



UNC
GILLINGS SCHOOL OF
GLOBAL PUBLIC HEALTH

BIostatISTICS SEMINAR

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A powerful and adaptive association test for rare variants with application to neuroimaging data

We consider conducting global testing for association between a binary trait and a set of rare variants (RVs), though its application can be much broader to other types of traits, common variants (CVs) and gene set or pathway analysis. We show that many of the existing tests have deteriorating performance in the presence of many non-associated RVs: their power can dramatically drop as the proportion of non-associated RVs in the group to be tested increases. We propose a class of so-called sum of powered score (SPU) tests, each of which is based on the score vector from a general regression model, hence can deal with different types of traits and adjust for covariates, e.g. principal components accounting for population stratification. The SPU tests generalize the Sum test, a representative burden test based on pooling or collapsing genotypes of RVs, and a sum of squared score (SSU) test that is closely related to several other powerful variance component tests; a previous study (Basu and Pan 2011) has demonstrated good performance of one, but not both, of the Sum and SSU tests in many situations. The SPU tests are versatile in the sense that one of them is often powerful, though its identity varies with the unknown true association parameters. We propose a adaptive SPU (aSPU) test to approximate the most powerful SPU test for a given scenario, consequently maintaining high power and being highly adaptive across various scenarios. We conducted extensive simulations to show superior performance of the aSPU test over several state-of-the-arts association tests in the presence of many non-associated RVs. The test can be applied to neuroimaging and other high-dimensional data. This is joint work with Peng Wei, Junghi Kim, Yiwei Zhang and Xiaotong Shen.

Thursday, September 25, 2014

Time: 3:30-4:30 PM

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