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Quantifying the Ambient Population using Big Data and Agent-Based Modelling

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<http://surf.leeds.ac.uk/>

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Ambient population

Not (only) where people live...



But where they are throughout the day

Quantifying the ambient population

1. Simulating urban flows

2. Agent behaviour and activities

3. ABM calibration

Photos show high streets insanely crowded in rush for the last presents



Jen Mills for Metro.co.uk Sunday 20 Dec 2015 2:52 pm



15



Send help (Picture: PA)

It's happened... There are just FIVE days left until Christmas and you'll







Applications

Crime risk: more people, more crime?

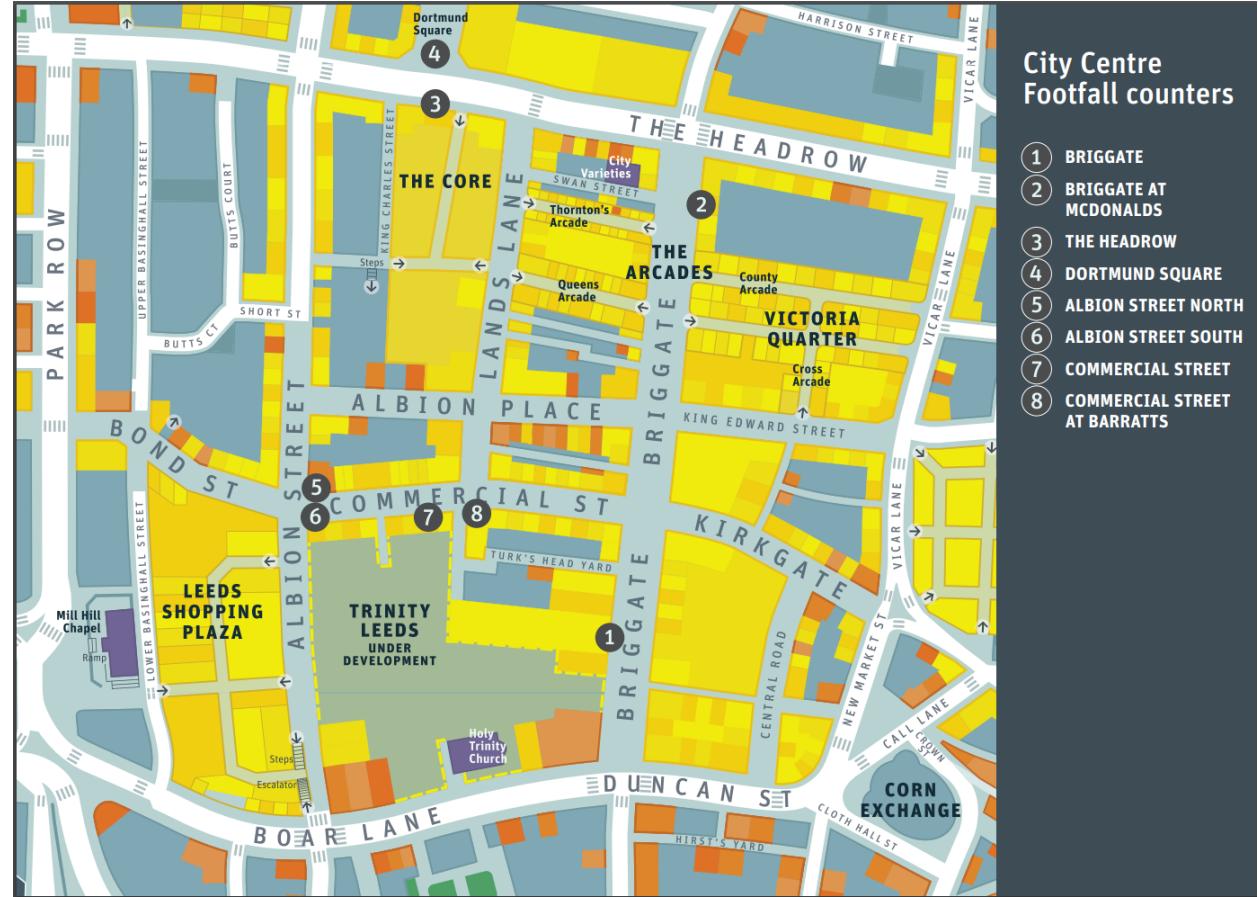
Air pollution risk: more people, more people affected

