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Minimal representations of flow trajectories reveal Lagrangian Coherent Structures[1] THEODORE MACMILLAN, DAVID RICHTER, University of Notre Dame — What is the most compact piece of information through which one could fully describe the kinematics of a flow trajectory? Inspired by recent progress in the unsupervised learning of dynamical systems, we employ a deep variational autoencoder (VAE) to compress flow trajectories through a low-dimensional latent space and reconstruct the trajectories using only information in this latent space. We find that by imposing certain constraints on the structure of this low-dimensional space and given only the relative motion of trajectories (i.e. not including their absolute position in the flow) our framework learns to encode trajectories into their respective Lagrangian Coherent Structures (LCSs) as the most efficient minimal representation of their kinematics. We discuss this work along with possible extensions to the analysis of transient LCSs.

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