

Moving Hot Spots on Public Transport: Theft on the Underground

Paper Presented to the *Transport Statistics User Group (TSUG)*:
Reducing Crime on the Transport Network: The Role of Data
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Glossary

- Public Transport (PT)
- **'Theft'** of personal property
 - *pick-pocketing/pocket-picking*
 - *NOT snatch offences or other thefts*
- Case Study - London Underground (LU)
- Methodology
 - Interstitial Crime Analysis (ICA)
- Crime Data
 - British Transport Police (BTP): 'at' station
 - Metropolitan Police Service (MPS) and City of London Police (CoLP): 'near' station

Scope

- **5,063** thefts on LU (Financial Yr 2011/2012)
 - 4 thefts per million passenger journeys
- As proportion of LU offences: >50%
 - **27%** all rail crimes in Eng and Wales
 - **40%** all theft person on UK rail: = on LU

Theory

- **Mass transit stations as system cause of crime** (Piza and Kennedy, 2003)
 - Helps to shape crime patterns of urban areas
 - Movement of passengers (high density v low density crimes)
- **Crime attractors and crime generators**
 - (Brantingham and Brantingham 1995)
- **Risky facilities** (Clarke and Eck, 2005)
 - Shaped by urban mobility patterns, nodes and paths
- **Radiators and Absorbers** (Bowers 2013)

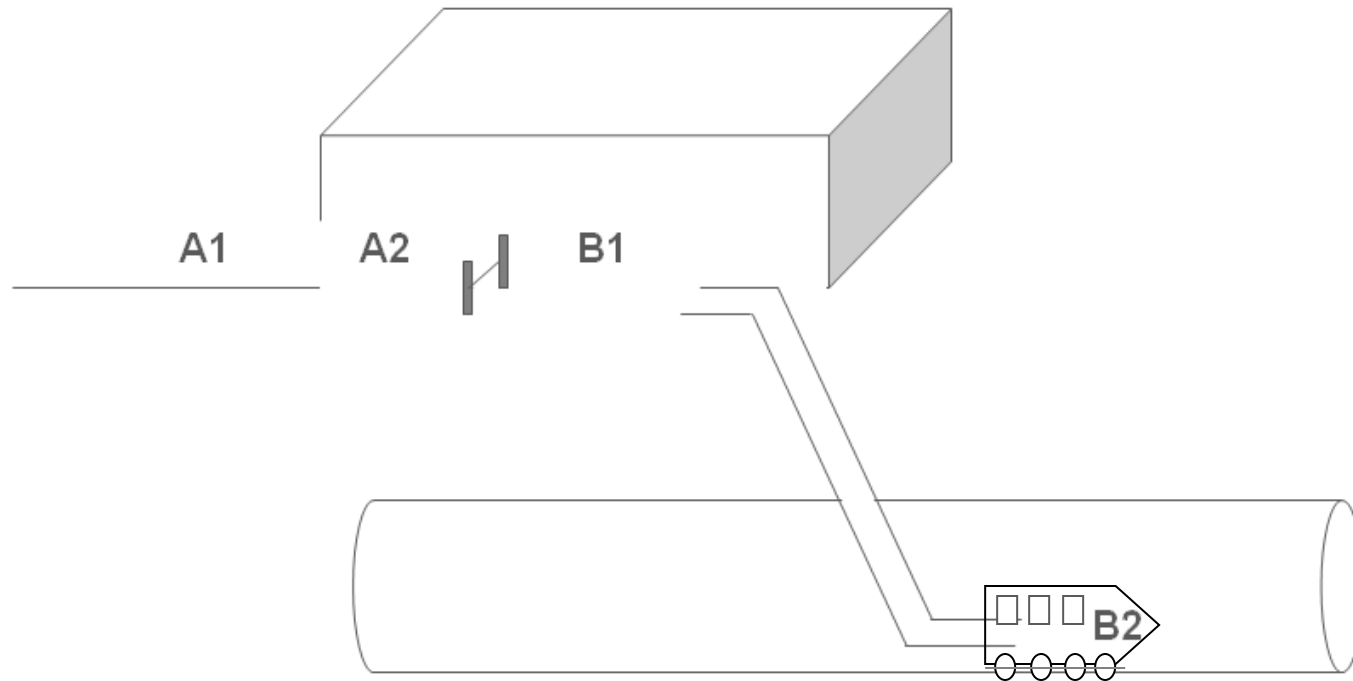
Theft Mechanisms

- Range of factors influence theft on PT systems
 - high densities people clustered together in small spaces
 - lack of user knowledge of system
 - ease of passenger distraction
 - accessibility and ease of access to and exit from stations
 - anonymity of offenders
 - barriers to movement between and within stations
 - staffing, protection and guardianship.

Key Questions

1. What are patterns of theft on LU?
2. Is there transmission of risk at ***Transit environs?***
 - **Spatial Interplay** (Robinson and Goridano, 2011)
 - **Radiators and Absorbers** (*Bowers 2013*)
 - a) Crime at transport nodes **related** to surrounding areas
 - *Block and Block (2000); Loukatiou-Sideris, 2002 ;Bernasco and Block 2009; Cecatto (2011), Newton et al, (2014)*
 - a) Good design **insulate** stations from surrounding areas
 - *Clarke, 2006; La Vigne 2007*
3. Are features of stations and nearby environments predictive of theft?

