

1032-55-115

Ross E. Staffeldt* (ross@nmsu.edu), Department of Mathematical Sciences, MSC 3MB P.O. Box 30001, New Mexico State University, Las Cruces, NM 88003-8001. *Introduction to Topology of Data Sets*. Preliminary report.

Given a large sample of high-dimensional data, the problem of finding meaningful structures of relatively low dimension hidden in the high-dimensional observations arises immediately. Certain classical techniques, such as principal component analysis and multi-dimensional scaling, find linear structures approximating the data, according to certain criteria. But, by their nature, these methods overlook non-linear phenomena that may be expected or important. I will describe briefly how one builds simplicial complexes to approximate a sample space, starting with intuitive classical considerations and moving to an economical recent construction due to de Silva and Carlsson. Along the way I will also demonstrate software with which one can manipulate simplicial complexes in Matlab. Finally, I will introduce persistent homology, a powerful idea that unifies topological phenomena in data at different scales of resolution. The talk will provide background to more specialized talks in the area of computational applications of algebraic topology. (Received August 17, 2007)