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Proceedings of the Annual Meeting of the Cognitive Science Society

Title

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Permalink

<https://escholarship.org/uc/item/4x292998>

Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 41(0)

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Publication Date

2019

Peer reviewed

Modeling Axonal Plasticity in Artificial Neural Networks

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Abstract

Axonal growth and pruning is the brains primary method of controlling the structured sparsity of its neural circuits, as without long distance axon branches connecting distal neurons no direct communication is possible. Further, artificial neural networks have almost entirely ignored axonal growth and pruning instead relying on implicit assumptions that prioritize dendritic/synaptic learning above all other concerns. This project proposes a new model called the Axon Game, which allows the incorporation of biologically inspired axonal plasticity dynamics into most artificial neural network models with computational efficiency. We will explore the qualities of receptive windows grown under this methodology and discuss how they can integrate with neural network simulations.