Industrial & Systems Engineering

Seminar Announcement

Dynamic Monitoring and Treatment Control of Chronic Diseases with a Case Study of Glaucoma

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Abstract: To effectively manage chronic disease patients, clinicians must know (1) how to monitor each patient (i.e., when to schedule the next visit and which subset of tests to take), and (2) how to control the disease (i.e., what levels of controllable disease risk factors will sufficiently slow progression). My research addresses these questions simultaneously in an integrated model and provides the optimal solution to a novel linear quadratic Gaussian state space model. For the new quadratic objective of minimizing the relative change in state over time (i.e., disease progression), I show that the classical two-way separation of estimation and control holds, thereby making a previously intractable problem solvable by decomposition into two separate, tractable problems while maintaining optimality. The resulting optimization is applied to the management of glaucoma. Based on data from two large randomized clinical trials, I validate the model and demonstrate how the decision support tool can provide actionable insights to the clinician caring for a patient with glaucoma. This methodology can be applied to a broad range of chronic diseases to optimally devise patient-specific monitoring and treatment plans.

Bio: *Pooyan Kazemian* is a Ph.D. Candidate in the department of Industrial and Operations Engineering at the University of Michigan. Pooyan's research is focused on designing new data-driven optimization models for improving healthcare operations and medical decision making and aims to improve the quality of care, access, and health outcomes. Pooyan is the recipient of the INFORMS Bonder Scholarship for Applied Operations Research in Health Services for the potential in making a significant contribution to the field of applied operations research in healthcare systems and the Rackham Graduate School Predoctoral Fellowship for working on a dissertation that is unusually creative, ambitious and risk-taking.

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