School of Social and Political Sciences

# Can point-level app location data be used to estimate the volume of traffic?: A methodological contribution

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Traditional mobility and traffic monitoring systems often have limited geographic and temporal coverage. Point-level app location data is an innovative source identified with the potential to offer broader and more dynamic insights (Zhang et al. 2023). Yet, its efficacy and the methods to process it for traffic volume estimation remain limited.

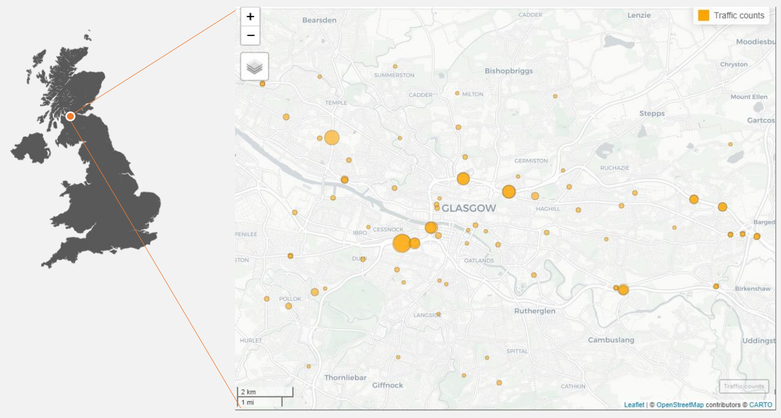



Figure 1. Location of Glasgow, United Kingdom (UK), and manual traffic count point locations in the study area. The size of the bubble indicates the total volume of traffic.

## RESEARCH QUESTIONS

1. How can point-level app location data be extracted effectively to estimate the volume of traffic?

2. How can the heterogeneous character of app location data be controlled to estimate the volume of traffic?

## METHOD

The app location data is sourced from Huq Inc. It includes records between 2019 and 2020 (N≈1bn).

App data is compared to manual traffic counts in Glasgow, UK, collected by the Department of Transport (DfT).

A series of systematic buffers are designed to extract app location data:

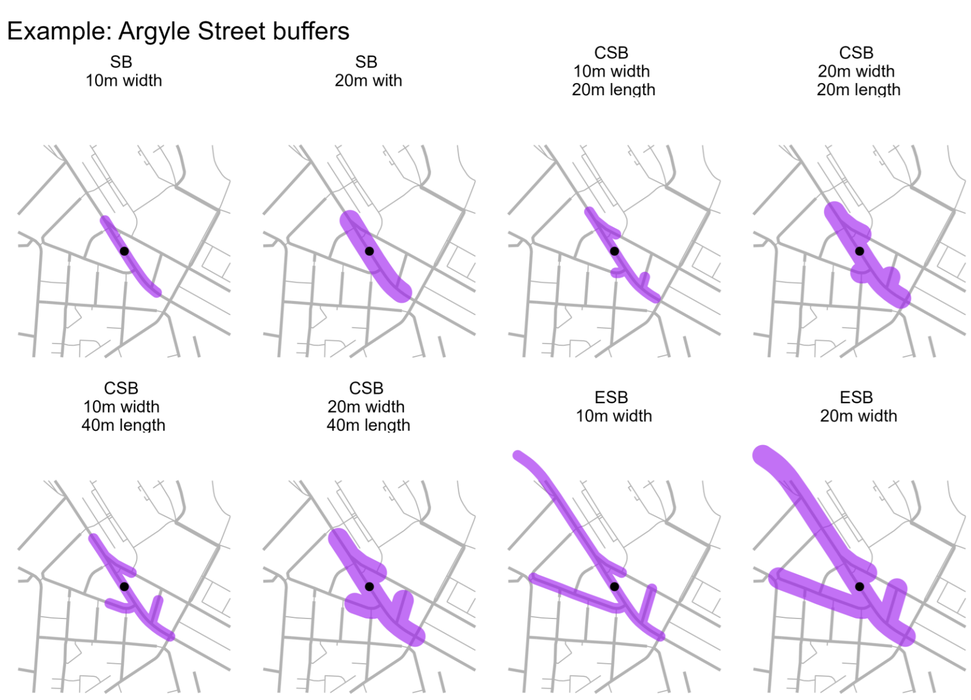
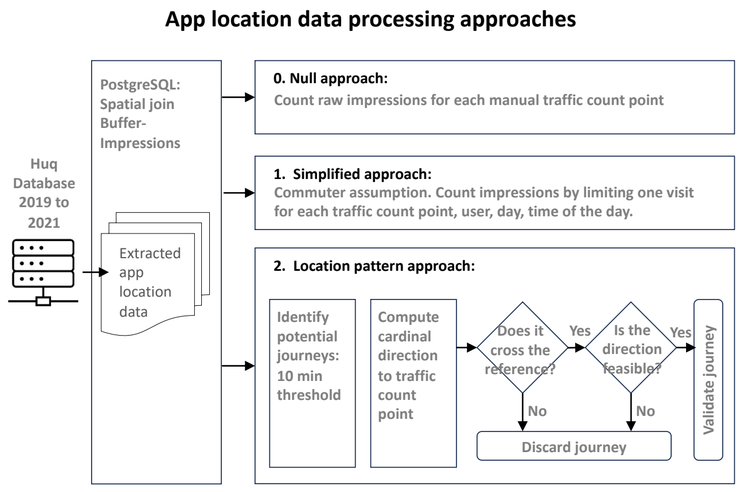



Figure 2. Example of the systematic buffers used to extract app location data in Glasgow Area. SB = Simple buffer; SCB = Connected street buffer; ESB = Entire street buffer.

