



Friday, June 15, 2012.

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The Metric Nearness Problem

Abstract:

In this talk, I will discuss the metric nearness problem: given a set of pairwise dissimilarities, find a "nearest" set of distances that satisfy the properties of a metric, principally the triangle inequality. This problem occurs in many applications (such as clustering and metric-based indexing and querying) where the data comes from an underlying metric space, but the observations are nonmetric due to measurement errors or other issues. We formulate the metric nearness problem as a convex optimization problem, which we then solve using efficient triangle fixing algorithms that are based on an iterative projection method. An intriguing aspect of the metric nearness problem is that a special case turns out to be equivalent to the all pairs shortest paths (APSP) problem. We exploit this equivalence to develop a new algorithm for APSP using a primal-dual method. We include experiments that demonstrate the computational superiority of triangle fixing over general purpose convex programming software.

This is joint work with Justin Brickell, Suvrit Sra and Joel Tropp.

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