In and Around:

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In and Around: Examining Attractors and Generators of Theft on the London Underground

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Glossary/Scope

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- '**Theft**' of personal property
  - *pick-pocketing/pocket-picking*
  - *NOT robbery /violent offences*
- Public Transport (PT)
  - Mass/Rapid Transit Systems
- Case Study - London Underground (LU)
- Methodology - Interstitial Crime Analysis (ICA)
- Crime Attractors and Generators (Brantingham(s))
  - NOT attractors/generators of passengers (transport planners)
- Data
  - British Transport Police (BTP)
  - London Metropolitan Police Service (MPS)

Aims

- **Aim**: Examine **theft** on **underground** transport systems

- Q1: Is there a transmission of risk between **‘above’** and ‘**below’** ground settings?
- Q2: What factors ‘**in’** and **‘around’** stations may act as crime attractors or crime generators?

- To test this: **Interstitial Crime Analysis** (ICA)

Mechanisms for Theft on PT

- **bring together mix of persons**: different backgrounds/demographics (Brantingham, 1991)
- users **constantly interchange** (Richards and Hoel, 1980);
- passengers **unfamiliar** with areas and susceptible to victimisation (Block and Block, 2000; Piza, 2003)
- passengers **easy targets**, eg tired, carrying accessible items, pre-occupied, or distracted travelling with young children (Mhyre and Rosso, 1996)

Mechanisms for Theft on PT

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- stations provide **easy and rapid entry and exit** points for offenders (Block and Block, 2000; Loukaitou-Sideris et al, 2002)
- offenders **linger** at stations for long time periods **without** arising **suspicion** (Block and Davis, 1996; Piza, 2003)
- **Crowded conditions** offer **anonymity** to offenders (Loukaitou-Sideris et al, 2002)
- certain degree of **jostling** or bumping might even be **expected** (Herrmann, 2012)

Transmission of ‘theft’ risk?

- ***Transit environs***
  - Is there transmission of risk?

1. Crime at transport nodes **related** to surrounding areas
   - *Block and Block (2000); Loukatiou-Sideris, 2002 ;Bernasco and Block 2009; Cecatto (2011)*
2. Good design **insulate** stations from surrounding areas
   - *Clarke, 2006; La Vigne 2007*

- **Spatial Interplay** (Robinson and Giordani 2011)
- **Radiators** and **Absorbers** *(Bowers 2013)*

Context: Theft on LU

- **5,063** thefts on LU (financial year 2011/2012)
  - 4 thefts per million passenger journeys
    - **50%** all crime on LU versus **27%** all rail crimes in Eng and Wales
    - **40%** all theft person on UK rail: = on LU
- Research Literature
  - (i) '***risky-facilities'*** *(80/20 rule)* and (ii)'***peak times***'
- BUT Problems with estimating **LOCATION** and **TIME**?
  - Limited victim knowledge about when/where offence occurred
  - end of line recording (75% LU thefts)
  - based on "*known station*" thefts (less than 25% thefts)
- How examine theft on journeys? **ICA**

Public Transport and Crime Events: The crime analysis matrix

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

Newton et al, in press:

Why Interstitial?

- *Interstitial* Spaces
  - Chicago School (alternative name for Zone of Transition)
  - Felson – Crime and Nature
    - Interstitial spaces (gap between, no real ownership)
- Ratcliffe – *Aoristic Crime Analysis*
  - Burglary – "temporal uncertainty"
- ICA - spatial and temporal uncertainty
  - Interstice- "*is an empty space or gap between spaces full of structure or matter*"

ICA: How does it work?

