INDIVIDUAL LEVEL AGENT BASED CONTAGION SIMULATOR

Modelling disease spread in the context of rapidly evolving intervention measures and strains

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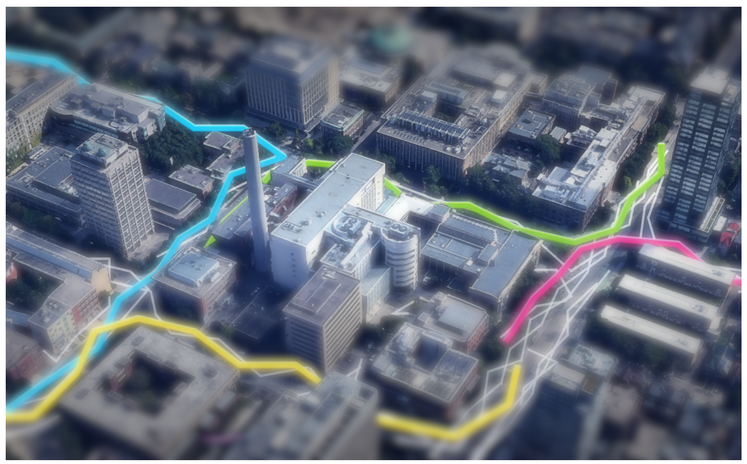
MOTIVATION

To supplement ODE models of contagion spread with a stochastic network model to capture the inherent heterogeneity of spatio-temporal contact networks; and hence inform Public Health strategy by providing simulations of intervention measures such as masking, social-distancing, lockdowns, household bubbles, vaccinations and testing strategies.



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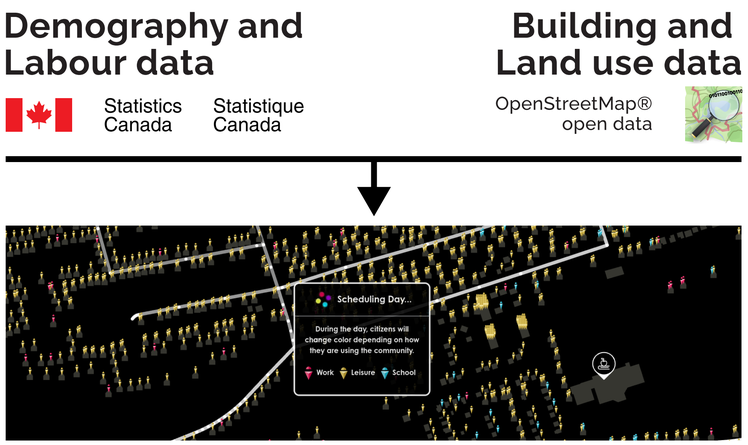
SYNTHETIC CONTACT NETWORK

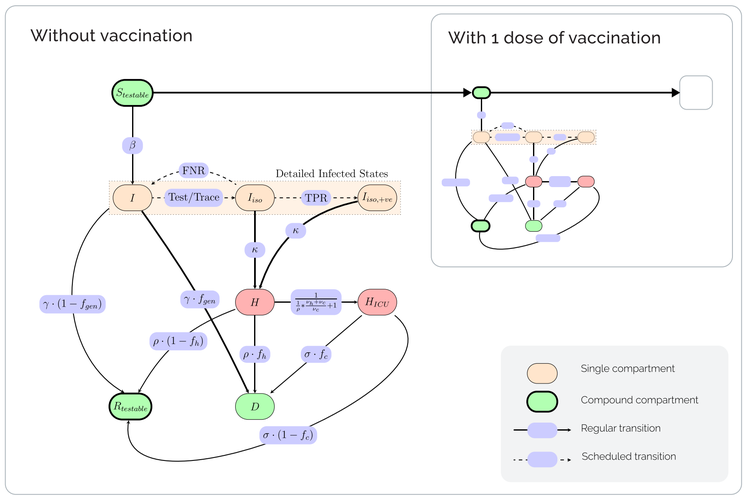
Our work is based on the Citisketch™ software package by the Black Arcs, which synthesises data from open GIS and StatCan and to simulate the mobility of a population using the Toronto Area Scheduling Model for Household Agents (TASHA) model. We convert Citisketch™ data into a stochastic contact matrix to simulate disease propagation.



