Mobile phone data and tourism flows

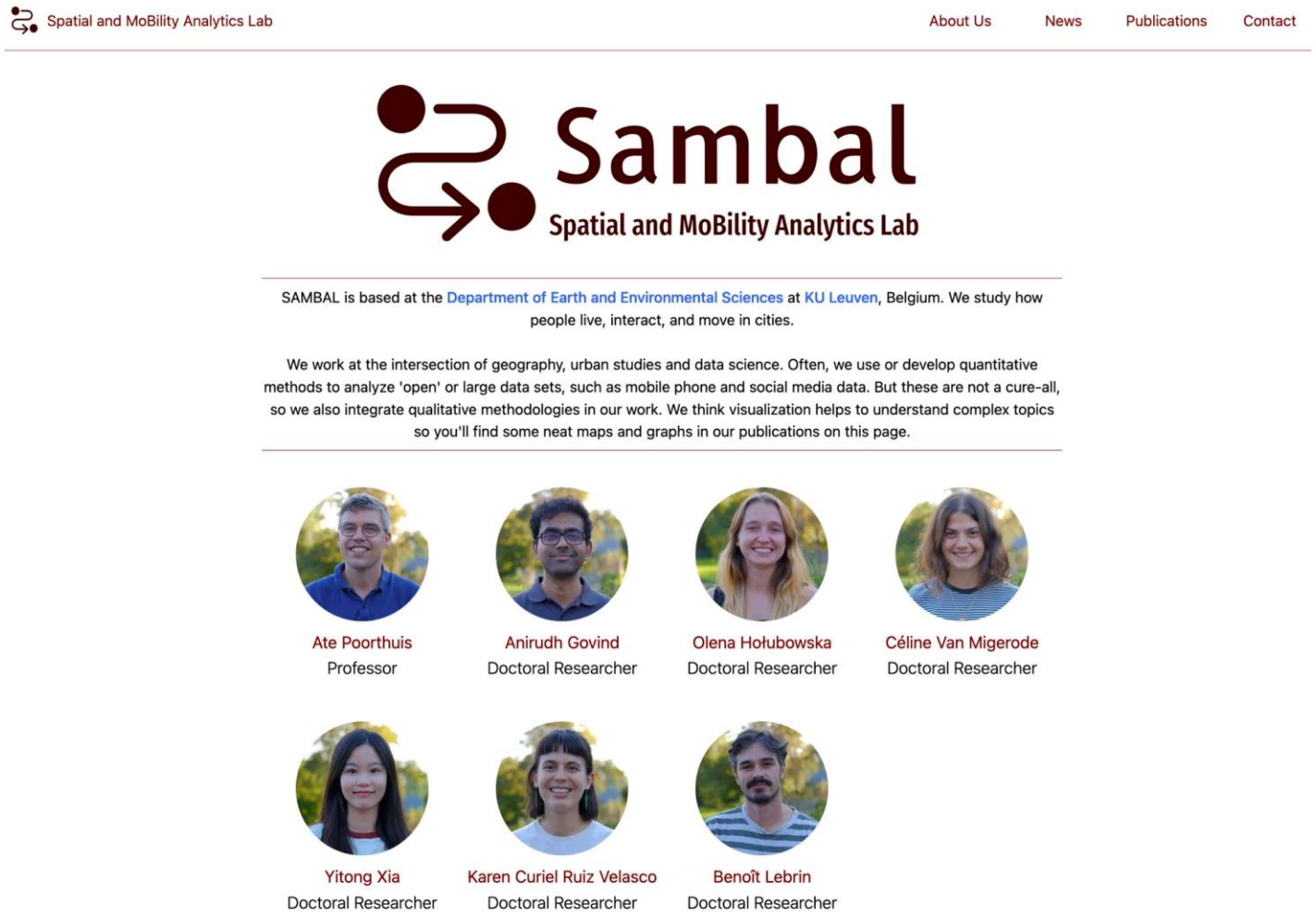
Karen Curiel-Ruiz-Velasco, Yitong Xia & Céline Van Migerode

Mona webinar – 12/12/2024

KU LEUVEN

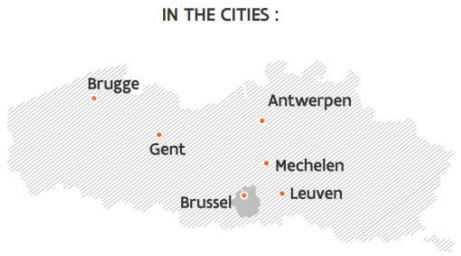
Sambal
Spatial and MoBility Analytics Lab

Introduction



Limitations of traditional tourism data sources

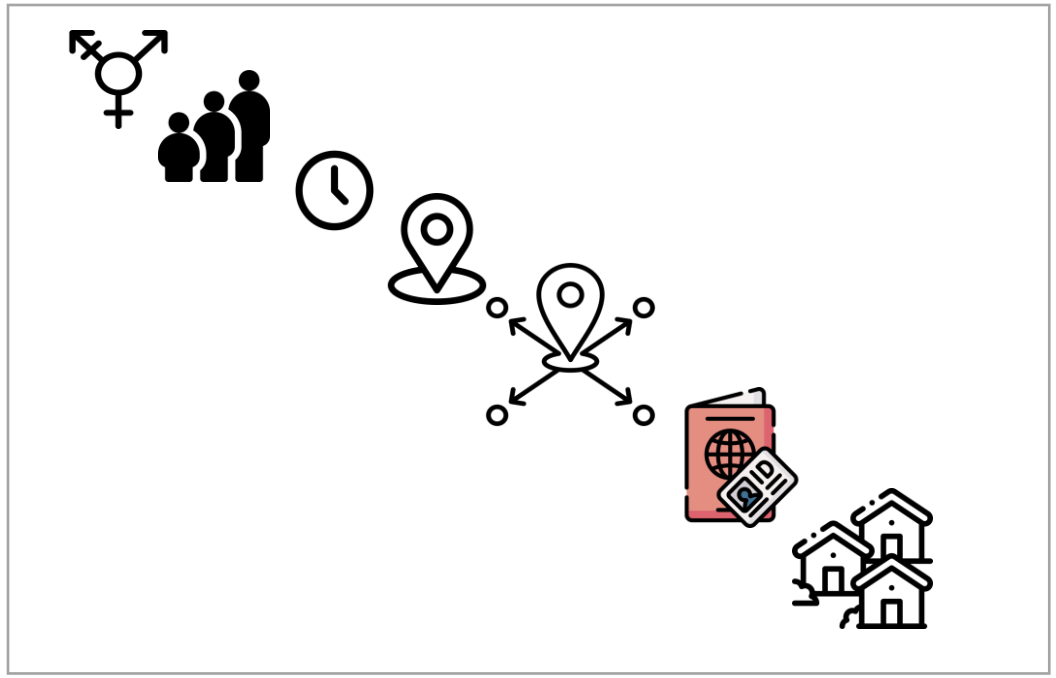
- Challenges
  - "Who visits where? How often?"
- Rely on
  - Visitor surveys, visit counts & overnight register-based
- Cons:
  - Time-consuming, costly, and labor-intensive
  - Scarce and disparate
  - Depend on administrative status of regions
- Traditional methods allow to go deep but not broad



