The University of Chicago
Department of Statistics

Seminar Series

KEITH WORSLEY
Department of Mathematics and Statistics
McGill University

"Detecting Connectivity Between Images by Thresholding Random Fields: MS Lesions, Cortical Thickness, and the 'Bubbles' Task in an fMRI Experiment"

MONDAY, October 30, 2006 at 4:00 PM
133 Eckhart Hall, 5734 S. University Avenue
Refreshments following the seminar in Eckhart 110.

ABSTRACT

We are interested in the general problem of detecting connectivity, or high correlation, between pairs of pixels or voxels in two sets of images. To do this, we set a threshold on the correlations that controls the false positive rate, which we approximate by the expected Euler characteristic of the excursion set. An exact expression for this is found using new results in random field theory involving Lipschitz-Killing curvatures and Jonathan Taylor's Gaussian Kinematic Formula. The first example is a data set on 425 multiple sclerosis patients. Lesion density was measured at each voxel in white matter, and cortical thickness was measured at each point on the cortical surface. The hypothesis is that increased lesion density interrupts neuronal activity, provoking cortical thinning in those grey matter regions connected through the affected white matter regions. The second example is an fMRI experiment using the 'bubbles' task. In this experiment, the subject is asked to discriminate between images that are revealed only through a random set of small windows or 'bubbles'. We are interested in which parts of the image are used in successful discrimination, and which parts of the brain are involved in this task.

Please send email to Mathias Drton (drton@galton.uchicago.edu) for further information. Information about building access for persons with disabilities may be obtained in advance by calling the department office at (773) 702-8333.