Open Problems for ICMS Workshop

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Open Problem 1: Is it possible to embed a constant-degree expander with n vertices in ℓ_∞ with distortion strictly smaller than 3 and dimension $o(n)$?

Open Problem 2:

Definition 0.1 *Given an undirected graph $G = (V, E, \omega)$, and a set $S \subseteq V$ of vertices, a subgraph $G' = (V, E', \omega)$ is called a source-wise distance presetver with respect to S if for every $u, w \in V$, $dist_{G'}(u, w) = dist_G(u, w)$.*

It is known [Coppersmith,Elkin, SODA'05] that for every N-vertex undirected possibly weighted graph $G = (V, E, \omega)$, and a subset $S \subseteq V$ of $O(N^{1/4})$ vertices, there exists a source-wise distance preserver with $O(N)$ edges. On the negative side, for any sufficiently large N and s that satisfy $\omega(N^{1/4}) = s = o(N^{9/16})$ there exists an N-vertex graph G and a subset S of s vertices such that any source-wise preserver of G with respect to S contains $\omega(N + s^2)$ edges. The range of parameters $\Omega(N^{9/16}) = s = o(N)$ constitutes an open problem. In particular, it is not known whether for any graph G and a subset S of $N^{2/3}$ vertices, there exists a source-wise preserver of G with respect to S with $O(N^{4/3})$ edges. This problem is open even for unweighted graphs. If one allows the subgraph to approximate the distances within an additive error of 2, then an upper bound of $O(N^{4/3})$ on the size the subgraph with these properties with respect to S of size $N^{2/3}$ is known.

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