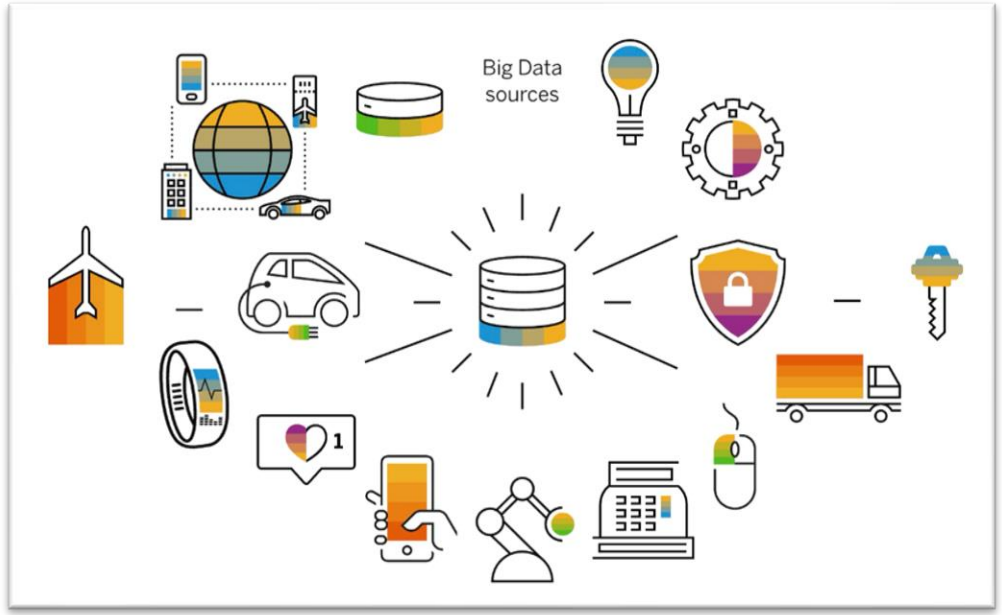
Sambal
Spatial and MoBility Analytics Lab

Big Data, is it ***the*** solution?

Big Data: *Large data different from 'conventional' datasets. It allows for faster acquisition and processing speeds, and more detailed information on finer spatial scales.*



Detailed information possibilities by Big Data



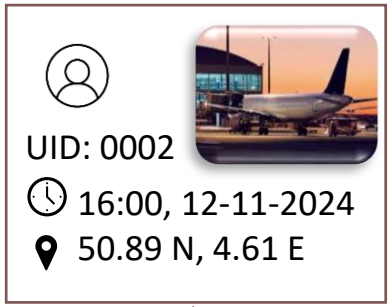
Collection of Big Data

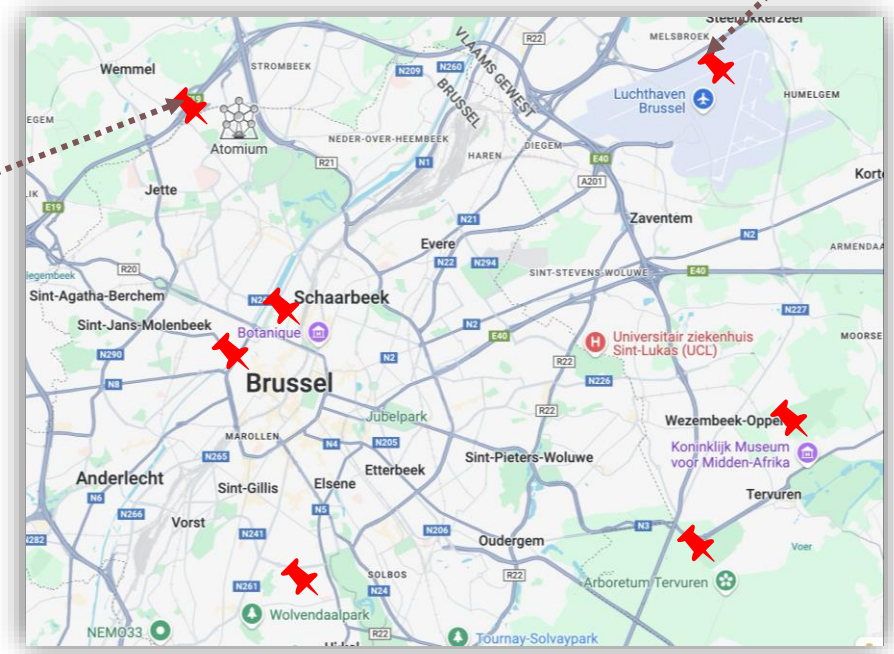
Sambal
Spatial and MoBility Analytics Lab

Different types of big data

1. Social Media Data







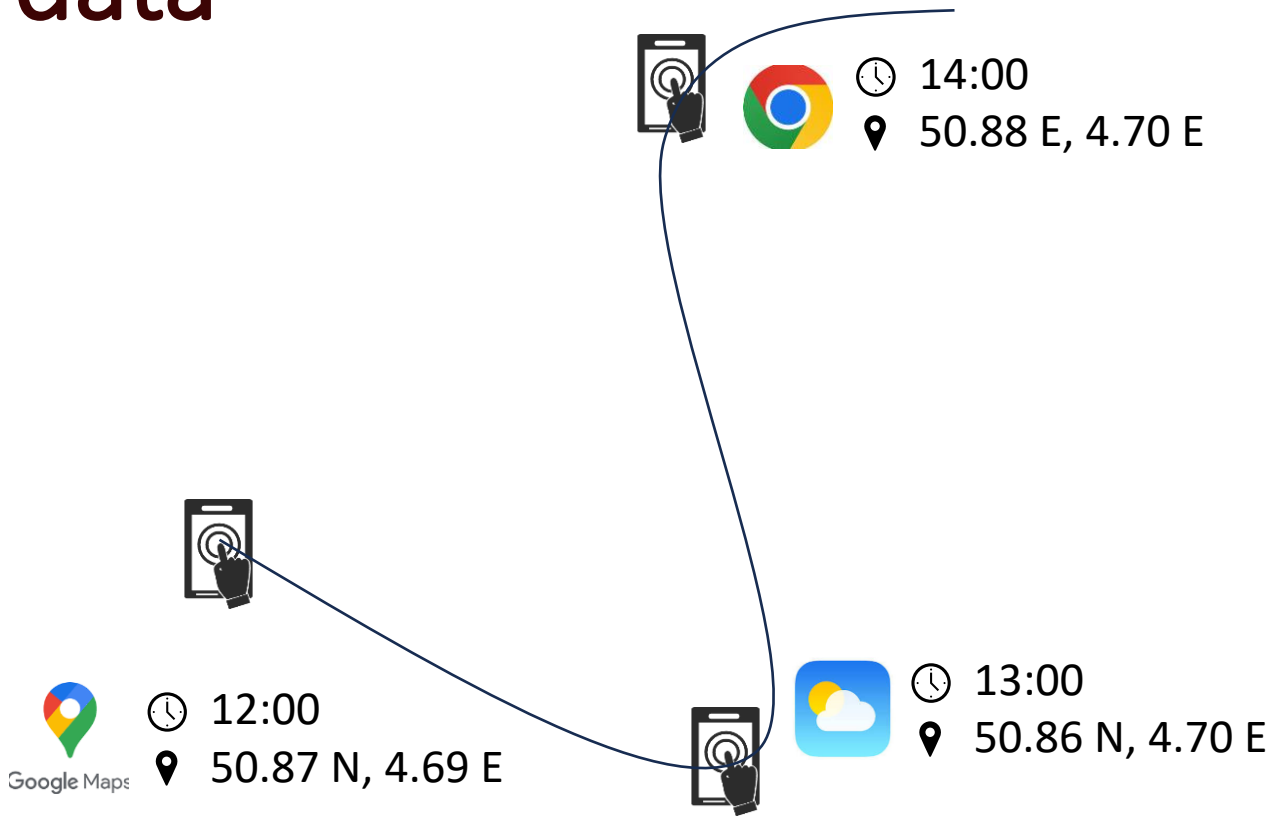
- **When:** User active sharing of information and geolocation on social media platforms.
- **What:** text/image/video post, time, geolocation (with permission).
- **Benefits:** global, rich content
- **Limitations:** discontinuous, user-dependent, potential bias, not accessible anymore (Twitter -> X)

Sambal
Spatial and MoBility Analytics Lab

Different types of big data

2. Mobile App Data

- **When:** when people open or use apps on their phone, the app background records data **automatically and continuously**.
- **What:** app-usage data, transaction data, time, geolocation (with permission), etc.
- **Benefits:** granular, continuous, precise.
- **Limitations:** depend on user permission and user frequency of opening apps; potential bias; ethics.

