UNIVERSITY AT ALBANY
State University of New York

College of Arts and Sciences
Department of Mathematics and Statistics

Algebra/Topology Seminar

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Fractal Dimension Estimation with Persistent Homology

Thursday, October 31, 2019
1:15 p.m. in ES-143

Abstract. Persistent homology describes the shape of a geometric object in terms of how its topology changes as it is thickened. Recently, there has been a surge of interest in applications of persistent homology including dimension estimation. We prove that the fractal dimension of a measure can be recovered from the persistent homology of random point samples, assuming the measure satisfies a standard regularity hypothesis. Our work generalizes a classical theorem of Steele on random minimum spanning trees (0-dimensional persistent homology) from the case of non-singular measures on Euclidean space to the fractal setting. We also present computational results (joint with J. Jaquette) indicating that a persistent homology-based dimension estimation algorithm performs as well or better than classical techniques.