PerPPS 2025

Mercoledì 22 gennaio

ore 15:00 - aula A

Quantum convolutional Neural Networks for jet images classification

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Quantum computing's potential to outperform classical methods has triggered growing interest, particularly in quantum machine learning (QML). In this talk, we explore the application of QML in high-energy physics (HEP), focusing on top-quark tagging—a task where classical convolutional neural networks (CNNs) excel but struggle with highly energetic jet images. Given this task, we use quantum convolutional neural networks (QCNNs) with a noiseless simulator and compare their performance to classical CNNs. Through varying encoding types—used to translate the classical data into quantum states—, loss functions, and convolutional quantum circuits, we demonstrate how QCNNs, especially those optimized via dimensional expressivity analysis (DEA), can outperform classical models with fewer parameters. These findings highlight the potential of QML in advancing HEP analysis.