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Random Symmetry Breaking and Freezing in Chaotic Networks

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Parameter space of a driven damped oscillator in a double well potential presents either a chaotic trajectory with sign oscillating amplitude or a non-chaotic trajectory with a fixed sign amplitude. A network of such delay coupled damped oscillators is shown to present chaotic dynamics while the amplitude sign of each damped oscillator is randomly frozen. This phenomenon of random broken global symmetry of the network simultaneously with random freezing of each degree of freedom is accompanied by the existence of exponentially many randomly frozen chaotic attractors with the ize of the network. Results are exemplified by a network of modified Duffing oscillators with infinite ange pseudo-inverse delayed interactions.

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