligence in sleep analysis) algorithm we have developed provides high rates of correspondence with the results produced by human experts. Additional features are the transparent decision-making process and information about the detailed structure of sleep. This has been achieved by utilizing neural networks for pattern recognition and neuro-fuzzy systems for rule evaluation. The AI components chosen to perform these two classification steps were particularly successful due to their individual strengths.

Many important space and military missions require maximal alertness which is dependent on adequate amounts of rest and sleep. In order to study sleep-wakefulness patterns in realistic space and military situations, it is necessary to monitor the level of arousal with simplified reliable band-limited devices. The limited time bandwidth available for the transmission of sleep information necessitates the development of a technique for data compression. This report describes the possibility of extracting sleep information from heart rate data. Several features of heart rate which contain sleep information are computed and analysis of variance is used to indicate the suitability of these measures in the pattern recognition of sleep stages from heart rate data.

(Author).

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technical information and added a major new chapter on artifacts. Other highlights include complete coverage of EEG in the intensive care unit and new chapters on integrating other recording devices with EEG; transcranial electrical and magnetic stimulation; EEG/TMS in evaluation of cognitive and mood disorders; and sleep in premature infants, children and adolescents, and the elderly. A companion website includes fully searchable text and image bank.

EEG signal processing is one of the hottest areas of research in digital signal processing applications and biomedical research. Analysis of EEG signals provides a crucial tool for diagnosis of neurobiological diseases. The problem of EEG signal classification into different sleep stages is primarily a pattern recognition problem using extracted features. Many methods of feature extraction have been applied to extract the relevant characteristics from a given EEG data. The EEG data was collected from publicly available source. The data consists of different age male & female recordings for a whole night of 8 hrs. The feature extraction was done by computing the Discrete Wavelet Transform and ANN using BP algorithm. The wavelet transform coefficients compress the number of data points into few features. The Approximation & Detailed coefficients obtained from Sub-band coding method provide important features of the EEG signals. In this project we have applied optimization techniques to reduce the computation complexity of the network without affecting the accuracy of the classification. Classification of the EEG data using neural network provides robust and improved Performance

This book gathers selected papers presented at the 6th International Conference on Artificial Intelligence and Evolutionary Computations in Engineering Systems, held at the Anna University, Chennai, India, from 17 -18 December. It covers advances and recent developments in various computational intelligence techniques, with an emphasis on the design of communication systems. In addition, it shares valuable insights into advanced computational methodologies such as neural networks, fuzzy systems, evolutionary algorithms, hybrid intelligent systems, uncertain reasoning techniques, and other machine learning methods and their application to decision-making and problem-solving in mobile and wireless communication networks.

The six volume set LNCS 10634, LNCS 10635, LNCS 10636, LNCS 10637, LNCS 10638, and LNCS 10639 constitutes the proceedings of the 24rd International Conference on Neural Information Processing, ICONIP 2017, held in Guangzhou, China, in November 2017. The 563 full papers presented were carefully reviewed and selected from 856 submissions. The 6 volumes are organized in topical sections on Machine Learning, Reinforcement Learning, Big Data Analysis, Deep Learning, Brain-Computer Interface, Computational Finance, Computer Vision, Neurodynamics, Sensory Perception and Decision Making, Computational Intelligence, Neural Data Analysis, Biomedical Engineering, Emotion and Bayesian Networks, Data Mining, Time-Series Analysis, Social Networks, Bioinformatics, Information Security and Social Cognition, Robotics and Control, Pattern Recognition, Neuromorphic Hardware and Speech Processing.

This book – in conjunction with the volumes LNCS 8588 and LNAI 8589 – constitutes the refereed proceedings of the 10th International Conference on Intelligent Computing, ICIC 2014, held in Taiyuan, China, in August 2014. The 58 papers of this volume were carefully reviewed and selected from numerous submissions. The papers are organized in topical sections such as machine learning; neural networks; image processing; computational systems biology and medical informatics; biomedical informatics theory and methods; advances on bio-inspired computing; protein and gene bioinformatics: analysis, algorithms, applications.

Abstract: "Electroencephalogram (EEG) has been widely used in EEG-based pattern recognition systems such as epileptic seizure, sleep stage, emotion, alcoholics and person recognitions. However, one of the major challenges of EEG is the huge amounts of data that need to be processed, transmitted and stored. Developing effective EEG compression algorithms is therefore necessary. As EEG lossy compression algorithms achieve a much higher Compression Ratio (CR) than lossless ones, most studies related to EEG compression focus on lossy algorithms. Studies also indicate that EEG signals under brain disorders, for example, epilepsy are different from the normal EEG, especially on frequency. Numerous lossy compression algorithms have been proposed with none being reported as the best algorithm. This project focuses on developing an EEG lossy compression algorithm to maximize CR while minimizing the loss of information. This research also focuses on developing an EEG lossy compression algorithm for epileptic EEG signals. EEG lossy compression algorithms allow advanced CR compared to lossless ones; however data is lost in the reconstructed signals including diagnosing and biometric information, which may negatively affect EEG-based applications. Little work has been done in evaluating the effect of lossy compression on EEG-based seizure recognition systems. Hence, this research evaluates the impacts of EEG lossy compression on EEG-based pattern recognition systems including person, seizure, alcoholics, age, and gender recognition systems. Evaluation experiments conducted on a wide range of public EEG datasets show that the proposed EEG lossy compression algorithms give better compression performances than some recent lossy compression algorithms. In addition, lossy compression algorithms do have the impact on EEG-based pattern recognition systems as the recognition performances decrease when compression increases. However, it is feasible to apply lossy compression to EEG-based pattern recognition systems and using lossy compression is still more advantageous than using lossless approaches."

