COLLOQUIUM
and Opening Lecture of
2014 Fall Theme Semester on Discrete Networks: Geometry, Dynamics and Applications

Vertical versus horizontal Poincare inequalities

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This talk is devoted to a description of the history and recent progress related to an old question in metric geometry that has received renewed impetus due to the discovery of its links to algorithmic graph partitioning. No prerequisites will be assumed.

A classical result of Pansu and Semmes asserts that the Heisenberg group does not admit a bi-Lipschitz embedding into any Euclidean space. Several alternative proofs of this fact have been subsequently found, yielding the non-embeddability of the Heisenberg group into a variety of spaces, including uniformly convex spaces and L_1. These proofs rely on metric differentiation methods, i.e., the use of a limiting procedure to show that it suffices to rule out certain more structured embeddings. For certain applications, which will be explained in this talk, it is important to get quantitative bounds, in which case turning the metric differentiation arguments into quantitative statements is quite challenging and yields sub-optimal bounds. This talk, which assumes no prerequisites, will start by explaining the approaches to the Heisenberg embeddability question based on metric differentiation, and then present a new and different approach based on Littlewood-Paley theory that yields asymptotically sharp distortion bounds for embeddings of balls in the Heisenberg group into uniformly convex spaces. We will end with a conjectural isoperimetric inequality that is motivated by the new Littlewood-Paley approach, and explain its implications to approximation algorithms.

The lecture will take place in Thackeray 704 at 3:30pm.
Refreshments will start at 3:00pm.