



COLLOQUIA DI DOTTORATO, A.A. 2025/2026

A102, Dipartimento di Fisica
Mercoledì 18 marzo 2026 ore 16:00

Tensor network algorithms for quantum simulations and optimisations

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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 Montangelo
Springer International Publishing

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

[3] Quantum algorithms for equational reasoning, Davide Rattacaso, Daniel Jaschke, Marco Ballarin, Ilaria Siloi, Simone Montangelo
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 Montangelo
arXiv:2410.16355

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