

Persistence and Topological Complexity

Ling Zhou

Duke University

Topological complexity is a homotopy invariant that measures the minimal number of continuous rules required for motion planning in a space. In this work, we introduce persistent analogs of topological complexity and its cohomological lower bound, the zero-divisor-cup-length, for persistent topological spaces, and establish their stability. For Vietoris–Rips filtrations of compact metric spaces, we show that the erosion distances between these persistent invariants are bounded above by twice the Gromov–Hausdorff distance. We also present examples illustrating that persistent topological complexity and persistent zero-divisor-cup-length can distinguish between certain spaces more effectively than persistent homology.

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