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Automatic Search for Artificial Life in Nonlinear Optical Neural Networks

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Traditional neural networks consume vast amounts of energy, driving the search for efficient alternatives like Optical Neural Networks (ONNs), which perform computations with light. This project aims to demonstrate the potential of ONNs to structure light in complex ways by using them to generate self-evolving patterns known as artificial life.

For our experimental setup we use a nonlinear all-optical neural network that relies on the Kerr effect, rather than digital processing, to achieve nonlinearity. As a first experimental benchmark, we are working on implementing an optical decoder to demonstrate that this ONN can perform nonlinear operations. Building on this platform, we aim to use Automated Search for Artificial Life (ASAL), a framework to find interesting artificial life simulations, to tune the network parameters and find regimes that produce complex spatiotemporal behavior.

Field of Research/Work

Atomic, Molecular, and Optical Physics

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