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BOSTON UNIVERSITY STATISTICS

AND PROBABILITY SEMINAR SERIES

Nonlinear Dimension Reduction through Local Multidimensional Scaling

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111 Cummington Street, Boston

Tea and Cookies at 3:30pm in MCS 153

Abstract: In recent years there has been a resurgence of interest in nonlinear dimension reduction methods, which concern with constructing a nonlinear low dimensional embedding of a hypothetical manifold near which the data fall. In this talk we will introduce a family of new nonlinear dimension reduction methods called "Local Multidimensional Scaling" or LMDS. Like other methods in the area, LMDS only uses local information from user-chosen neighborhoods, but it differs from them in that it uses ideas from the area of "graph layout". We approach the force paradigm, which is commonly used in "graph layout", by proposing a parametrized family of stress or energy functions inspired by Box-Cox power transformations. This family provides users with considerable flexibility for achieving desirable embeddings, and it comprises most energy functions proposed in the past.

Facing an embarrassment of riches of energy functions, we propose a meta-criterion that measures how well the sets of K-nearest neighbors agree between the original high-dimensional space and the low-dimensional embedding space. This meta-criterion has intuitive appeal, and it performs well in creating faithful embeddings.

For directions and maps, please see *http://math.bu.edu/research/statistics/statseminar.html.*