

Resilience in Pandemics: Data and Digital Infrastructure for Informed Decision-Making

Session Co-chairs: Jessilyn Dunn, Duke University, and Jennifer Pazour, Rensselaer Polytechnic Institute

COVID-19 has impacted all people across the globe in all aspects of life. It has underscored the need to monitor new outbreaks, to ensure equitable access to testing and healthcare resources, to make difficult closing/reopening decisions for schools and businesses, and to quickly and safely manufacture and distribute vaccines and new biomedical solutions. Engineers play a unique role in all of these societally-important decisions, and especially during times of uncertainty, engineers can use data to increase resilience in the current pandemic and to be better prepared to respond to future pandemics.

This session will focus on the impact of data collected from digital infrastructures like sensors for improved manufacturing and biomedical innovation, as well as online platforms and healthcare dashboards to inform critical decision making and to promote health equity. Dr. Peter Frazier will focus on testing strategies and data infrastructure for reviewing cases and the response to COVID-19 in higher education. Dr. Samantha Keppler will focus on the impact of COVID-19 to frontline educational workers and the impact that data has in making operational decisions balancing the needs for community safety and education. Dr. Sarah Nielsen will discuss digitalization of biomedical manufacturing to enable reductions in non-conformance, advanced process control, real time release and real time product quality. Dr. Karen Hicklin will focus on ways data and advanced mathematical modeling can improve equitable health decisions.

Speakers:

Fighting the Pandemic with Data: A Case Study at Cornell University

Peter Frazier, Cornell University

Peter Frazier received a B.S. in Physics and Engineering/Applied Science from the California Institute of Technology in 2000, after which he spent several years in industry as a software engineer, working for two different start-up companies and for the Teradata division of NCR. In 2005, he entered graduate school in the Department of Operations Research & Financial Engineering at Princeton University, and received an M.A. in 2007 and a Ph.D. in 2009. He joined the faculty at Cornell in 2009 as an Assistant Professor in the School of Operations Research & Information Engineering, where he is now an Associate Professor. His research is in sequential decision-making under uncertainty, optimal methods for collecting information, and machine learning, focusing on applications in simulation, e-commerce, medicine and biology. He is the recipient of a CAREER Award from the National Science Foundation and a Young Investigator Award from the Air Force Office of Scientific Research. He is currently on leave at Uber, where he is a Staff Data Scientist and Data Science Manager. At Uber, he worked on UberPOOL from 2015-17, and on broader pricing efforts from 2016-17. He now leads a data science team focused on pricing.

<https://www.orie.cornell.edu/faculty-directory/peter-frazier>

Digitalization of Biomedical Manufacturing

Sarah Nielsen, Janssen Supply Chain

Sarah Nielsen is a Principal Scientist within Janssen Supply Chain leading Small Molecule Integrated Quality. Sarah and her team/colleagues are responsible for developing a digital quality strategy. This strategy utilizes data analytics, sensors, and mathematical modeling to provide assurance of quality for product release in real time. Sarah started her career with J&J 12 years ago as a post-doctoral fellow working on cardiovascular stent research, and more recently in her current role in Pharmaceuticals, which focuses on integrating data science with manufacturing. She has a Ph.D. in Chemistry from the University of Washington.

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Improved Healthcare Decision-making through Data and Advanced Mathematical Modeling

Karen Hicklin, University of Florida

Karen Hicklin is an Assistant Professor in the Department of Industrial & Systems Engineering at the University of Florida. Her research is primarily focused on mathematical modeling of stochastic systems with an emphasis on statistical and decision analysis as applied to healthcare and service environments. Before beginning her faculty appointment, she completed Postdoctoral Training in the Department of Statistics and Operations and Department of Health Behavior in the Gillings School of Global Public Health at the University of North Carolina at Chapel Hill. Her research interest include the data-driven approaches to model decision making for healthcare quality improvement. She focuses on using optimization methods (e.g., decision trees, simulation, Markov decision processes (MDPs), and Bayesian decision analysis) to provide solutions and policies for healthcare delivery. She received her PhD in Industrial Engineering from North Carolina State University, her MS in Mathematics and Statistics from Georgetown University, and her BS from Spelman College where she majored in mathematics.

<https://www.ise.ufl.edu/hicklin/>

The Impact of COVID-19 on Frontline Educational Workers

Samantha Keppler, University of Michigan

Samantha Keppler is an Assistant Professor of Technology and Operations at the University of Michigan Stephen M. Ross School of Business. She studies front-line service workers and technology, predominantly in the public and nonprofit sectors. She received her PhD in Industrial Engineering and Management Sciences from Northwestern University's McCormick School of Engineering. Before graduate school, she was a high school math teacher with Teach For America in the Bronx, NY.

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