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Entanglement classification via Neuronal Networks

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In this talk, we investigate the application of machine learning to an NP-hard problem in quantum information theory, the separability problem of classifying a quantum state as entangled or separable. This problem arises for entangled quantum systems of dimension three or higher, where no exact solution is currently known. We demonstrate that neural networks can accurately classify mixtures of Bell states. This classification can be achieved by considering the properties of the mixtures themselves and by entropy-related quantities. We further highlight convolutional neural networks in this process. Our findings indicate that these networks can reflect entanglement structures crucial for accurate classification. The study underscores the synergistic potential of machine learning and quantum information science. It suggests a promising direction for their combined application in solving complex quantum problems.

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