Smart Monitoring of Complex Diseases: What a Statistician can Do

Dr. Shuai Huang

Department of Industrial & Systems Engineering

University of Washington

Abstract: In the era of "big data", an unprecedented opportunity is the abundance of individual data easily acquired from a wide range of perspectives over many years. These powerful sensing infrastructures hold great promises to accelerate the paradigm transition of the U.S. healthcare sector from reactive care to preventive care. In the context of a specific disease such as Alzheimer's Disease or Type 1 diabetes, one central question is how could we translate the big disease data into better health management of millions of preclinical or diseased patients. While many diseases manifest complex progression process, involving both temporal dynamics and spatial evolution, how could we model, monitor, and modify these processes, have been challenging, *beyond the scope of either statistics or operations research alone*. All these issues demand technological breakthroughs rather than incremental extensions of the current methodology. In this talk, I will introduce some of my research works that collectively aim to answer the following question: *how can we transform the role of the current sensing infrastructures from passive information collection into smart monitoring, which can proactively characterize the underlying complex time-varying disease process shaped by individual's risk factors and environmental exposures*? If successful, such a "smart monitoring" method will provide powerful data-driven decision-making capabilities for better disease management, leading to more efficient targeted screening and affordable care, better treatment planning, and improved quality of life for both patients and caregivers.

Bio: *Shuai Huang* is an assistant professor in Industrial and Systems Engineering at University of Washington. He received his B.S. in Statistics from the University of Science and Technology of China in 2007, and his Ph.D. in Industrial Engineering from the Arizona State University in 2012. Before he joined the University of Washington, he worked at the University of South Florida for two years as an assistant professor in the Department of Industrial and Management Systems Engineering. His research interest is identifying data-driven solutions for managing complex healthcare and engineering problems, emphasizing innovations in statistical learning and data mining and system-level quality improvement. Shuai is the recipient of the best paper award of the IIE Transactions in 2014. Two of his papers were also highlighted as the Feature Article in the IIE Magazine. Other awards include the Outstanding Graduate Award and the University Graduate Fellowship from the Arizona State University. He is a member of IEEE, INFORMS, IIE and ASQ.