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DEPARTMENT OF STATISTICS AND ACTUARIAL SCIENCE
THE UNIVERSITY OF HONG KONG

Seminar

Professor CHAN Kung-Sik

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will give a talk

entitled

CONSTRAINED SEMIPARAMETRIC REGRESSION ANALYSIS WITH ZERO-INFLATED DATA

Abstract

Zero-inflated data, i.e. data with high number of zeroes, abound in ecological studies as well as in other scientific and quantitative fields. Nonparametric regression with such data are often analyzed by a two-step approach consisting of the presence/absence analysis via generalized additive model (GAM), followed by another GAM analysis of the non-zero data. The two-step approach implicitly assumes that the zero inflation process is uncoupled with the underlying non-zero-inflated process, which may not be true. Besides the zero inflation, spatio-temporal data may be non-stationary, owing to covariate variability, e.g. climate change. We develop a new statistical framework, the constrained zero-inflated generalized additive model (COZIGAM), to model and make inference with zero-inflated data by assuming a linear relationship between the probability of non-zero-inflation and the average mean non-zero-inflated response, on their link scales. The COZIGAM requires only adding a small number of parameters to a GAM whereas the two-step approach alluded to above requires estimating two smooth predictors. Hence, the COZIGAM provides more efficient estimation and simplifies the statistical inference when the postulated linear constraint holds.

We develop an iterative algorithm for penalized likelihood estimation of a COZIGAM, and derive formulas for constructing confidence intervals. The asymptotic properties including consistency and limiting distribution of the penalized likelihood estimator are derived. We also propose a Bayesian model selection criterion for choosing between the unconstrained and the constrained models. Some extensions will be discussed, including imposing additive-component-specific proportional constraints and a threshold model accounting for non-stationarity. The new approach is illustrated with both simulated data and real, large-scale spatio-temporal applications.

The talk is based on joint work with Hai Liu.

on

Monday, January 12, 2009

3:00 p.m. – 4:00 p.m.

at

**Room 524, Meng Wah Complex
(behind the Chong Yuet Ming Amenities Centre)**

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