Auburn Montgomery

Department of Mathematics

Colloquium/$\mathcal{MAMS}$

Time: Friday, October 12, 2012, 2:00pm–3:00pm

Place: Auburn Montgomery, Goodwyn Hall, Room 202

Speaker: Professor Jianzhong Wang, Department of Mathematics and Statistics, Sam Houston State University

Title: Randomized Isomaps for Nonlinear Dimensionality Reduction

Abstract: With the current rapid technological advancement in data acquisition, the high demand for innovative methods to manipulate and understand large volumes of high-dimensional data is more urgent than ever. This talk is concerned with the randomized Isomaps to high-dimensional data representation, although the same approach applies to many other dimensionality methods as well. High-dimensional data are assumed to reside on a low-dimensional manifold. Represent the data by their manifold coordinates is a natural and effective approach to extract the data features, which is called dimensionality reduction. Among the methods of nonlinear dimensionality reduction, Isomaps method is a relative accurate method. However, the method is involved in the spectral decompositions of dense matrices. In many applications, the sizes of such matrices are huge. Therefore, their spectral decompositions encounter difficulties in at least three aspects: large memory usage, high computational complexity, and computational instability. In this presentation, we introduced the randomized anisotropic transformation (RAT) technique for Isomaps, creating a very simple algorithm called randomized Isomaps. The new algorithm avoids the spectral decompositions of huge-size Isomaps kernels, dramatically reduces memory usage and computational complexity, and increases numerical stability as well. A theoretical proof confirms the validity of the new algorithm. The experiments of randomized Isomaps are also given in this presentation.

There is also a Math Club social gathering starting at 1:00pm.
****Refreshments will be served at 1:00pm****