

Examining day-to-day variability by connecting network- and traveller-focused analyses of travel behaviour

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Outline

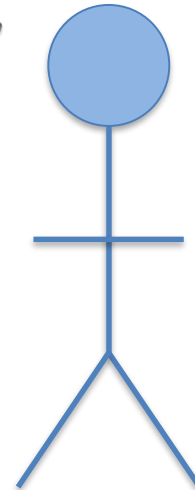
1. Background
2. Proposed approach
3. Application to a site in Greater Manchester

Quantitative analyses of day-to-day variability in travel behaviour?

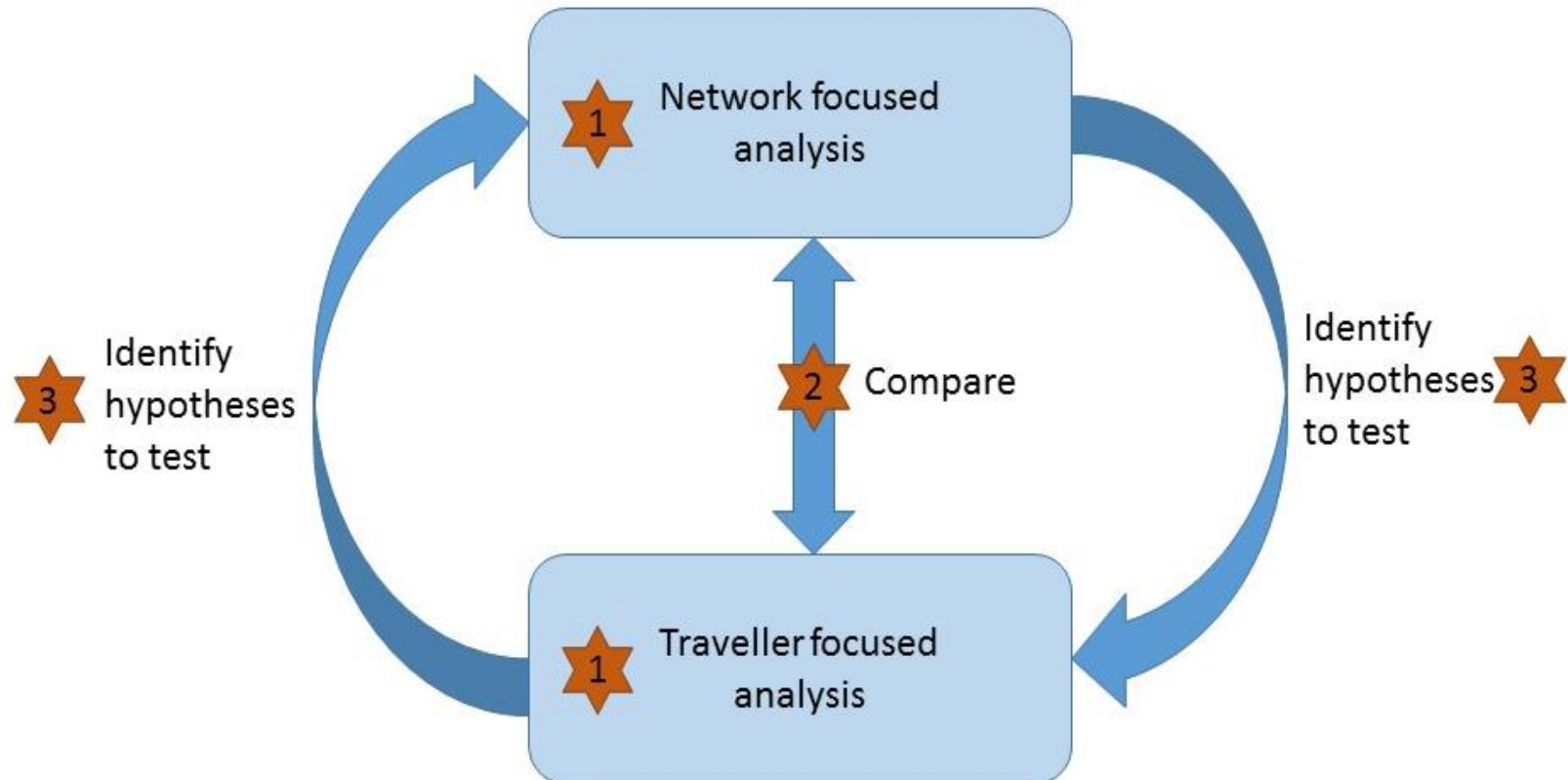
Network focused analysis



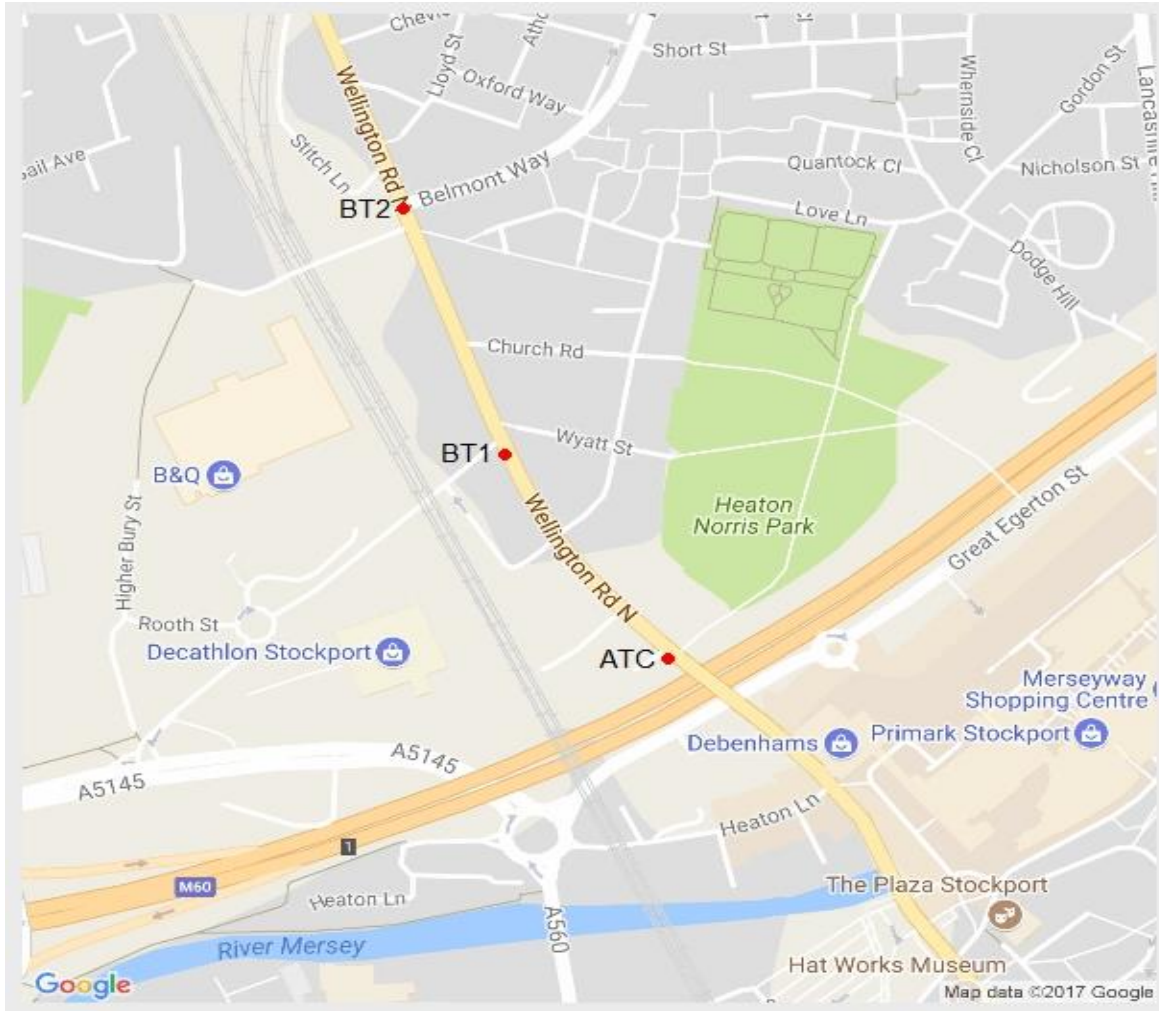
Traveller focused analysis



Overview of approach



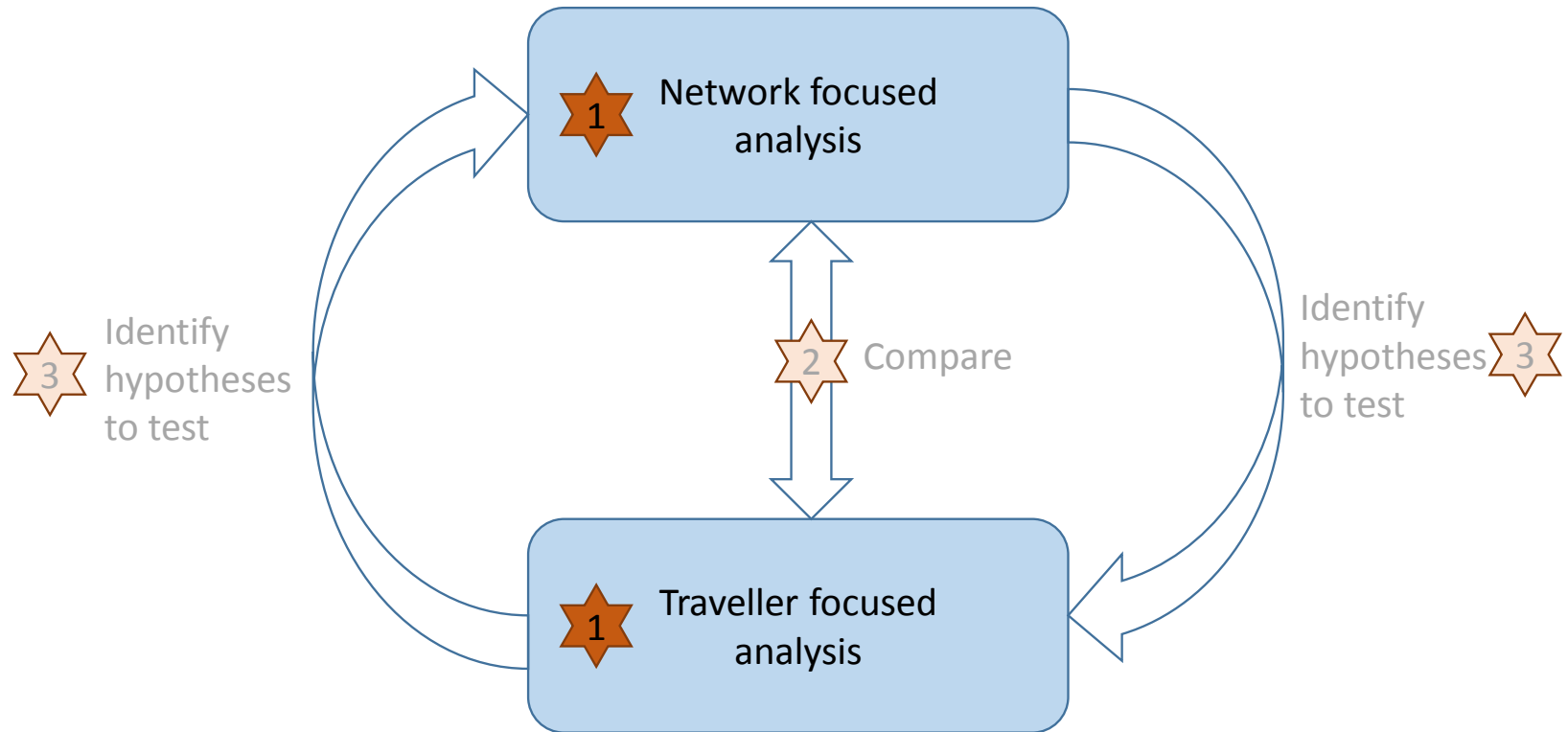
