

**ICTS**

INTERNATIONAL
CENTRE *for*
THEORETICAL
SCIENCES

TATA INSTITUTE OF FUNDAMENTAL RESEARCH

ICTS Statistical Physics and Condensed Matter Seminar

Title : Superconductors are topological phases protected by generalized symmetries

Speaker : Ashvin Vishwanath (Harvard University, USA)

Date : Monday, 30 June 2025

Time : 11:30 AM (IST)

Abstract : Recently, major strides have been taken towards a complete classification of gapped quantum states of matter. Yet a commonly observed gapped state—ordinary superconductors—sits awkwardly within this classification. Here we will answer the question of classification by proposing that the minimal description of a superconductor is in terms of symmetry protected topological (SPT) phases. A key role is played by the magnetic symmetry, a 1-form symmetry in three spatial dimensions, which encodes the absence of magnetic monopoles. The known properties of superconductors can be reproduced from the SPT characterization. Besides providing a minimalist derivation that is complementary to the Landau-Ginzburg approach, the non-perturbative nature of this viewpoint may be useful in situations when fluctuations are significant.

Furthermore, this approach reveals an unexpected relation between persistent currents at the surface of a superconductor and the Josephson effect on the one hand and Thouless pumps and the quantum spin Hall effect on the other.

Venue : Emmy Noether Seminar Room

Zoom Link: <https://icts-res-in.zoom.us/j/98843194798?pwd=QIzFAJGnpB3QeOJ2FkA24xqOwHL9No.1>

Meeting ID: 988 4319 4798

Passcode: 643593