

STATISTICS COLLOQUIUM

MONDAY, OCTOBER 1, 2007

TALK: 4:00 PM — SCIENCE CENTER RM. 309

RECEPTION: 5:15 PM — SCIENCE CENTER, 300h

“Semiparametric Detection of Significant Activation for Brain fmri”

Chunming Zhang
University of Wisconsin-Madison
Statistics Department

ABSTRACT

Functional magnetic resonance imaging (fMRI) aims to locate activated regions in human brains when specific tasks are performed. The conventional tool for analyzing fMRI data applies some variant of the linear model, which is restrictive in modeling assumptions. To yield more accurate prediction of the time-course behavior of neuronal responses, the semi-parametric inference for the underlying hemodynamic response function is developed to identification of significantly activated voxels. Under mild regularity conditions, we demonstrate that a class of the proposed semi-parametric test statistics, based on the local-linear estimation technique, follow χ^2 distributions under null hypotheses for a number of useful hypotheses. The asymptotic power functions of the constructed tests are derived under the fixed and contiguous alternatives. Furthermore, a new false discovery rate approach which incorporates spatial information of voxel-wise p-values is devised for detecting the regions of activation. Simulation evaluations and real fMRI data application endorse that the semiparametric inference procedure delivers more efficient detection of activated brain areas than popular imaging analysis tools AFNI and FSL.

LINKS:

<http://www.stat.wisc.edu/~cmzhang/>

Paper available at: <http://www.stat.wisc.edu/~cmzhang/fMRI/>