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Efficient function approximation by tree-structured neural networks.

An algebra A of continuous functions from a compact $K \subset \mathbb{R}^n$ to $\mathbb{R}$ can be defined by tree-structured neural networks (TSNN) such that the uniform closure of A consists of all continuous functions from K to $\mathbb{R}$. Each TSNN has an equivalent representation as a feed-forward neural network with two hidden layers. It is shown that the average case time $T(N)$ needed to evaluate a given TSNN function or its Jacobian matrix is in $O(N^q)$, where N is the TSNN size and $q \in [0, 1]$ depends on the TSNN and the distribution of query points.

Reference: A. P. Heinz. A tree-structured neural network for real-time adaptive control. In S. Amari, L. Xu, L. -W. Chan, I. King, and K. -S. Leung, editors, *Progress in Neural Information Processing*, 926–931, Berlin, 1996, Springer.