Artificial Intelligence for Groundbreaking Mobile Medicine in Cardiovascular Diseases

Abstract

Health monitoring is nowadays a significant societal challenge because there is urgent need for development of new methods and techniques that allow more sensitive, specific and rapid diagnosis that could be complementary and faster to the existing conventional methods. Taking advantage of wearable technologies, this talk is aimed at introducing how new artificial intelligence (AI) paradigms using affordable wearable devices could provide personalized healthcare monitoring with clinical value to a variety of medical scenarios.

With the rise of mobile medicine and the popularization of personalized health concepts, the field of smart wearable devices has developed rapidly in recent years. Among them, wearable medical devices have become one of the most promising fields. These intelligent devices assist people in pursuing a healthier lifestyle and provide a constant stream of health care data for disease diagnosis and treatment. Thus, wearable medical devices have the potential to become a mainstay of the future mobile medical market.

This talk will be focused on recent developments and applications of new AI solutions to monitor the cardiovascular system. The idea is to provide a rigorous overview about how wearable devices can be transformed into medical devices. This way, monitoring of patients with reliable clinical information under a variety of cardiovascular diseases will be possible at reduced costs. Diseases with extraordinary high prevalence and incidence in the general population, such as hypertension, cardiac arrythmias or obstructive sleep apnea could benefit from new AI paradigms applied to wearable devices. Given that all these pathologies share the common feature of affecting the cardiovascular system, new AI paradigms would be used for quantitative assessment and clinical validation of the cardiovascular condition of patients suffering from these and other diseases in which the cardiovascular system can be used as a sentinel.

Biography:

José J. Rieta received the M. Eng. degrees in Image and Sound Engineering from the Polytechnic University of Madrid, Spain, in 1991, the M. Sc. degree in Telecommunication Engineering and the Ph.D. degree in Biomedical Signal Processing from the Polytechnic University of Valencia (UPV), Spain, in 1996 and 2003, respectively. He is Full Professor at the Electronic Engineering Department of the UPV, becoming Lecturer since 1995. He has taught many subjects related to Electronic and Biomedical Instrumentation, Analog Systems, Data conversion Systems and Control Engineering, and has been the author of several academic publications in these areas.

His most relevant scientific contributions are two novel lines of research related to new methodologies aimed at extracting information from cardiac recordings, which are currently highly cited references into the field of biomedical signal analysis. Firstly, the application of blind signal separation methods to cardiac arrythmias (323 citations), which provided unprecedented and powerful new alternatives to separate ventricular from atrial activities in atrial fibrillation, the most common cardiac arrhythmia. Secondly, the application of nonlinear methods to cardiac signals (195 citations), that introduced new insights in the extraction of unknown information from electrocardiographic recordings. These two lines have yielded numerous publications and several doctoral theses supervised both by Prof. Rieta and by others in Spanish and foreign universities. He also participated in the most cited international collaboration laying the groundwork for analysis of electrocardiograms in atrial fibrillation (242 citations). He has coauthored about 90 publications in international Journals of his field, more than 300 international and national conference communications as well as 18 books or book chapters related to biomedical engineering and cardiovascular diseases.

He has participated in more than 30 competitive research grants since the last 25 years, being the leader in 19 of them, with special mention to four National Research Grants from the Spanish Research State Plan. As additional contributions to society, he has participated and leaded many agreements of technological transfer with companies related to biomedical engineering during last 20 years. During his research, he has collaborated in many international publications with top reputed researchers and universities around the world and has contributed to training young researchers with the supervision of 12 doctoral theses where most of his trained young researchers are now Lecturers and/or researchers at reputed universities, hospitals or expert engineers at private companies. He is active research grant evaluator of the Spanish National Agency of Evaluation and other Spanish and international research agencies. He acts as regular reviewer of more than 20 prestigious international Journals and Conference Committees related to biomedical engineering and is Associate Editor of several international peer-review journals. In 2006 he founded the Biosignals & Minimally Invasive Technologies (BioMIT.org) research group in the UPV, where is the CEO and responsible of the advanced biomedical signal processing line. His research interests include the application of artificial intelligence, statistical and non-linear signal processing to biomedical signals, specially focused in cardiovascular signals aimed at developing clinical solutions to study, monitor and characterize the cardiovascular system and cardiovascular pathologies.