UNIVERSITY OF SOUTH CAROLINA, DEPARTMENT OF STATISTICS

PALMETTO LECTURES IN STATISTICS

James O. Ramsay, McGill University

Tuesday March 29, 2pm, LeConte College, Room 210A

Watching Children Grow Taught Me All I Know

We see more and more data where a single observation is a set of measurements that can be considered as defining a smooth function that underlies the data. Sets of measurements on the heights of children, whether over all of childhood and adolescence or over the first days of life, can be viewed as defining samples of growth curves. What makes functional observations like these unique among statistical data is the possibility of estimating derivatives, such as height velocity and acceleration. The relationships among these derivatives curves have revealed some astonishing structure and provided clues to growth dynamics. Moreover, these data highlight the fact that time itself is an elastic medium, with each child's physiological or growth time having interesting nonlinear relationships to the clock times at which the data are recorded. The growth of children will be used in this talk to introduce a wide range of applications of functional data analysis.

Thursday March 31, 2pm, LeConte College, Room 210A

A Compact Functional Estimate of a Functional Variance-Covariance or Correlation Kernel

In functional data analysis, as in its multivariate counterpart, estimates of the bivariate covariance kernel $\sigma(s,t)$ and its inverse are useful for many things. However, the dimensionality of functional observations often exceeds the sample size available to estimate $\sigma(s,t)$. Then the analogue of the multivariate sample estimate is singular and non-invertible. Even when this is not the case, the high dimensionality of the usual estimate often implies unacceptable sample variability and loss of degrees of freedom for model fitting. The common practice of employing low-dimensional principal component approximations to $\sigma(s,t)$ to achieve invertibility also raises serious issues. This talk describes a functional and nonsingular estimate of $\sigma(s,t)$ defined by an expansion in terms of finite element basis functions that permits the user to control the resolution of the estimate as well as the time lag over which covariance may be nonzero. This estimate also permits the estimation of covariances and correlations at observed pairs of sampling points, and therefore has applications to many classical statistical problems, such as discrete but unequally spaced time and spatial series.

Refreshments available after both lectures in LeConte 213.