Three alternative approaches to processing app location data are tested:




## FINDINGS

- Figure 4 shows a positive relationship for all cases.
- The 'Null' approach shows considerable under- and overestimation.
- Both the simplified approach and the pattern-based (1 and 2) improve the correlation, but some buffers are not able to capture enough information.

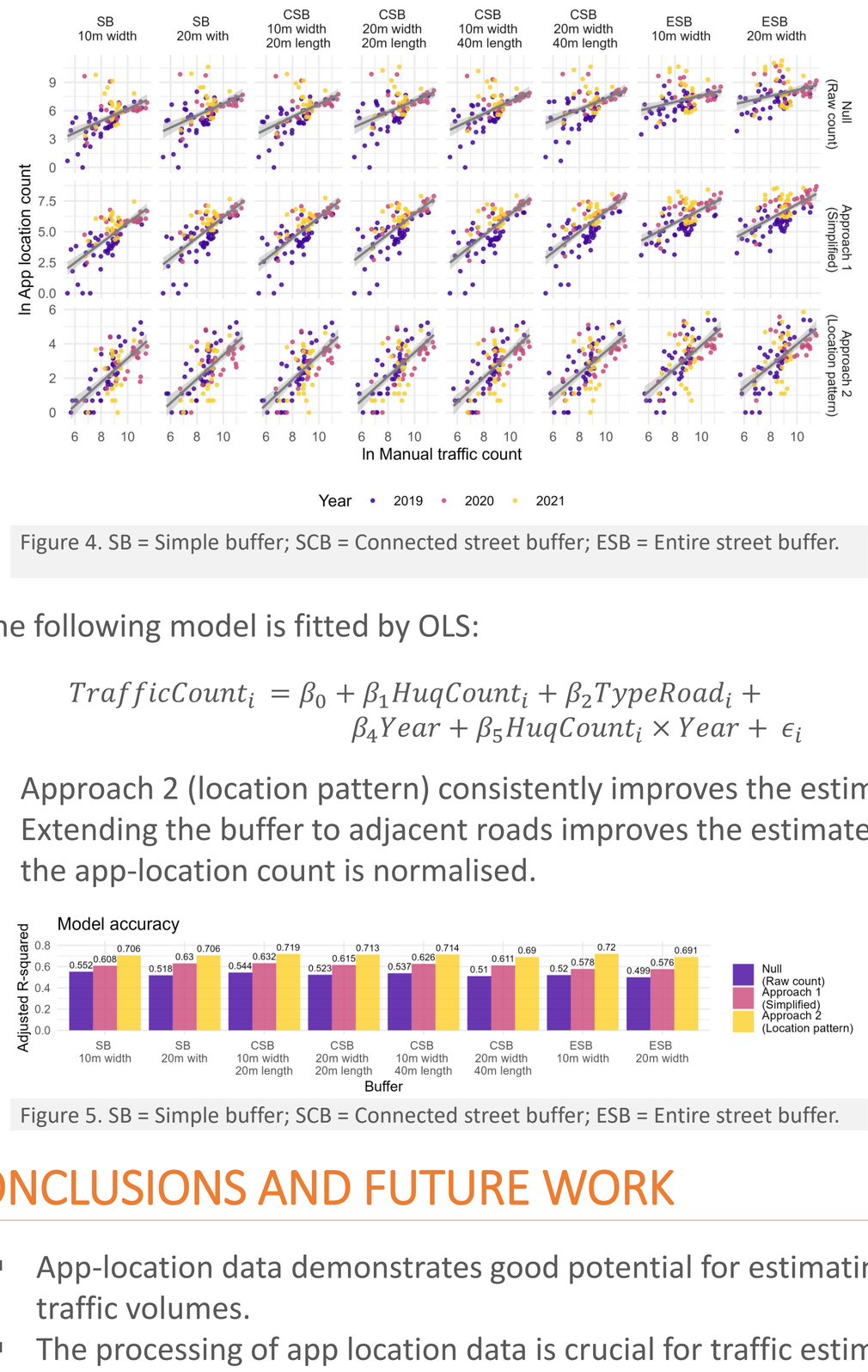



Figure 4. SB = Simple buffer; SCB = Connected street buffer; ESB = Entire street buffer.

The following model is fitted by OLS:

$$TrafficCount_i = \beta_0 + \beta_1 HuqCount_i + \beta_2 TypeRoad_i + \beta_4 Year + \beta_5 HuqCount_i \times Year + \epsilon_i$$

- Approach 2 (location pattern) consistently improves the estimates.
- Extending the buffer to adjacent roads improves the estimates if the app-location count is normalised.




Figure 5. SB = Simple buffer; SCB = Connected street buffer; ESB = Entire street buffer.

## CONCLUSIONS AND FUTURE WORK

- App-location data demonstrates good potential for estimating traffic volumes.
- The processing of app location data is crucial for traffic estimates.
- Future work can focus on active travel.

## REFERENCES

Zhang, P., Stewart, K., & Li, Y. (2023). Estimating traffic speed and speeding using passively collected big mobility data and a distributed computing framework. Transactions in GIS, tgis.13061. https://doi.org/10.1111/tgis.13061

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