

Pairwise Correlations Determine the Activities of a Neuronal Network *in vivo*

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In studying the activities of neuronal networks, much attention has been focused on pairwise correlations between neurons. This popular analysis might overlook higher-order correlations within the neuronal population and, consequently, prevent one from understanding the network dynamics fully. By using a maximum entropy model, it has been shown recently that pairwise correlations explain most of the temporal structure of population activities in isolated retina and in cultured neuronal networks, suggesting that 2nd order correlations alone are sufficient to characterize the behavior of these networks [1]. Here we investigated whether this finding can be generalized to more complex cortical networks *in vivo*. We recorded the visual responses of a neuron population in area 17 of anesthetized cats. We found, similarly to the study *in vitro*, that the structure of network activity could be predicted successfully by considering only the 2nd order correlations. In addition, we found that the correlated structure of cortical activity has much more capacity for representing various spatial patterns than what has been reported for retina.

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References

[1] Weak pairwise correlations imply strongly correlated network states in a neural population. E. Schneidman, M.J. Berry II, R. Segev, and W. Bialek, *Nature* 440(7087):1007-1012, April 2006.