Plenary lecture- 04/04/2014- 11h- M1/129

GUSTAVO DECO
Head of Group
Computational Neuroscience Group
Department of Information and Communication Technologies
UNIVERSITAT POMPEU FABRA

"Linking the Functional and Structural Human Connectome"

The ongoing activity of the brain at rest, i.e. under no stimulation and in absence of any task, is astonishingly highly structured into spatio-temporal patterns. These spatio-temporal patterns, called resting state networks, display low-frequency characteristics (<0.1 Hz) observed typically in the blood oxygenation level-dependent (BOLD) fMRI signal of human subjects. We aim here to understand the origins of resting state activity through modelling. Integrating the biologically realistic DTI/DSI based neuroanatomical connectivity into a brain model, the resultant emerging resting state functional connectivity of the brain network fits quantitatively best the experimentally observed functional connectivity in humans when the brain network operates at the edge of instability. Under these conditions, the slow fluctuating (< 0.1 Hz) resting state networks emerge as structured noise fluctuations around a stable low firing activity equilibrium state in the presence of latent “ghost” multi-stable attractors. The multistable attractor landscape defines a functionally meaningful dynamic repertoire of the brain network that is inherently present in the neuroanatomical connectivity.