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Mathematical Foundations of Deep Neural Networks

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Message from the Guest Editors

Deep learning is popular in various domains, e.g., computer vision, natural language processing, financing, medical applications, etc. Modern deep learning models include a huge number of parameters and demand a high computation power. One of the fundamental issues of machine learning models is their mathematical foundations, which provide insights into the model explanation, model design and network architecture search. In this Special Issue, topics related to the mathematical foundation of deep learning are welcomed, including but not limited to: geometric, topological, Bayesian, and game-theoretic formulations; analytical approaches to exploiting optimal transport theory, optimization theory, approximation theory, information theory, dynamical systems, partial differential equations, and mean field theory; exploring efficient training with small data sets, adversarial learning, reinforcement learning, and closing the decision-action loop; and foundational work on understanding success metrics, privacy safeguards, causal inference, algorithmic fairness, uncertainty quantification, interpretability, and reproducibility.

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Message from the Editor-in-Chief

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