Quantum Computer Systems Lecture Series
Quantum Circuit Decomposition and Routing Collaborative Design

Bio
Evan McKinney is a third-year PhD student, co-advised by Dr. Alex K. Jones and Dr. Michael Hatridge at the University of Pittsburgh. He received his bachelor's from Iowa State University in computer engineering and physics. His research is on quantum computing architecture and optimizations for near-term QC applications.

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Zoom link:

Abstract
In this talk, I will highlight our work in the co-design of superconducting quantum computers, emphasizing our focus on developing specialized transpilation tools. Transpilation serves to tackle key bottlenecks, notably the computational overhead arising from the frequent use of SWAP gates due to limited qubit connectivity in NISQ systems. Our most recent contribution is an optimization technique termed MIRAGE. This approach enhances existing circuit routing algorithms by incorporating 'mirror gates,' which inherently include data movement in their decompositions. Mirror gates execute alternative quantum gates simply by reversing the order of qubit outputs. MIRAGE effectively reduces circuit depth by minimizing the reliance on SWAP gates, making it highly compatible with systems employing the root of iswap basis gate.

For more information, visit sites.nd.edu/quantum and qmlsys.mit.edu or scan QC code
Organized by Zhiding Liang (Notre Dame), Hanrui Wang (MIT)