Case study



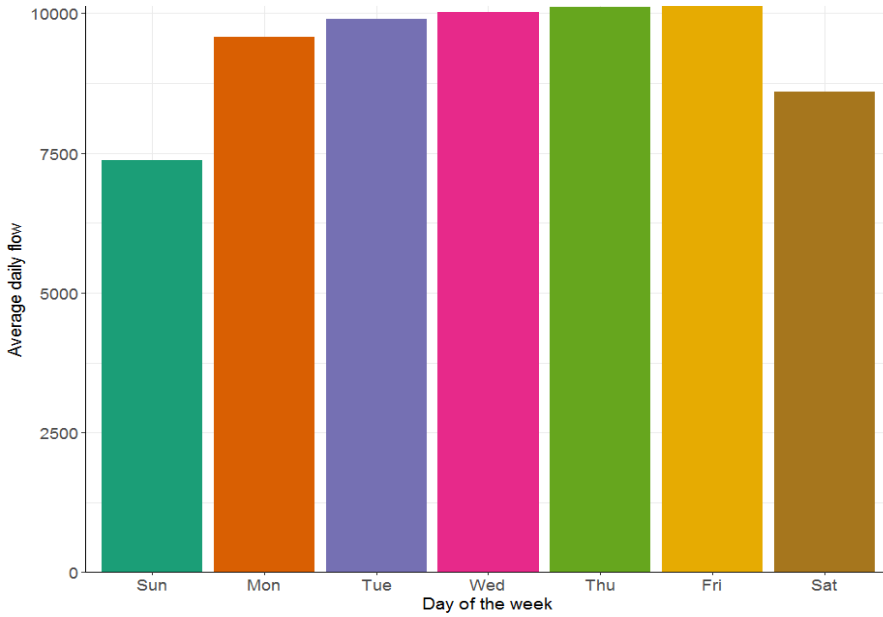
- One loop detector
- Two Bluetooth detectors
- Two years of data



Stage 1



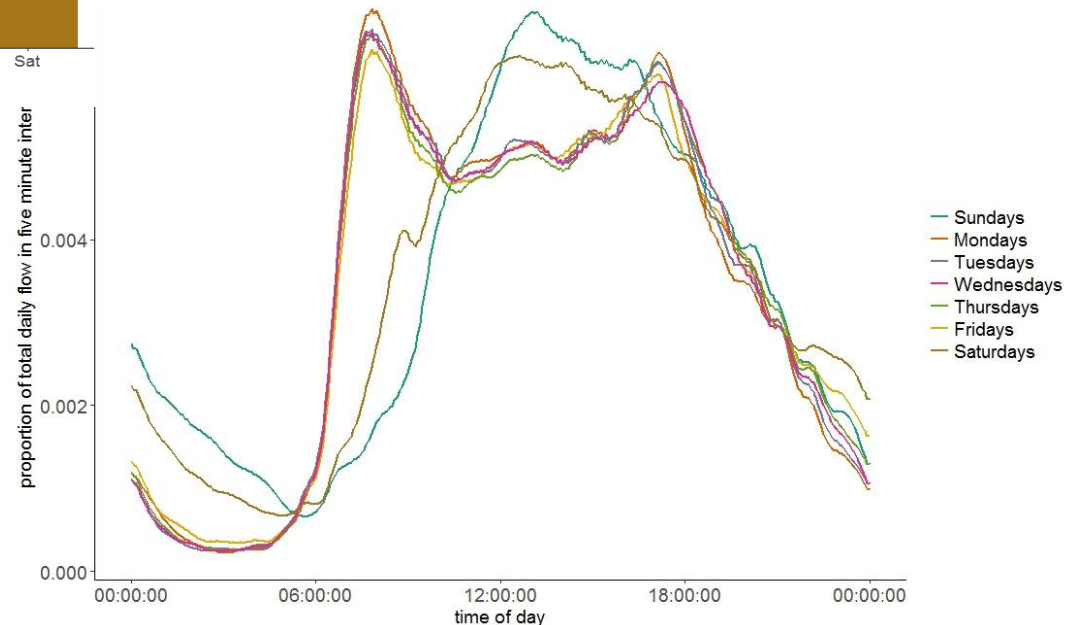
Network-focused analysis



Total daily flows show statistically significant differences, except for:

