



UT AUSTIN PORTUGAL 2019 ANNUAL CONFERENCE

MASTERCLASS I QUANTUM COMPUTING: PRINCIPLES, ALGORITHMS AND APPLICATIONS

Lecture 4: "Algorithms: Quantum Monte Carlo integration"

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The lecture will present quantum algorithms for Monte Carlo integration. This problem has received a lot of attention lately, since it is at the core of many financial risk analysis techniques. Quantum computing should allow, in the medium term, addressing larger simulations (due to the exponential quantum state space) and producing better solutions (due to the availability of truly random distributions).

The algorithms to be discussed are based on the Quantum Amplitude Estimation algorithm, which is itself based on amplitude amplification and the inverse Quantum Fourier Transform (QFT). A practical implementation will be demonstrated, together with a discussion on current limitations.

The lecture finishes with an overview of a very recent method that dispenses with the QFT, significantly reducing the quantum circuit complexity.