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Long-range mutual information and topological uncertainty principle CHAO-MING JIAN, Stanford Univ, ISAAC KIM, Perimeter Institute, XIAO-LIANG QI, Stanford Univ — Ordered phases in Landau paradigm can be diagnosed by a local order parameter, whereas topologically ordered phases cannot be detected in such a way. In this paper, we propose long-range mutual information (LRMI) as a unified diagnostic for both conventional long-range order and topological order. Using the LRMI, we characterize orders in $n+1$ D gapped systems as m -membrane condensates with $0 \leq m \leq n-1$. The familiar conventional order and $2+1$ D topological orders are respectively identified as 0-membrane and 1-membrane condensates. We propose and study the topological uncertainty principle, which describes the non-commuting nature of non-local order parameters in topological orders.

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