Quantum Information Science Talks

UNIVERSITÄT DES SAARLANDES

Montag
20.01.25, 12:00 Uhr
Geb. E2 1, Raum 0.01
Alle Interessierten
sind herzlich willkommen

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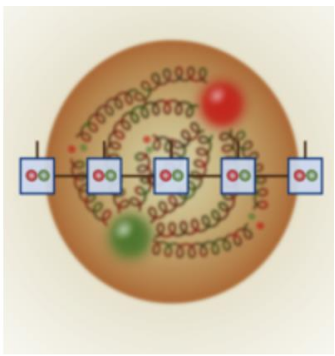
Quantum-inspired methods for lattice field theory

Monday, January 20th, 2025 at 12:00p.m.
Building E2 1, Room 0.01

One of the major breakthroughs of particle physics has been the development of the Standard Model, which describes all known elementary particles and the forces between them, except for gravity. Theoretically, it is formulated using gauge theories, which present considerable challenges and, in many interesting regimes, do not permit analytical solutions. After discretizing such theories on a lattice, they can be addressed with numerical methods. Conventionally this is done with Markov Chain Monte Carlo (MCMC) methods, that have been highly successful for studying mass spectra, phase diagrams and many other (static) properties. However, despite this great success, the MCMC approach suffers from the infamous sign problem in certain parameter regimes, leaving a lot of questions unanswered. Quantum-inspired methods might provide an alternative route towards tackling problems that are currently inaccessible with conventional MCMC methods.

In this colloquium, I will discuss progress towards tackling lattice field theories in these regimes with two different methods. First, I will discuss Tensor Networks, a particular kind of ansätze for the wave function of a strongly-correlated quantum many-body system. Second, I will present recent progress on using quantum computers for tackling problems in lattice field theory. While those two methods are seemingly complementary, they share a common foundational basis and seem promising for addressing problems beyond the reach of conventional MCMC methods in the future.

From LinkedIn: Stefan Kühn



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Website:
www.uni-saarland.de/fachrichtung/physik/veranstaltungen/qis-seminar.html

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