



Ph.D. Dissertation Defense

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Degree:	Doctor of Philosophy
School/Department.:	Interdisciplinary / Data Science
Date:	Wednesday, April 22, 2026
Time:	1:30 pm – 3:30 pm
Location:	Gateway South 324
Title:	Personalized blood glucose management using data-driven approaches
Chairperson:	Dr. Samantha Kleinberg, Computer Science, School of Engineering and Science
Committee Members:	Dr. Ping Wang, Computer Science, School of Engineering and Science Dr. Yue Ning, Computer Science, School of Engineering and Science Dr. Hyewon Oh, Marketing, School of Business Dr. Onur Asan, Human Systems Interaction, School of Systems and Enterprises

Abstract

Managing blood glucose (BG) levels is essential for metabolic health. In free-living settings, BG is impacted by many interacting factors such as diet, physical activity, insulin, and gut microbiome. These factors vary across individuals and change over time, requiring frequent and complex decision making. Large-scale health datasets collected from sources like continuous glucose monitors (CGM), self-reported meal logs, and gut microbiome samples and have created new opportunities to characterize individual BG dynamics and develop data-driven BG management strategies, such as forecasting BG levels to inform insulin dosing and predicting postprandial glycemic responses to support personalized nutrition. However, computational challenges remain. There is substantial inter- and intra-individual variability in glycemic dynamics, making it difficult to achieve consistently accurate predictions across individuals or to identify which factors significantly impact glycemic patterns. In addition, individuals differ in the availability and completeness of their data sources, further complicating the development of personalized models.

In this thesis, I tackle these challenges by developing data-driven approaches for (i) predicting long-term BG with incrementally retrained stacked long short-term memory (IS-LSTM) models from limited data [1], (ii) predicting postprandial glycemic responses with limited variables available and examining sources of intra-individual variability, (iii) quantifying the contributions of food, prior glucose patterns, sleep, and gut microbiome to glycemic response prediction, and (iv) move beyond prediction to examine causal relationships between dietary factors and postprandial glycemic outcomes, enabling personalized dietary recommendations informed not only by association but by actionable intervention effects.