PT Settings



Dynamic Hotspots

1. Transport Systems Move – Transient/Dynamic
 - Constant movement of passengers and staff
 - Juxtaposition of opportunity structures
 - potential targets/offenders/guardians
2. For majority (75%) of thefts
 - Victims limited knowledge: when/where occurred
 - How estimate location and time
 - Previously used end of line recording
 - Estimate using ICA (methodological challenge)

Methodological Challenges



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Crime event	Precise time		Time frame	
Static	Robbery at a bus stop	At x_1, y_1, t_1	Bus Shelter Damage	At x_1, y_1 , between t_1 and t_2
Transient / Dynamic	Assault on a train	Between x_1, y_1, t_1 and x_2, y_2, t_1	Pick-pocketing on journey	Between x_1, y_1, t_1 and x_2, y_2, t_2

Methodological Challenges

Crime event	Precise time	Time frame
Static	Point Pattern Analysis	Aoristic Analysis
Transient / Dynamic	Hot Lines	Interstitial Crime Analysis (ICA)

ICA Method



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King's
Cross
St. Pancras



Euston



Warren
Street

Oxford
Circus



Theft 1



Theft 2



Theft 3



Theft 4



Andy Gill and Henry Partridge Transport for London

King's
Cross
St. Pancras



Euston



Warren
Street

Oxford
Circus



Theft 1



Theft 2



Theft 3



Theft 4



TOTAL

		2	2
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King's Cross
St. Pancras



Euston



Warren Street

Oxford Circus

SEGMENT
S VALUE

Theft 1

0.33

0.33

0.33

3

0.33

Theft 2

0.5

0.5

2

0.5

Theft 3

0.5

0.5

2

0.5

Theft 4

1.0

1

1.0



VALUE

0.83

2.33

0.83

King's Cross
St. Pancras



Euston



Warren Street

Oxford Circus

SEGMENT VALUE

S

Theft 1



5 0.2

Interchange

Theft 2



5 0.2

Theft 3



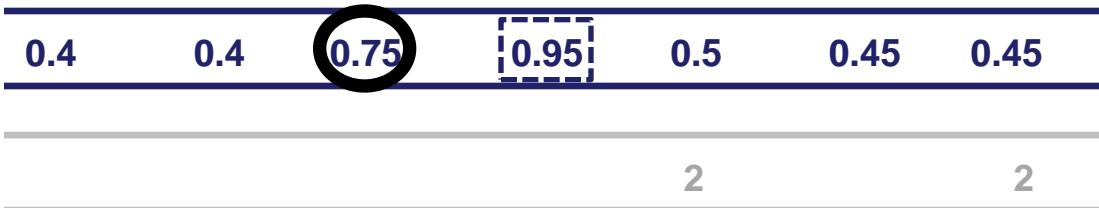
4 0.25

Theft 4



3 0.3

VALUE
End of
line
reportin
g



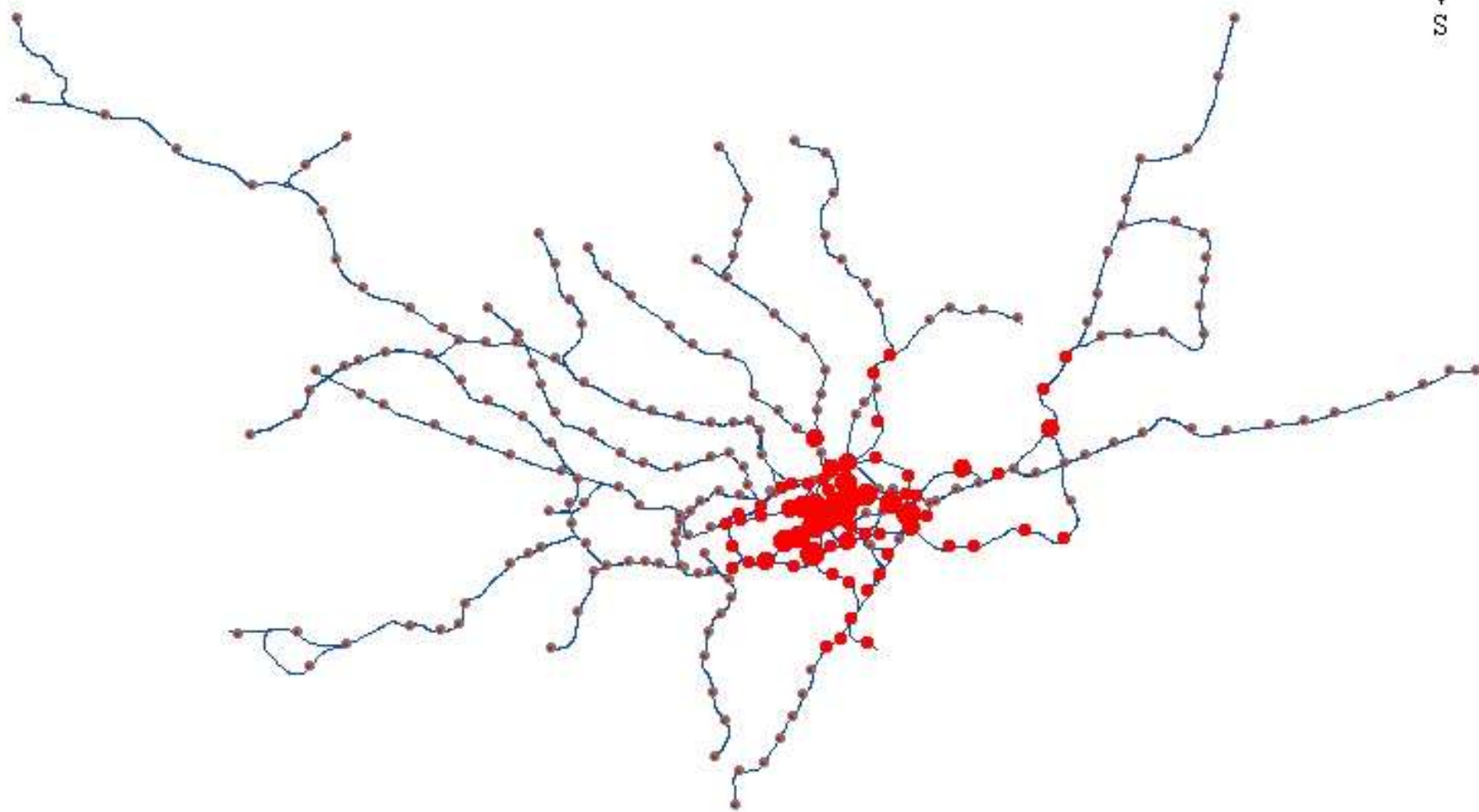
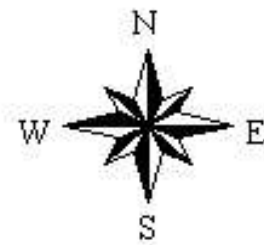
ICA: Results



