ICFO

INSIGHT SEMINAR: Understanding and decoding decohered non-Abelian topological order

PABLO SALA DE TORRES-SOLANOT

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12:00 to 13:00
Elements Room

ABSTRACT:
The rapid development of new experimental platforms enables the study of quantum many-body systems and their applications to quantum information tasks. Specifically, topological order (TO) provides a natural platform for storing and manipulating quantum information. However, its stability to noise has only been systematically understood for Abelian TOs. In this talk, we will generalize to the broader landscape of non-Abelian TO. Remarkably, we find that noise that proliferates non-Abelian anyons leads to enhanced stability, compared to the Abelian counter-part. Our general framework is based on effective stat-mech loop models involving the quantum dimension of the anyons. Specific examples include decoherence of the Kitaev honeycomb model, quantum doubles as well as D4 TO

which has recently been experimentally realized in quantum processors and that will be the central focus on this talk. We will then exploit the non-deterministic fusion of non-Abelian anyons to inform active error correction and design decoders where the fusion products, instead of flag qubits, herald the noise.

BIO:

Pablo recently joined UC Berkeley and the Simons Institute for the Theory of Computing as a joint postdoctoral fellow, after spending three years at Caltech as a Burke postdoctoral fellow. Pablo completed his PhD studies at the Technical University of Munich on 2022, where he focused on quantum many body dynamics. Pablo's doctoral research led to the discovery of Hilbert space fragmentation, an ergodicity-breaking mechanism that arises as a consequence of kinetic constraints. As a postdoctoral researcher, Pablo has developed a research program focused on various aspects of quantum many-body physics in the presence of measurements and decoherence. His recent work includes the demonstration and quantification of entanglement generation in open systems, the characterization of non-Abelian topological order under decoherence, and the identification of novel phenomena induced by quantum measurements and decoherence.

Hosted by: Prof. Dr. Darrick Chang