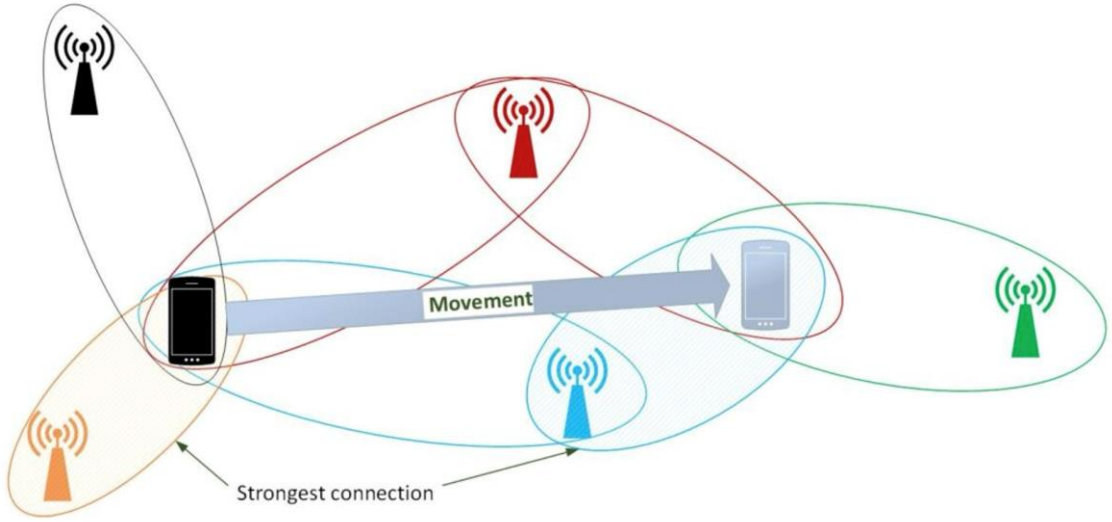


Sambal
Spatial and MoBility Analytics Lab

Different types of big data

3. Mobile (Cell) phone data for tracking flow of people

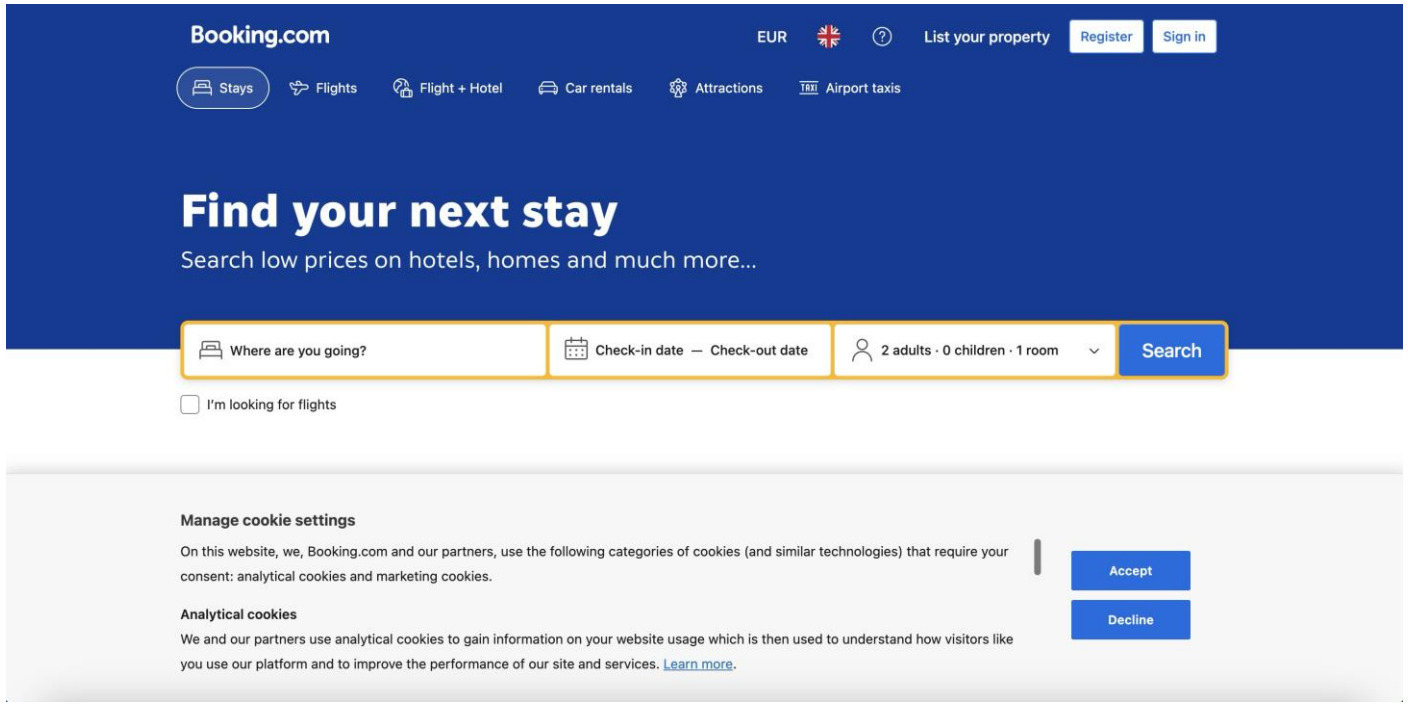
- **When:** As people move, cellular operators automatically record the connection between the phone and nearby cell towers.
- **What:** call logs, proximate geolocation, network usage, etc.
- **Benefits**: Continuous, broad coverage, automatic.
- **Limitations**: coarse geolocation, less detailed.



Sambal
Spatial and MoBility Analytics Lab

Different types of big data

4. Other types of big data



Booking.com – accommodation big data

Train/metro check-in data

Sambal
Spatial and MoBility Analytics Lab

Big data in mobility research

Big data with geolocation can function as a **proxy to analyze everyday activity spaces and movement patterns**, which gains a new perspective on mobility and segregation.

Landscape and Urban Planning 142 (2015) 198–211

Contents lists available at ScienceDirect

Landscape and Urban Planning

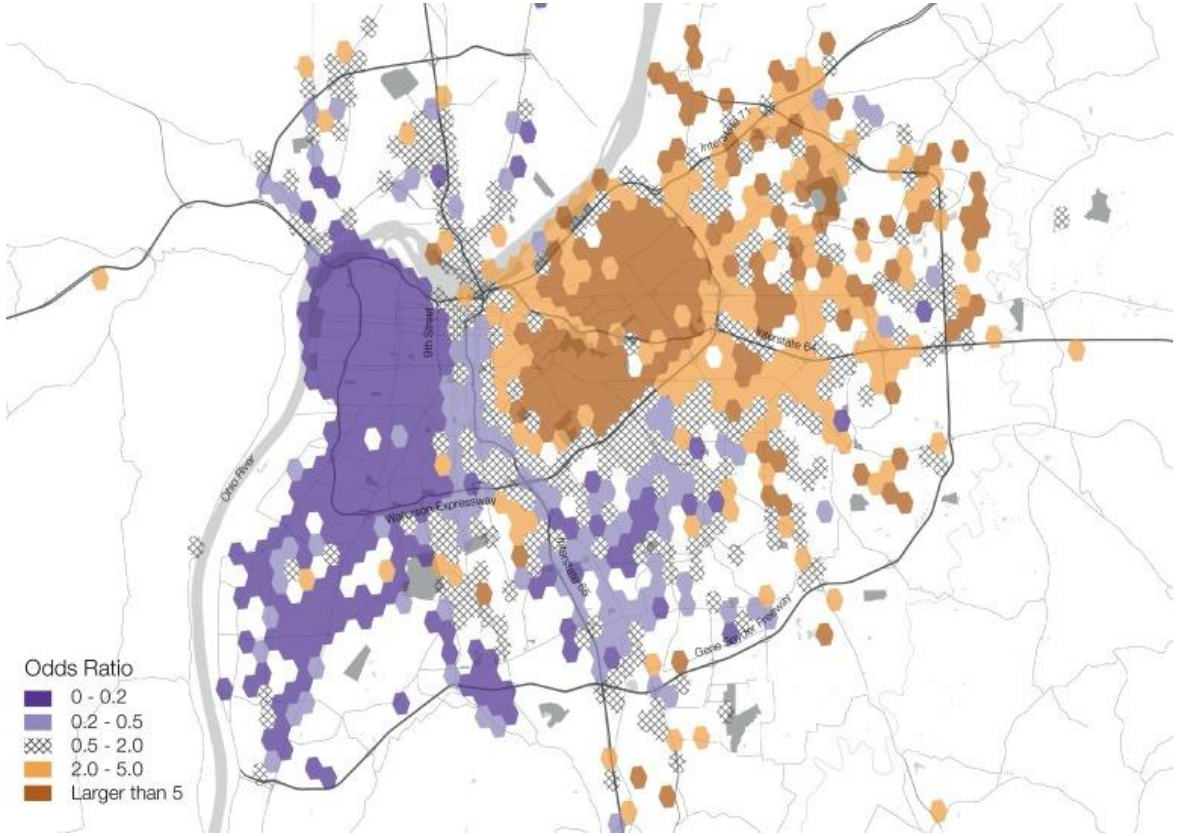
journal homepage: www.elsevier.com/locate/landurbplan

