Mathematics, Statistics, and Computer Science **@ UIC**

Statistics and Data Science Seminar

Modeling Non-stationary Multivariate Time Series of Counts via Common Factors

Fangfang Wang (University of Wisconsin at Madison)

Abstract: In this talk, a new parameter-driven model for multivariate time series of counts is discussed. The time series is not necessarily stationary. The mean process is modelled as the product of modulating factors and unobserved stationary processes. The former characterizes the long-run movement in the data, while the latter is responsible for rapid fluctuations and other unknown or unavailable covariates. The unobserved stationary processes evolve independently of the past observed counts, and might interact with each other. We express the multivariate unobserved stationary processes as a linear combination of possibly low-dimensional factors that govern the contemporaneous and serial correlation within and across the observed counts. Regression coefficients in the modulating factors are estimated via pseudo maximum likelihood estimation, and identification of common factor(s) is carried out through eigenanalysis on a positive definite matrix that pertains to the autocovariance of the observed counts at nonzero lags. Theoretical validity of the two-step estimation procedure is presented. We also provide numerical results that corroborate the theoretical findings. Finally, we illustrate the use of the proposed model through an application to the numbers of National Science Foundation funding awarded to seven research universities from January 2001 to December 2012.

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