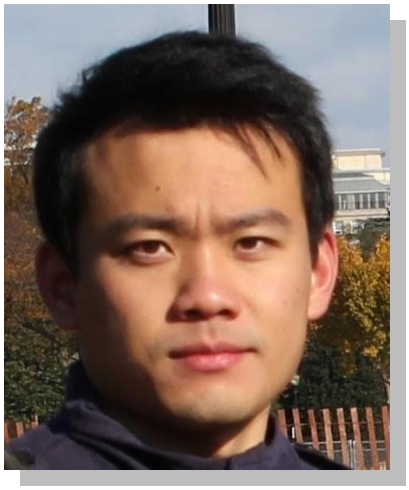
CoCo Seminar Series Spring 2017

A Statistical Modeling Approach for Spatio-Temporal Data and Its Applications



Dr. Xiao Liu
Research Staff Member
IBM Thomas J. Watson Research Center

Friday April 21st, 2017 1:00-2:00pm
(note the irregular time)
Engineering Building H-9 (Knoll-MacDonald Commons / Watson Commons)

For many real-life spatio-temporal processes, such as surface quality degradation, air pollution, etc., the space-time covariance structure is so complex that can hardly be specified or envisioned directly. Fortunately, the underlying physical mechanism usually provides valuable insights into the statistical modeling. In this talk, we propose a statistical modeling approach for spatio-temporal data motivated by physical processes, which are typically given by Partial Differential Equations. In particular, we express the quantity of interest at any spatial location and time as an additive superposition of two stochastic components: a spatial generation process, and a spatio-temporal propagation process. This approach naturally establishes a non-stationary random field with a space-time non-separable and anisotropic covariance structure. We also show the connection, under special conditions, between the proposed statistical model and generic scalar transport process. Some applications of the proposed approach are provided, including the modeling of spatio-temporal degradation data and urban air quality data.

Dr. Xiao Liu is a Research Staff Member with IBM Thomas J. Watson Research Center. He received his Ph.D. from the Department of Industrial and Systems Engineering, National University of Singapore (NUS). His research interests lie primarily in the applications of statistical and data analytics methods in solving real-world problems in broad areas such as quality and reliability engineering, environmental modeling and prediction, etc. He has published in peer-reviewed journals including Technometrics, the Annals of Applied Statistics, IIE Transactions, Journal of Quality Technology, etc. He received the prestigious Ralph A. Evans/P.K. McElroy Award for the best paper at the 2011 Reliability and Maintainability Symposium and 2015 IBM Outstanding Technical Achievement Award. He is on the editorial board of Quality and Reliability Engineering International, and served as an Adjunct Assistant Professor at the ISE Department, NUS from 2013 to 2016.

For more information, contact Changqing Cheng (ccheng@binghamton.edu). http://coco.binghamton.edu/
Acknowledgment: This seminar is sponsored by Teaching Enrichment Award for SSIE 561 Quality Assurance for Engineer.