- Tuesdays and Wednesdays
- Thursdays and Fridays

The standardised daily flow profiles are significantly different each day



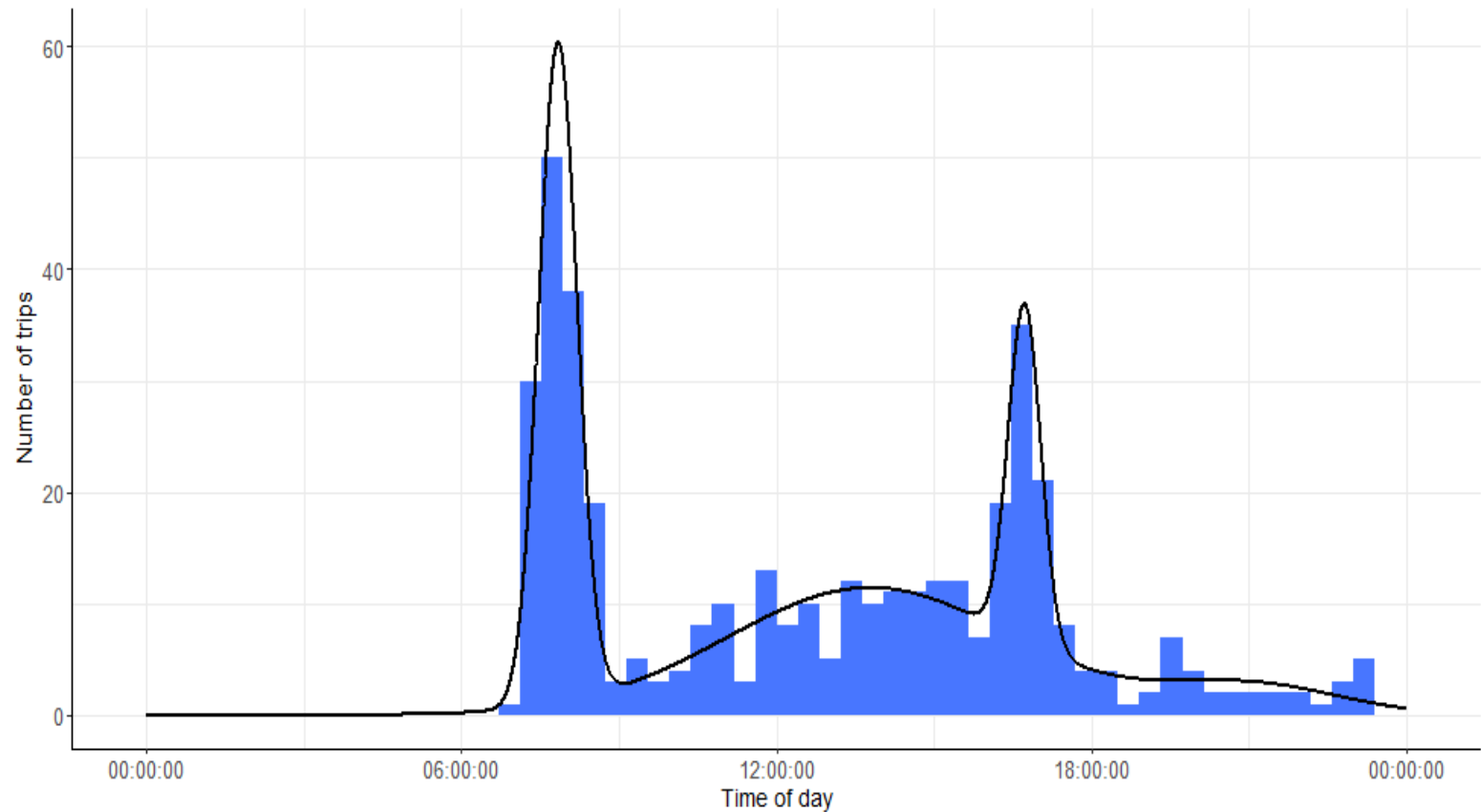
Traveller-focused analysis

Analysed 1.1 million trips (from BT1 to BT2) made by 197,474 different MAC addresses

These unique MAC addresses ('travellers') were then clustered to find user classes based on:

- Number of trips observed
- Variability in times of day observed at this location

Trip timing: example for one traveller

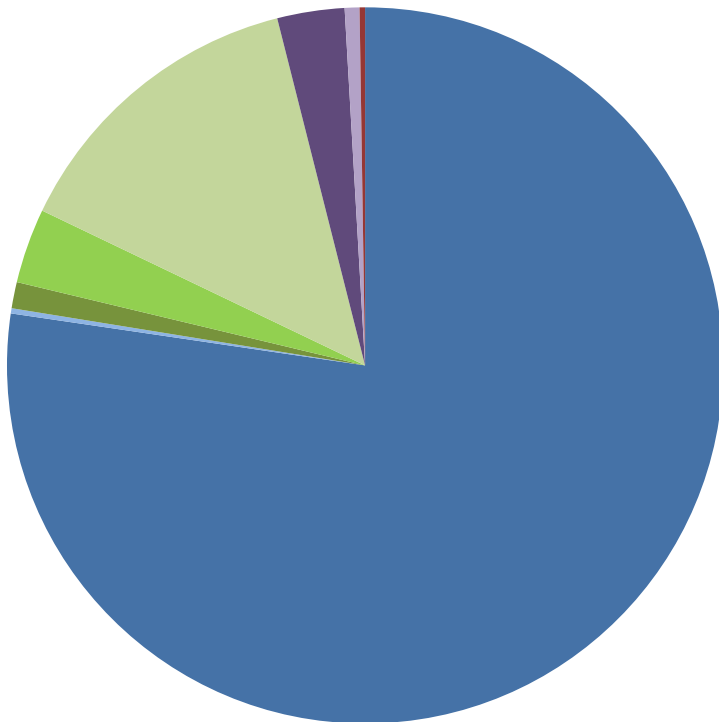


Four user classes identified

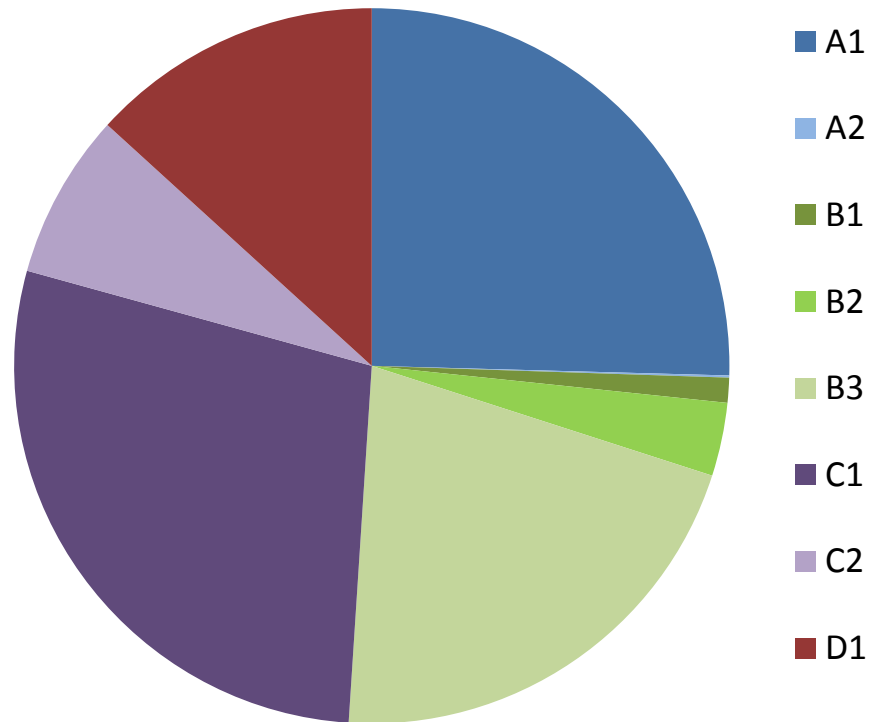
User class	User subclass	Average trip frequency	Average number of time of day clusters	Average variance of time of day clusters
A: Annually	A1	1.8	1	0.001
	A2	2.3	1	0.330
B: Three times per year	B1	5.3	1	0.162
	B2	5.4	1	0.073
	B3	8.4	1	0.024
C: Fortnightly	C1	51.5	2	0.008
	C2	62.1	5	0.003
D: Three times per week	D1	298.3	4	0.006