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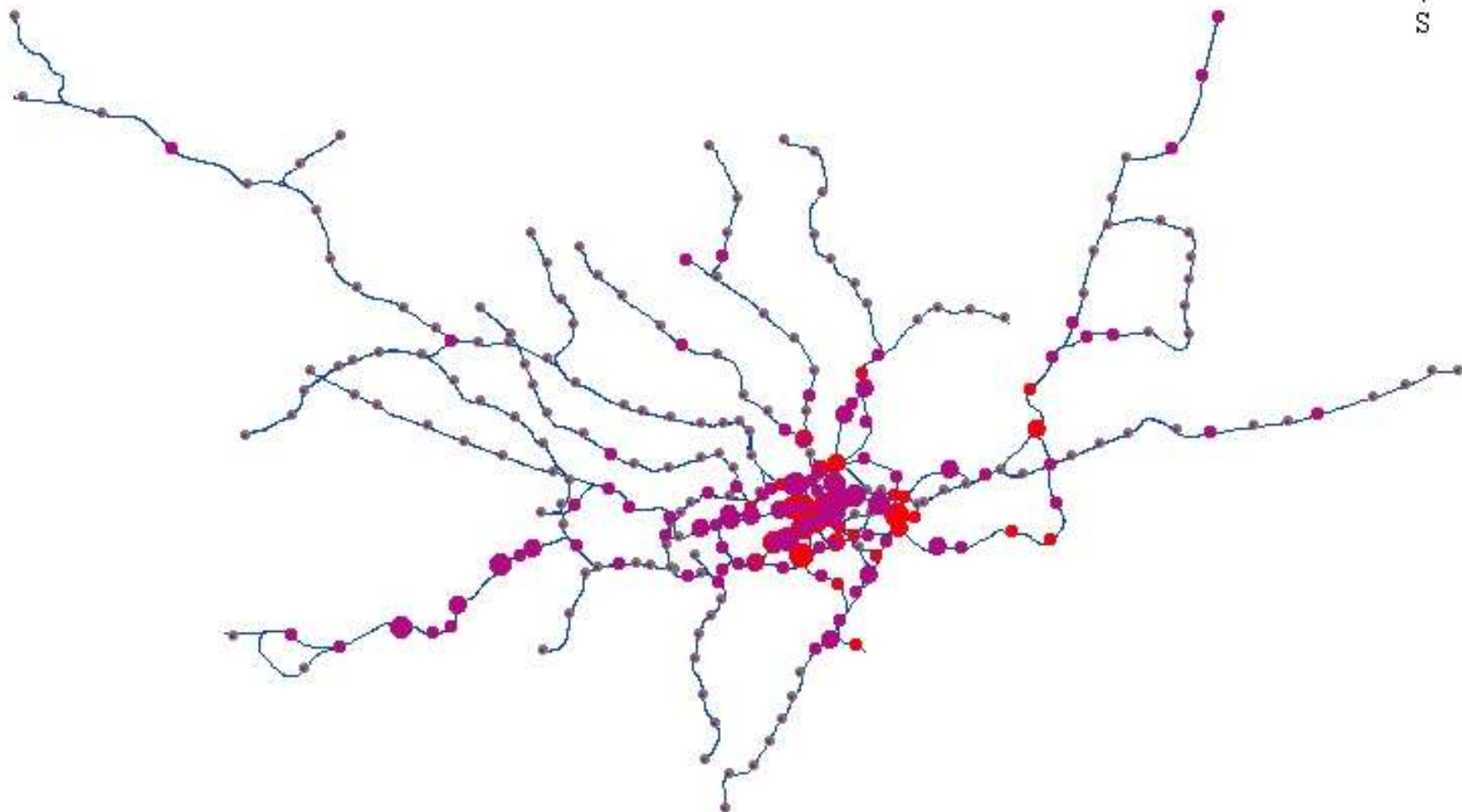
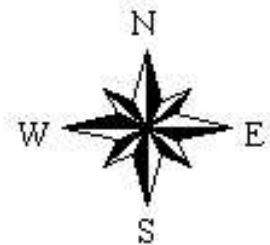


ICA scores (counts)



0 10 20 30 40 Kilometers

ICA adj* scores (rates)



Above and Below

Theft from person (per million passenger journeys)		A1: Near stations		
		Shoplifting	Other thefts	Theft from person
Below ground theft (B12)	End of Line	-0.09	*.141	0.108
	Interstitial Crime Analysis	*-.132	*.135	** .228
Theft from person (per million passenger journeys)		A2: At stations		
		Shoplifting	Theft from property	Theft from person
Below ground theft (B12)	End of Line	*-.180	0.044	.045
	Interstitial Crime Analysis	** -.277	-0.115	** .280

**Correlation is significant at the 0.01 level;

*Correlation is significant at the 0.05 level.