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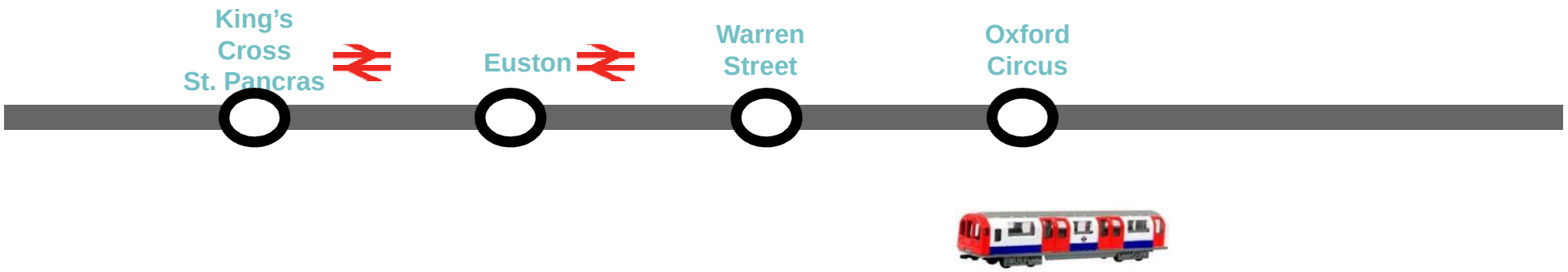
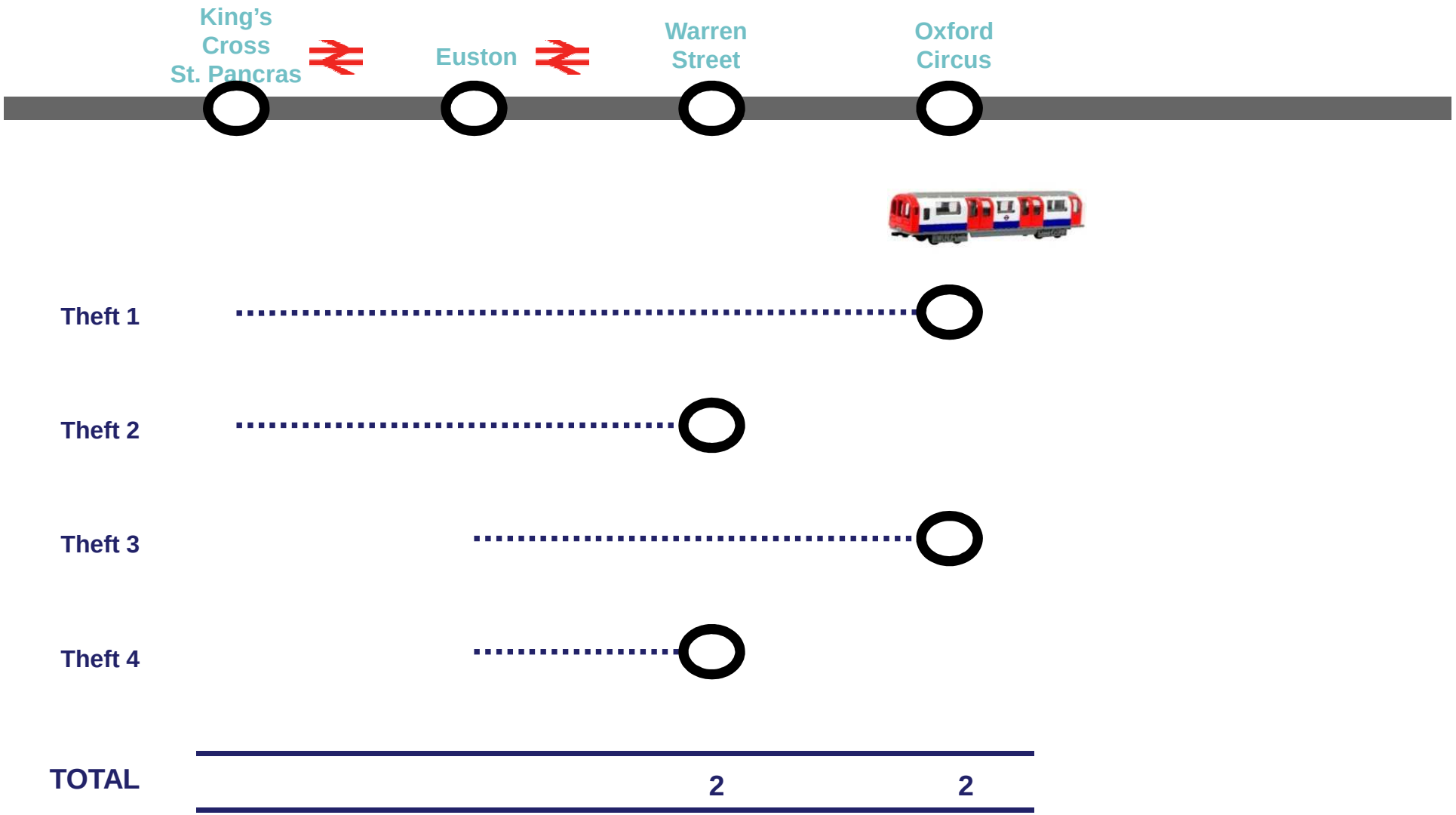


