Special Issue

Biologically Plausible Deep Learning

Message from the Guest Editor

Deep learning has achieved remarkable success in various problems, such as pattern recognition, image classification, segmentation, object detection, and natural language processing. However, networks based on oversimplified McCulloch–Pitts neurons usually necessitate hyper-complex architectures to learn the representations of data with multiple levels of abstraction, resulting in high computational costs. Furthermore, as black-box methods, these networks pose challenges in elucidating the reasons behind their high performance. In contrast, the human brain's neurons demonstrate potent computational capabilities with plausible structures while consuming minimal energy. There is adequate evidence to reveal how biological neurons, such as residual networks, dendrites, and spiking neurons, process signals in neuroscience. Consequently, neurons inspired by the biological nervous system have the potential to provide powerful computation capability with a simple structure, thereby reducing computation costs. Hence, as next-generation deep learning methods, biologically plausible deep learning models promise to be cogent tools for complex problems.

Guest Editor

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The journal *Mathematics* publishes high-quality, refereed papers that treat both pure and applied mathematics. The journal highlights articles devoted to the mathematical treatment of questions arising in physics, chemistry, biology, statistics, finance, computer science, engineering and sociology, particularly those that stress analytical/algebraic aspects and novel problems and their solutions. One of the missions of the journal is to serve mathematicians and scientists through the prompt publication of significant advances in any branch of science and technology, and to provide a forum for the discussion of new scientific developments.

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