Vertex-Sparsifiers for Graphical Metrics

Date Tuesday, November 27

Time 3:00 pm

Location 303 Mudd

Abstract: Given a tree $T = (V, E)$ where the edges have non-negative lengths, we define the natural shortest-path metric d_T between the nodes. Suppose we color the nodes of the tree red/blue: can we obtain a tree T' whose vertices are now exactly the blue nodes, and whose shortest path distances $d_{T'}$ are within constant factors of the original shortest-path distances d_T, restricted to the blue nodes?

What if we had a planar graph instead of a tree: is every restriction of a planar metric to a subset of nodes (approximately) representable by some planar graph? One can ask this question about other graph families as well.

These questions about metric spaces are intimately related to flows and cuts in graphs: given a capacitated network where we want to support multi-commodity flows between a specified subset of nodes (called terminals), can we define a smaller network (on just the terminals) such every flow matrix routable in the old network is routable in the new one, and (approximately) vice-versa?

In this talk, we will talk about the connections between these metric and flow/cut problems, survey some of the results, and mention open problems.