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Topic: Complex Networks Preference: Oral

Some properties of a complex network memory model for neurosis

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We have described the mental pathology known as neurosis, in terms of its relation to memory function and proposed neural network mechanisms, whereby neurotic behavior is described as a brain associative memory process. Modules corresponding to sensorial and symbolic memories interact, representing unconscious and conscious mental processes. Memory was first modeled by a Boltzmann machine (BM), represented by a complete graph. Since it is known that brain neural topology is selectively structured, we have further developed the memory model, including known microscopic mechanisms that control synaptic properties and self-organize the complex network to a hierarchical, clustered structure.

The resulting power-law and q-exponential behavior for the node degree distribution of the network's topology suggest that memory dynamics and associativity may not be well described by Boltzmann-Gibbs (BG) statistical mechanics. We thus model memory access dynamics by a generalization of the BM called Generalized Simulated Annealing (GSA), derived from the nonextensive formalism. We illustrate the neurocomputational substrate model with simulations, showing some properties of these complex networks' topological structures and behavior.

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