Contribution ID: **32** Type: **Contributed Talk**

Conditions to circumvent Eastin-Knill restrictions

Saturday 7 June 2025 11:30 (15 minutes)

A long-standing challenge in quantum error correction is the infeasibility of universal transversal gates, as shown by the Eastin- Knill theorem. We show that the Eastin-Knill no-go result is a special case that does not hold for a general error model and obtain a necessary and sufficient condition for a quantum error-correcting code to have universal transversal gates. Introducing a Lie algebraïc approach, we completely classify transversally implementable gate sets for fault-tolerant quantum computing, quantum metrology, and codes for the AdS/CFT correspondence, only depending on the errors on a quantum system. We present a code construction with universal transversal gates that changes the logical error probability from a lower bound to an upper bound, and enables exact correction of both local and correlated errors that affect many experimental platforms.

Author: GUPTA, Pragati (University of Calgary)

Co-author: SANDERS, Barry

Presenter: GUPTA, Pragati (University of Calgary)

Session Classification: Quantum Information