Research Paper

Social media and the city: Rethinking urban socio-spatial inequality using user-generated geographic information

Taylor Shelton [a,*], Ate Poorthuis [b], Matthew Zook [b]

[a] Clark University, Graduate School of Geography, 950 Main Street, Worcester, MA 01610, United States
[b] University of Kentucky, Department of Geography, Lexington, KY, United States

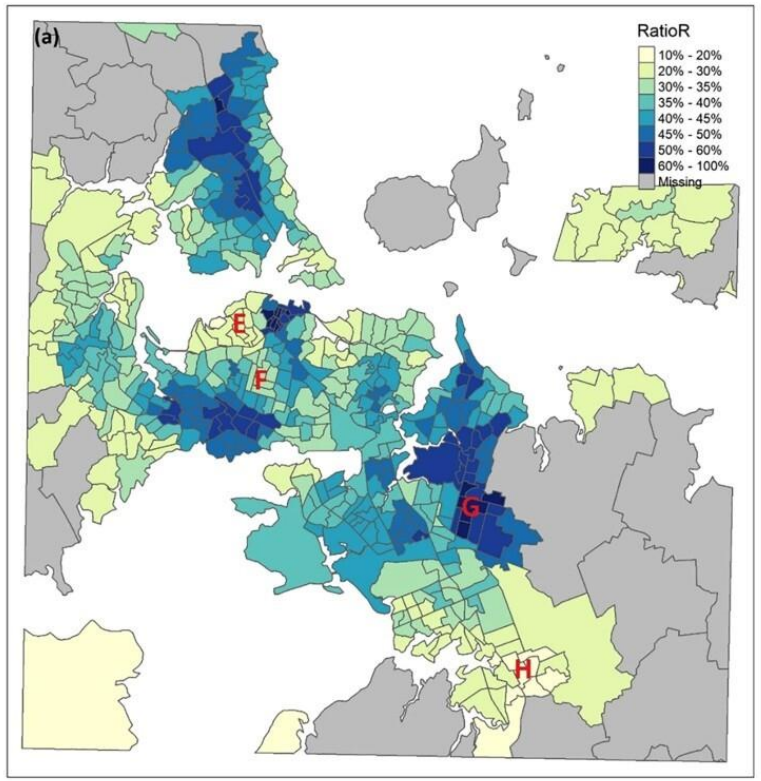


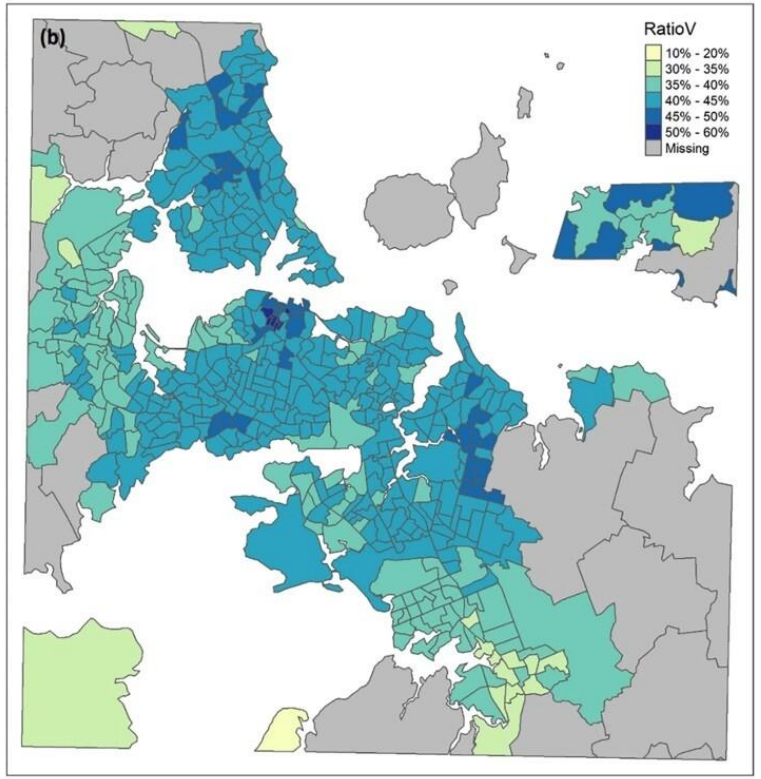
Unevenly segregated activity spaces derived from geotagged Twitter data (Shelton et al, 2015)

Sambal
Spatial and MoBility Analytics Lab

Big data in mobility research

Case study: use mobile app data to analyze and compare segregation patterns in residential versus activity spaces in New Zealand.





Hołubowska & Poorthuis (2024)

Residential segregation (from census data)

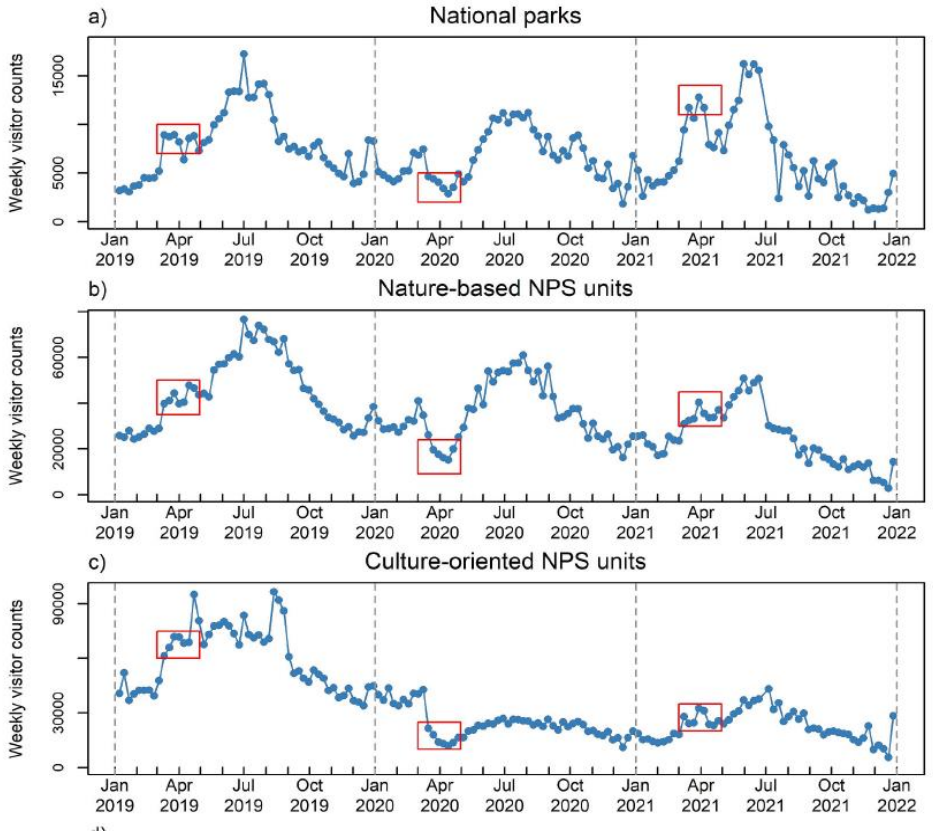
Activity space segregation (from Mobile app data)

Sambal
Spatial and MoBility Analytics Lab

Big data in tourism / recreational studies

How did pandemics affect visitation and travel behaviors to US national parks?
How did sociodemographic characteristics influence visitation?