Andy Gill and Henry Partridge Transport for London



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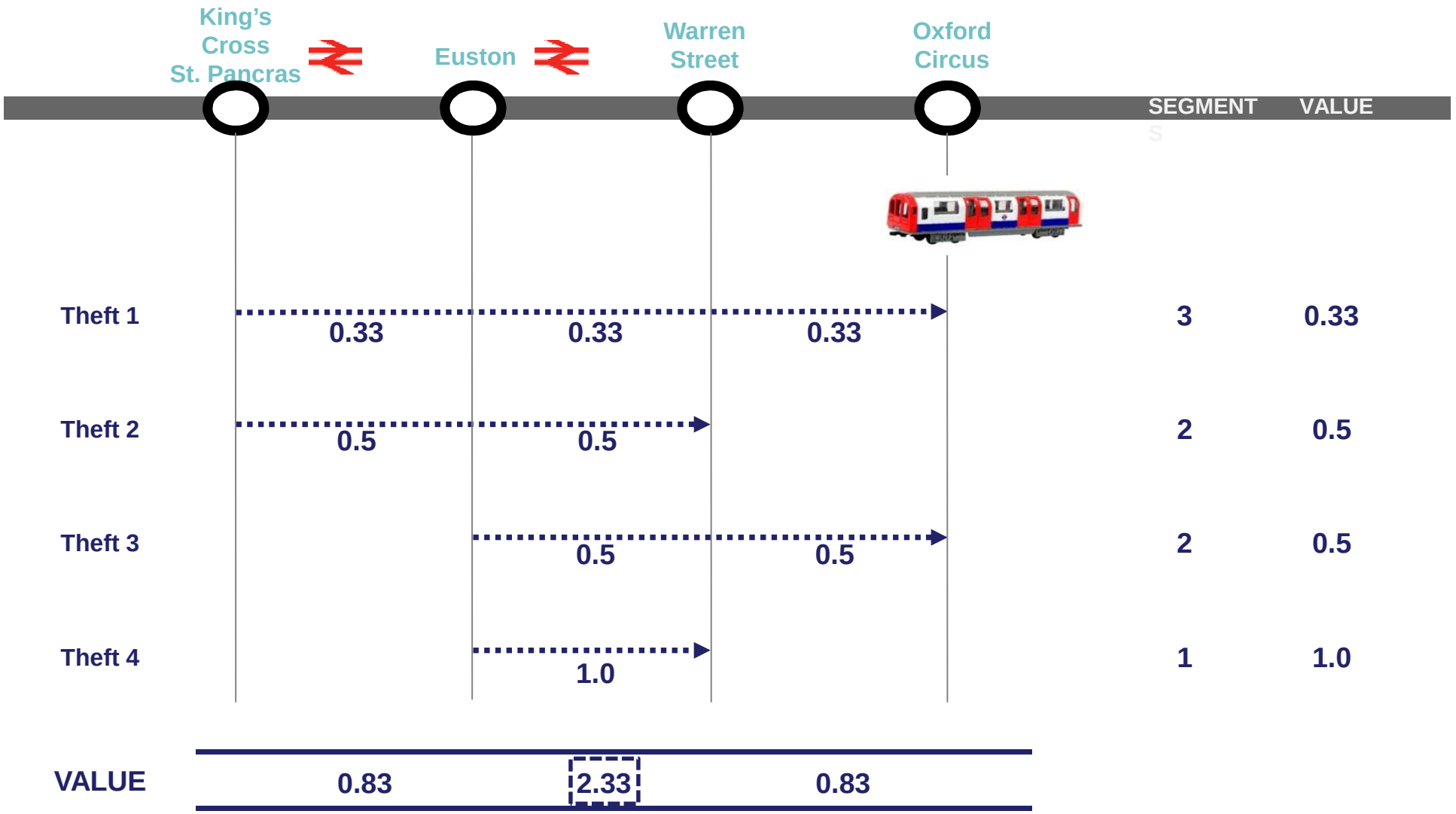