Time of Day

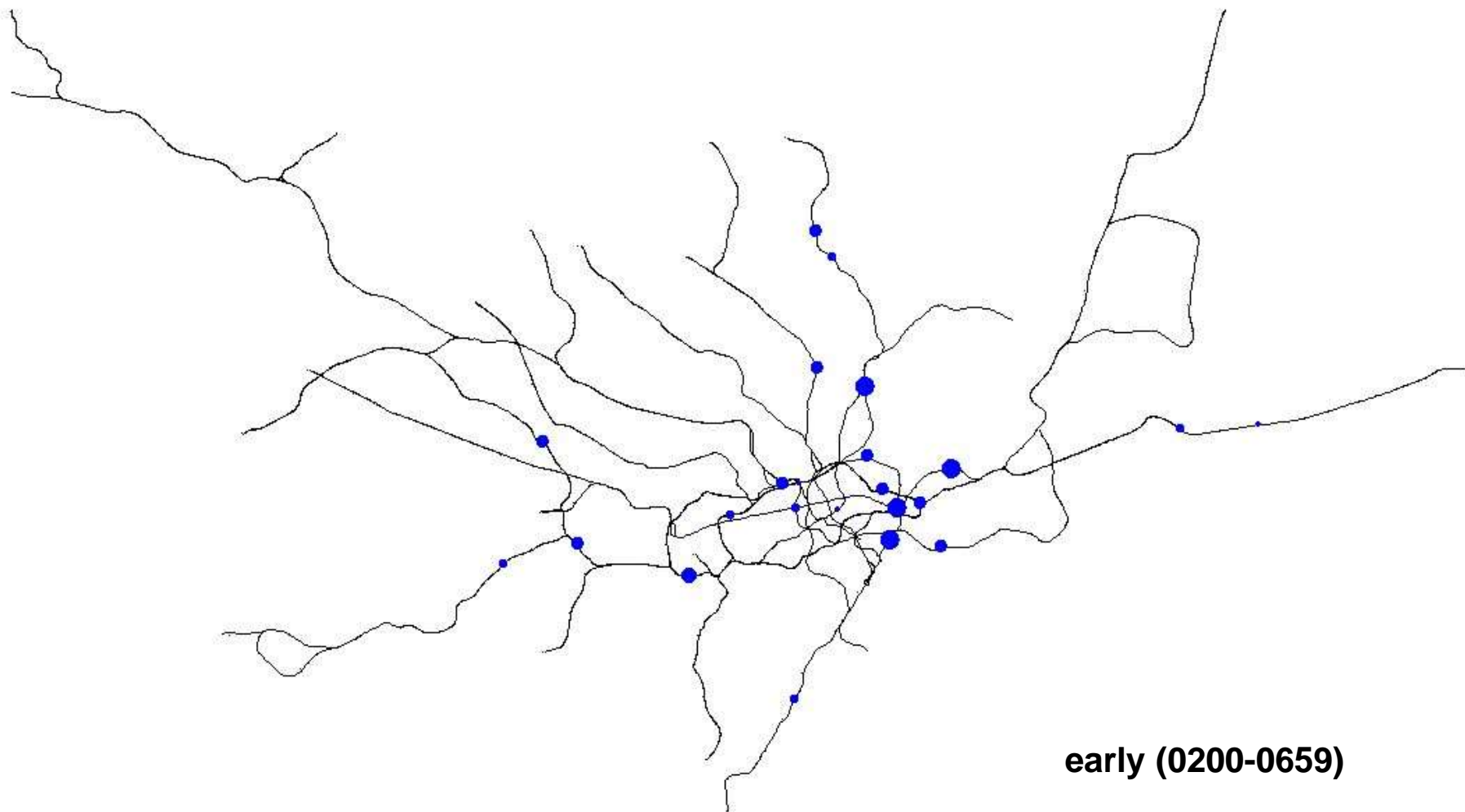


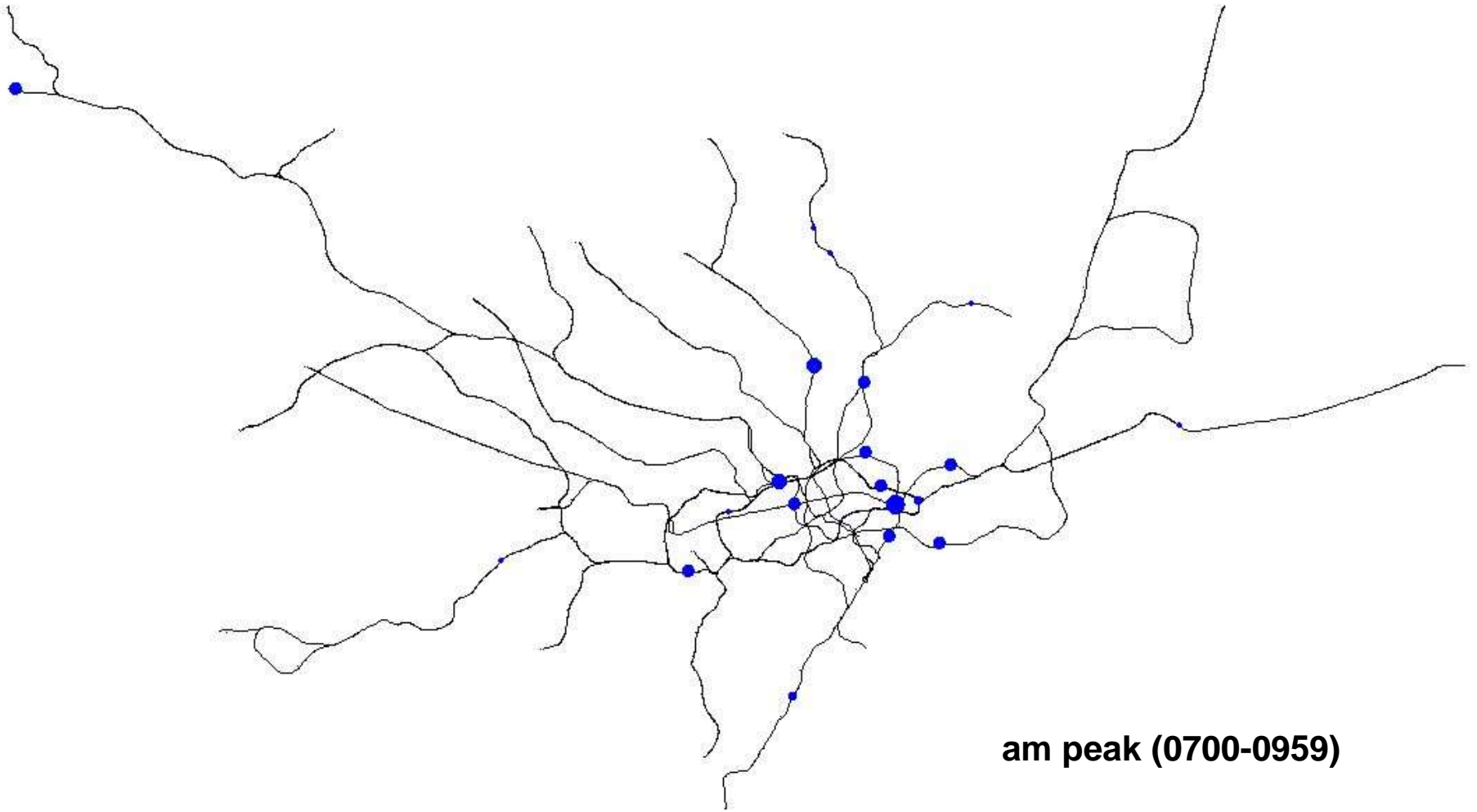
