



## Physical Sciences Seminar

# Bridging the gap between classical and quantum many-body information dynamics

**Andrea Pizzi**

University of Vienna

Host: Maksym Serbyn

The fundamental question of how information spreads in closed quantum many-body systems is often addressed through the lens of the bipartite entanglement entropy, a quantity that describes correlations in a comprehensive (nonlocal) way. Among the most striking features of the entanglement entropy are its unbounded linear growth in the thermodynamic limit, its asymptotic extensivity in finite-size systems, and the possibility of measurement-induced phase transitions, all of which have no obvious classical counterpart. Here, we show how these key qualitative features emerge naturally also in classical information spreading, as long as one treats the classical many-body problem on par with the quantum one, that is, by explicitly accounting for the exponentially large classical probability distribution. Our analysis is supported by extensive numerics on prototypical cellular automata and Hamiltonian systems, for which we focus on the classical mutual information and also introduce a classical entanglement entropy'. Our study sheds light on the nature of information spreading in classical and quantum systems, and opens new avenues for quantum-inspired classical approaches across physics, information theory, and statistics.

**Monday, May 23, 2022 11:00am - 12:00pm**

Heinzel Seminar Room / Office Bldg West (hybrid enabled) (I21.EG.101)



This invitation is valid as a ticket for the ISTA Shuttle from and to Heiligenstadt Station.

Please find a schedule of the ISTA Shuttle on our webpage:

<https://ista.ac.at/en/campus/how-to-get-here/> The ISTA Shuttle bus is marked ISTA Shuttle (#142) and has the Institute Logo printed on the side.