Adaptive Sparsity: Remembering less to learn more

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Presentation Abstract Summary Robust AI demands algorithms that can adapt to new environments containing entirely unanticipated forms of information. We gain insight for solving this challenge from biology. Studies of working memory in human subjects suggest that a guiding principle of biological information acquisition is to store as little information as a task requires, preferring storage of abstract representations over simpler representations that are comparatively easy to extract from the environment. We term this principle adaptive sparsity and suggest that this is necessary to efficiently construct a knowledge base. Storing less information about each momentary experience reduces the dimensionality of the search for semantic relationships between concepts, provided that the decisions of what information to cut are appropriately tuned. We present evidence of such sparsity in human observers, a computational model that implements such sparsity, and a conceptual framework for knowledge acquisition in Intelligent Systems.

The presentation would begin with a description of working memory studies that show how human memory storage is extremely sparse, follow with a neurocomputational model of working memory that emphasizes such sparsity and conclude with a broader view of how sparse working memory likely contributes to learning knowledge structures.

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