Transportation: which mode? Optimising public transport

Footfall model

- By Nick Malleson & Molly Asher
- Leeds City Centre footfall cameras
 - Counts per hour
 - Since 2007/2009
 - Publicly available

<https://datamillnorth.org/>



- Aims:
 - Understand drivers
 - Predict
- Machine learning
 - Random forest algorithm



Explanatory variables:
weather
day of week; time of day
holidays / seasons

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Behaviour

Intensities

Time intensity

Background intensity

Other behavioural framework?

PECS (Schmidt, 2000; Urban, 2000)

- » Physical needs
- » Emotional states
- » Cognition
- » Social status

Differentiate for seasons / weather... (~ footfall model)

Activities

Individual agents that move around to do these activities:

Being home

Working

Shopping

Eating outside

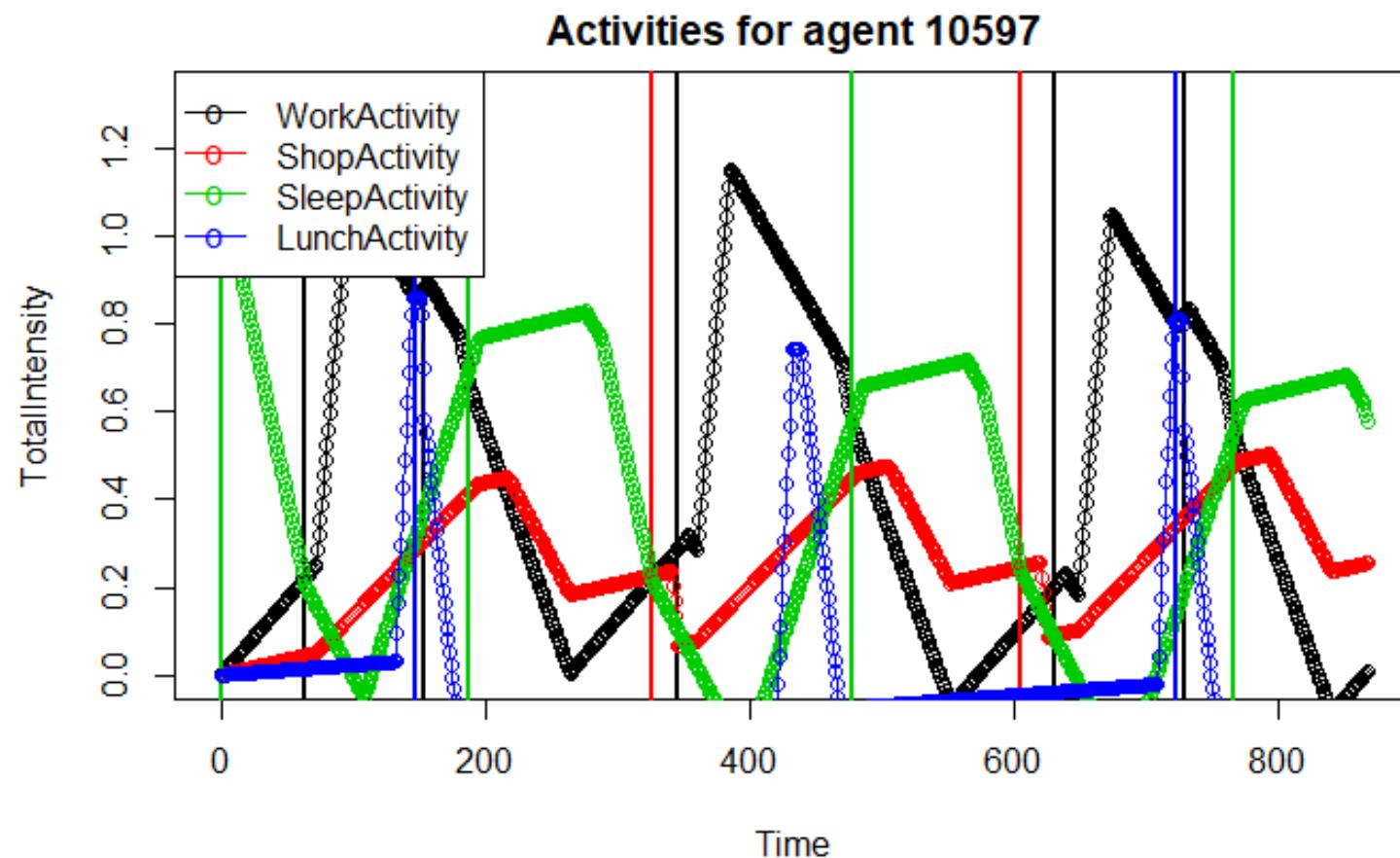
(Leisure)