Imagery ©2022 CitiSketch™, the Black Arcs

COMPARTMENTAL MODELS

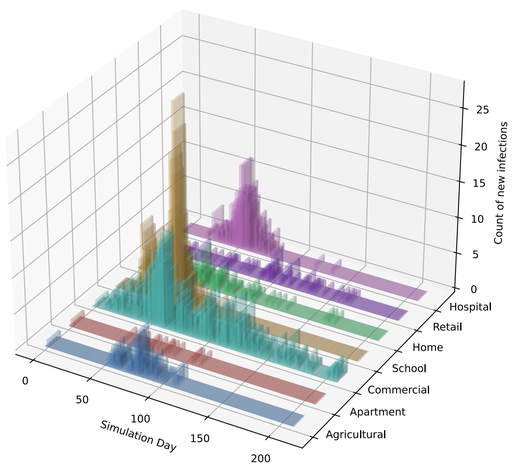
Informed by available data on the SARS-CoV-2 pandemic, we have augmented the SIR model to account for infection latency, asymptomatic vectors, case detection through diagnostic testing, and vaccine-induced immunity.



Augmented SIR with diagnostic testing and hospitalisation - visualised with tikzpicture - LaTeX

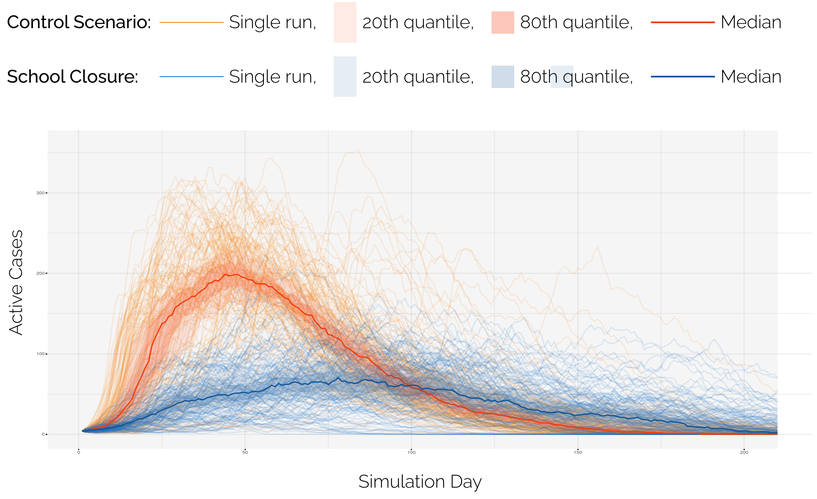
SIMULATION RESULTS

Shown here are examples of some outputs from our network simulations. Specifically, these plots show the effects of different contact-tracing and venue-specific lockdown strategies.



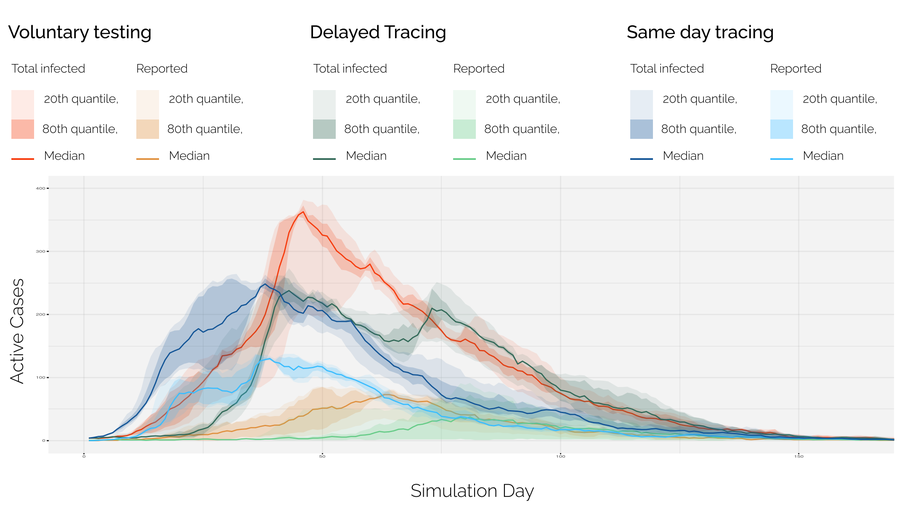
Simulation output for Campbellton region, NB, Canada - visualised with matplotlib - Python

Comparing effect of School Closure on Infections



Aggregated Simulation outputs for Campbellton region, NB, Canada - visualised with ggplot2 - R

Comparing effects of diagnostic testing strategy on Infections



Link to more example scenarios
Hosted on github.com, https://github.com/sseahra/

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