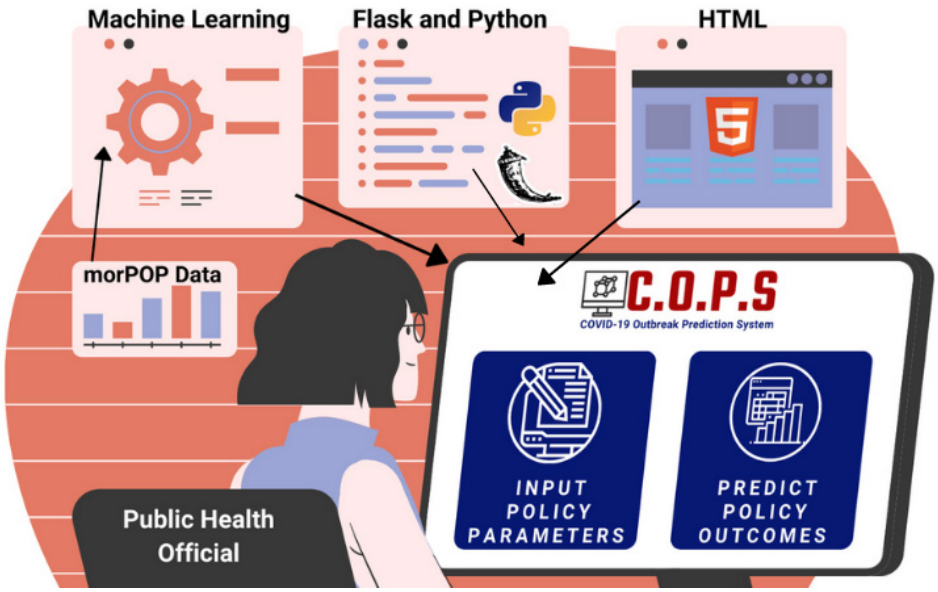

C.O.P.S: COVID-19 Outcome Prediction System

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Machine Learning Prediction of COVID-19 public policy outcomes

The COVID-19 pandemic emphasizes the need for time-sensitive and evidence-based public health policy decisions. Due to the novelty of this virus, data to support such decisions are scarce and simulations are crucial to fill this gap. The Medical Operations Research Lab (morLAB) uses a large-scale agent-based simulation tool called morPOP (morLAB Pandemic Outbreak Planner) to inform public health decisions around a Canadian province's COVID-19 response. However, running simulations and analyzing the results is time-consuming, and requires niche expertise. Therefore, there is a need for a faster method to assess simulation outcomes without relying on model experts. This project makes accurate policy outcome predictions available for ad-hoc analyses through a machine learning system easily utilized by public health officials and other intended users. The tool helps public health officials to estimate the outcomes of specific policies as it relates to the spread of the virus and forecast requirements for essential supplies in response to the COVID-19 pandemic. The quick, accurate results provided allow faster implementation of effective policies, which will help ensure the health and safety of the general population. The system has the potential to be utilized for a wide variety of public health crises, from pandemic management to vaccine rollout.

The COVID-19 policy outcome prediction web application

The COVID-19 Outcome Prediction System (C.O.P.S) is the first to leverage morPOP data to construct machine learning models for COVID-19 predictions. The results from a subset of all possible morPOP simulations constructed a robust and meaningful dataset which was utilized to train a series of machine learning algorithms. The chosen classification algorithms yielded 95.7%, 96.8%, 97.5% and 95.6% classification accuracy on test datasets of Pandemic Days, Infections, Deaths and Hospitalizations respectively. Flask, a web framework written in Python and equipped with the tools, libraries, and technologies necessary to build a web application, connects the user interface to the machine learning models, making C.O.P.S web-ready for public health officials. The webpages within the application are coded in HTML, enabling Flask to render interface functionalities on a web browser. Thus, the system allows users to input their desired policies for testing and obtain predictions on outcomes from trained Machine Learning models through a web-based user interface. The predictions relate to public health metrics such as the length of the pandemic, the total number of deaths, hospitalizations and infections and can be saved and downloaded by users for future reference.