

Dimension reduction in the l_1 norm: When and how is it possible?

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Through the Johnson-Lindenstrauss Lemma and related results, it is known that a small set of points in a high-dimensional space can be linearly embedded into a space of much lower dimension in such a way that Euclidean distances between the points are nearly preserved, and that a random projection can be used for such embeddings. At the same time, it is known that a result of this kind is not possible if we replace Euclidean distance by the l_1 norm, at least not for arbitrary sets of points. Certain sets, such as sparse vectors, can be linearly embedded in low dimension with respect to the l_1 norm, and sparse random matrices work well for such embeddings. In this talk, we present a general framework which aims to address: for which sets of points, using what randomized linear maps, and to what extent is dimensionality reduction in l_1 possible?