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Dynamics of quantum systems with long-range interactions

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Atomic, molecular, and optical systems often exhibit long-range interactions, which decay with distance r as a power law $1/r^{\alpha}$. In this talk, we will derive bounds on how quickly quantum information can propagate in such systems. We will then discuss applications of these bounds to numerous phenomena including classical and quantum simulation of quantum systems, prethermal phases in Floquet systems, entanglement area laws, sampling complexity, and scrambling.