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**TITLE:** What can we learn of brain organization by mining resting-state?

**ABSTRACT:** The brain rests, but never stops working. This ongoing activity is a fairly unspecific signal; however it holds great promises for basic as well as clinical neuroscience. Firstly, the structure revealed by fluctuations of ongoing activity is a window on intrinsic brain organization. Second, it holds the promises of functional diagnosis makers suited even for the severely impaired patients that cannot undergo traditional functional brain mapping. Fully exploiting resting-state data does not fall in the traditional inferential frameworks of brain mapping. What statistical tools and models are best suited to draw conclusion from rest? More importantly, what conclusions can we draw?

Concerning clinical applications, I will show how a careful study of the impact of strokes on on-going activity exhibits markers of behavioral deficit in resting-state scans. Mechanisms of brain function and dysfunction are revealed by the correlation structure of a few functional networks. I will discuss how to keep this ``functional connectome`` faithful to functional interactions in the brain. This statistical analysis of network connectivity builds upon the choice of a reduced set of regions, so far conducted manually by an expert. I will present ongoing work to automatically segment the relevant regions from rest fMRI.

Different pictures of intrinsic brain organization have emerged from the study of resting-state: segregated and anti-correlated functional networks, or a high-connected graph with small-world properties. I will show how both views are biased by statistical challenges arising from the high dimensionality of the connectome. Drawing from the machine learning literature can reunite them into a richer view of brain connectivity that appears as a non-decomposable graph in which sub-communities can be mapped to functional networks.