

The Challenges of Replicating the Ferguson Model

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What is the Ferguson model?

- An agent-based model \succ
- Created by Neil Ferguson in 2005
- \succ Originally designed to model influenza
 - Adapted in 2020 to model Covid-19
- Produced results that encouraged enforced UK lockdown
- "Thousands of lines of undocumented C (code)" \succ



Why are we replicating it?







Verification of results

Expansion of features

Exploration of replicability

Perform Disea

transmissio

Have we

reached the pecified number epochs?

Stop

Setup initial

infections

High level example of a replication realization

Has the epoch ended?

Perform ager beahviours

The main challenges of this replication

Documentation

- Insufficient reporting in model publications
- Difficult to obtain input data
- No model specifications



Input parameters

Allocate

population to

households

to schools

Solutions

- Group exploration of available literature
- Collection of comparable input data
- Calculated estimations for algorithms and features

Performance

- Simulating the entire UK is expensive (~66.65 million agents)
- Agent model optimisation is often challenging
- Faster realizations = Faster results

Solutions

- Aggressive optimisation using Cython and profiling
- Problem points identified and focused

An overview of our current Replication state

- An agent-based model implemented in Python
- Models COVID-19 transmission throughout the UK (or sub-sections)
- Current goal is version 3.0 (Release)
 - Aims to be functionally comparable to the original Ferguson model

Raster Map

Population Data

lace schools

enviroment

Create

households

Currently ~37% to goal

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workplaces

lace workplace

in enviroment