

Theoretical Insights into Neural Networks and Deep Learning: Advancing Understanding, Interpretability, and Generalization

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ABSTRACT

This work aims to provide profound insights into neural networks and deep learning, focusing on their functioning, interpretability, and generalization capabilities. It explores fundamental aspects such as network architectures, activation functions, and learning algorithms, analyzing their theoretical foundations. The paper delves into the theoretical analysis of deep learning models, investigating their representational capacity, expressiveness, and convergence properties. It addresses the crucial issue of interpretability, presenting theoretical approaches for understanding the inner workings of these models. Theoretical aspects of generalization are also explored, including overfitting, regularization techniques, and generalization bounds. By advancing theoretical understanding, this paper paves the way for informed model design, improved interpretability, and enhanced generalization in neural networks and deep learning, pushing the boundaries of their application in diverse domains.

KEYWORDS

Neural networks, Deep learning, Interpretability, Generalization, Theoretical analysis

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