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Talk : **TITLE: Cooperative effects and long range interaction: Cooperative Shielding.**

ABSTRACT:

Cooperative effects in long range interacting systems are at the center of interest in many systems in physics such as cold atomic clouds, light harvesting systems, and trapped ions. Cooperative effects are at the heart of Superradiance and Supertransfer showing enhance energy transport efficiency and a robustness to noise. In the first part of the talk we will review the role of cooperativity in different physical systems, focusing on the role of long range interaction in determining cooperative behaviours. The second part of the talk will be devoted to discuss the interplay of cooperativity and noise in systems with long range interaction (many body spin systems and tight binding models). The main focus will be on Cooperative Shielding. Contrary to the common expectation that long-range interaction should necessarily induce an instantaneous spread of information in the thermodynamic limit, we show that, as the system size increases, the dynamics can actually become more confined into invariant subspaces. In such subspaces, the dynamics is effectively shielded from long-range interaction, that is, it occurs as if that interaction was absent. Shielding is a cooperative effect, because the time over which it is effective diverges with system size. In quantum systems, shielding can be related to the quantum Zeno effect. The latter refers to the confinement of the dynamics into invariant subspaces of a system under “continuous measurement”. This implies that long-range interaction plays a role similar to a measuring apparatus.

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References
[1] L. Santos, F. Borgonovi and G.L.Celardo, arXiv:1507.06649 (2015).