Data Science Seminar

Hosted by the Department of Mathematics and Statistics

- Date: Tuesday, March 21, 2023
- Time: 12:00pm – 1:00pm
- Room: Zoom
- Speaker: Dr. Hamsa Bastani (University of Pennsylvania)
- Title: Efficient and targeted COVID-19 border testing via reinforcement learning.

Abstract

Throughout the COVID-19 pandemic, countries relied on a variety of ad-hoc border control protocols to allow for non-essential travel while safeguarding public health: from quarantining all travellers to restricting entry from select nations based on population-level epidemiological metrics such as cases, deaths or testing positivity rates. Here we report the design and performance of a reinforcement learning system, nicknamed 'Eva'. In the summer of 2020, Eva was deployed across all Greek borders to limit the influx of asymptomatic travellers infected with SARS-CoV-2, and to inform border policies through real-time estimates of COVID-19 prevalence. In contrast to country-wide protocols, Eva allocated Greece's limited testing resources based upon incoming travellers' demographic information and testing results from previous travellers. By comparing Eva's performance against modelled counterfactual scenarios, we show that Eva identified 1.85 times as many asymptomatic, infected travellers as random surveillance testing, with up to 2-4 times as many during peak travel, and 1.25-1.45 times as many asymptomatic, infected travellers as testing policies that only utilize epidemiological metrics. We demonstrate that this latter benefit arises, at least partially, because population-level epidemiological metrics had limited predictive value for the actual prevalence of SARS-CoV-2 among asymptomatic travellers and exhibited strong country-specific idiosyncrasies in the summer of 2020. Our results raise serious concerns on the effectiveness of country-agnostic internationally proposed border control policies that are based on population-level epidemiological metrics. Instead, our work represents a successful example of the potential of reinforcement learning and real-time data for safeguarding public health.

Biography of the speaker: Dr. Bastani is an Assistant Professor of Operations, Information, and Decisions at the Wharton School, University of Pennsylvania. Her research focuses on developing novel machine learning algorithms for data-driven decision-making, with applications to healthcare operations and social good. Her work has received several recognitions, including the Wagner Prize for Excellence in Practice (2021), the Pierskalla Award for the best paper in healthcare (2016, 2019, 2021), the Behavioral OM Best Paper Award (2021), as well as first place in the George Nicholson and MSOM student paper competitions (2016).