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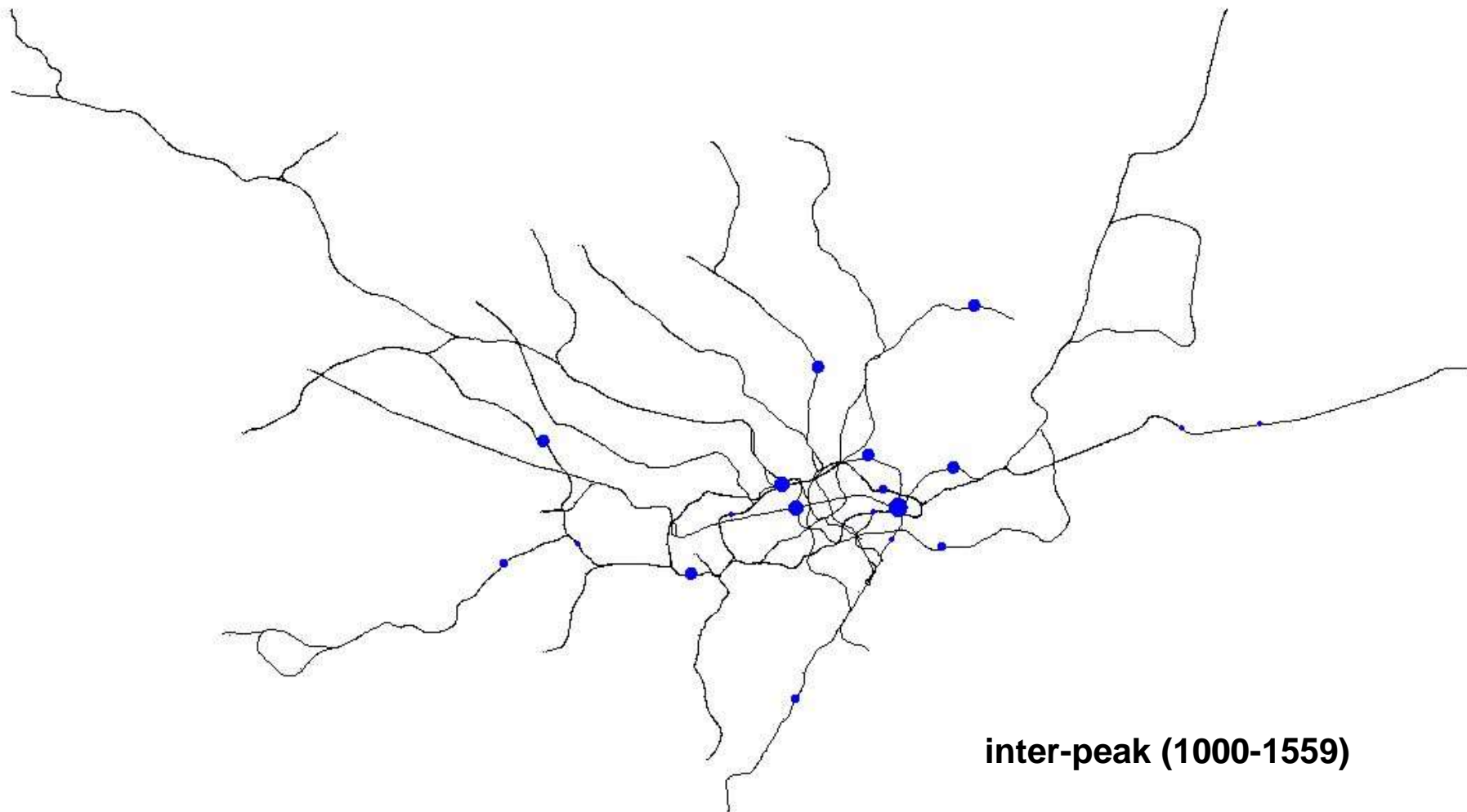