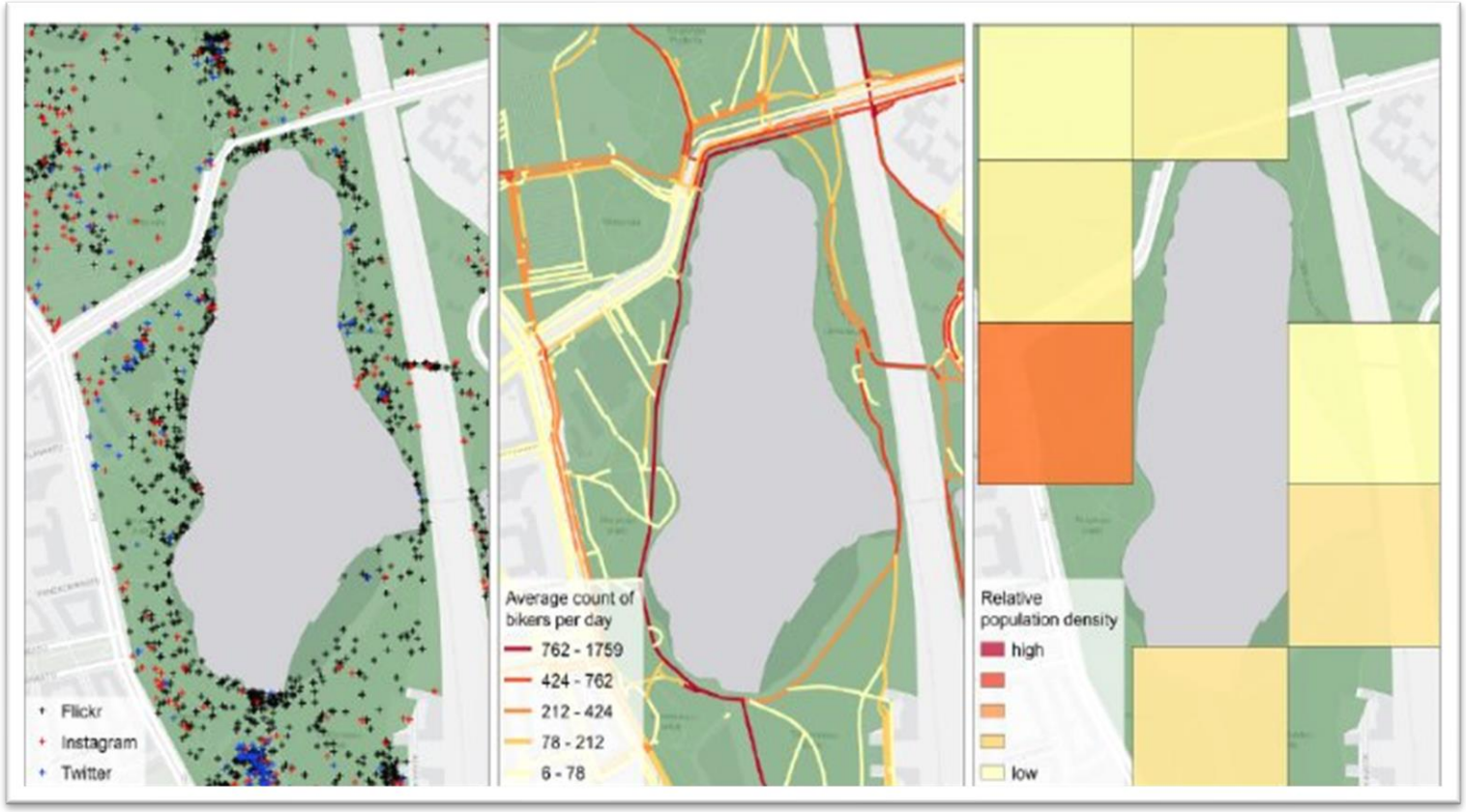
- Mobile app data
- Findings
  - People travel less to national parks post-pandemics than pre-pandemics
  - Minorities and low-income groups are less likely to visit national parks
- Big data
  - Study visits within the whole country
  - Preserving granularity



Lu et al. (2023)

Big data in tourism / recreational studies

What kind of information about urban green space use can be extracted from different types of Big Data?



Social media data | Mobile app data | Mobile phone data

Heikinheimo et al. (2020)

What can big data tell us about tourism flows?

- Case study of tourism in Belgium, using a dataset of geotagged tweets
  - *20+ billion worldwide, 9 million in Belgium*
  - *2012 – 2019*
  - *detecting country of origin based on twitter behaviour*

- Who visits where, and how often?

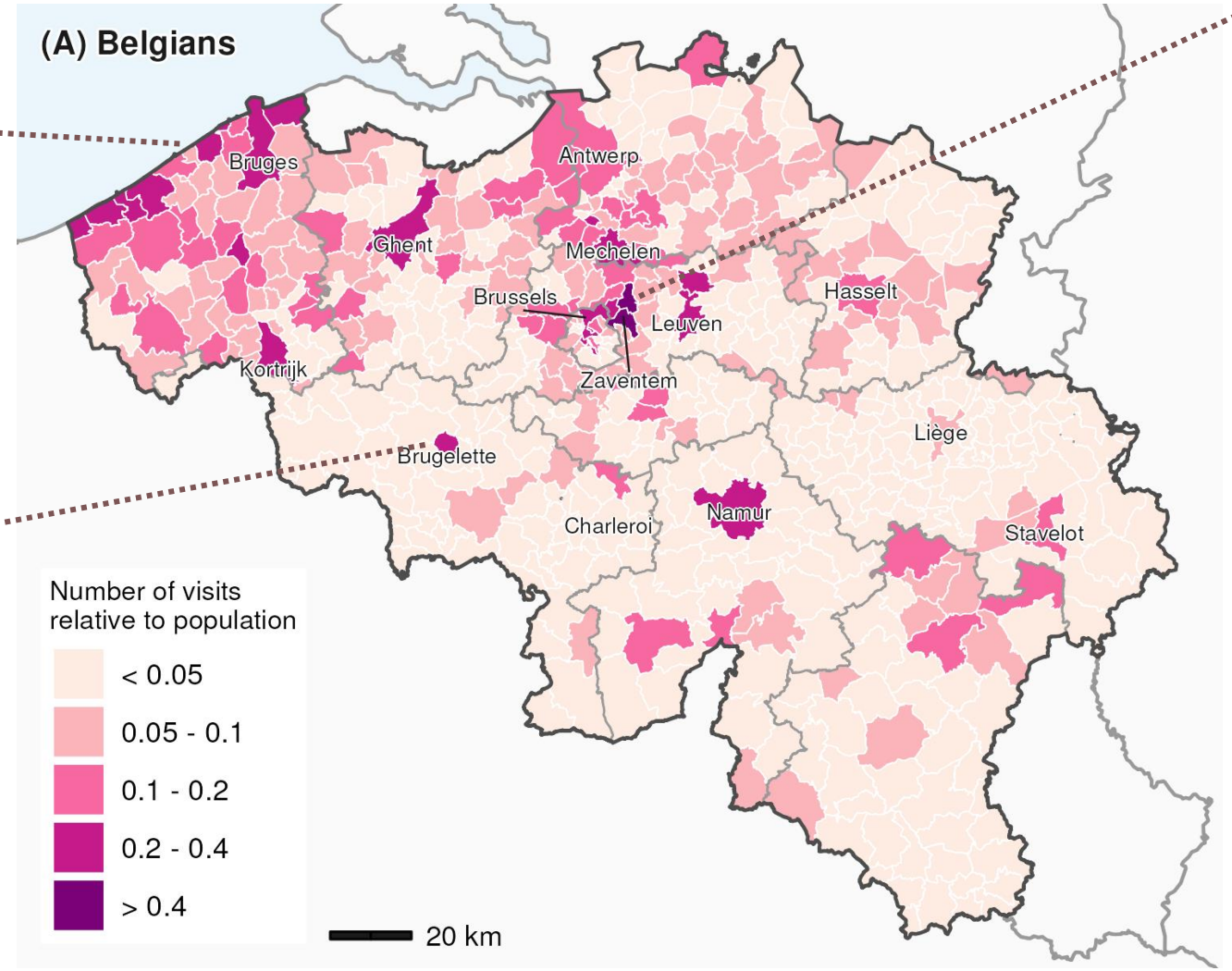
Sambal
Spatial and MoBility Analytics Lab

Where are the most visits?

