

BI-CO MATHEMATICS COLLOQUIUM

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“Topological Persistence via Category Theory”

Joint Talk with Computer Science

Monday, February 9, 2015

Talk at 4:00 – Park 338

Tea at 3:30 – Park 355, Math Lounge

Abstract:

Topological persistence originated as a strategy for measuring the topology of a statistical data set. The naive approach is to build a simplicial complex from the data and measure its homological invariants; but this approach is extremely sensitive to noise and is therefore unusable. The correct approach (made effective by Edelsbrunner, Letscher and Zomorodian in 2000) is to represent the data by a multiscale family of simplicial complexes, and to measure the homology as it varies across all scales. The resulting multiscale invariants, known as persistence diagrams, are provably robust to perturbations of the data (Cohen-Steiner, Edelsbrunner, Harer 2007).

In this talk, I will explain some of these ideas and then describe how to cast them in category theoretic language. The basic concepts extend quite widely. In particular, I will explain how Reeb graphs and joint-trees/well known constructions in data analysis can be thought of as persistent invariants, enjoying some of the same properties as persistence diagrams. My collaborators in this work include Peter Bubenik, Jonathan Scott, Elizabeth Munch, Amit Patel.

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