THE UNIVERSITY OF CHICAGO

Department of Statistics

DISSERTATION PROPOSAL

SAYAR KARMAKAR

Department of Statistics
The University of Chicago

An Optimal Gaussian Approximation and Its Applications

THURSDAY, November 17, 2016, at 10:00 AM
Jones 304, 5747 S. Ellis Avenue

ABSTRACT

In this proposal talk, we discuss a strong invariance principle for dependent and non-stationary multiple time-series. Our focus is on obtaining the optimal error bound as a function of the decay rate of dependence. This allows us to capture those processes where dependence is decaying very slowly. We discuss the error bounds for some specific series, e.g. stationary, cyclo-stationary, locally stationary etc. as corollaries to our main result. In order to generate the approximating Gaussian process, one needs a complicated estimate of the covariance structure of the original process. We propose a simple block multiplier technique which also keeps the optimal approximation rate intact.

We move on to discuss some applications of our Gaussian approximation result. Estimating the trend function noised with dependent errors is one of the field where our results will be very useful. In existing literature, the functions are typically assumed to be very smooth with at least two derivatives. With our optimal result, we can obtain simultaneous confidence bands for functions that are only Holder-1/2 continuous.

Next, we discuss a different type of application in the regime of change-point detection for multiple time-series. Our goal is to test whether change-points exist for different co-ordinates and if they do whether they are synchronized or not. In the presence of dependent errors/noise, obtaining the null distribution of the proposed test statistic is difficult. To address this issue, we use a bootstrap technique in the light of our optimal Gaussian approximation. We will apply our results on some real life data coming from electric power grade.

For information about building access for persons with disabilities, please contact Laura Rigazzi at 773.702-0541 or send an email to lrigazzi@galton.uchicago.edu. If you wish to subscribe to our email list, please visit the following web site: https://lists.uchicago.edu/web/arc/statseminars.