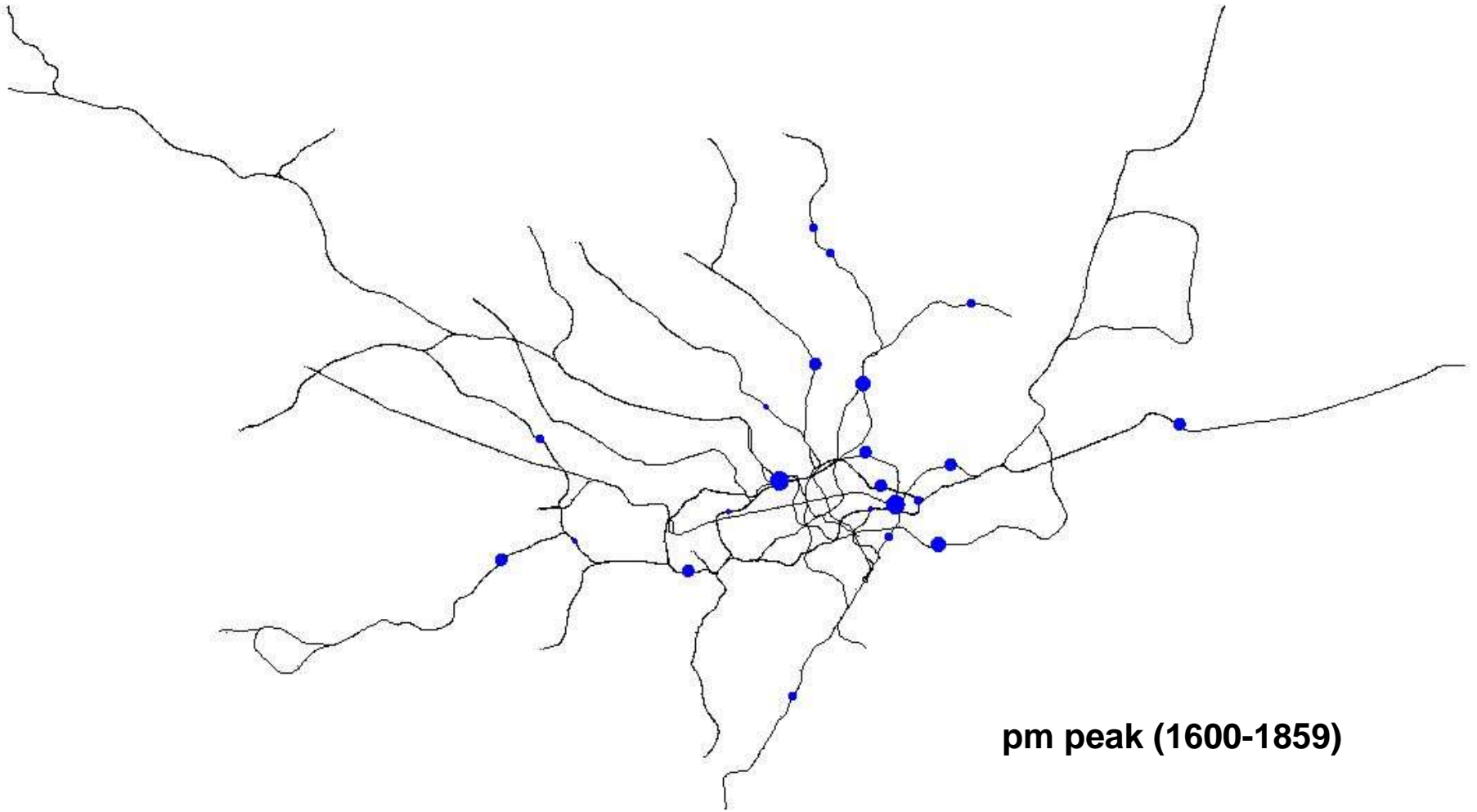
ICA adj* by time of day



