

Translational AI Center (TrAC) Seminar Spring 2024

Michael Risbeck

February 28th at 1:00 PM (US Central Time)

Zoom link and more information: <https://trac-ai.iastate.edu/event/trac-seminar-series-michael-risbeck/>

Data-driven Optimization of HVAC Systems to Balance Airborne Infection Risk and Energy Use

Abstract

During the COVID-19 global pandemic, significant attention was paid to how the operation of building ventilation systems contributes to airborne transmission of pathogens via respiratory aerosols. Via increased filtration, outdoor-air ventilation, and other mechanisms, the effective residence time of these infectious particles can be reduced, along with it the risk to occupants. With careful modeling and appropriate data collection, these phenomena can be modeled quantitatively to facilitate optimization of control strategies, and application of these techniques helps avoid excess energy use or unnecessary closure of spaces resulting from naive operation. At the same time, the end of the pandemic has brought a renewed emphasis on energy-efficiency, which underscores the need for flexibility to adapt to changing priorities. In this talk, I will present my and my colleagues' recent work in this area. By combining physics-based modeling and machine-learning approaches, key parameters can be inferred from more readily available measurements, and model-based multi-objective optimization can be used to make operational decisions. The approach will be illustrated using real data collected on a university campus during the pandemic. We will close by discussing how these techniques can be extended to other objectives and included within a broader vision for healthy, efficient, and autonomous buildings.

Short Bio

Dr. Risbeck is a controls engineer and data scientist specializing in modeling and optimization of building energy systems with numerous journal publications, conference presentations, and patents. He completed a BS in Chemical and Biomolecular Engineering at The Ohio State University and a PhD in Chemical and Biological Engineering at University of Wisconsin—Madison focusing on mixed-integer model predictive control and real-time optimization for HVAC central plants. In his current role, Dr. Risbeck is a Senior AI Scientist at Johnson Controls working to develop and deploy machine-learning and optimization solutions to improve operational efficiency and achieve sustainability goals in buildings.