EML WEBINAR

ZOOM DISCUSSION: 271 079 684
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10 AM BOSTON, 3 PM LONDON, 10 PM BEIJING

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DATA-DRIVEN MODELING OF COVID-19—LESSONS LEARNED

Understanding the outbreak dynamics of COVID-19 through the lens of mathematical models is an elusive but significant goal. Within only half a year, the COVID-19 pandemic has resulted in more than 19 million reported cases across 188 countries with more than 700,000 deaths worldwide. Unlike any other disease in history, COVID-19 has generated an unprecedented volume of data, well documented, continuously updated, and broadly available to the general public. Yet, the precise role of mathematical modeling in providing quantitative insight into the COVID-19 pandemic remains a topic of ongoing debate. Here we discuss the lessons learned from six month of modeling COVID-19. We highlight the early success of classical models for infectious diseases and show why these models fail to predict the current outbreak dynamics of COVID-19. We illustrate how data-driven modeling can integrate classical epidemiology modeling and machine learning to infer critical disease parameters—in real time—from reported case data to make informed predictions and guide political decision making. We critically discuss questions that these models can and cannot answer and showcase controversial decisions around the early outbreak dynamics, outbreak control, and exit strategies. We anticipate that this summary will stimulate discussion within the modeling community and help provide guidelines for robust mathematical models to understand and manage the COVID-19 pandemic.

Ellen Kuhl is the Robert Bosch Chair of Mechanical Engineering at Stanford University. She received her PhD from the University of Stuttgart in 2000 and her Habilitation from the University of Kaiserslautern in 2004. Her area of expertise is Living Matter Physics, the design of theoretical and computational models to simulate and predict the behavior of living structures. Ellen has published more than 250 peer-reviewed journal articles and edited two books; she is an active reviewer for more than 20 journals at the interface of engineering and medicine and an editorial board member of eight international journals in her field. She is a founding member of the Living Heart Project, a translational research initiative with 400 participants from research, industry, and medicine from 24 countries. Ellen is the current Chair of the US National Committee on Biomechanics and a Member-Elect of the World Council of Biomechanics. She is a Fellow of the American Society of Mechanical Engineers and of the American Institute for Mechanical and Biological Engineering. She received the National Science Foundation Career Award in 2010, was selected as Midwest Mechanics Seminar Speaker in 2014, and received the Humboldt Research Award in 2016. Ellen is an All American triathlete, a multiple Boston, Chicago, and New York marathon finisher, and a Kona Ironman World Championship qualifie.

Discussion leader: **Pradeep Sharma**, University of Houston

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