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Loschmidt echo, emerging dual unitarity and scaling of generalized temporal entropies after quenches to the critical point

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The dynamics of quantum many-body systems is one of the traditionally most challenging problems to study for classical simulators. Recently, however, the development of novel methodologies based on the concept of temporal entanglement has opened the way to a series of new results, allowing to access dynamical properties of quantum systems with efficient classical algorithms.
In this talk, I will discuss a recent breakthrough in this direction: by considering the return probability of a quantum many-body system system to its initial state after out-of-equilibrium evolution in a quench at the critical point, we have been able to build a connection with conformal field theory and provide analytical predictions for the properties of such time evolution and its associated generalized temporal entropies, which have also been recently introduced in the context of holography. The logarithmic growth of these entropies also implies the feasibility of efficient simulations with state of the art tensor network algorithms based on transverse contraction methods, which allowed us to confirm numerically our predictions.

[1] S. Carignano and L.Tagliacozzo, https://arxiv.org/pdf/2405.14706
[2] S. Carignano, CR Marimon and L.Tagliacozzo, Phys. Rev. Research 6, 033021 (2024)

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