北京大学前沿计算研究中心
Center on Frontiers of Computing Studies, Peking University

静园5号院
青 年 讲 座

Efficient high-threshold decoding for concatenated quantum Hamming codes

Dr. Shilin Huang

Department of Physics
Hong Kong University of Science and Technology

Host：李彤阳 助理教授
2026年6月9日 星期二 16:00
静园五院204室

Abstract

In this talk, I will present a polynomial-time hard-decision decoder for concatenated quantum codes that improves on conventional local decoding by using higher-level syndrome information to revise lower-level recovery decisions. We refer to this approach as the bidirectional decoder. As a benchmark, we apply it to the concatenated [[15,7,3]] quantum Hamming code under independent bit-flip noise, where it improves the decoding threshold by nearly a factor of three. Numerical results further indicate that it preserves the full code-distance scaling for at least three levels of concatenation. These results suggest that improved decoding can make high-rate concatenated-code architectures more competitive for low-overhead fault-tolerant quantum computation.

Biography

Shilin Huang is an Assistant Professor in the Department of Physics at the Hong Kong University of Science and Technology. His research focuses on quantum information science, with interests including quantum error correction and fault tolerance. Before joining HKUST, he was a Postdoctoral Associate at Yale Quantum Institute. He received his PhD from Duke University, and completed his undergraduate studies at Tsinghua University.