

Monitored Quantum Systems on a Quantum Computer: From Phase Transitions to Social Network Analysis (12'+3')

Thursday 29 June 2023 11:40 (15 minutes)



Figure 1: Speaker –Sabine Tornow

Abstract

There are two central processes in quantum systems: the unitary time evolution and projective measurements that break unitarity. Quantum systems, which are continuously “monitored”, e.g., by mid-circuit measurements, are subject to new dynamics called measurement induced quantum walks (MIQW), which correspond to random walks through the Hilbert space. The competition between unitary evolution and projective measurements leads to a surprisingly rich diversity of novel phenomena of monitored quantum systems, like dynamical phase transitions or topological invariants of the quantum evolution. Network modelling plays an important role in understanding and analyzing data structures. We utilize MIQW for a network analysis that quantifies the importance of each network node and of the community structure, which is key in

characterizing, e.g., social networks. To compute the centrality and community structure, MIQW are experimentally implemented on transmon quantum computers. We discuss noise models, error prevention and error mitigation schemes. Our results reflect the large potential of new capabilities provided by current quantum computers in terms of mid-circuit measurements.

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Session Classification: Quantum Computing –Algorithms & Theory