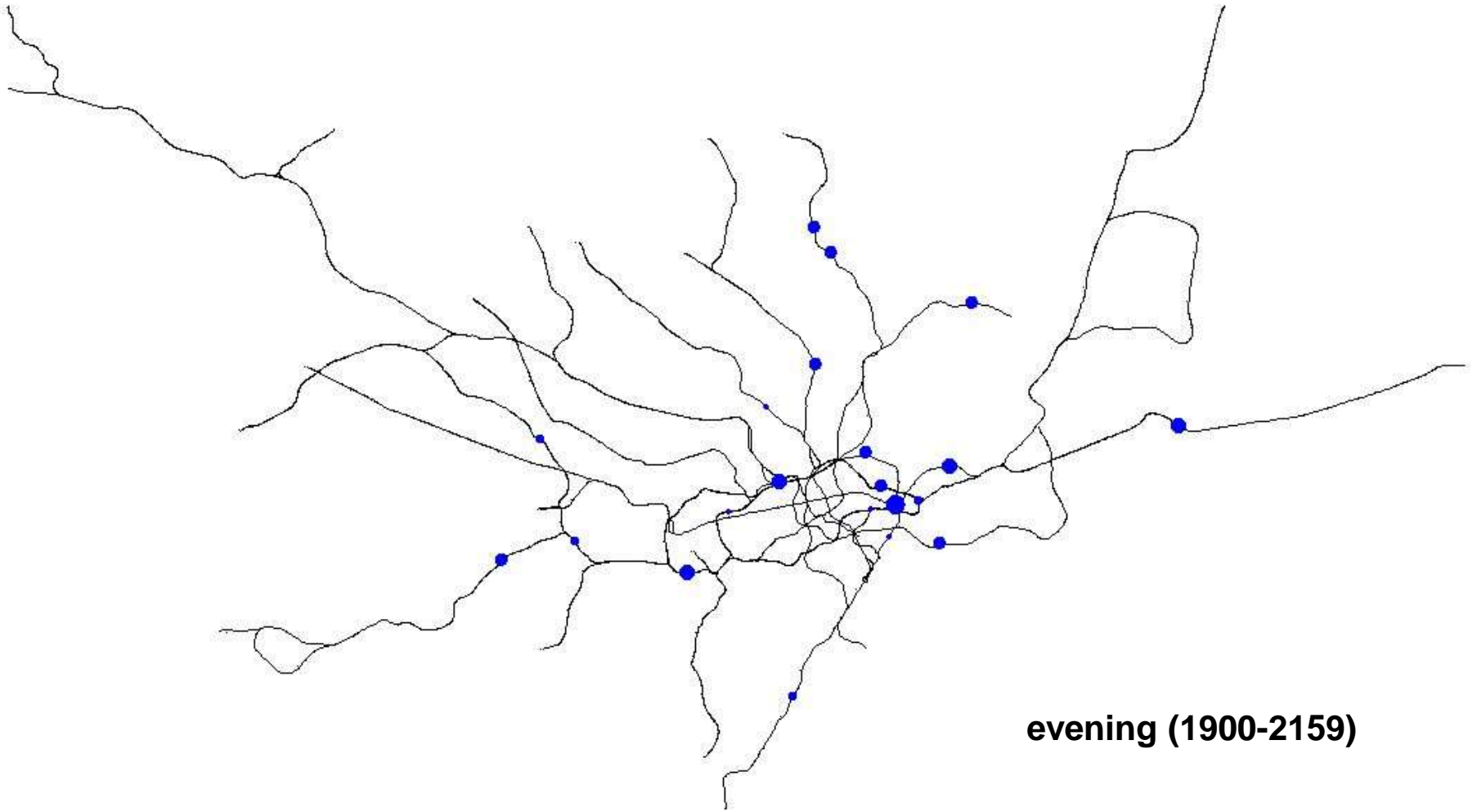




inter-peak (1000-1559)

