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Categorical Landau Paradigm

Thursday 5 September 2024 14:00 (30 minutes)

Landau's paradigm for understanding phase diagrams of quantum systems occupies a central place in theoretical physics. Quantum states are organised into phases characterized by patterns of spontaneous breaking of global symmetries. Despite its successes, severe limitations of this paradigm have been uncovered over the last decades with the discovery of an increasing number of phases of matter that cannot be explained within this paradigm. I will advocate that a solution out of this puzzle may be to generalise the Landau paradigm by incorporating spontaneous breaking of generalised symmetries. I will present the results of recent studies on generalised Landau paradigm for non-invertible symmetries that are characterized mathematically using category theory, due to which this generalisation is referred to as the 'Categorical Landau Paradigm'. These studies provide a description of all possible gapped and gapless phases for systems exhibiting such symmetries, fitting them together into a Hasse phase diagram, along with concrete lattice models realising the aforementioned phases in the infrared; thus demonstrating that the categorical Landau paradigm vastly expands the landscape of quantum phases that can be explained theoretically in terms of spontaneous breaking of global symmetries.

Link to publication (if applicable)

Presenter: BHARDWAJ, Lakshya Session Classification: Parallel sessions