Colloquium

Towards a quantum future of computation

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ETH Zurich and Microsoft Research

Host:

More than a century after the development of quantum mechanics we have reached an exciting time where non-trivial devices that make use of quantum effects can be built: quantum random number generators to produce true random numbers, optical lattice emulators to mimic models of condensed matter physics and quantum annealers to solve classical optimization problems. As the roadmap to building universal quantum computers becomes more concrete an important emerging question is the identification of important real-world applications of quantum computers. In order for a quantum computer to be competitive, it needs to not only be asymptotically superior but be able to solve problems within a limited time that no classical supercomputer can solve. I will discuss the necessary steps of quantum software engineering needed to turn a quantum algorithm into a quantum killer app . I will review how substantial algorithmic improvements of quantum algorithms have turned problems in materials science and quantum chemistry to realistic applications of quantum computers, with applications from novel superconductors to understanding the mechanism of biological nitrogen fixation.

Monday, December 19, 2016 04:00pm - 05:15pm

Raiffeisen Lecture Hall, Central Building

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