User classes

Travellers

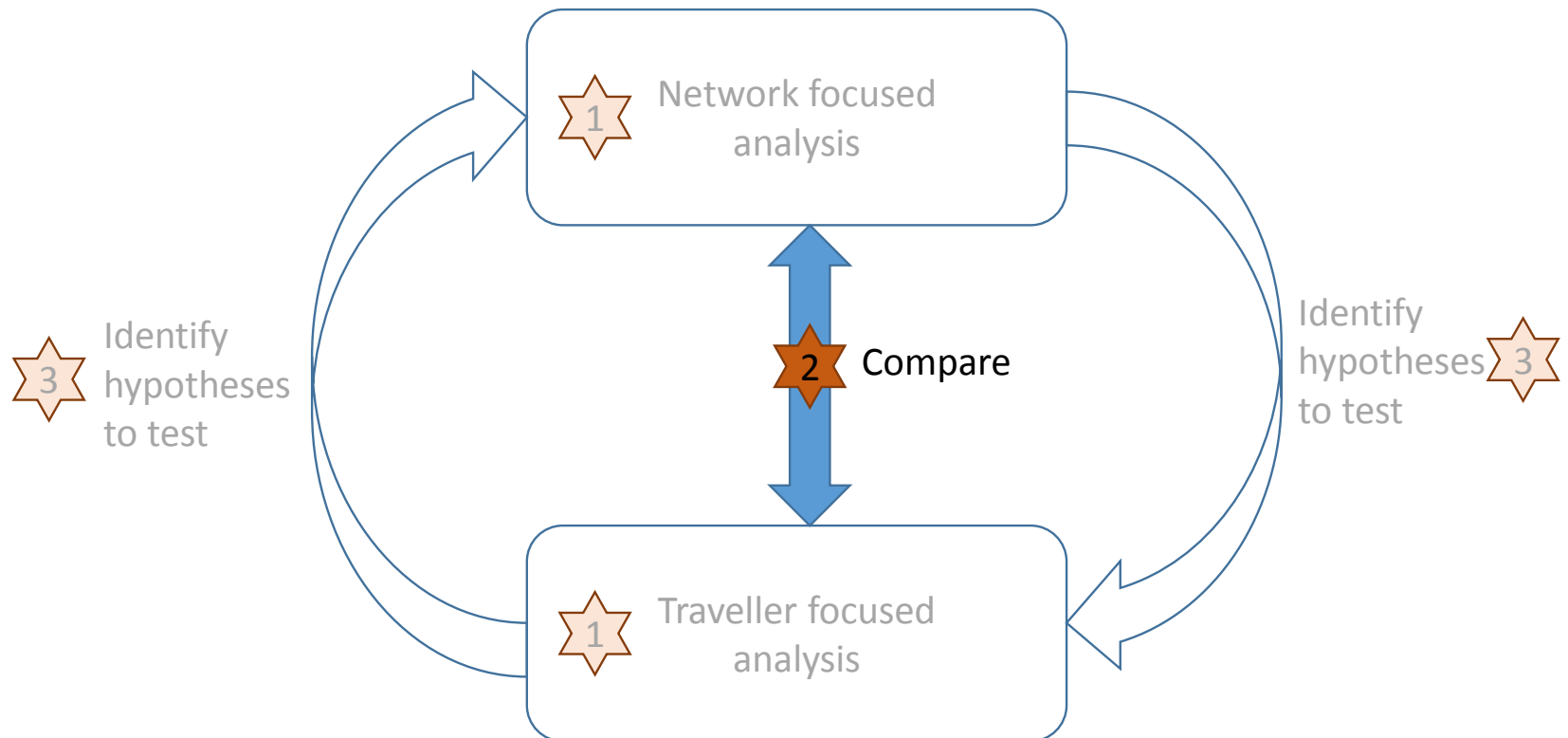


Trips



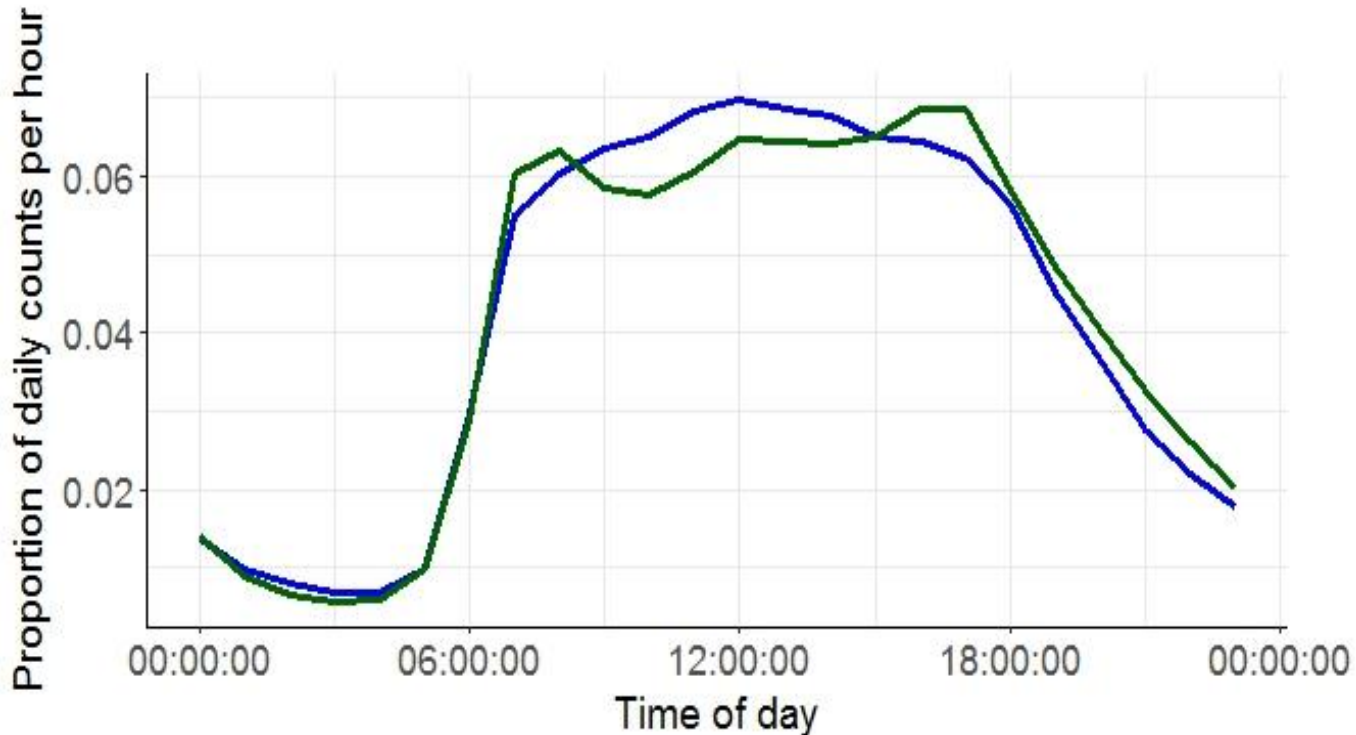
- A1
- A2
- B1
- B2
- B3
- C1
- C2
- D1

Now on to stage 2...



