"Data fusion and statistical learning in patient care cycle: from diagnosis to care to system-level decision-making"

by: Bing Si, Ph.D.

(Assistant Professor in Systems Science and Industrial Engineering, State University of New York at Binghamton, Binghamton, NY)

Reception begins at 11:00 a.m. on February 7, 2020 in the NanoFab South Rotunda

Abstract: Technology advancements in diagnostic imaging, smart sensing, and health information systems have resulted in a Big Data environment in health care. It is now possible to track every piece of information related to a patient's care cycle including diagnosis, prognosis, treatment, care delivery, and continuous monitoring. This offers a great opportunity for Precise Medicine. On the other hand, the size and complexity of the data overwhelm the modeling capability of existing statistical methods. In this talk, I will present two topics that tackle the data science challenges in migraine diagnosis/subtyping and in care coordination, respectively. In the first topic, a Multimodality Factor Mixture Model (MFMM) is developed to enable migraine subtype discovery from multimodality imaging data. MFMM employs a novel doubly-penalized formulation to achieve hierarchical selection of informative imaging modalities and informative features within each modality. This work enables refined classification of migraine patients and subtype-optimized treatment. In the second topic, I will present the development of a Multi-response Multi-level Model (M3) to fuse multi-source data collected by the recently developed Nurse Care Coordination Instrument (NCCI), in order to reveal how care coordination activities are affected by nurse training, workload, and their practice environment. This work enables development of best practices to improve care coordination and patient outcomes. Both works will be demonstrated by real-world data and case studies.

Her visit to SUNY Polytechnic Institute is hosted by Professor Yubing Xie.

Biography: Bing Si is an Assistant Professor in Systems Science and Industrial Engineering at State University of New York at Binghamton. She received her B.S. in Mathematics from University of Science and Technology of China and an M.S. and a Ph.D. in Industrial Engineering from Arizona State University in 2014 and 2018, respectively. Bing's research focuses on developing data analytics and statistical learning methodologies to support health care decisions in diagnosis, prognosis, treatment, and care delivery. Her research has been applied to a number of disease domains including Alzheimer's disease, migraine, and traumatic brain injury. She has experience collaborating with medical professionals in Mayo Clinic, ASU School of Nursing and Health Innovation, and the medical school at Technical University of Munich, Germany. She is a recipient of multiple awards and scholarships, including Dean's Dissertation Award from Ira A. Fulton Schools of Engineering at ASU, Outstanding Emerging Fulton Student Organization Leader (for serving as VP of INFORMS Student Chapter), Grace Hopper Scholarship for Women in Computing, IISE Conference Healthcare Student Best Paper 3rd Place, Quality & Productivity Research Conference Student Scholarship, and ASU CIDSE Doctoral Fellowship. She is a member of IISE, INFORMS, and IEEE.