EPSTEIN INSTITUTE SEMINAR ▪ ISE 651

Efficient and Targeted COVID-19 Border Testing Via Reinforcement Learning

ABSTRACT - Throughout the coronavirus disease 2019 (COVID-19) pandemic, countries have relied on a variety of ad hoc border control protocols to allow for non-essential travel while safeguarding public health, from quarantining all travelers to restricting entry from select nations on the basis of 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 severe acute respiratory syndrome coronavirus 2 (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 on the basis of 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 utilize only 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.

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SPEAKER BIO – Kimon Drakopoulos is the Robert R. Dockson Assistant Professor in Business Administration at the Data Sciences and Operations department at USC Marshall School of Business. His research focuses on the operations of complex networked systems, social networks, stochastic modeling, game theory and information economics. In 2020 he served as the Chief Data Scientist of the Greek National COVID-19 Scientific taskforce and a Data Science and Operations Advisor to the Greek Prime Minister. He has been awarded the Wagner Prize for Excellence in Applied Analytics and the Pierskalla Award for contributions to Healthcare Analytics.

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