PYSQT's SEMINARS

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11.00 h (CET), On-line

Towards a Framework for Analyzing Quantum Machine Learning Algorithms

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Quantum machine learning (QML) has promised to leverage quantum resources to address general problems. Nowadays, the two main tracks for QML are a) kernel-based methods, often combined with classical post-processing, with provable problem-specific success and even quantum advantages; and b) variational approaches with broader applicability but poor performance when blindly applied to unfamiliar data. The gap between these paradigms—often navigated via heuristics—remains poorly understood, hindering the development of robust and general-purpose QML algorithms.

In this talk, I will present a systematic approach to analyzing and guiding the design of heuristic QML models through numerical diagnostics. I will outline key properties such tools should capture, and showcase three examples: (i) assessing the average gradient magnitude across optimization landscapes, (ii) testing the randomness of generated quantum states, and (iii) evaluating how data-induced randomness influences classification performance. These tools mark a step toward a general-purpose characterization framework for QML models, aiming to inform both theoretical development and experimental implementation.

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