UNIVERSITÀ DI PAVIA
Dipartimento di Fisica
"Alessandro Volta"

Dottorato di Ricerca in Fisica

COLLOQUIA DI DOTTORATO, A.A. 2025/2026

A102, Dipartimento di Fisica

Mercoledi 18 marzo 2026 ore 16:00

Tensor network algorithms for quantum simulations and optimisations

Simone Montagnero

(Quantum Computing and Simulation Center, University of Padova)

This seminar will review recent advances in the development of efficient tree tensor network algorithms and their applications to quantum simulation, benchmarking, and theoretical interpretation [1,2].
In particular, results on two- and three-dimensional systems will be presented, both in and out of equilibrium, including scattering processes and induced false vacuum decay in the two-dimensional quantum Ising model [3]. It will further highlights the use of tree tensor network methods beyond traditional quantum simulation, such as addressing hard classical combinatorial problems through mappings to many-body quantum Hamiltonians, optimizing quantum compilation tasks, integer factorization and enabling quantum equational reasoning [4].

[1] Introduction to Tensor Network Methods, Simone Montangero
Springer International Publishing

[2] Scattering and induced false vacuum decay in the two-dimensional quantum Ising model, Luka Pavešić, Marco Di Liberto, Simone Montangero
arXiv:2509.02702

[3] Quantum algorithms for equational reasoning, Davide Rattacaso, Daniel Jaschke, Marco Ballarin, Ilaria Siloi, Simone Montenegro
arXiv:2508.21122

[4] Quantum inspired factorization up to 100-bit RSA number in polynomial time
Marco Tesoro, Ilaria Siloi, Daniel Jaschke, Giuseppe Magnifico, Simone Montangero
arXiv:2410.16355

The seminar is in presence up to the maximum occupancy of the lecture hall.