Special Issue

Formal Analysis of Deep Artificial Neural Networks

Message from the Guest Editors

Artificial neural networks (ANN) represent a hot, fast-growing research field with a large impact on many application areas. In spite of some long-established mathematical results on approximation and modeling capabilities of traditional ANN architectures (in particular, shallow ANNs), the theoretical understanding of the behavior and of the properties of complex or quantum ANNs (including very deep multilayer ANNs, or recurrent neural networks) is still limited. In recent years, the principles and methodologies of several mathematical disciplines have been proposed for the theoretical analysis of ANN architectures, dynamics, and learning. Such disciplines include approximation theory, complexity theory, information theory, as well as the study of von Neumann entropy in quantum ANNs.

This Special Issue welcomes original research papers on the analysis of ANNs based on mathematically founded methods in general. Review articles describing the current state of the art of ANNs in the aforementioned contexts are highly encouraged. All submissions to this Special Issue must include substantial theoretical aspects of ANN research.

Guest Editors

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Deadline for manuscript submissions

closed (31 October 2022)

Entropy

an Open Access Journal by MDPI

Impact Factor 2.0
CiteScore 5.2
Indexed in PubMed

mdpi.com/si/103271

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The concept of entropy is traditionally a quantity in physics that has to do with temperature. However, it is now clear that entropy is deeply related to information theory and the process of inference. As such, entropic techniques have found broad application in the sciences.

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