

Program on Quantum Many-Body Dynamics: Thermalization and its Violations



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**ICTP-SAIFR, São Paulo, Brazil
Venue: Principia Institute**

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Invited Speakers

- **Edgard Macena Cabral** (Instituto de Física de São Carlos -USP, Brazil): *Usage of quantum information measures to classify phases in machine learning models.*

Identifying quantum phases of matter is a central challenge in condensed matter physics. Building on recent work showing that quantum information measures can serve as probes for phase transitions, this work explores their use as features in machine learning algorithms. We investigate how (i) short and long-range correlators, (ii) Von Neumann Entropy, (iii) and Quantum Fisher Information can distinguish phases across three distinct spin-1 chains: the XXZ chain with uniaxial anisotropy, the bond-alternating XXZ chain, and the bilinear-biquadratic chain. Our initial results, relying exclusively on (i), show that a simple K-Nearest Neighbors (KNN) model trained on two of the systems can predict the common phases of the previously unseen model with over 70% accuracy. This demonstrates the potential for machine learning models to identify universal phase characteristics and generalizes across different physical Hamiltonians.