What we may learn from EEG/MEG signals about the dynamics of neuro-cognitive processes?

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Abstract

In this lecture I consider how dynamical neuronal assemblies are formed based on the mechanism of co-activation of neuronal elements, and how oscillations may emerge in local field potentials (LFPs). Considering that LFPs are the building blocks of EEG/MEG signals, the latter are considered in the light of 3 main functional attributes of LFP/EEG/MEG signals with respect to information processing in the brain: to enable/disable, to modulate and to encode information in neuronal networks. Some major features of the role of specific frequency components from very slow to high frequencies are reviewed, with special emphasis on synchronization of neuronal activities, phase relations and other dynamic properties. It is emphasized that most associations between LFP/EEG/MEG signals and cognitive processes should be considered taking into consideration multiple combinations of such signals, instead of single frequency oscillations. Concluding, EEG/MEG features, notably certain rhythmic activities taken jointly, can be useful to better understand the dynamics of how the brain processes and encodes information.

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