1077-51-2840 **P. Thomas Fletcher**, **John Moeller**, **Jeff M Phillips** and **Suresh Venkatasubramanian*** (suresh@cs.utah.edu). *Horoball Hulls and Extents in Positive Definite Space.*

The space of positive definite matrices $P(n)$ is a Riemannian manifold with variable nonpositive curvature. It includes Euclidean space and hyperbolic space as submanifolds, and poses significant challenges for the design of algorithms for data analysis.

In this paper, we develop foundational geometric structures and algorithms for analyzing collections of such matrices. A key technical contribution of this work is the use of *horoballs*, a natural generalization of halfspaces for non-positively curved Riemannian manifolds. We propose generalizations of the notion of a convex hull and a centerpoint and approximations of these structures using horoballs and based on novel decompositions of $P(n)$. This leads to an algorithm for approximate hulls using a generalization of extents. (Received September 22, 2011)