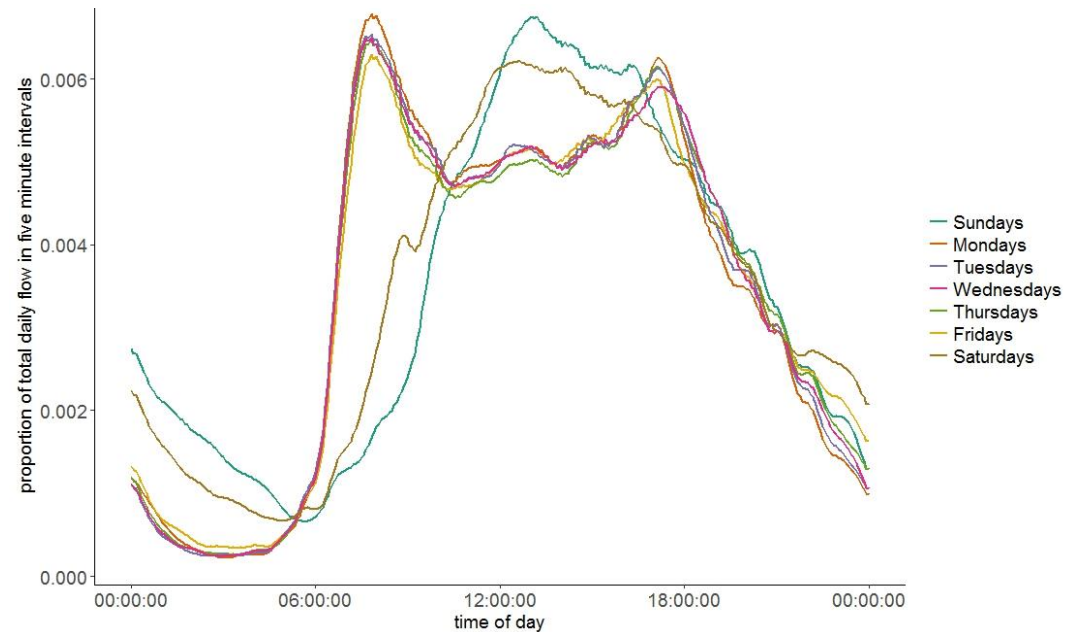
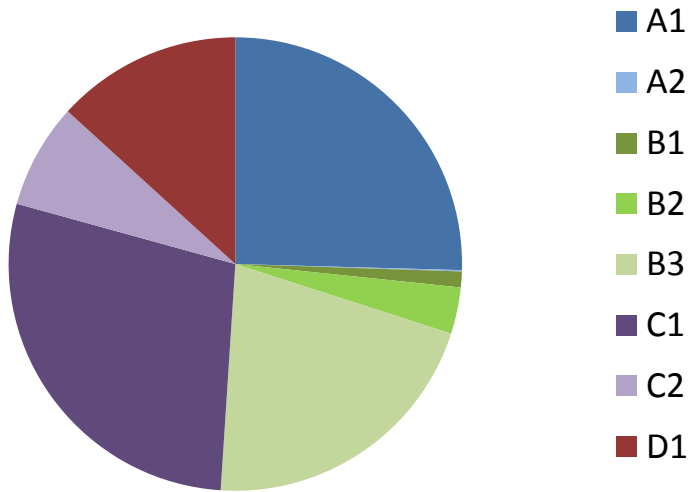
Stage 2: Compare the data

Standardised daily profile of counts for the loop detector (green) and the Bluetooth detector (blue)

