CIRRELT

Séminaire du CIRRELT Seminar

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Optimal Responses to Epidemics: Models to Support Good Decisions

Abstract: Policy makers make consequential choices about how to allocate limited resources to improve population health. My research aims to find avenues to optimize the use of these resources. The first part of my talk addresses the problem of how to optimally allocate limited vaccines to control the spread of an infectious disease. This problem is dynamic, nonlinear and stochastic, and is typically solved numerically. By approximating the epidemic dynamics, I am able to develop simple analytical conditions characterizing the optimal vaccine allocation for four different objectives. The approximated solution is an all-or-nothing allocation based on a prioritized list of population groups given by the analytical conditions. This provides a practical and intuitive tool for decision makers as they allocate vaccines over time. I illustrate my method with an example of COVID-19 vaccination, calibrated to epidemic data from New York State. Numerical computations show that my method achieves near-optimal results over a wide range of scenarios. Although black-box models are prevalent in the literature, this work shows that accuracy need not be sacrificed for interpretability.

In the second part of the talk, I briefly present a dynamic model to assess the effectiveness of interventions for controlling the US opioid epidemic. I show that reductions in opioid prescriptions are necessary but may lead to a short-term increase in heroin overdose deaths, and thus must be combined with scale up of treatment for addicted individuals -- but that even with immediate policy changes, significant morbidity and mortality will still occur. This project informed the work of the Stanford-Lancet Commission on the North American Opioid Crisis, and provides critically needed evidence-informed recommendations for reducing opioid-related morbidity and mortality in the US.

Biography: Isabelle Rao is a PhD candidate in the department of Management Science and Engineering at Stanford University. Her research integrates tools from operations research, epidemiology, computer science and health economics to inform critical decisions in public policy and personalized medicine. The goal is to develop interpretable models that can provide actionable insights for operational and policy decisions in healthcare. Recently, her work has focused on the areas of COVID-19, opioid abuse and epidemic control. Her work is supported by a Stanford Interdisciplinary Graduate Fellowship.

Lundi / Monday

23 janvier / January 23rd, 2023

10h30

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Université de Montréal

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