DOCTORAL PROGRAM
DISCRETE MATHEMATICS

TU & KFU GRAZ · MU LEOBEN
AUSTRIA

Graz University of Technology

30.9.2016 (14 Uhr)

Hörsaal BE01, Steyergasse 30

Discrete Geometry and Topology Colloquium

14:00 **H. Edelsbrunner** (ISTA): **Distances and divergences in topological data analysis**. Given a finite set in a metric space, the topological analysis assesses its multi-scale connectivity quantified in terms of a 1-parameter family of homology groups. Going beyond metrics, we show that the basic tools of topological data analysis also apply when we measure dissimilarity with Bregman divergences. A particularly interesting case is the relative entropy whose infinitesimal version is known as the Fisher information metric. It relates to the Euclidean metric on the sphere and, perhaps surprisingly, the discrete Morse properties of random data behaves the same as in Euclidean space.

Coffee Break

15:30 **Raman Sanyal** (Goethe-Univ. Frankfurt: **The geometry of double posets**, In 1984 Stanley showed that partially ordered sets (posets) can be studied from the perspective of geometry. His order- and chain polytopes express combinatorial properties of posets as geometric quantities, furnishing a number of deep results in both combinatorics and geometry. In 2011, Malvenuto and Reutenauer introduced double posets (finite sets equipped with two partial order relations). This notion underlies many constructions in algebraic combinatorics such as P-partitions, Littlewood-Richardson rules, permutation statistics. In this talk, I will explain how double posets can be studied from a geometric point of view, highlighting connections to centrally-symmetric polytopes (weak Hanner polytopes), combinatorial optimization (anti-blocking polytopes), valuations on distributive lattices, and generalized Hibi (semigroup) rings. This is joint work with T. Chappell and T. Fried.

16:20 **Wöden Kusner** (TU Graz): **Critical packings, rigidity, and the radius function**. There are a number of classical problems in geometric optimization that ask for the "best" configuration of points with respect to some function. We are interested in the relationships between various notions of criticality for such functions on configuration spaces, in particular the injectivity or packing radius. This is not a Morse function, but it has been observed to be Morse-like, in that the topological notion of regularity can be defined in an analogous way. Furthermore, there is a geometric interpretation from rigidity theory that characterizes configurations as critical by the existence of a strut measure.

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