To do...

Households

» Children / Schools

Intensities and activities

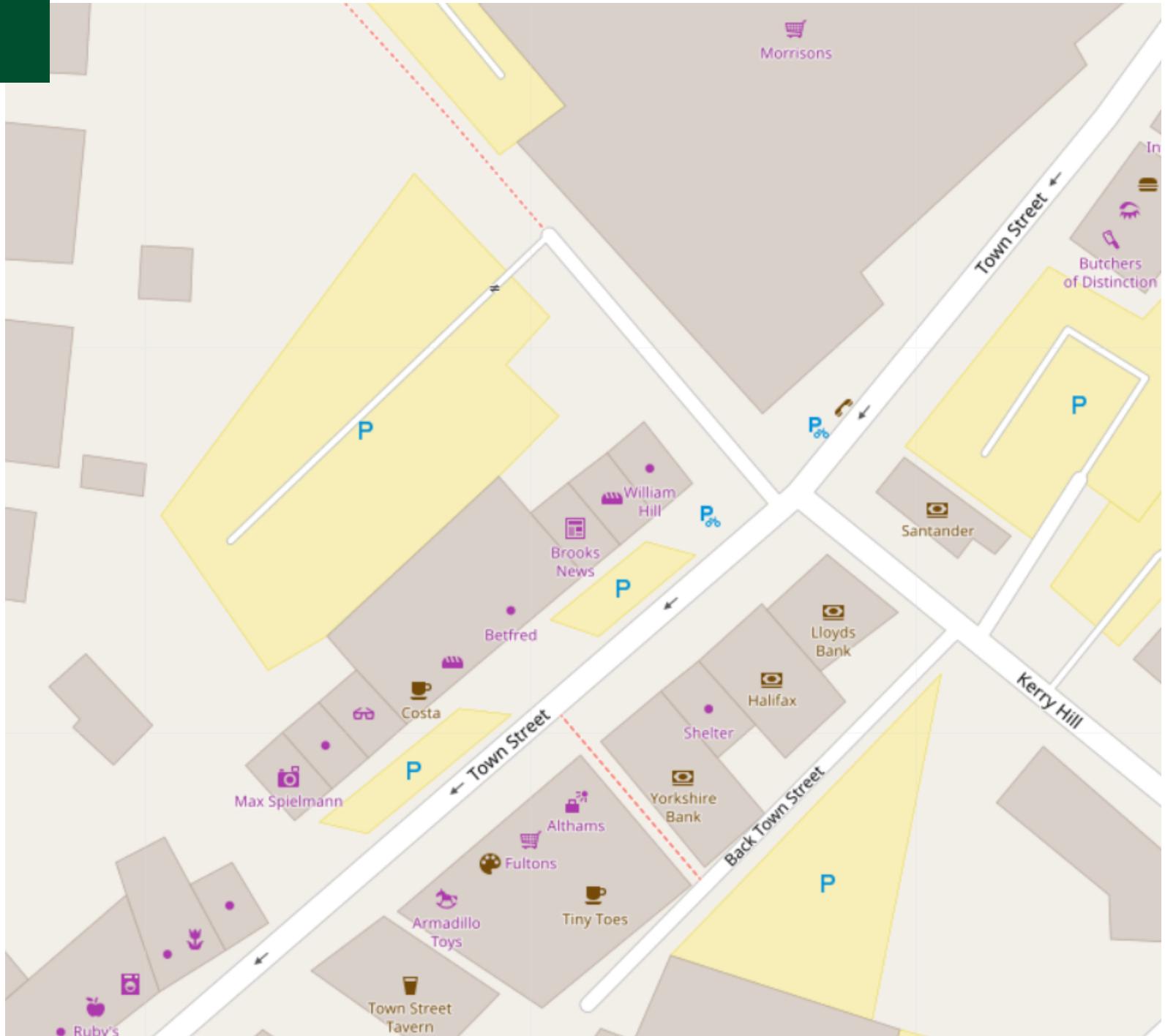