Belgian Coast

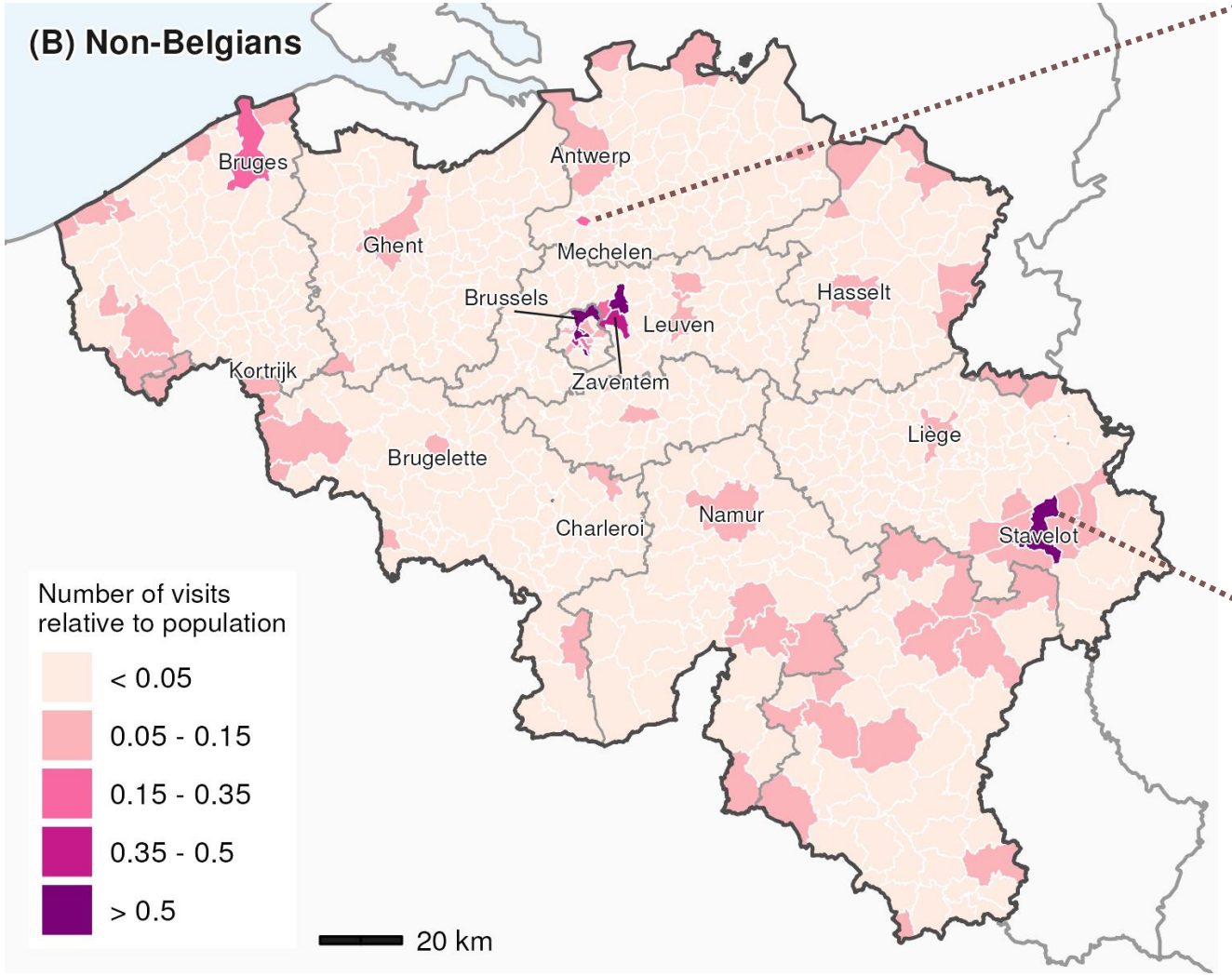
Brussels-Airport

Pairi Daiza



Sambal
Spatial and MoBility Analytics Lab

Where are the most visits?

