Seminar on Combinatorial Computing
April 12, 2007, Thursday, 4:15 p.m.
Room 9204/9205, Graduate Center
365 Fifth Avenue, New York
NOTE SPECIAL PLACE AND TIME!

The story of the Sparsest Cut Problem

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Abstract

In the past decade methods from Riemannian geometry and Banach space theory have become a central tool in the design and analysis of approximation algorithms for a wide range of NP hard problems. In the reverse direction, problems and methods from theoretical computer science have recently led to solutions of long standing problems in metric geometry. This talk will illustrate the connection between these fields through the example of the Sparsest Cut problem. This problem asks for a polynomial time algorithm which computes the Cheeger constant of a given finite graph. The Sparsest Cut problem is known to be NP hard, but it is of great interest to devise efficient algorithms which compute the Cheeger constant up to a small multiplicative error. We will show how a simple linear programming formulation of this problem leads to a question on bi-Lipschitz embeddings of finite metric spaces into L_1, which has been solved by Bourgain in 1986. We will then proceed to study a quadratic variant of this approach which leads to the best known approximation algorithm for the Sparsest Cut problem. The investigation of this "semidefinite relaxation" leads to delicate questions in metric geometry and isoperimetry, in which the geometry of the Heisenberg group plays an unexpected role.

For further information contact Janos Pach at pach@cims.nyu.edu, or visit our website
http://www.math.nyu.edu/p̃ach/public_html/combinatorics_seminar.html