Study area



Locations

- Census
- OSM



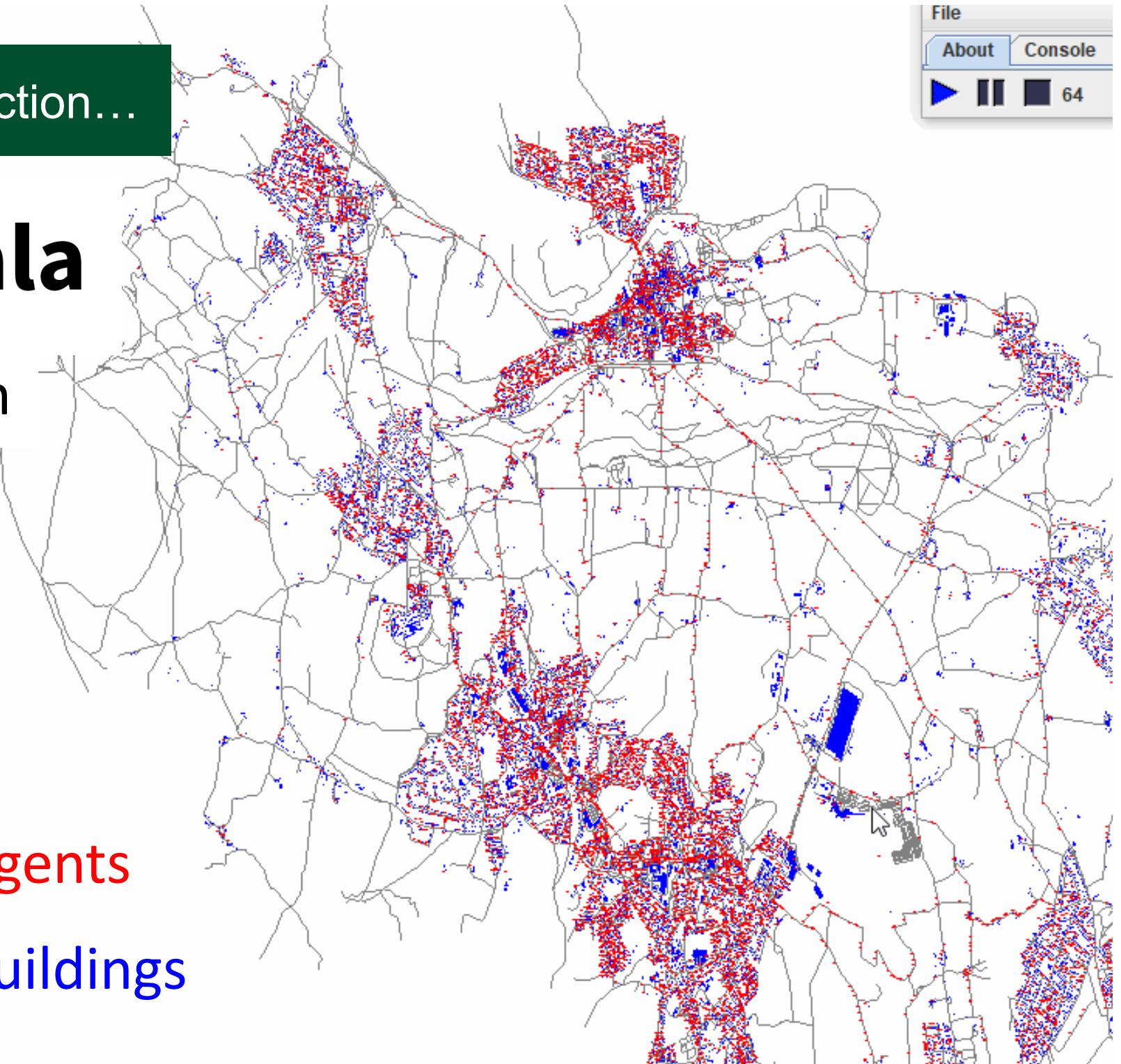
Model in action...



