

April 2023 Thematic Committee Briefing

Theme #2: Modeling the Impact of Intervention Policies for Disease Prediction

The Theme 2 aim of the PIPP Phase I PILOT (Predictive Intelligence for Limiting Outbreak Threats) project is to identify and assess models and tools that prioritize and accurately predict the impact of intervention policies for disease prevention at both the individual and community levels.

In January 2023, we successfully organized a hybrid workshop titled "Modeling the Impact of Intervention Policies for Disease Prediction," held at Carnegie Mellon University (CMU), Boston Children's Hospital, and Harvard Medical School. This event brought together experts and attendees to explore state-of-the-art methods and brainstorm innovative approaches in three key areas: (1) AI and multiagent systems for social good; (2) game-theoretic multi-region epidemic models between multiple states; and (3) microscopic epidemic models. Workshop attendees engaged in in-depth discussions following speaker presentations on each of these topics, addressing critical issues such as the effective evaluation of proposed intervention methods and strategies to enhance public understanding during ongoing pandemics.

Led by our trainees Zhicheng Zhang (Research Assistant, CMU) and Paula Rodriguez Diaz (Research Assistant, Harvard University), we are currently compiling a white paper and a policy brief that summarize the essential points discussed during the event, examining the feasibility of the ideas raised and analyzing their interconnections. For example, our white paper considers how Restless Multi-Armed Bandits (RMAB), a model to sequentially allocate limited resources, could be used in the field of pandemics, and the potential of utilizing the microscopic pandemics model as a testbed for evaluating governmental policies.

These two documents also highlight the challenges identified by the attendees, such as complexities in encouraging policymaker uptake of microscopic models, and outlines potential future directions for addressing these challenges. This document has enriched our understanding of the subject and uncovered promising opportunities in the realm of disease prediction and prevention.

Moreover, we have recently initiated a project that utilizes publicly available wastewater data for pandemic prediction and forecasting. Our approach, which diverges from other studies that relied on private data sources, is better suited for informing policy-related decision making. By modeling the problem as a time series prediction challenge, we are currently focused on developing various models to ensure accurate predictions.

As we progress, we remain committed to building on the insights gained from the workshop and our ongoing research efforts.

Thematic Committee: Fei Fang, PhD (co-PI); Milind Tambe, PhD (co-PI); Andrew Perrault, PhD (Ohio State University); Arunesh Sinha, PhD (Rutgers University); and Alpan Raval, PhD (Wadhvani AI)