What can we learn from spontaneously occurring brain and other physiological signals about an individual's cognitive and affective state and how can we make use of this information? One line of research that is actively involved with this question is Passive Brain-Computer-Interfaces (BCI). To date most BCIs are aimed at assisting patients for whom brain signals could form an alternative output channel as opposed to more common human output channels, like speech and moving the hands. However, brain signals (possibly in combination with other physiological signals) also form an output channel above and beyond the more usual ones: they can potentially provide continuous, online information about an individual's cognitive and affective state without the need of conscious or effortful communication. The provided information could be used in a number of ways. Examples include monitoring cognitive workload through EEG and skin conductance for adaptive automation or using ERPs in response to errors to correct for a behavioral response. While Passive BCIs make use of online (neuro)physiological responses and close the interaction cycle between a user and a computer system, (neuro)physiological responses can also be used in an offline fashion. Examples of this include detecting amygdala responses for neuromarketing, and measuring EEG and pupil dilation as indicators of mental effort for optimizing information systems. The described field of applied (neuro)physiology can strongly benefit from high quality scientific studies that control for confounding factors and use proper comparison conditions. Another area of relevance is ethics, ranging from dubious product claims, acceptance of the technology by the general public, privacy of users, to possible effects that these kinds of applications may have on society as a whole. In this Research Topic we aimed to publish studies of the highest scientific quality that are directed towards applications that utilize spontaneously, effortlessly generated neurophysiological signals (brain and/or other physiological signals) reflecting cognitive or affective state. We especially welcomed studies that describe specific real world applications demonstrating a significant benefit compared to standard applications. We also invited original, new kinds of (proposed) applications in this area as well as comprehensive review articles that point out what is and what is not possible (according to scientific standards) in this field. Finally, we welcomed manuscripts on the ethical issues that are involved. Connected to the Research Topic was a workshop (held on June 6, during the Fifth International Brain-Computer Interface Meeting, June 3-7, 2013, Asilomar, California) that brought together a diverse group of people who were working in this field. We discussed the state of the art and formulated major challenges, as reflected in the first paper of the Research Topic.

Recognition of Sleep Stages from Sensor Data

This book presents the select proceedings of Congress on Advances in Materials Science and Engineering (CAMSE 2020). It focuses on the state-of-the-art research, development, and commercial prospective of recent advances in mechanical engineering. The book covers various synthesis and fabrication routes of functional and smart materials for applications in mechanical engineering, manufacturing, physics, chemical and biological sciences, metrology, optimization and artificial intelligence among others. This book will be a useful resource for researchers, academicians as well as professionals interested in the highly interdisciplinary field of materials science and mechanical engineering. .

Interest in using sleep stage patterns to determine the amount and quality of a pilot or astronaut's sleep has led to a series of Air Force sponsored studies. The ultimate goal of these studies is to be able to determine sleep stage from beat-by-beat heart rate data along (not using the EEG). Work performed at the University of Texas by Welch, et al, and Aldredge et al, has indicated that stage REM (rapid eye movement sleep) is refractory to detection by techniques which perform satisfactorily on the other sleep stages. In addition, the Welch algorithm performs more effectively when the times of occurrence of stage REM (or combined stages REM and 1) are already known. The purpose of this phase of study is to test the hypothesis that the occurrence of rapid eye movements can be detected by concurrent transient oscillations in the heart rate. A knowledge of REM occurrences would then greatly simplify recognition of the REM sleep stage. Alternatively, direct recognition of stage REM, 1 (stage REM + stage 1) sleep may be possible by spectral analysis of heart rate. Both possibilities are investigated. (Modified author abstract).

Cognitive Informatics, Computer Modelling, and Cognitive Science: Theory, Case Studies, and Applications presents the theoretical background and history of cognitive science to help readers understand its foundations, philosophical and psychological aspects, and applications in a wide range of engineering and computer science case studies. Cognitive science, a cognitive model of the brain, knowledge representation, and information processing in the human brain are discussed, as is the theory of consciousness, neuroscience, intelligence, decision-making, mind and behavior analysis, and the various ways cognitive computing is used for information manipulation, processing and decision-making. Mathematical and computational models, structures and processes of the human brain are also covered, along with advances in machine learning, artificial intelligence, cognitive knowledge base, deep learning, cognitive image processing and suitable data analytics.

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