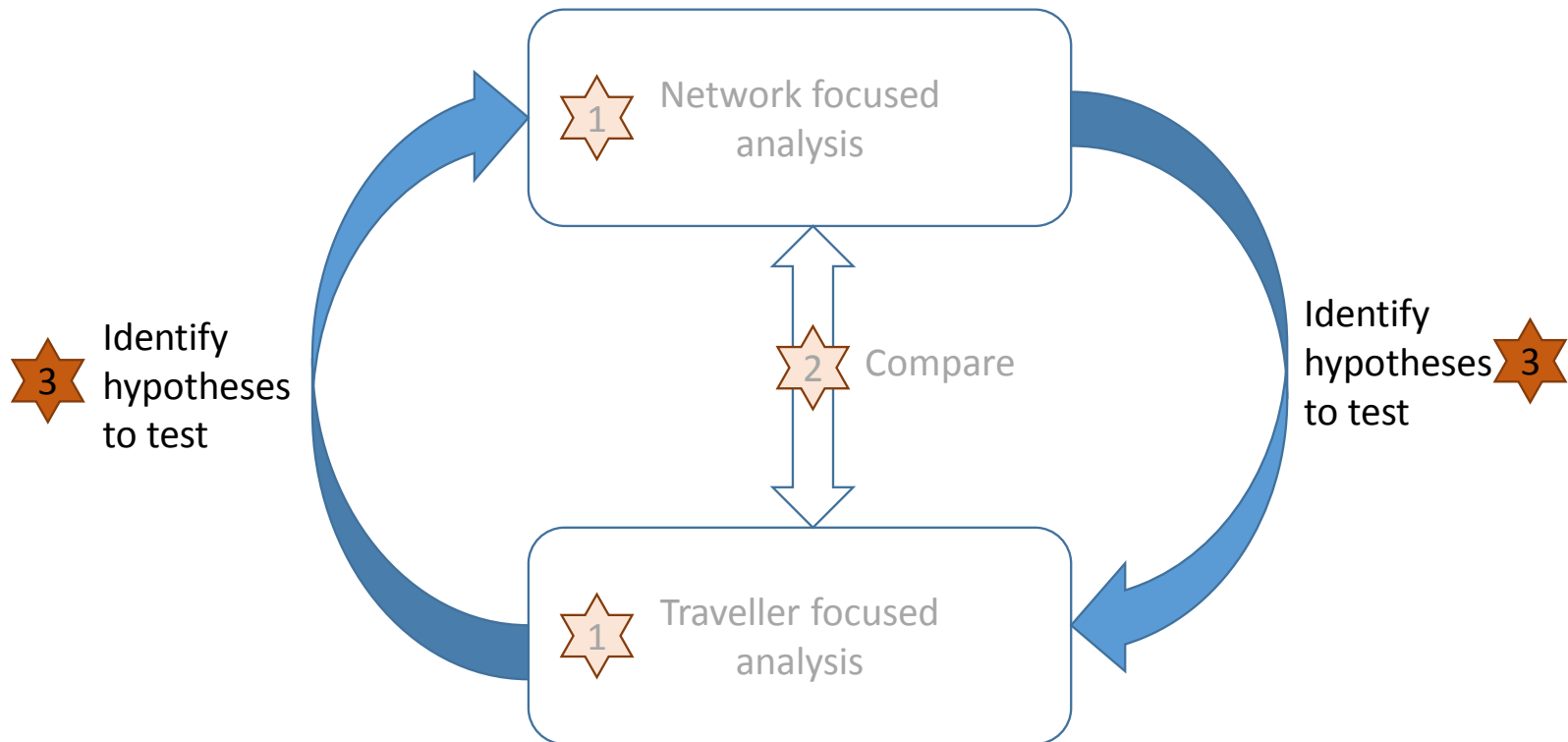


Stage 2: Compare the findings

Trips



On to stage 3:

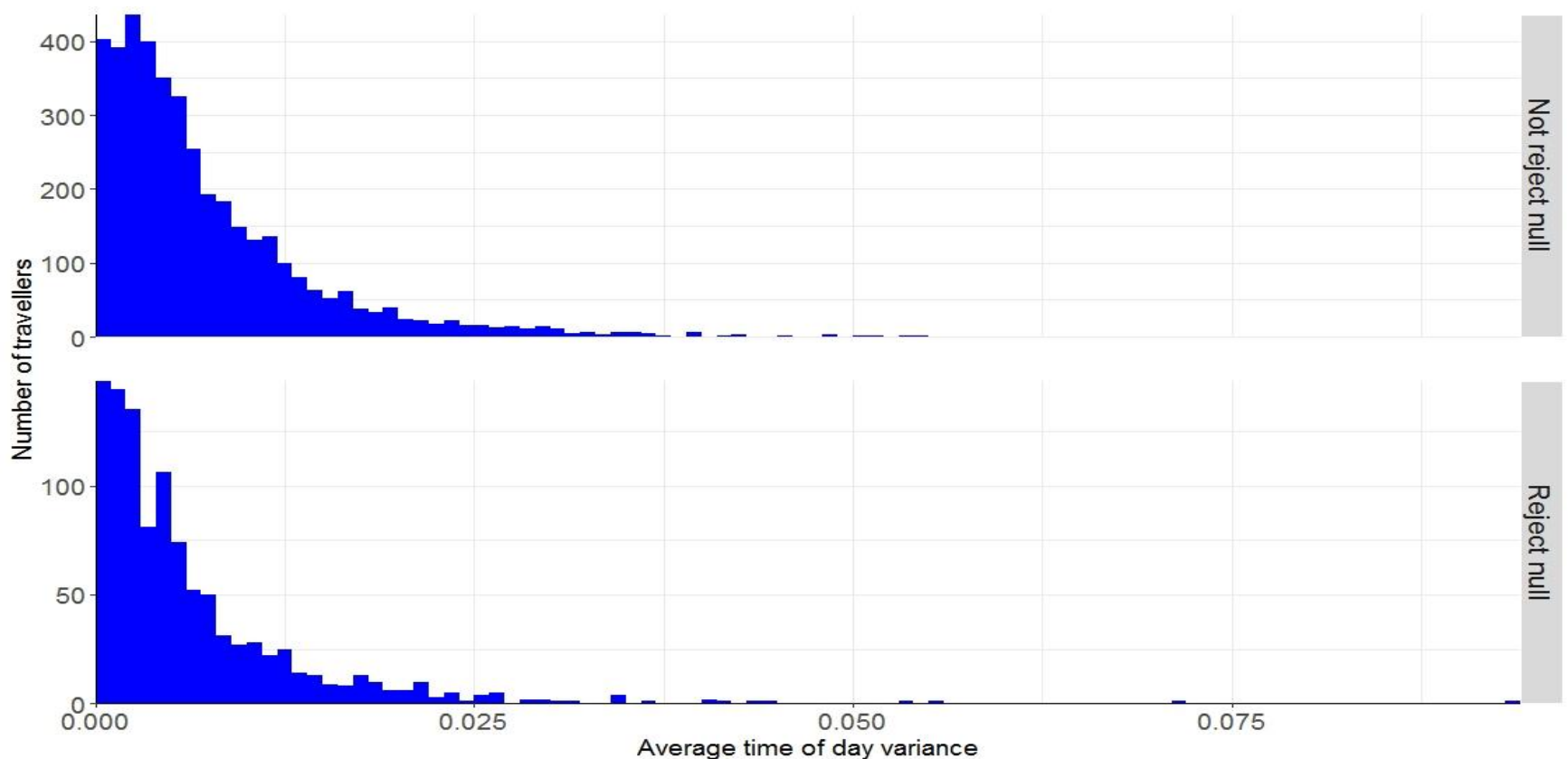


Stage 3: Network to traveller focused analysis

- Do different people travel on systematically different days of the week?
- Do individual people travel at systematically different times of the day on different days of the week?

Do different people travel on systematically different days of the week?

For 20% of the travellers assessed, the null hypothesis, that weekday trips were evenly distributed over Monday to Friday, was rejected at the 95% level.



Do individual people travel at systematically different times of the day on different days of the week?

Do individual people travel at systematically different times of the day on different days of the week?

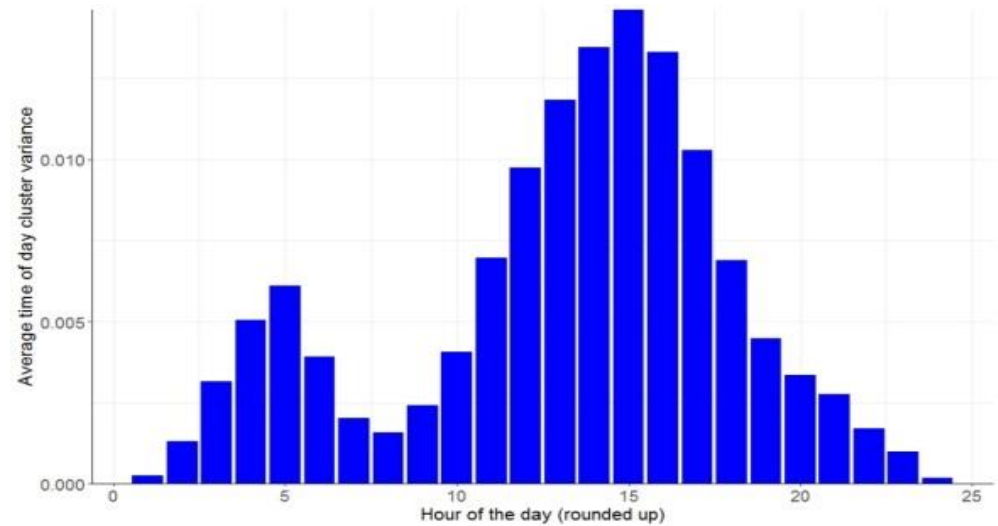
	Monday	Tuesday	Wednesday	Thursday	Friday	Total weekday
Time of day cluster 1	$x_{M,1}$	$x_{Tu,1}$	$x_{W,1}$	$x_{Th,1}$	$x_{F,1}$	$x_{A,1}$
Time of day cluster 2	$x_{M,2}$	$x_{Tu,2}$	$x_{W,2}$	$x_{Th,2}$	$x_{F,2}$	$x_{A,2}$
....						
Total for traveller	x_M	x_{Tu}	x_W	x_{Th}	x_F	x_A

- Only 1,077 travellers had suitable data for comparison (0.5% of travellers accounting for 14% of trips).
- The hypothesis that observations were evenly distributed between time of day clusters for each day of the week was rejected for 33% of these travellers.

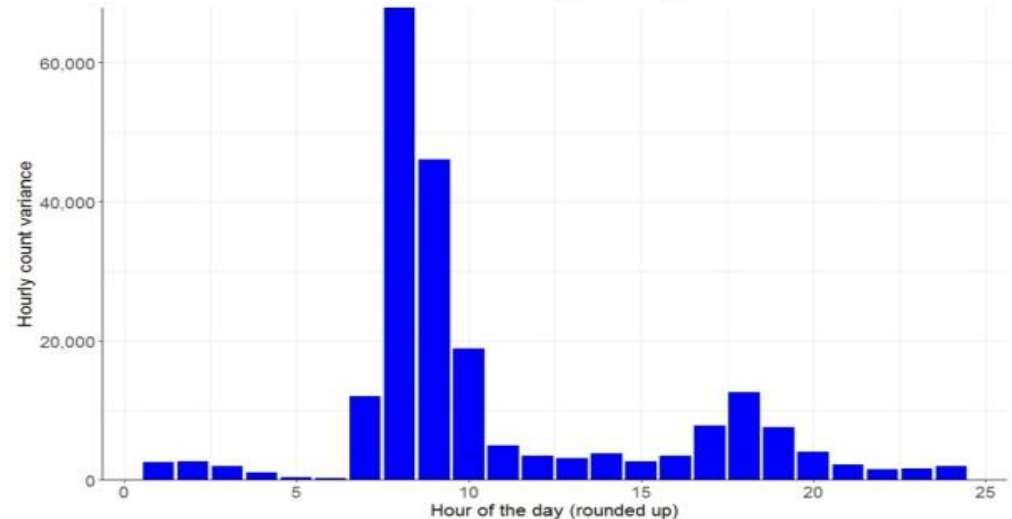
Stage 3 : Traveller to network focused analysis

Does individual time of day variability equate to variability in flows?

Bluetooth data: Average
time of day cluster
variance for all travellers



Loop detector data:
Variance of hourly loop
detector data



Conclusion

We have proposed an overall approach and showed how it could work for a very small case study

Implications for:

- Planning research?
- Analysing 'big data'?

Acknowledgements

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UNIVERSITY OF LEEDS



Thank you for listening!



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