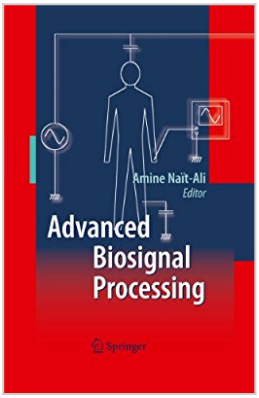


# Advanced Biosignal Processing

*By Amine Nait-Ali (Ed.)*



**Advanced Biosignal Processing** By Amine Nait-Ali (Ed.)

Generally speaking, Biosignals refer to signals recorded from the human body. They can be either electrical (e. g. Electrocardiogram (ECG), Electroencephalogram (EEG), Electromyogram (EMG), etc. ) or non-electrical (e. g. breathing, movements, etc. ). The acquisition and processing of such signals play an important role in clinical routines. They are usually considered as major indicators which provide clinicians and physicians with useful information during diagnostic and monitoring processes. In some applications, the purpose is not necessarily medical. It may also be industrial. For instance, a real-time EEG system analysis can be used to control and analyze the vigilance of a car driver. In this case, the purpose of such a system basically consists of preventing crash risks. Furthermore, in certain other appli- tions,asetof biosignals (e. g. ECG,respiratorysignal,EEG,etc. ) can be used toc- trol or analyze human emotions. This is the case of the famous polygraph system, also known as the “lie detector”, the ef ciency of which remains open to debate! Thus when one is dealing with biosignals, special attention must be given to their acquisition, their analysis and their processing capabilities which constitute the nal stage preceding the clinical diagnosis. Naturally, the diagnosis is based on the information provided by the processing system.

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## Editorial Review

From the Back Cover

Through 17 chapters, this book presents the principle of many advanced biosignal processing techniques. After an important chapter introducing the main biosignal properties as well as the most recent acquisition techniques, it highlights five specific parts which build the body of this book. Each part concerns one of the most intensively used biosignals in the clinical routine, namely the Electrocardiogram (ECG), the Elektroenzephalogram (EEG), the Electromyogram (EMG) and the Evoked Potential (EP). In addition, each part gathers a certain number of chapters related to analysis, detection, classification, source separation and feature extraction. These aspects are explored by means of various advanced signal processing approaches, namely wavelets, Empirical Modal Decomposition, Neural networks, Markov models, Metaheuristics as well as hybrid approaches including wavelet networks, and neuro-fuzzy networks.

The last part, concerns the Multimodal Biosignal processing, in which we present two different chapters related to the biomedical compression and the data fusion.

Instead organising the chapters by approaches, the present book has been voluntarily structured according to signal categories (ECG, EEG, EMG, EP). This helps the reader, interested in a specific field, to assimilate easily the techniques dedicated to a given class of biosignals. Furthermore, most of signals used for illustration purpose in this book can be downloaded from the Medical Database for the Evaluation of Image and Signal Processing Algorithm. These materials assist considerably the user in evaluating the performances of their developed algorithms.

This book is suited for final year graduate students, engineers and researchers in biomedical engineering and practicing engineers in biomedical science and medical physics.

About the Author
Dr. Amine Nait-Ali is an Associate Professor at the University Paris 12 (France), and a member of the Laboratory LISSI. His research interests are focused on physiological signal processing and analysis, optimisation using metaheuristics, none linear system modeling, biosignal and medical image compression.

Dr. Christine Cavaro-Menard is an Associate Professor at the University of Angers (France), and a member of the Laboratory LISA. Her research interests include medical image processing (segmentation, classification, texture analysis, registration) for diagnosis assistance, medical image compression and quality evaluation of compressed medical images.

## Users Review

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