GeoMason

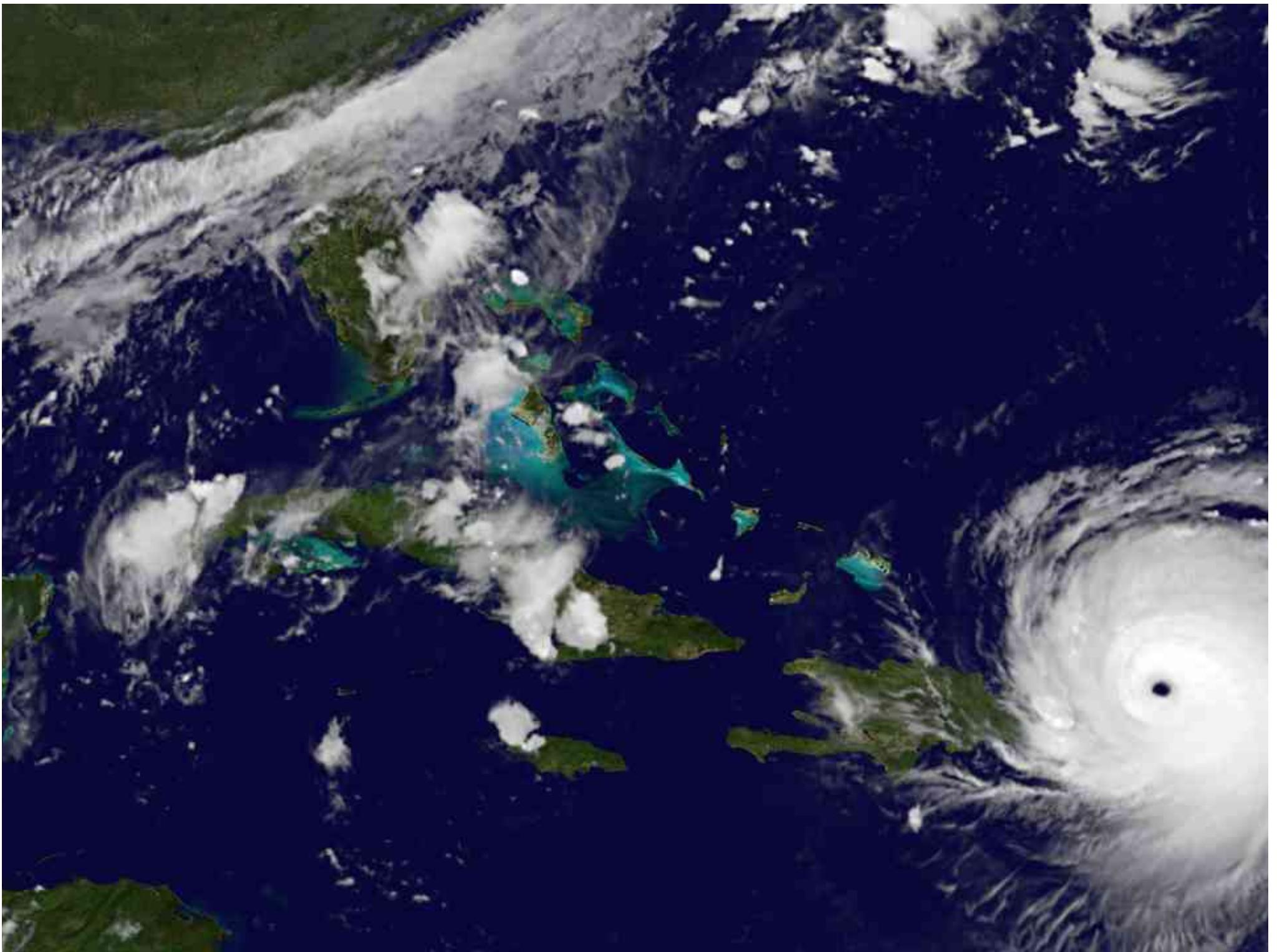
Agents

Buildings



Quantifying the ambient population

- 1. Simulating urban flows**
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Calibration

