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SPECIAL LECTURE

Tuesday 21 June 2016 at 4 pm

Dora Hermes, NYU

Neuronal synchrony and the relation between the BOLD response and the local field potential in human visual cortex

Abstract

The most widespread measures of human brain activity are the blood oxygen level dependent (BOLD) signal and surface field potential. Understanding their relationship is essential for achieving an integrated view of human brain function. We measured BOLD responses with fMRI and field potentials using (electrocorticography) ECoG in human visual cortex during the presentation of different visual patterns. The ECoG signal showed three responses:
a narrowband gamma increase, with a peak in the spectrum between 30 and 100 Hz,
a broadband power increase, without a specific peak in the power spectrum, and a decrease in alpha oscillations around 10 Hz. Different visual input drove these three signals in varying ways.

These three ECoG responses were directly compared with the BOLD response. To account for the observed relation between ECoG and BOLD, we modeled (a) responses in a population of neurons, and (b) the transformation of these responses to the fMRI BOLD signal and the ECoG field potential. Our model accounts for the relationship between the measured BOLD and ECoG data from human visual cortex (V1-V3). The model matched the data in three ways: BOLD amplitude was positively correlated with ECoG broadband spectral power, negatively correlated with the amplitude of alpha oscillations, and uncorrelated with the amplitude of gamma oscillations. We infer that features of the field potential that are uncorrelated with BOLD, including gamma oscillations in V1-V3, arise largely from changes in the synchrony, rather than level, of neural activity within a local population.

Location: colloquium room
Host: Pieter Roelfsema