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Forgetting and Remembering in Chaotic Dynamical Systems

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Abstract—Chaotic systems generate information. The amount is quantified by the Kolmogorov-Sinai entropy or the Lyapunov exponents. When positive, a system is unpredictable and appears random. But what is the quality of this information? We answer this by showing that it consists of two components: randomness that a system forgets (ephemeral information) and randomness that a system remembers (bound information). We show how to calculate these informations in the logistic, tent, and Lozi maps, demonstrating that this new decomposition identifies hitherto unseen structural features in their dynamics.

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