Chez Pierre

Presents ...

Chez Pierre Seminar

Margarita Davydova, Caltech

**"Stabilizing topological order below 4D and
dynamical phases of matter".**

Realizing a stable and scalable topological quantum memory in two and three dimensions is an open challenge that is theoretically and practically motivated. None of the existing solutions are local and respect physical speed limits.
We propose a dynamical system involving strictly local quantum operations that preserves a logical state of the 2D toric code for an exponentially long time and is perturbatively robust to arbitrary noise. Our construction is inspired by the classical cellular automata of Tsirelson and Gács, which, by renormalization group-like dynamics, realize stable one-dimensional ordered phases, evading no-go results for ordered phases in 1D equilibrium statistical mechanics. Our results solve the open problem of constructing a local and scalable topological quantum memory below 4D. Based on arXiv:2412.19803.