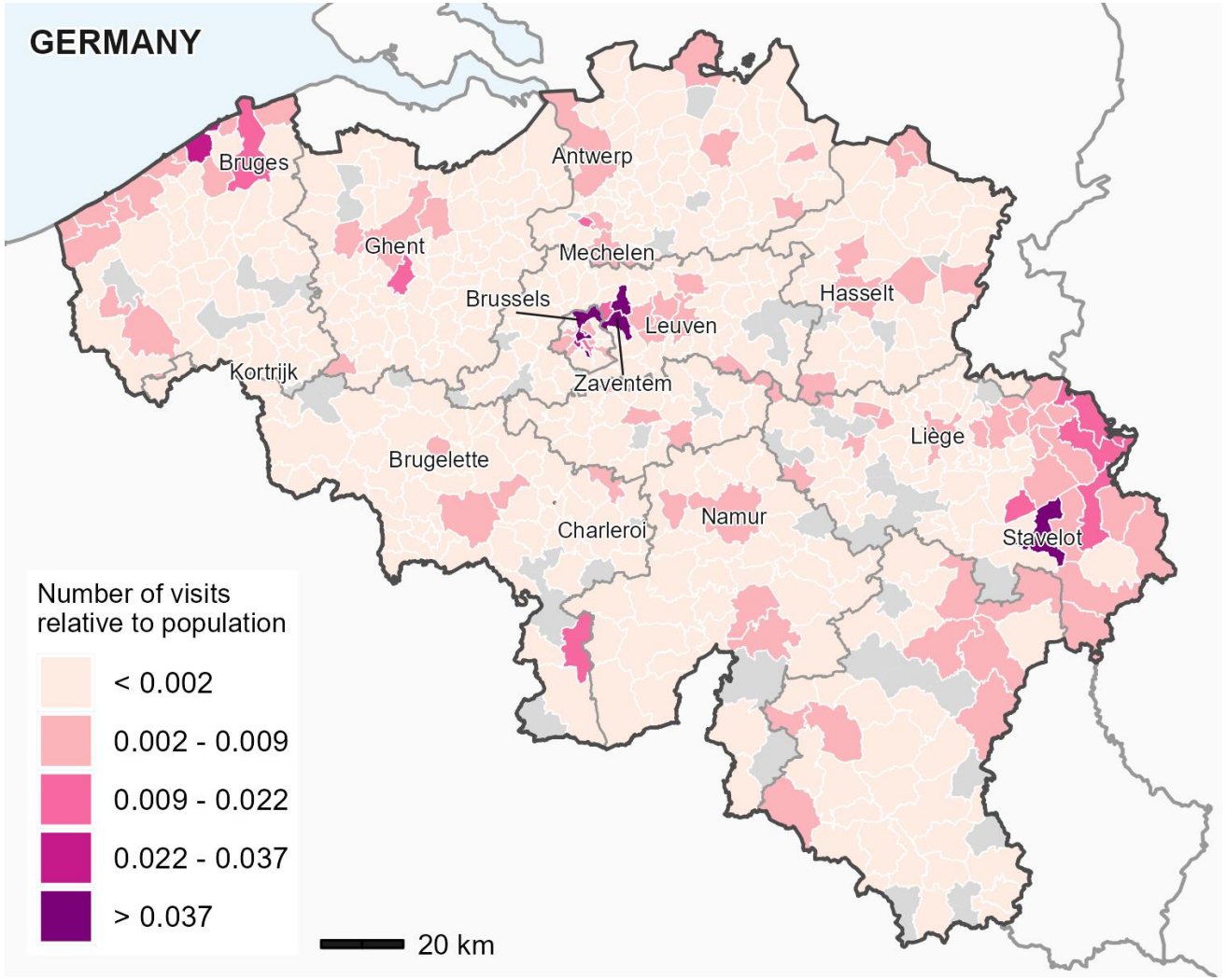


Tomorrowland

Spa Francorchamps

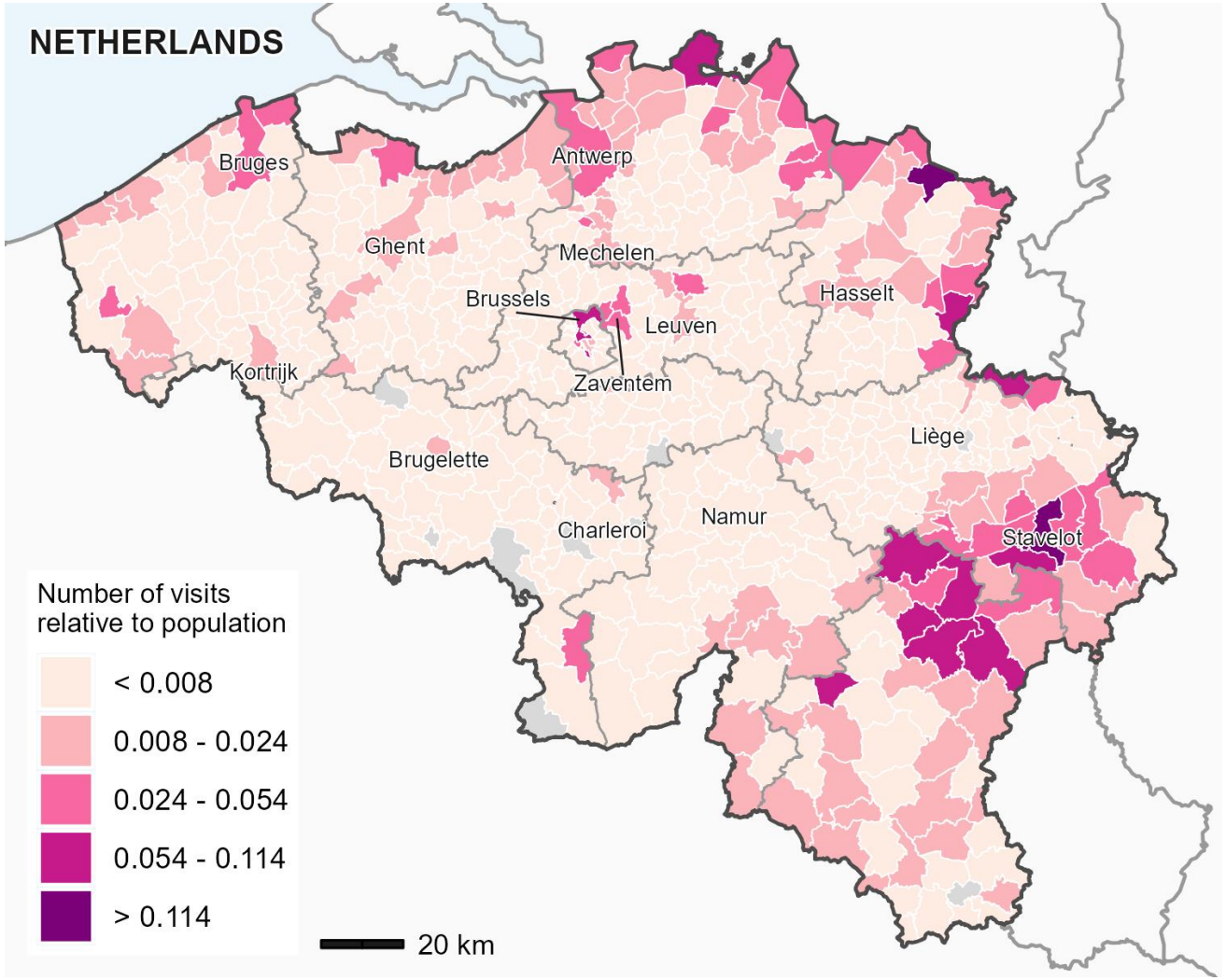
Sambal
Spatial and MoBility Analytics Lab

Where are visitors coming from?



Sambal
Spatial and MoBility Analytics Lab

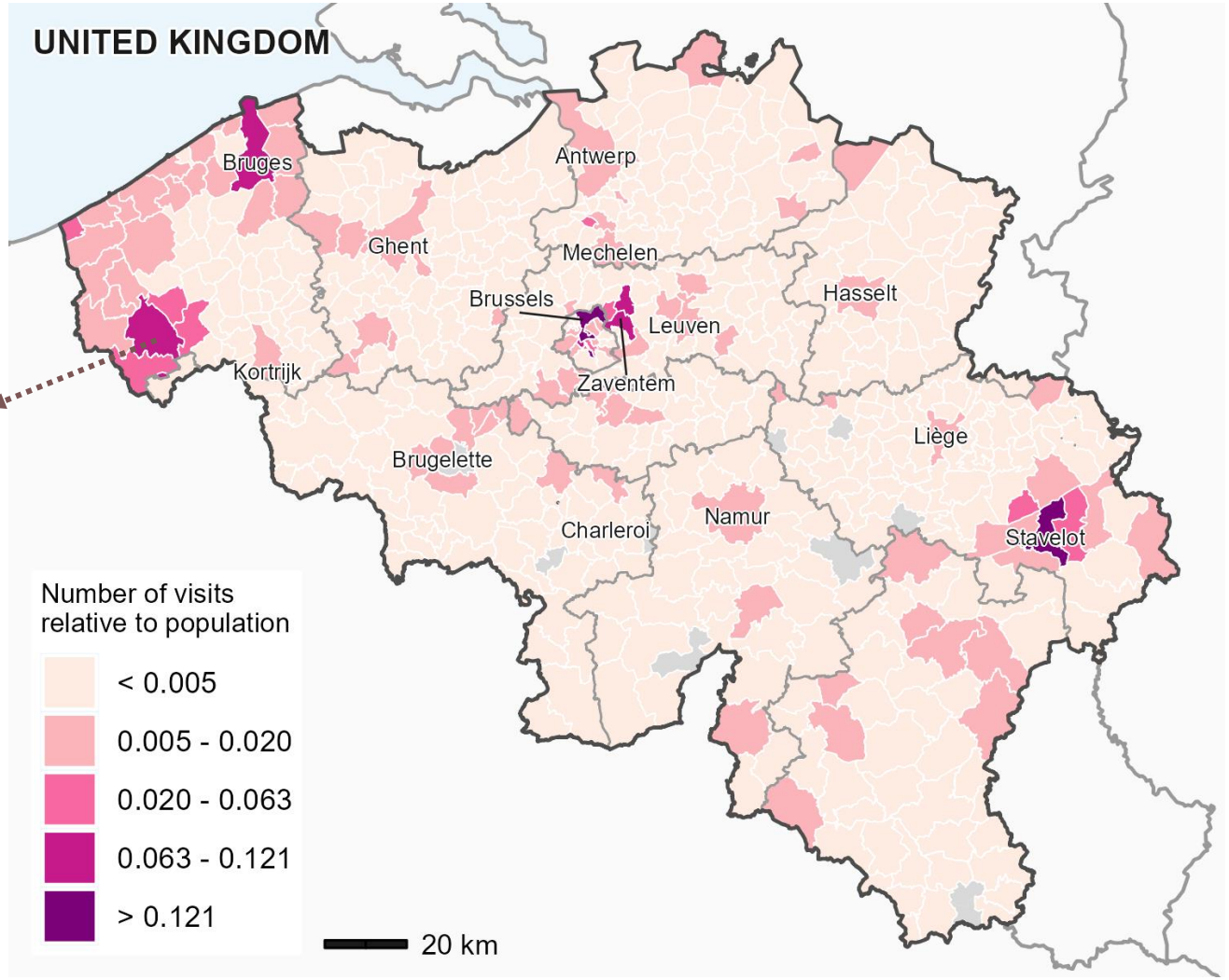
Where are visitors coming from?



