CCSU

DEPARTMENT OF MATHEMATICAL SCIENCES

COLLOQUIUM

Friday, September 2

2:00 – 3:00 PM

Maria Sanford, Room 101

INTERSECTION OF STATISTICS WITH GEOMETRY, INFORMATION, AND RIEMANNIAN MANIFOLDS

ROGER BILISOLY

CENTRAL CONNECTICUT STATE UNIVERSITY

Abstract: This talk discusses the connections between statistics and geometry, consisting of three parts. First, suppose that we have a data set with sample size *n*. We will show that by treating each variable as a vector with n entries, many ideas from a first-year statistics course can be described in terms of Euclidean geometry. For instance, the Pearson correlation coefficient is the cosine of the angle between the two data vectors. For example, a one-sample t-test corresponds to projecting the data vector onto two orthogonal subspaces of R^n, one corresponding to the model, the other corresponding to the error. The connections will be illustrated by concrete examples using real data. Second, we will explore how researchers starting from 1945 into the 1980s slowly realized (1) how the Fisher information matrix was linked to information theory and entropy, and (2) that families of probability distribution functions (pdfs) could be viewed as a Riemannian manifold using Fisher information as a metric. Third, returning to applications, we will see how researchers, starting from the 1970s, realized that data itself could arise from Riemannian manifolds, and that the metric of the manifold can be used to generalize the ideas of mean and standard deviation. Again we will consider an example based on real data.

For further information:

gotchevi@ccsu.edu 860-832-2839

http://www.math.ccsu.edu/gotchev/colloquium/