Generalized Persistence Parameters for Analyzing Stratified Pseudomanifolds

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The fundamental paradigm of persistent homology is to vary an unknown parameter while computing algebraic invariants. The stability of the invariants is then analyzed to determine significant topological features of a space. Traditionally, this parameter is an incremental distance e used to generate a filtered complex of a point cloud. This project aims to begin a program that searches for more of these parameters. To head in this direction, we study the point clouds of stratified pseudomanifolds, as our new parameters will provide new information about their singular sets. Our main examples are the perversity p of intersection homology groups IH^p_• and the inclusion chain of Cech nerves C(X)_k with limiting dimension. Not only do these stratified spaces enrich our theoretical understanding of persistence, but they are also plentiful in real-world applications. We conclude that these newfound parameters can successfully identify singular points. Suspicions about a categorical framework of generalized parameters are discussed. Applications to protein docking and elliptic curve cryptography are outlined.

Awards Won:
Third Award of $1,000
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