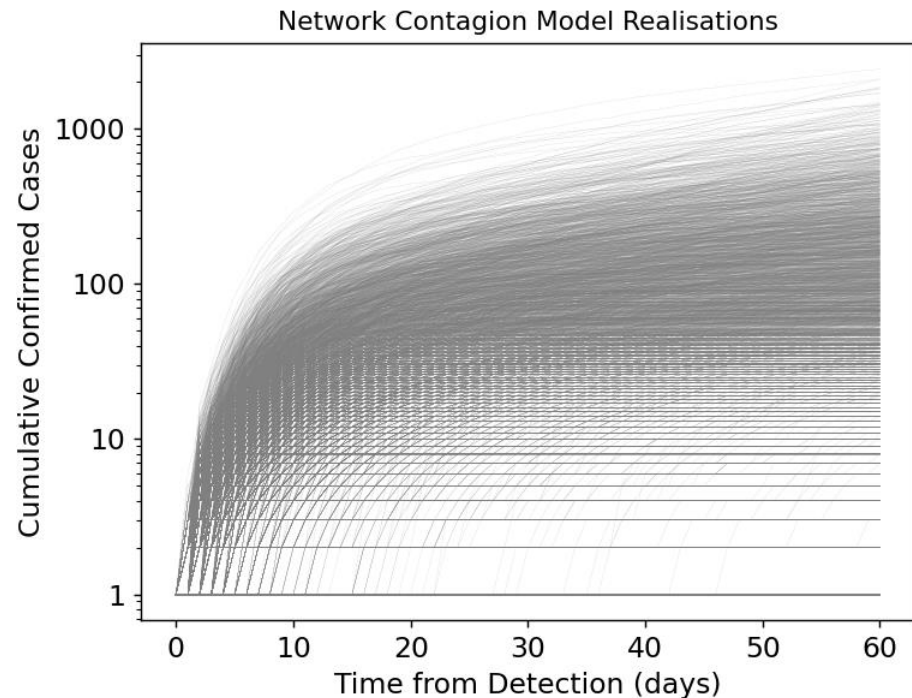


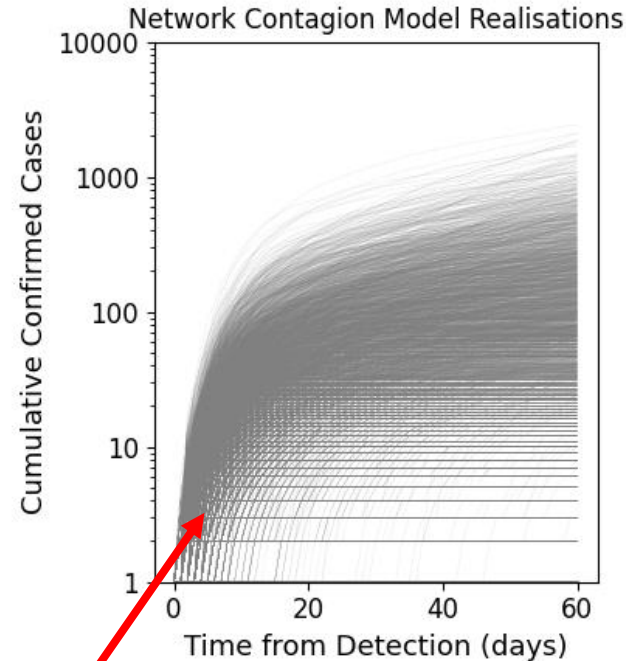
Uncertainty Quantification for Complex Network Contagion Simulation Models



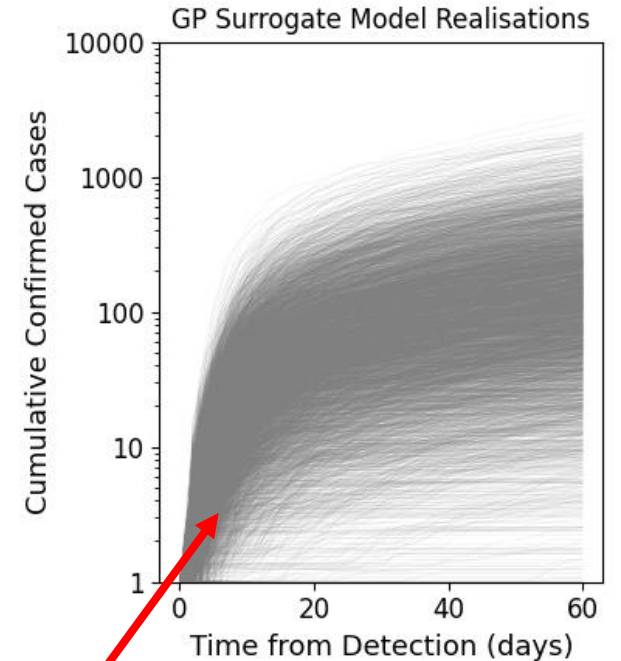
- Our network contagion model is **highly complex**
- Sources of **uncertainty**
 - In the *model* itself
 - In the *parameters* that define it
- Computationally **expensive** to run

