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Computational Topology for Shape Optimization and Geometrical Data Analysis

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Abstract

Persistent homology describes the topological "shape" of an object by a set of numbers, that encode how its topology evolves moving between different points of view. Celebrated stability theorems ensure that these numbers can be used as features, to infer properties of the object itself; interestingly, however, a kind of converse also holds, in that their computation is locally sufficiently smooth (in a specific, weak sense) that a notion of subgradient can be defined, opening the door for topological optimization. In this talk I will give an overview of how these two complementary approaches can be employed for data analysis, and discuss some questions that I am trying to answer.

Keywords

Topological Data Analysis, Persistent Homology, Differentiable Persistent Homology, Topological Machine Learning