Roma Tre

Dipartimento di Matematica e Fisica
Segreteria per la Ricerca

italian

SEMINARIO di CRITTOGRAFIA

Ilaria SILOI

(Università di Padova)

Quantum and Quantum-Inspired Methods for Combinatorial Problems

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AULA M3

Abstract: Tensor-network methods provide a compact representation of high-dimensional objects and have found applications in quantum many-body physics, optimization, and machine learning. This seminar discusses their use, together with quantum algorithmic constructions, for the study of combinatorial problems. The first part describes an application of RSA prime factorization based on Schnorr's algorithm, in which tensor-network methods are used to approximately solve a set of closest-vector problem instances. This approach is validated on the factorization of semiprimes up to 100 bits. The second part introduces a quantum computational framework for equational reasoning, in which equivalence classes of symbolic expressions are encoded into Hamiltonian ground states. This formulation can be used to address the word problem, count equivalent expressions, and study the structure of equivalence classes. Finally, maximally compact polymers are discussed as an application for estimating thermodynamic properties. The construction encodes ensembles of Hamiltonian cycles on two-dimensional lattices into the amplitudes of a quantum state, with possible relevance to simplified models of protein folding and soft-matter systems.

per informazioni: Dr. Nicoletta Falcone (nicoletta.falcone@uniroma3.it)