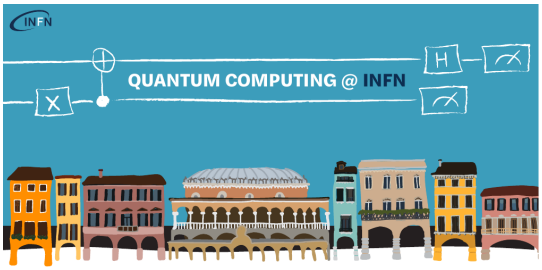

Contribution ID: **5** Type: **not specified**

QUnfold: Quantum Annealing for Distributions Unfolding in High-Energy Physics

Tuesday, 29 October 2024 15:30 (20 minutes)

In High-Energy Physics experiments, each detector exhibits a unique signature in terms of efficiency, resolution, and geometric acceptance. The overall effect is that the measured distribution of a given physical observable can be smeared and biased. The unfolding algorithm is the classical statistics technique employed to correct for this distortion, aiming to recover the underlying true distribution. This process is essential to make effective comparisons between experimental results and theoretical predictions.
In this context, the emerging technology of quantum computing represents an opportunity to enhance the unfolding performance and potentially yield more accurate results. *QUnfold* is a Python package designed to tackle the unfolding problem by harnessing the capabilities of quantum annealing. The regularized log-likelihood maximization formulation of the unfolding problem is translated into a Quantum Unconstrained Binary Optimization (QUBO) problem, solvable by D-Wave's quantum annealing systems. The algorithm is validated on a simulated data sample of particle collision events, generated by combining the *Madgraph* Monte Carlo event generator and the *Delphes* simulation software to model a realistic scenario. Several kinematic distributions are unfolded, and the results are compared with conventional unfolding methods widely used in precision measurements at the Large Hadron Collider.

Sessione

Altro

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