1056-68-2149 **Vin de Silva*** (vin.desilva@pomona.edu), Department of Mathematics, Pomona College, 610 N College Ave, Claremont, CA 91711-4411. *From Isomap to Persistence: nonlinear dimensionality reduction with circular coordinates.*

Nonlinear dimensionality reduction (NLDR) is the art of discovering low-dimensional coordinate embeddings of high dimensional data; the hope is that the the new coordinates reveal low-dimensional intrinsic structure that might not be easily recognised in the original coordinates. Algorithms for NLDR include Isomap, LLE, Laplacian Eigenmaps, Hessian Eigenmaps, and many more.

The limitation of these techniques is the inherent assumption that the data *can* be usefully embedded in low dimensional Euclidean space. In particular, it is usually assumed that the data can be represented as a convex coordinate patch in Euclidean space. In particular, data sets with the topology of a circle or torus are not well handled.

I will discuss recent work with Mikael Vejdemo Johansson and Dmitriy Morozov which extends the NLDR framework to a search for low-dimensional coordinates which are circle-valued (rather than real-valued). We use the machinery of topological persistence, specifically persistent cohomology, to identify 1-cocycles and represent them as smooth circle-valued functions on the data. This appears to give good results for simple data spaces with nontrivial topology. (Received September 23, 2009)