stretching and folding of dough in the making of puff pastries. Each patch of dough stretches horizontally under the rolling pin, separating exponentially quickly in two spatial directions. Then the dough is folded and flattened, compressing nearby patches in the vertical direction. The weather, wildfires, the stormy surface of the sun and all other chaotic systems act just this way, Kantz said. “In order to have this exponential divergence of trajectories you need this stretching, and in order not to run away to infinity you need some folding,” where folding comes from nonlinear relationships between variables in the systems.

The stretching and compressing in the different dimensions correspond to a system’s positive and negative “Lyapunov exponents,” respectively. In another recent paper in *Chaos*, the Maryland team reported that their reservoir computer could successfully learn the values of these characterizing exponents from data about a system’s evolution. Exactly why reservoir computing is so good at learning the dynamics of chaotic systems is not yet well understood, beyond the idea that the computer tunes its own formulas in response to data until the formulas replicate the system’s dynamics. The technique works so well, in fact, that Ott and some of the other Maryland researchers now intend to use chaos theory as a way to better understand the internal machinations of neural networks.

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