Battle Type 1 Diabetes with Data Analytics:
Rule-based methods and collaborative learning

Abstract: In recent years we have witnessed tremendous development of AI and data science tools for healthcare and biomedicine applications, ranging from disease research to patient monitoring and management to treatment discovery. Still there are many methodological challenges that need breakthroughs in both general principles and theories of AI and machine learning and domain-specific wisdoms and insights and interdisciplinary solutions. In this talk, I will share our research on Type 1 diabetes (T1D), for which we have been contributing novel data analytics models and tools such as the rule-based algorithms and the collaborative learning method. I will give a historic account of this 10-year journey to show how these models were gradually developed over time, shaped by a close collaboration between engineers and medical doctors to find new interdisciplinary solutions for the challenging medical problem. I will also talk about our ongoing works to combine the strengths of rule-based method with collaborative learning to create interpretable and fairness-enforced risk models of T1D to overcome data disparity issues and achieve equitable performance across multiple ethnic groups.

Bio: Dr. Shuai Huang is an Associate Professor at the Department of Industrial & Systems Engineering at the University of Washington (UW). He is also Adjunct Faculty with the Department of Biomedical Informatics and Medical Education at UW. He received a B.S. degree on Statistics from the School of Gifted Young at the University of Science and Technology of China in 2007 and a Ph.D. degree on Industrial Engineering from the Arizona State University in 2012. Shuai's research is driven by challenging data analytics and AI problems, emphasizes innovation in machine learning and AI modeling for complex systems and processes in the connected world, automates the integration of human with these data-driven learning systems, and targets interpretable and explainable decision-makings. He develops methodologies for modeling, monitoring, diagnosis, and prognosis of complex networked systems such as brain connectivity networks, cyber physical systems, disease progression processes, and many emerging applications in IoT. He also develops machine learning models to integrate massive and heterogeneous datasets such as neuroimaging, genomics, proteomics, laboratory tests, demographics, and clinical variables, for facilitating scientific discoveries in biomedical research and better decision-makings in clinical practices. His research has been funded by the National Science Foundation (NSF), National Institute of Health (NIH), Defense Advanced Research Projects Agency (DARPA), Air Force Office of Scientific Research (AFOSR), Juvenile Diabetes Research Foundation (JDRF), and several other research institutes and foundations. Dr. Huang currently serves as Associate Editor for the IISE Transactions in Healthcare Systems Engineering and INFORMS Journal of Data Science.