

Comparing time-frequency patterns in brain signals: a new analysis method

The present work focuses on the neural dynamics supporting perception and memory. It is experimentally possible to approach this question by recording simultaneously electrical activity of neuronal populations: electroencephalographic recordings, and, more recently, with a much more satisfactory spatial resolution, local field potential recordings. Within these recordings, we will seek to identify characteristics that have a cognitive significance, i.e. which can be relevant to the 'neural code'.

The electrophysiological recordings, representing complex behaviours of large neuronal assemblies, make statistical comparisons between a large set of individuals trials a particularly difficult task. We will describe a new method, the 'bump decomposition', which aims at solving that problem: the method is based on an adaptative decomposition of wavelet time-frequency maps into elementary functions, representing oscillation patterns. From many trials, reproducible time-frequency events are automatically identified. Classifications using neural networks and statistical analysis of sequences of frequency patterns are subsequently carried out.