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Calculating entanglement entropy with generative neural networks

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Quantum entanglement, a fundamental concept for understanding physics at atomic and subatomic scales, is explored in this presentation. We introduce a novel technique for computing quantum entanglement (Rényi) entropy, grounded on the replica trick and leveraging the abilities of generative neural networks for accurate partition function calculations. The approach is demonstrated on the 1-dimensional quantum Ising model, employing autoregressive networks and Neural Importance Sampling (NIS) for unbiased estimation. Numerical results are presented for the Rényi entropy and entropic c-function, illustrating the efficacy of the proposed methodology. This work contributes to the evolving landscape of quantum physics and underlines the transformative potential of generative neural networks in exploring entanglement phenomena.

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