UNIVERSITY OF MIAMI
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University of Miami, Physics Department Colloquium

Date: Wednesday, Jan 31, 2024
Time: 4:00 pm – 5:00 pm
Location: Wilder Auditorium – Rm 112, Knight Physics Building

Quantum Software

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Abstract

In these days, we are witnessing amazing progress in both the variety and quality of platforms for quantum computation and quantum communication. Since algorithms and communication protocols designed for traditional 'classical' hardware do not employ the superposition principle and thus provide no gain even when used on quantum hardware, we are in need of developing specific quantum algorithms and quantum communication protocols that make clever use of the superposition principle and extract a quantum advantage. "Quantum hardware needs quantum software", so to say. Furthermore, due to noise in the qubits, known as decoherence, an additional quantum-specific software layer is required that emulates a perfect quantum machine on top of a noise one. I will demonstrate our recent work on this subject with theorems as well data from university and commercial quantum devices.

Biography

Matthias Chistandl is in the Department of Mathematical Sciences at the University of Copenhagen, Center Leader of the Quantum for Life Center funded by the Novo Nordisk Foundation and co-PI of the VILLUM Foundation research centre QMATH, the Centre for the Mathematics of Quantum Theory. He also heads the UCPH Quantum Hub, a cross-departmental and cross-faculty collaborative initiative. Previously, he was Assistant Professor at ETH Zurich (2010–2014) and at the University of Munich (2008–2010), and Postdoctoral Fellow at the University of Cambridge (2005–2008). He holds a PhD from the University of Cambridge (2006) and a Diploma from ETH Zurich (2002). In 2013, he was awarded an ERC Starting Grant and in 2018 an ERC Consolidator Grant, and was elected to the Royal Danish Academy of Sciences and Letters in 2016. In 2018, he was on sabbatical at MIT for one semester while serving as programme committee chair for QIP 2019, the premier conference in the field of quantum information processing. His research aims to understand the way quantum mechanics impacts on information processing. To this end, he has made contributions of an algorithmic, cryptographic, information-theoretical and foundational nature, drawing on techniques and concepts from mathematics, computer science, physics and engineering. Excited by recent experimental breakthroughs in the building of quantum devices, he continues this theoretical line of research with a focus on the near-term facilitation and long-term benefits of quantum computing.