Sambal
Spatial and MoBility Analytics Lab

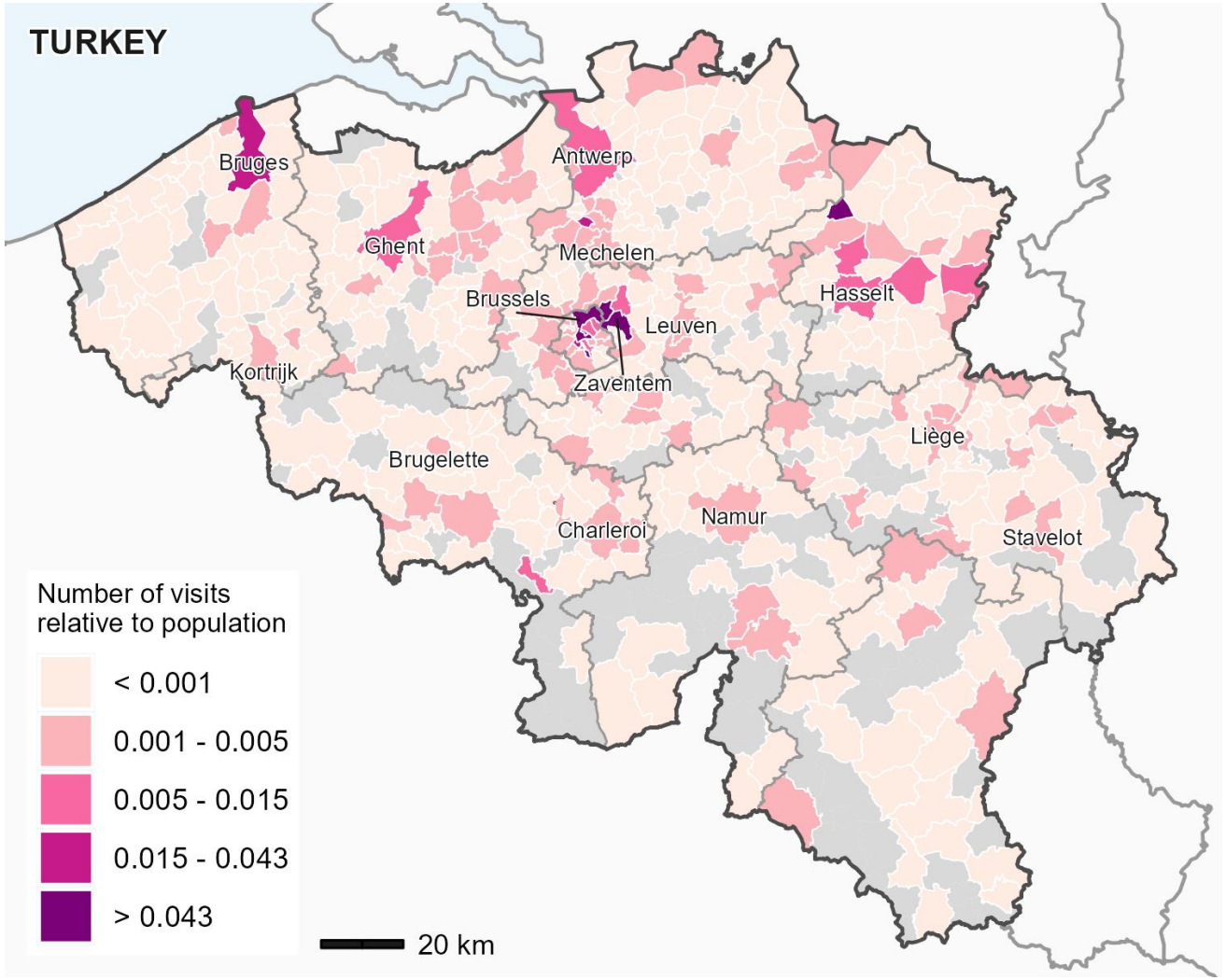
Where are visitors coming from?

Ypres



Sambal
Spatial and MoBility Analytics Lab

Where are visitors coming from?



Sambal
Spatial and MoBility Analytics Lab

Challenges with Twitter data

- Traditional tourism definitions

arrival at a touristic accommodation

≈

a person tweeting from the same place on separate days

- Hard to differentiate between ‘tourism’ trips and other trips

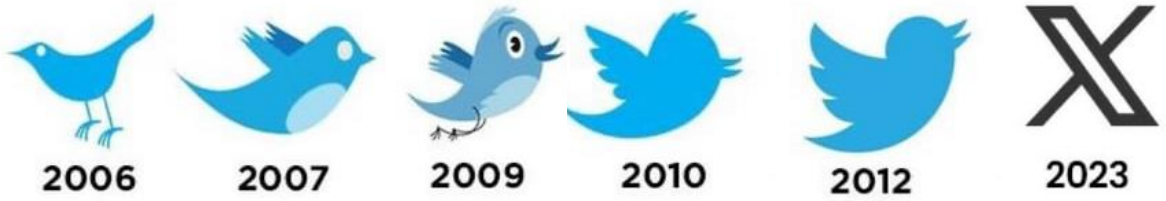
- What is a “tourism visit” → within-country trips
  - *Shopping trip close to home?*
  - *Shopping trip in another city?*
  - *Shopping trip combined with a theatre visit in another city?*

Sambal
Spatial and MoBility Analytics Lab

Future prospects

- More big data

  ≠ more accessible data



- Mobile app data as alternative?

- Research community sharing open and enriched datasets

Urban Data/Code

B Urban Analytics and City Science

A nationwide dataset of de-identified activity spaces derived from geotagged social media data

Ate Poorthuis
KU Leuven, Belgium

Qingqing Chen
University at Buffalo, USA

Matthew Zook
University of Kentucky, USA

EPB: Urban Analytics and City Science
2024, Vol. 0(0) 1–12

DOI: 10.1177/23998083241264051
journals.sagepub.com/home/epb
Sage

Sambal
Spatial and MoBility Analytics Lab

References

- Heikinheimo, V., Tenkanen, H., Bergroth, C., Järv, O., Hiippala, T., & Toivonen, T. (2020). Understanding the use of urban green spaces from user-generated geographic information. Landscape and Urban Planning, 201, 103845. https://doi.org/10.1016/j.landurbplan.2020.103845.
- Hołubowska, O., & Poorthuis, A. (2024). Examining the impact of daily urban activity on spatial segregation: disparities in the proportion of foreign-born residents across residential areas and visited locations. Journal of Ethnic and Migration Studies, 1–22. https://doi.org/10.1080/1369183X.2024.2352502.
- Lu, J., Huang, X., Kupfer, J. A., Xiao, X., Li, Z., Wei, H., Wang, S., & Zhu, L. (2023). Spatial, temporal, and social dynamics in visitation to U.S. national parks: A big data approach. Tourism Management Perspectives, 48, 101143. https://doi.org/10.1016/j.tmp.2023.101143
- Poorthuis, A., Chen, Q., & Zook, M. (2024). A nationwide dataset of de-identified activity spaces derived from geotagged social media data. Environment and Planning B: Urban Analytics and City Science, 51(9), 2264-2275. https://doi.org/10.1177/23998083241264051
- Shelton, T., Poorthuis, A., & Zook, M. (2015). Social media and the city: Rethinking urban socio-spatial inequality using user-generated geographic information. *Landscape and Urban Planning*, *142*, 198–211. https://doi.org/10.1016/j.landurbplan.2015.02.020

Sambal
Spatial and MoBility Analytics Lab

Thank you

We would love to hear your questions or comments on the topic!

Karen Curiel-Ruiz-Velasco, Yitong Xia & Céline Van Migerode

www.sambal-leuven.be

KU LEUVEN

FOLLOW US

Sambal
Spatial and MoBility Analytics Lab