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Title: Emergent dynamics in a model of visual cortex

Abstract:

I will report on a recent study the results of which suggest strongly that the network dynamics of the mammalian visual cortex are highly structured and shaped by temporally localized barrages of excitatory and inhibitory firing we call 'multiple-firing events' (MFEs).

Our proposal is based on careful study of a network of spiking neurons built to reflect the coarse physiology of a small patch of layer 2/3 of V1.

When appropriately benchmarked this network is capable of reproducing the qualitative features of a range of phenomena observed in the real visual cortex, including orientation tuning, spontaneous background patterns, surround suppression and gamma-band oscillations.

Detailed investigation into the relevant regimes reveals causal relationships among dynamical events driven by a strong competition between the excitatory and inhibitory populations. It suggests that along with firing rates, MFE characteristics can be a powerful signature of a regime. Testable predictions are proposed.