

## Direction of the PhD

- While PhD material should be publishable, whether contributions are theoretical/methodological/application-based is quite open to student/supervisors.
- At this stage let's focus on the interesting aspects of the problem and what real-world questions actually need answering, without worrying too much about which methods are most appropriate.
- By end of 2024 PhD will be approx. 9 months old, by which point we should aim to have covered some background research and honed in on a specific research direction.

## Interesting aspects to the problem

- As the state of the system changes, so does the service time distribution, as a result of external factors and as a result of how long people have been waiting in the queue.
- Decision-period to optimise over is relatively short (due to high uncertainty in system making long term decisions difficult), but the period of time which is affected by those decisions is long (due to nature of housing having long-term effects)
- The shape of the decisions made over time is important for implementation and political buy-in. This effectively leads to feasible solutions at any time point being restricted by the previous decision.
- Queueing control systems typically focus on leverage of service time, here our leverage is with number of servers.
- Our problem formulation must penalise both the size of the unsheltered queue (as this is clearly undesirable) and the size of the sheltered queue (as this is not a permanent solution).

## Points on methodology

- The sequential nature of this problem could lend itself to a dynamic programming approach, but simulation could still play a role in such an approach, for example in approximating state-transition probabilities.
- Simulation could be used to model a rich selection of complexities in the system, to help us determine which meta-models may be helpful in approximating the real-world system.

## Details which could be included in a simulation model

- Different classes of customer, where customers can change class while passing through system (reflecting, say, their situation worsening as they wait for long periods).
- Housing taking longer to be made available than shelter.