Natural Signal Classification by Neural Cliques and Phase-Locked Attractors

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Cortical neural networks are responsible for identification, recognition and classification of natural signals mediated by various sensory channels. These tasks are still too complex to be accomplished by state-of-the-art engineering systems. There is, therefore, a great deal of interest in development of suitable biologically-motivated architectures which are based on a realistic model of generic neural ensembles. We present a computational architecture for classification of natural signals, based on the emergence of instant neural cliques and phase-locked attractors. The emergence of instant neural cliques enables mapping of complex classes of signals onto specific spatio-temporal firing patterns. The convergence of neural cliques onto attractors, along phase-locked pathways, reveals a new dynamic behavior of neural ensembles, and lends itself to simple discrete-output computational systems.

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