



Solid State Institute
המכון למצב מוצק

TECHNION
Israel Institute
of Technology



הטכניון
מכון טכנולוגי
לישראל

SPECIAL SEMINAR

סמינר מיוחד

New Avenues in Quantum Computing: Beyond Quantum Circuits with Trapped-Ion Qubits

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Abstract

Trapped ions are a leading quantum technology for quantum computation and simulation, with the capability to solve computationally hard problems and deepen our understanding of complex quantum systems. The quantum circuit model is the central paradigm for quantum computation, enabling the realization of various quantum algorithms by application of multiple one- and two-qubit entangling operations. However, the typical number of entangling operations required by this model increases exponentially with the number of qubits, making it difficult to apply to many problems.

In my presentation, I will discuss new methods for realizing quantum gates and simulations that go beyond the quantum circuit model. I will first describe a single-step protocol for generating native, n -body interactions between trapped-ion spins, using spin-dependent squeezing. Next, I will present a preparation of novel phases of matter using simultaneous and reconfigurable spin-spin interactions. Lastly, I will explore new avenues to harness the long-lived phonon modes in trapped-ion crystals for simulating complex bosonic and spin-boson models that are difficult to solve using classical methods. The presented techniques could push the performance of trapped-ion systems to solve problems that are currently beyond their reach.

ההרצאה תתקיים ביום המישי, ה-16.2.23 בשעה 12:30

באודיטוריום המכון למצב מוצק, קומת כניסה

The lecture will take place on Thursday, 16.2.23 at 12:30
at the Solid State Institute auditorium, entrance floor

Host: Associate Professor Yoav Sagi