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Temporal Entanglement in Chaotic Quantum Circuits

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The concept of space-evolution (or space-time duality) has emerged as a promising approach for studying quantum dynamics. The basic idea involves exchanging the roles of space and time and evolving the system using a space transfer matrix whose fixed points, also known as influence matrices, describe the interaction of the rest of the system acting as a bath on a subsystem. To evaluate the potential of this method as a numerical scheme, it is important to understand whether the influence matrices can be efficiently encoded in a classical computer. It is then natural to wonder what is the scaling of their entanglement, dubbed temporal entanglement, as a function of time. In this talk, I am going to present these ideas, and show how they can be applied for the calculation of generic two points correlation functions. Moreover, the Renyi entropies of these fixed points have a different qualitative behavior than the Von Neumann, which can be characterized exactly in some marginal cases, similarly to what has been observed for regular entanglement in systems with conservation laws.

This talk is based on the following paper: [arXiv:2302.08502](https://arxiv.org/abs/2302.08502)

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