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MADALGO seminar by Mohammad Ali Abam, Aarhus University

Geometric Spanners for Weighted Point Sets

Abstract:

Let (S, d) be a finite metric space, where each element $p \in S$ has a non-negative weight wt(p). We study t-spanners for the set S with respect to the following weighted distance function dω:
dω(p, q) = 0 if p = q,
dw(p,q) = wt(p) + d(p, q) + wt(q) if p <> q.

We present a general method for turning spanners with respect to the d-metric into spanners with respect to the dω-metric. For any given ε > 0, we can apply our method to obtain (5+ ε)-spanners with a linear number of edges for three cases: points in Euclidean space Rd, points in spaces of bounded doubling dimension, and points on the boundary of a convex body in Rd where d is the geodesic distance function.
We also describe an alternative method that leads to (2+ε)-spanners for points in Rd and for points on the boundary of a convex body in Rd. The number of edges in these spanners is O(n log n). This bound on the stretch factor is nearly optimal: in any finite metric space and for any ε > 0, it is possible to assign weights to the elements such that any non-complete graph has stretch factor larger than 2 − ε.

Joint work with:

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