



Séminaire du CIRRELT Seminar

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DECISION MAKING IN DYNAMIC MULTI-AGENT SYSTEMS WITH LIMITED RESOURCES

Abstract: In this talk, I will summarize my contributions toward designing intervention policies in dynamic multi-agent systems (for example, pollution regulation and drug interdiction) when governments and law enforcement bodies have limited resources. My talk is divided into three parts: In the first part, I will describe my research on dynamic systems where some agents strategically choose the timing of their actions. For instance, governments introduce new regulations (emission taxes, constraints on recycling) at specific dates during the year, while firms continuously emit pollutants as a by-product of their production process. We have developed models and solution methods to determine the optimal timing and level of interventions (impulses) in dynamic multi-agent systems. The second part of my talk focuses on a drug interdiction problem, where the law enforcement body, with its limited budget, removes arcs from the network to minimize the risk associated with the flow of drugs. On the other hand, a smuggler aims to maximize the flow of drugs in the network after observing the arc capacities and the arcs removed by the interdictor. When an interdictor has ambiguity about the true distribution of the arc capacities, we show that randomized interdiction strategies can perform better than deterministic interdiction plans. We have devised a scalable and globally optimal algorithm to solve the interdictor's bilinear optimization problem. I will conclude my talk with research questions related to decision-making under uncertainty and discuss techniques from game theory, risk measure theory, distributionally robust optimization, and machine learning that could be useful in answering them.

Biography: Utsav Sadana is currently a post-doctoral researcher in the Desautels Faculty of Management at McGill University, Montréal, Canada. He obtained his Ph.D. in Management Science from HEC Montréal in 2021 and his dual degree with a bachelor's degree in Materials Science and Engineering and a master's degree in Economics from the Indian Institute of Technology Kanpur (IIT-K), India, in 2017. During his Ph.D., he was a visiting student in the Coordinated Science Lab at the University of Illinois Urbana Champaign, Champaign, United States. His research interests span the fields of robust optimization, dynamic game theory, financial risk measure theory, and machine learning. He has received multiple scholarships from FRQNT for his internship, Ph.D., and post-doctoral research.

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