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Quantum Machine Learning: An Overview

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Quantum machine learning asks whether quantum computers can offer machine learning capabilities beyond classical methods. Assessing this potential requires a firm understanding of its fundamental concepts, the basic models, and their limitations. This talk reviews these foundations and the challenges of working with quantum devices before focusing on supervised quantum machine learning with variational quantum circuits (VQCs). We discuss how to encode classical data into quantum models and how to train their parameters using gradient-based optimization. Two VQC-based architectures serve as case studies: data re-uploading and dissipative quantum neural networks. We conclude with some central questions facing the field, including the trainability and scalability of variational models.

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