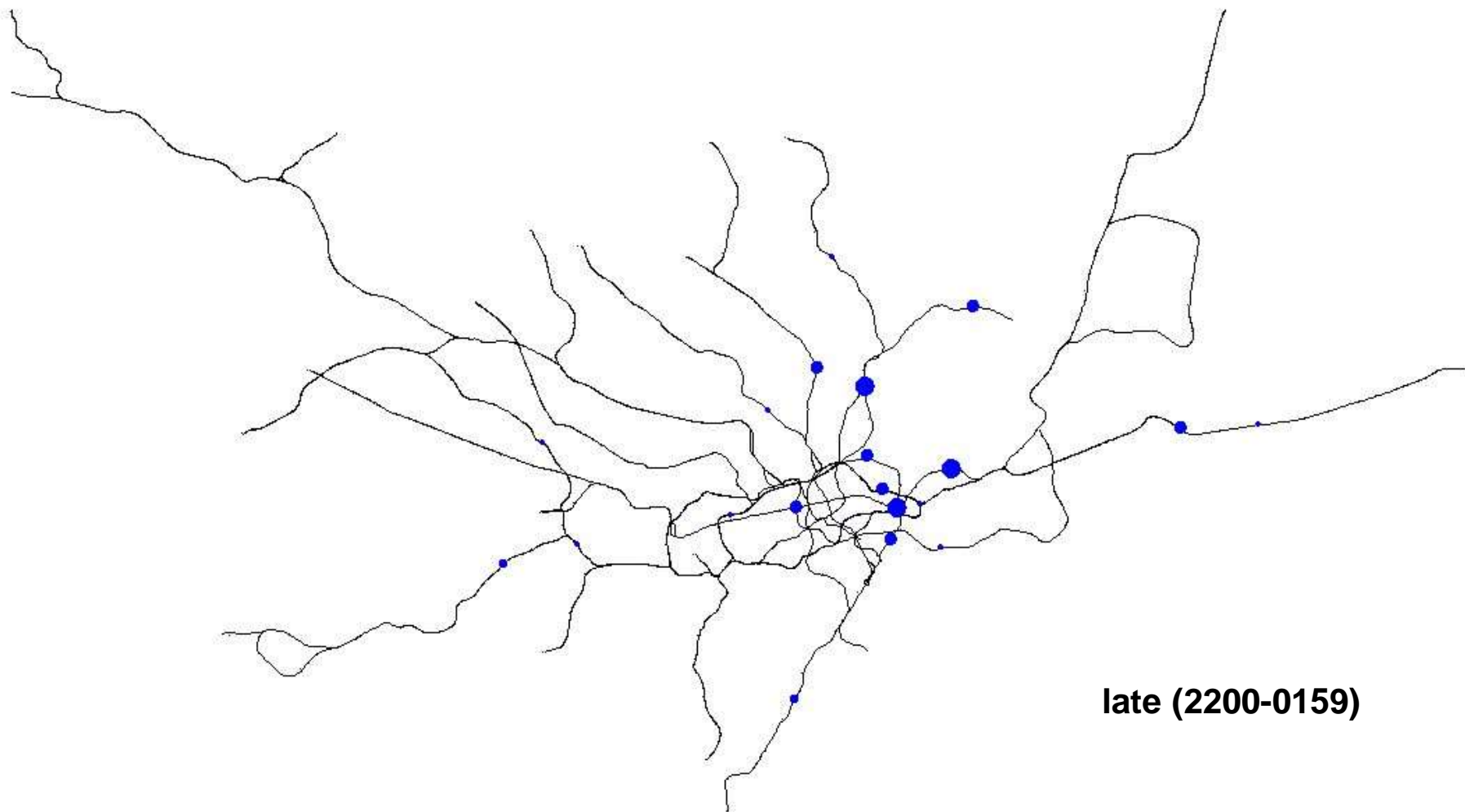


pm peak (1600-1859)



evening (1900-2159)

Theft from person by time of day



late (2200-0159)

Temporal Effect

Theft from person (per million passenger journeys per hour)		A1: Near stations		
		Shoplifting	Other thefts	Theft from person
Interstitial Crime Analysis: <i>Below ground</i> theft (B1+2)	Early (02–06:59)	0.087	** .375	** .425
	Am peak (07–09:59)	–0.05	** .173	** .169
	Inter-peak (10–15:59)	–0.083	0.025	0.105
	Pm peak (16–18:59)	*–.129	*.127	** .261
	Evening (19–21:59)	–0.06	0.084	** .190
	Late (22–01:59)	*–.132	0.012	0.026

******Correlation is significant at the 0.01 level;

*****Correlation is significant at the 0.05 level.

In and Around: Possible Predictor Variables

- Internal Design

- Age, depth
- Gates and ticket machines;
- lifts and escalators, surface and sub surface platforms,
- Amenities – cash machines; shops + kiosk rentals
- Waiting rooms
- Surface and sub-surface platforms
- Other crime 'at' station
- Staffing levels
- ***Not CCTV***

- External Characteristics

- % domestic and non domestic dwelling,
- % railways, paths, and green space,
- SES characteristics
 - population density, house prices, welfare benefits, and school truancy
- Crime rates
- Index of Multiple Deprivation

Results

Ran Series Negative Binomial Poisson Regression Models
Identified predictor variables – IN COMBINATION

Increased Risk

- encourage congestion of passengers within stations
 - lifts and waiting rooms
- increased levels of accessibility and access
 - more paths and roads nearby
- those identified as crime attractors (high theft counts and high theft rates)
- stations classified as tourist use

Reduced Risk

- decrease anonymity/ increase potential guardianship and detection
 - higher levels of staffing, personal validators, shop rentals
 - more domestic buildings nearby
- disperse passengers through station/ avoid congestion
 - more platforms
- Stations with lower theft levels in their surrounding environs
- Terminus stations

Implications

- Clear spatial and temporal patterns
 - Peak travel times for theft
- Both internal and external factors drive crime
- Transmission of risk:
 - **in** and **around**
- Evidence of spatial interplay/transmission of risk
- Predictor variables: inside station and external environs

Interpretations

- Hypothesis: Theft on Underground
 - **uni-nodal** offenders – operate at only one station
 - **multi-nodal** offenders – operate between stations
 - **system causes** of theft – busy stations – generate/attract thefts
- Q: Same offenders above or below?
- Q: Or use system to identify opportunities – *theft scripts*?

Next Steps

- Further refinement and development of ICA model
- More detailed examination of predictor variables
- How is currently used by officers (available within BTP performance portal)
- Hot spot policing
 - Effectiveness of Uniform Vs Dip Squad (plain clothed)
- MO and Property Stolen
- Relationship with Other Crime Types

REFERENCES

In and Around

- Newton, A., Partridge, H. and Gill, A. (2014) '[In and around: Identifying predictors of theft within and near to major mass underground transit systems](#)' *Security Journal* , 27 (2), pp. 132-146. ISSN 0955-1662

Above and Below

- Newton, A., Partridge, H. and Gill, A. (2014) '[Above and below: measuring crime risk in and around underground mass transit systems](#)' *Crime Science* , 3 (1), pp. 1-14. ISSN 2193-7680

Crime and Public Transport

- Newton, A (2014) '[Crime on Public Transport](#)'. In: *Encyclopedia of Criminology and Criminal Justice*. London: Springer. pp. 709-720. ISBN 978-1-4614-5689-6