Algebra/Topology Seminar

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Decomposing the Persistent Homology Transform of Star-Shaped Objects

Thursday, October 17, 2024
3:00 p.m. in BB-B012

ABSTRACT. In this talk, we study the geometric decomposition of the degree-0 Persistent Homology Transform (PHT) viewed as a persistence diagram bundle. We focus on star-shaped objects as they can be segmented into smaller, simpler regions known as "sectors". Algebraically, we demonstrate that the degree-0 persistence diagram of a star-shaped object in $\mathbb{R}^2$ can be derived from the degree-0 persistence diagrams of its sectors. Using this, we then establish sufficient conditions for star-shaped objects in $\mathbb{R}^2$ so that they have "trivial geometric monodromy". Consequently, the PHT of such a shape can be decomposed as a union of curves parameterized by S^1, where the curves are given by the continuous movement of each point in the persistence diagrams that are parameterized by S^1. Finally, we discuss the current challenges of generalizing these results to higher dimensions. Joint work of Shreya Arya (University of Pennsylvania), Barbara Giunti (University at Albany, SUNY), Abby Hickok (Columbia University), Lida Kanari (École Polytechnique Fédérale de Lausanne, Switzerland), Sarah McGuire (Michigan State University), and Kate Turner (Australian National University, Canberra, Australia).