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Brain connectivity dynamics in neurological dysfunctions

Studies on brain connectivity by means of functional neuroimaging data have increased the understanding of the organization of large-scale structural and functional brain networks. It has been argued that nonlinear analyses employing concepts like entropy, fractality and predictability provide significant diagnostic and prognostic information in a number of pathologies. The brain is like a mosaic of different and highly interconnected regions, so that knowledge of functional connectivity between brain regions is crucial to understanding perception, cognition, behavior, and differentiating healthy from sick subjects. Investigating functional connectivity constitute potential means to explore the causal relationship between the brain lesions and neuropsychological syndromes and, eventually, may suggest improved rehabilitation strategies for patients with brain injury through personalized treatment and recovery protocols. Spontaneous low-frequency (<0.1 Hz) fluctuations in BOLD resting-state fMRI signals are temporally coherent among brain areas that may be not structurally connected but functionally related. Neurological diseases stand for a range of conditions which primarily affect the neurons in the brain and are incurable and progressively result in degeneration and/or death of nerve cells. They are related with at least two brain functions: Memory loss and impaired judgment or language, and the inability to perform some common activities. Investigating the relationship between brain structure and function is a central issue in neuroscience research. The present work summarizes the specific changes in the resting-state networks univocally related to certain forms of neurological disorders and/or dementia phases, particularly among syndromes with relatively similar behavioral effects, on the basis of alterations in brain connectivity explored by the real-time fMRI during rest.

Biography

Radu Mutihac is a Head of Medical Physics Section, works in Neuroscience, Signal Processing, Microelectronics and Artificial Intelligence. As a Post-doc/Research Associate/Visiting Professor/Full Professor, he does his research at University of Bucharest, International Centre for Theoretical Physics (Italy), Ecole Polytechnique (France), Institute Henri Poincare (France) and KU Leuven (Belgium). His research in "Fused biomedical imaging modalities" was carried out at Johns Hopkins University, National Institutes of Health and Walter Reed Army Institute of Research, USA. He is a member of ISMRM, ESMRMB, OHBM, Romanian US Alumni Association, and Fellow of Signal Processing and Neural Networks Society IEEE. He has published over 100 scientific papers, 12 monographs and contributed with chapters in other 10 text books. He contributed to more than 150 scientific meetings with posters and oral presentations, seminars, invited and plenary lectures, as well as acting as Organizer, Chairman, and Keynote Speaker.

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