BI-CO MATHEMATICS COLLOQUIUM

Simons Senior Thesis Bi-Co Colloquium

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"Statistics in Tree Space"

Monday, March 2, 2015

Talk at 4:00 – H109
Tea at 3:30 – KINSC Math Lounge, H208

Abstract:

Data generated in such areas as medical imaging and evolutionary biology are frequently tree-shaped, and thus non-Euclidean in nature. As a result, standard techniques for analyzing data in Euclidean spaces become inappropriate, and new methods must be used. One such framework is the space of metric trees constructed by Billera, Holmes, and Vogtmann. This space is non-positively curved (hyperbolic), so there is a unique geodesic path (shortest path) between any two trees and a well-defined notion of a mean tree for a given set of trees. Furthermore, this geodesic path can be computed in polynomial time, leading to practical algorithms for computing the mean, variance, and other statistics. I will discuss applications of these to phylogenetic and lung airways imaging data, as well as present the first method for computing multiple principal components of trees.

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