QUANTUM COMPLEX SYSTEMS FOR MACHINE LEARNING.

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Machine learning plays a crucial role in a spectrum of temporal tasks ranging from chaotic systems forecasting to speech recognition. As an alternative to conventional computation with deep neural networks, the inherent dynamics of analogue quantum systems can be harnessed to efficiently realize these tasks, analyzing and predicting sequential data. Quantum reservoir computing (QRC) is a promising machine learning framework that utilizes a quantum system as a high-dimensional computational reservoir, leveraging quantum coherence to extract complex temporal correlations. Unlike conventional computing, this neuromorphic approach circumvents the von Neumann bottleneck, offering computational power while maintaining a compact physical implementation with easy-training. Notably, QRC enables the processing of both classical and quantum inputs, enhancing temporal information processing. In this talk, I will introduce the principles of QRC and discuss recent proposals that highlight its potential applications and future directions.