

# Simulating e-scooter ride sharing

## DSSC Project Proposal

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October 19, 2021

# Goal

- ▶ Goal : Build a model to simulate demand and journeys of a shared e-scooter system

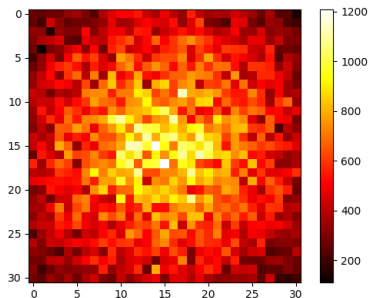


# Building a model

- ▶ We will need to simulate the following:
  - ▶ A city environment incl. population distribution, city layout
  - ▶ Scooter demand incl. variation throughout the day
  - ▶ Journeys incl. destinations, routes

## City Environment

- ▶ We simulate a city as an  $n \times n$  grid with a certain population at each grid point
- ▶  $\text{pop}(p) \sim \mathcal{N}(f(d), g(d))$ ,  $d = \text{distance from centre to } p$ .



**Figure:** Population distribution of simulated city (total population 529,953)

# Scooter Demand

- ▶ We simulate demand as a Poisson random variable
- ▶ For each time point  $t$  (minutes) of a day the number of scooter requests at location  $p$  is

$$N_{tp} \sim \text{Poi}(c(t) \times f(\text{pop}(p)))$$

where  $c(t)$  is a demand scaling at time  $t$

- ▶  $c(t)$  is small at night and high at rush hour.

# Journeys

- ▶ We assume that people are more likely to have end destination closer to the city centre (independent of start point)
- ▶ For each initiated journey we sample a destination from a 2d Gaussian

$$D \sim \mathcal{N}(\text{centre}, f(r) \times I_2)$$

where  $r$  is the city radius.

- ▶ A journey from start point to  $D$  is generated by randomly moving in the correct vertical or horizontal direction.

# Potential Questions

- ▶ Is this a reasonable model of e-scooter sharing?
- ▶ What's the optimal number of scooters to put in a city?
- ▶ How should we place the scooters at the start of the day?
- ▶ Should we intervene and move scooters about throughout the day?

Thanks for listening!