Agent-Based Simulation of a Social System



Calibration: data



Census



Footfall



mTickets

Smart card



Twitter

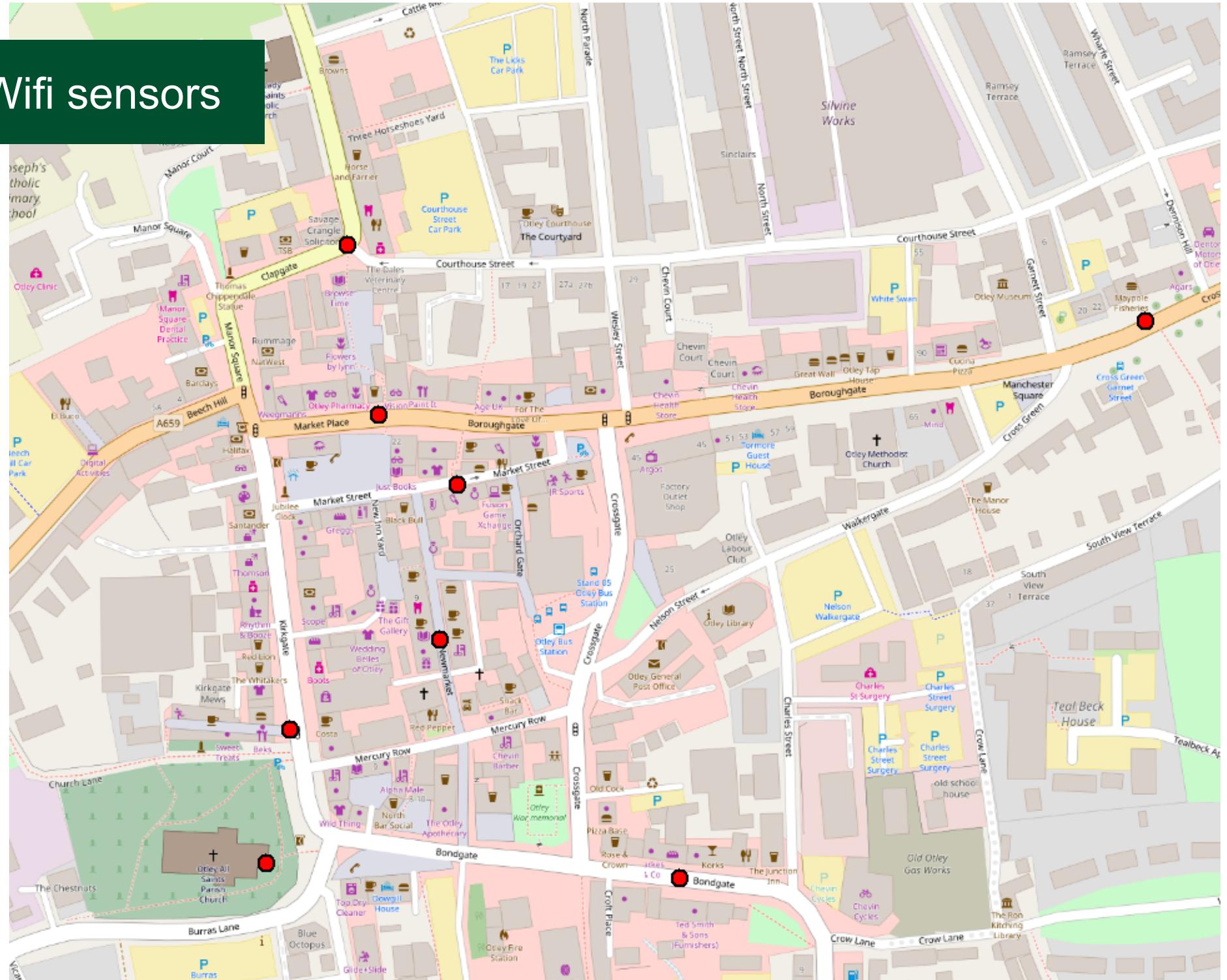


Apps



Phones

Wifi sensors



Wifi sensors



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Thank you!

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