Fitting a Surrogate Model

- A computationally **cheap** *substitute* for the true model
- Gaussian Process surrogates
 - Computationally **cheap and easy** to fit
 - Naturally model and incorporate **uncertainty**
 - Easy to **condition (update)** given new data



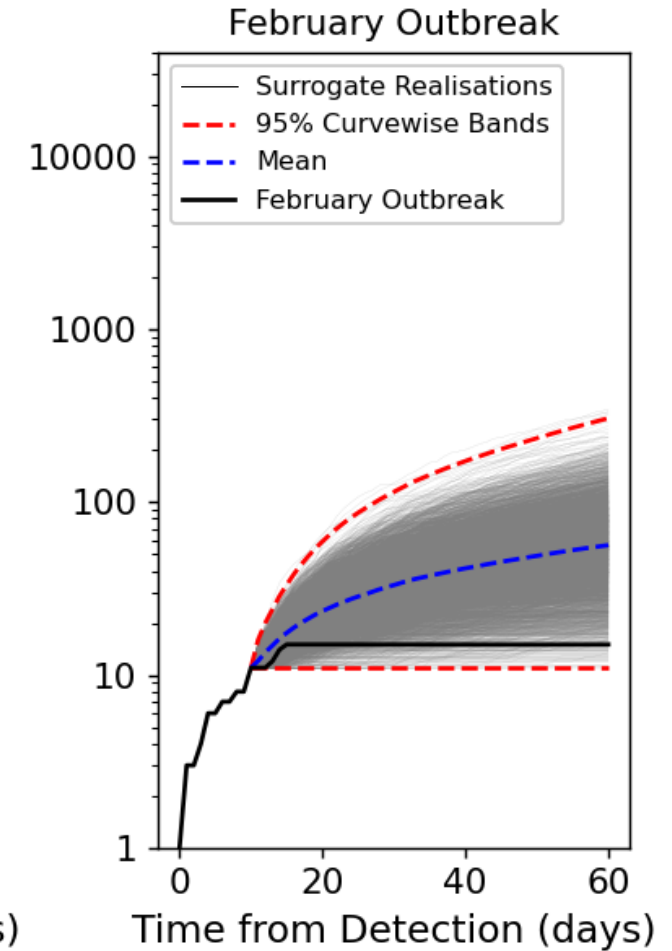
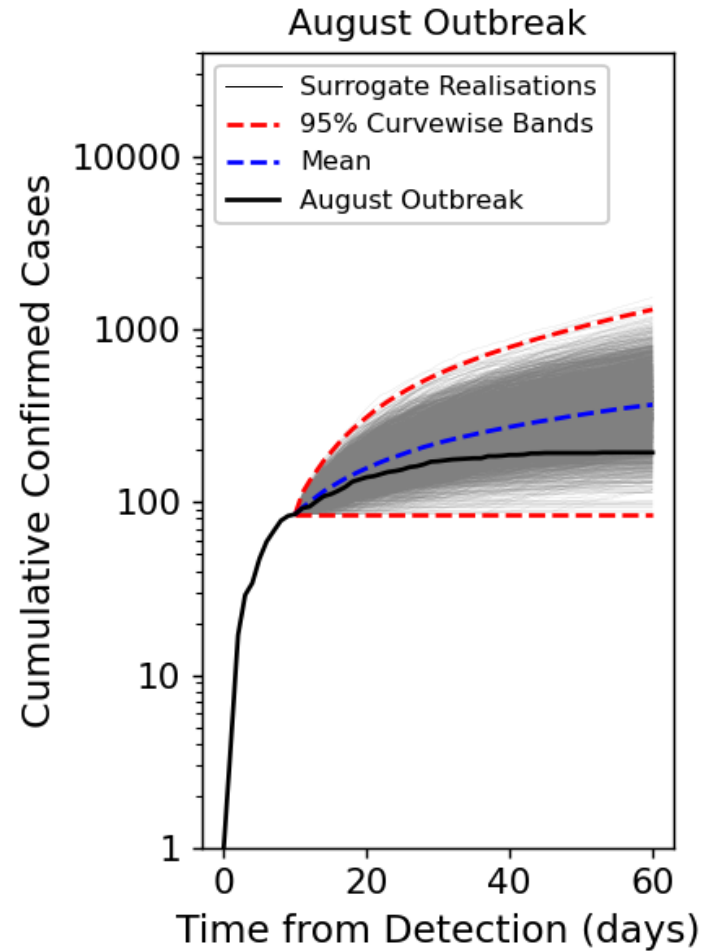
Took >3 hours to generate 5000 realisations on high-performance computers



Took <20 seconds to generate 5000 realisations on my laptop

Incorporating Data

- **Condition** the surrogate model on NZ COVID-19 case data
 - August 2020
 - February 2021
- Can make **quick predictions** without rerunning the network contagion model



Limitations and future work

- Gaussian surrogates are **naive**:
 - Don't naturally follow the shape and constraints of typical epidemic behaviour
 - Can consider enforcing ad-hoc rules, or try other surrogate models

- Need to do **a lot** more work on:
 - Parameter inference
 - Uncertainty analysis

Contact me

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