Neuroimaging and Multi-Modality Analysis

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Abstract

Understanding of the human brain structure and function in health and disease has been of great interest in recent years. Nowadays, imaging methods like X-ray computed tomography (CT) and magnetic resonance imaging (MRI) provide anatomical data while single photon emission computed tomography (SPECT), functional MRI (fMRI), electroencephalography (EEG), and magnetoencephalography (MEG) provide functional data. These modalities generate huge amounts of raw data that need to be efficiently processed to answer specific scientific questions. In this presentation, we will explain state-of-the-art anatomical and functional data acquisition and data analysis methods along with their specific applications in health and disease. In particular, we will describe signal and image processing methods developed in recent years to evaluate brain tissues and structures as well as its biochemistry and function in epilepsy and cancer. We will also present approaches proposed for fusion and integration of multi-modality data and information to improve evaluation of the brain structure and function in different applications. We will conclude the presentation with an overview of the problems solved by the recent methods and the challenges that remain to be solved by the scientific community.

Hamid Soltanian-Zadeh, PhD, was born in Yazd in 1960. He received BS and MS degrees in electrical engineering: electronics (with honors) from the University of Tehran, Tehran, Iran in 1986 and MSE and PhD degrees in electrical engineering: systems and bioelectrical sciences from the University of Michigan, Ann Arbor, Michigan, USA, in 1992. He is currently a full Professor and a founder of Control and Intelligent Processing Center of Excellence (CIPCE) in the Department of Electrical and Computer Engineering at the University of Tehran, Tehran, Iran. As a senior scientist and head of medical image analysis group, Prof. Soltanian-Zadeh directs research projects in the Department of Radiology, Henry Ford Health System, Detroit, Michigan, USA. He has active research collaborations with the Institute for Research in Fundamental Sciences (IPM), Tehran, Iran and Wayne State University, Detroit, MI, USA. His research interests include medical imaging, signal and image processing and analysis, pattern recognition, and neural networks. He has supervised or advised over 100 MS theses or PhD dissertations and coauthored more than 600 publications in journals and conference records or as book

chapters. Several of Prof. Soltanian-Zadeh's presentations received honorable mention awards at the SPIE and IEEE conferences. In addition to the IEEE, where he is a senior member and chairman of the Iran Section, he is a member of the SPIE, ISMVIP, and ISBME and has served on the scientific committees of several national and international conferences and review boards of more than 30 scientific journals. Prof. Soltanian-Zadeh is an associate member of the Iranian Academy of Sciences, president of the Iranian Society of Machine Vision and Image Processing (ISMVIP), has been recognized as an outstanding researcher by the national and international organizations, and has served on the study sections of the National Institutes of Health (NIH), National Science Foundation (NSF), American Institute of Biological Sciences (AIBS), and international funding agencies.