

Hyperdimensional Turing Machines

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A collection of high dimensional (eg: $D=10,000$) random bipolar vectors will be approximately orthogonal with high probability. We can define a few simple operations and a similarity metric on these hyper-vectors to form an algebraic system in which symbolic logic can be encoded. The holographic properties of hyper-vector symbol encodings enable robust error correction. We demonstrate how these structures can be used to construct a Hyperdimensional Turing Machine for general purpose computation, and we discuss how such a system is resilient against perturbations to data and state.

Keywords: hyper-dimensional computing, vector-symbolic architectures, hyper-vectors, robust computation