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Quantum Geometry for Fractional Chern Insulators and Exact Sum Rules

Tuesday 2 December 2025 11:00 (1 hour)

Geometry is a fundamental mathematical concept that also plays a crucial role in characterizing the local properties of quantum states, including both pure and mixed states. Pure state geometry, often referred to as wavefunction geometry, is known to be important in many areas of zero-temperature condensed matter physics, such as the anomalous Hall effect and electron localization. Mixed state geometry, or density matrix geometry, is essential in quantum information science, with applications in quantum metrology and entanglement witnessing. In this talk, I will begin by reviewing quantum geometry, encompassing both pure and mixed stats, and clarify the relationship between them. I will then discuss how wavefunction geometry is useful for characterizing fractional Chern insulators, with applications in moiré materials. Finally, I will show how density matrix geometry leads to families of exact sum rules.

Presenter: WANG, Jie