UNC
GILLINGS SCHOOL OF
GLOBAL PUBLIC HEALTH

BIOSTATISTICS SEMINAR

Timothy D. Johnson, Ph.D.
Department of Biostatistics
University of Michigan

The Estimation of Spatially Varying Coefficients via a Spatial GLMM with Application to Multiple Sclerosis MRI data

Multiple Sclerosis (MS) is an autoimmune disease that affects the central nervous system (CNS) by disrupting nerve transmission. This disruption is caused by damage to the myelin sheath surrounding nerves that acts as an insulator. Patients with MS have a multitude of symptoms that depend on where lesions occur in the brain and/or spinal cord. MS has no cure and in order to help manage the disease, physicians subtype MS patients into 4 categories that depend on the pattern of MS episodes. Patient symptoms are rated by the Kurtzke Functional Systems (FS) scores and the paced auditory serial addition test (PASAT) score. Of interest to Neurologists is whether lesion locations can be predicted using these FS and PASAT scores and whether the data can help predict MS subtype in a newly diagnosed patient.

To help answer these questions, we propose an autoprobit regression model with spatially varying random coefficients. The data of interest are digitized binary images of the brain derived from high-resolution T2-weight MRI images encoded such that, at each voxel, 1 indicates the presence of a lesion and 0 denotes absence of a lesion. These binary lesion maps are taken as the dependent variables. In contrast to most spatial applications, in which only one realization of a process is observed, we have multiple, independent realizations, one from each patient. This allows the modeling and estimation of spatially varying parameters of patient level covariates such as age, gender, disease duration, FS and PASAT scores. Maps of these spatially varying parameters over the brain allow us to spatially predict lesion probabilities over the brain given covariates. Furthermore, we show that, via Bayes Theorem, the model can be used to accurately predict the MS subtype of a new subject.

Thursday, November 13, 2014 **Time: 3:30-4:30 PM**

Place: Blue Cross & Blue Shield Auditorium (0001 MHRC)