# Analysis of clusters of correlated activity in fMRI data by Hopfield Neural Networks

**Abstract**

A variant of Hopfield's neural network model is presented as an approximative method for the identification of regions of interest from fMRI data. If a subset of pixels is mutually correlated it forms a cluster which can be interpreted as a functional unit. Correlation clusters are extracted from the data without any reference to the stimulus and thus various aspects of stimulus related activity can be distinguished and dependencies between stimulus related and background activity can be revealed. In this approach networks of pixels with correlated time cources represent functionally engaged regions of brain activity. The stationary configurations of the network dynamics represent such a kind of correlated clusters and can be assumed to indicate functional connectivity. The degree of connectivity within a retrieved cluster is allowed to range continuously between the extreme cases of cliques and connectivity components, allowing thus for clusters of intermediate connectivity. The graph connectivity can be fixed posteriorly by an intrinsic significancy measure or by correlation to the stimulus. These clusters are subsequently analyzed to identify spacial structures in the brain and more precisely task related regions. The computational complexity and disambiguation quality of the algorithm is compared to results from ICA and graph-theoretical algorithms.