

Autonomic Nervous System Dynamics for Mood and Emotional-State Recognition: Significant Advances in Data Acquisition, Signal Processing and Classification (Series in BioEngineering)

By Gaetano Valenza, Enzo Pasquale Scilingo

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This monograph reports on advances in the measurement and study of autonomic nervous system (ANS) dynamics as a source of reliable and effective markers for mood state recognition and assessment of emotional responses. Its primary impact will be in affective computing and the application of emotion-recognition systems. Applicative studies of biosignals such as: electrocardiograms; electrodermal responses; respiration activity; gaze points; and pupil-size variation are covered in detail, and experimental results explain how to characterize the elicited affective levels and mood states pragmatically and accurately using the information thus extracted from the ANS. Nonlinear signal processing techniques play a crucial role in understanding the ANS physiology underlying superficially noticeable changes and provide important quantifiers of cardiovascular control dynamics. These have prognostic value in both healthy subjects and patients with mood disorders. Moreover, Autonomic Nervous System Dynamics for Mood and Emotional-State Recognition proposes a novel probabilistic approach based on the point-process theory in order to model and characterize the instantaneous ANS nonlinear dynamics providing a foundation from which machine “understanding” of emotional response can be enhanced. Using mathematics and signal processing, this work also contributes to pragmatic issues such as emotional and mood-state modeling, elicitation, and non-invasive ANS monitoring. Throughout the text a critical review on the current state-of-the-art is reported, leading to the description of dedicated experimental protocols, novel and reliable mood models, and novel wearable systems able to perform ANS monitoring in a naturalistic environment. Biomedical engineers will find this book of interest, especially those concerned with nonlinear analysis, as will researchers and industrial technicians developing wearable systems and sensors for ANS monitoring.

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Editorial Review

From the Back Cover
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About the Author
Associate Professor Scilingo has worked for several years in the field of wearable monitoring systems, signal processing, human-computer interfaces and biomedical applications. He is author of hundreds of international scientific contributions in these fields and currently he is coordinating a European project focused on personalized health systems for mental care. More specifically, patients suffering from mood disorders are monitored by means of wearable systems acquiring a wide set of physiological signals and other behavioural and environmental parameters. Most of the results reported in this book are achieved within the framework of this project, through which Doctor Valenza has been focusing on statistical and nonlinear biomedical signal processing, cardiovascular and neural modeling, and wearable systems for physiological monitoring.
He is author of tens of international scientific papers in these fields and currently he is working with the University of Pisa (Italy), and the neuro-cardiovascular signal processing unit of the Massachusetts General

Hospital, Harvard Medical School, Boston, (MA, USA), and Massachusetts Institute of Technology, Cambridge, (MA, USA).

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