OutbreakLab: Building an Outbreak Simulator for Pandemic Preparedness

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This internship offers the opportunity to contribute to the development of OutbreakLab, an outbreak simulation framework designed to support pandemic preparedness and decision-making exercises. This project aims to communicate complex epidemiological modelling outputs into an interactive interface that can be used for teaching and response planning.

Epidemic models help us to understand and predict how infections spread through populations. They can improve our understanding of pathogens, forecast disease dynamics, and evaluate the impact of interventions such as vaccination strategies or mobility restrictions.

The intern will collaboratively design and build an interactive interface for outbreak simulations. The interface will display key outbreak metrics, such as disease incidence, reproduction number, and hospital occupancy, and also track disease spread spatially through maps and animations. A key feature of the system is to model and test intervention strategies within the simulation environment. These may be testing and isolation policies, mobility restrictions or different vaccination strategies. The interface should enable users to trigger interventions during a simulation, adjust the timing and intensity, and be able to immediately visualise the effects on outbreak dynamics. Outbreak simulations are typically computationally intensive, often requiring thousands of large-scale stochastic model runs or high-resolution spatial models. High performance computing (HPC) infrastructure will be used to run simulations in parallel and explore uncertainty.

OutbreakLab aims to bridge the gap between complex model output and practical insights for decision-making. The intern will gain experience designing and engineering an interactive interface, working with HPC infrastructure, and contributing to open-source software following robust coding practices.

Timeline:

- **Week 1:** Outbreak scenario design & familiarity with epidemic modelling outputs
- **Week 2:** Simulating scenarios (HPC)
- **Week 3-6:** Interface development
- **Week 7:** Testing and observability
- **Week 8:** Showcase preparation