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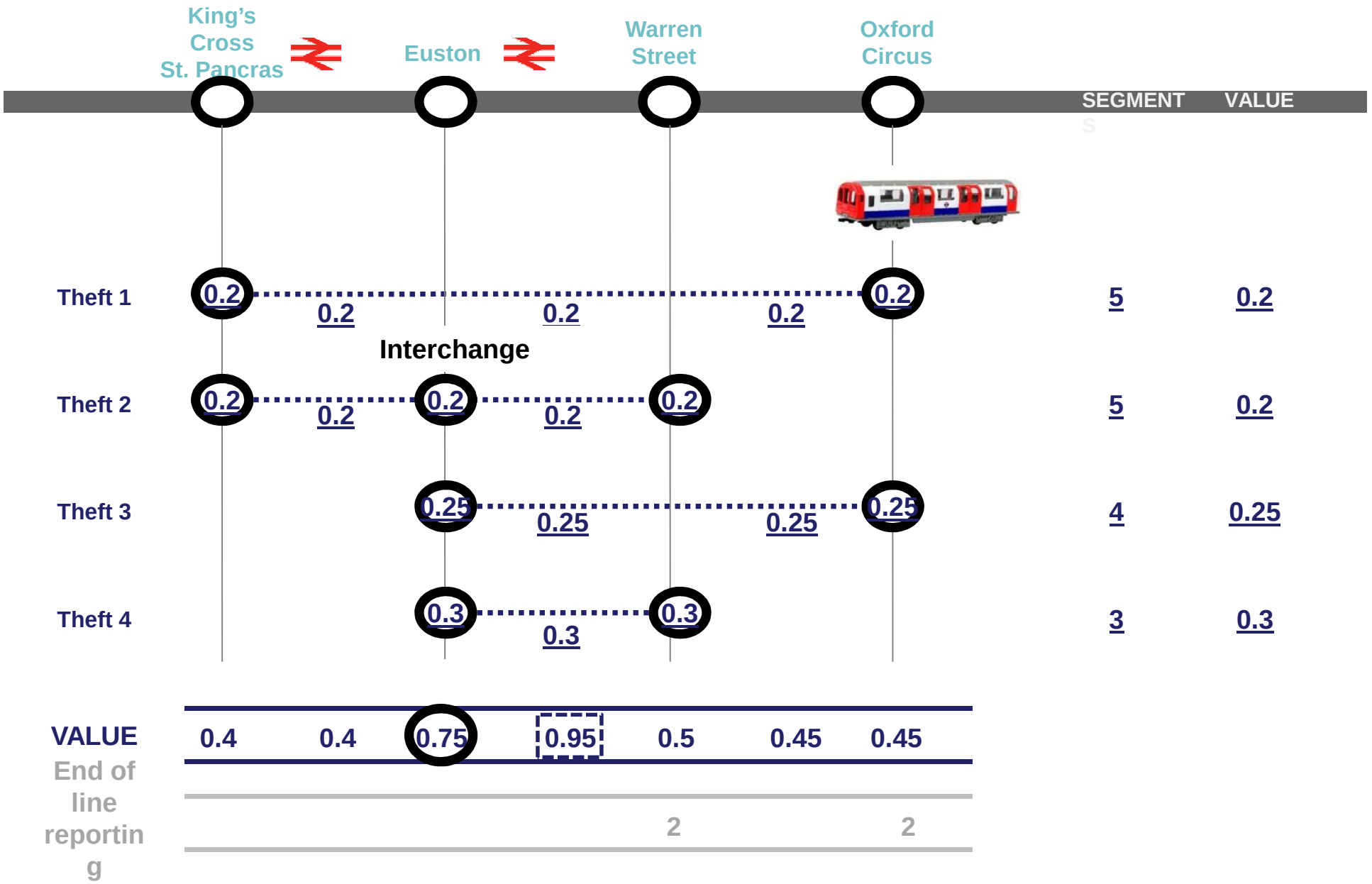
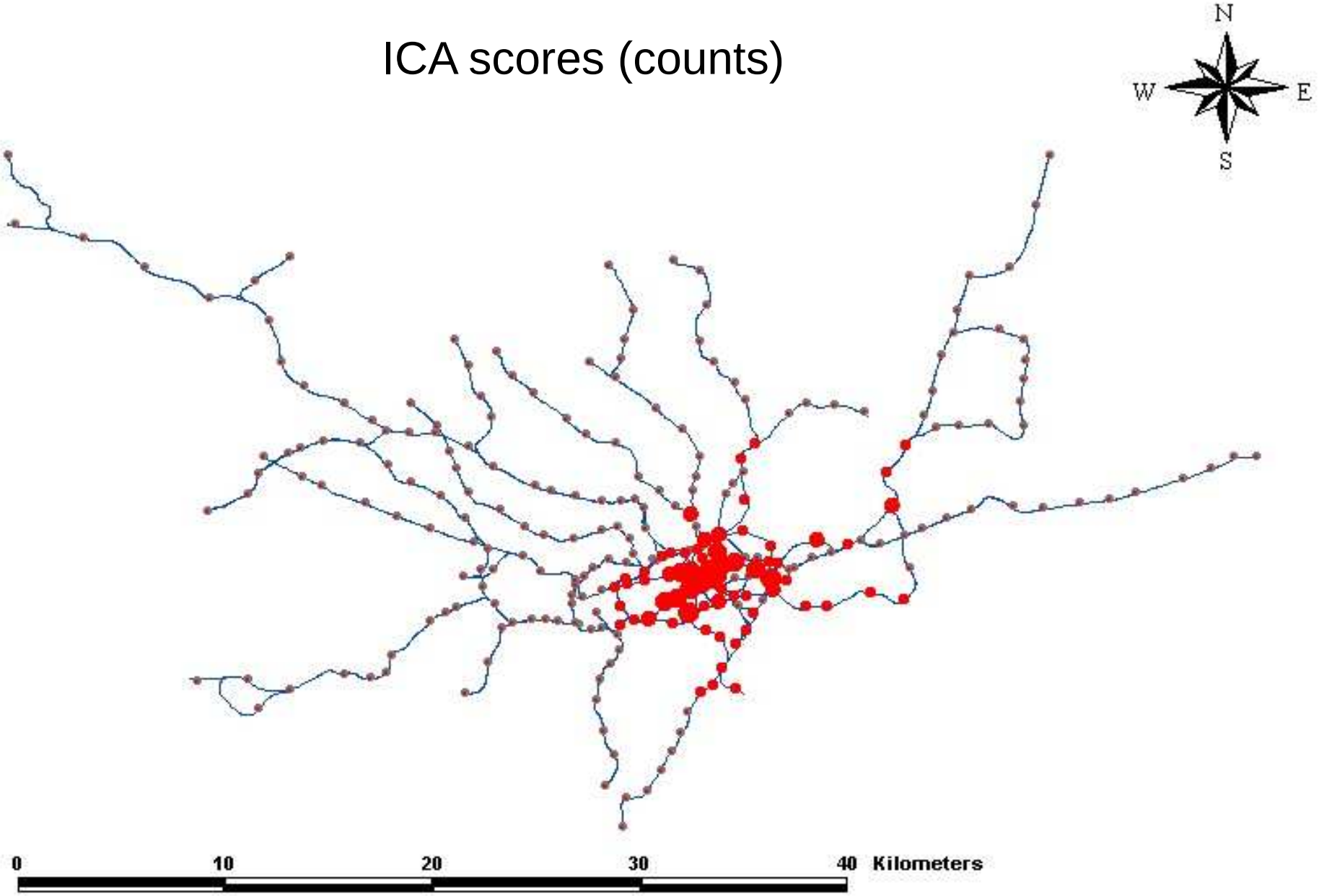
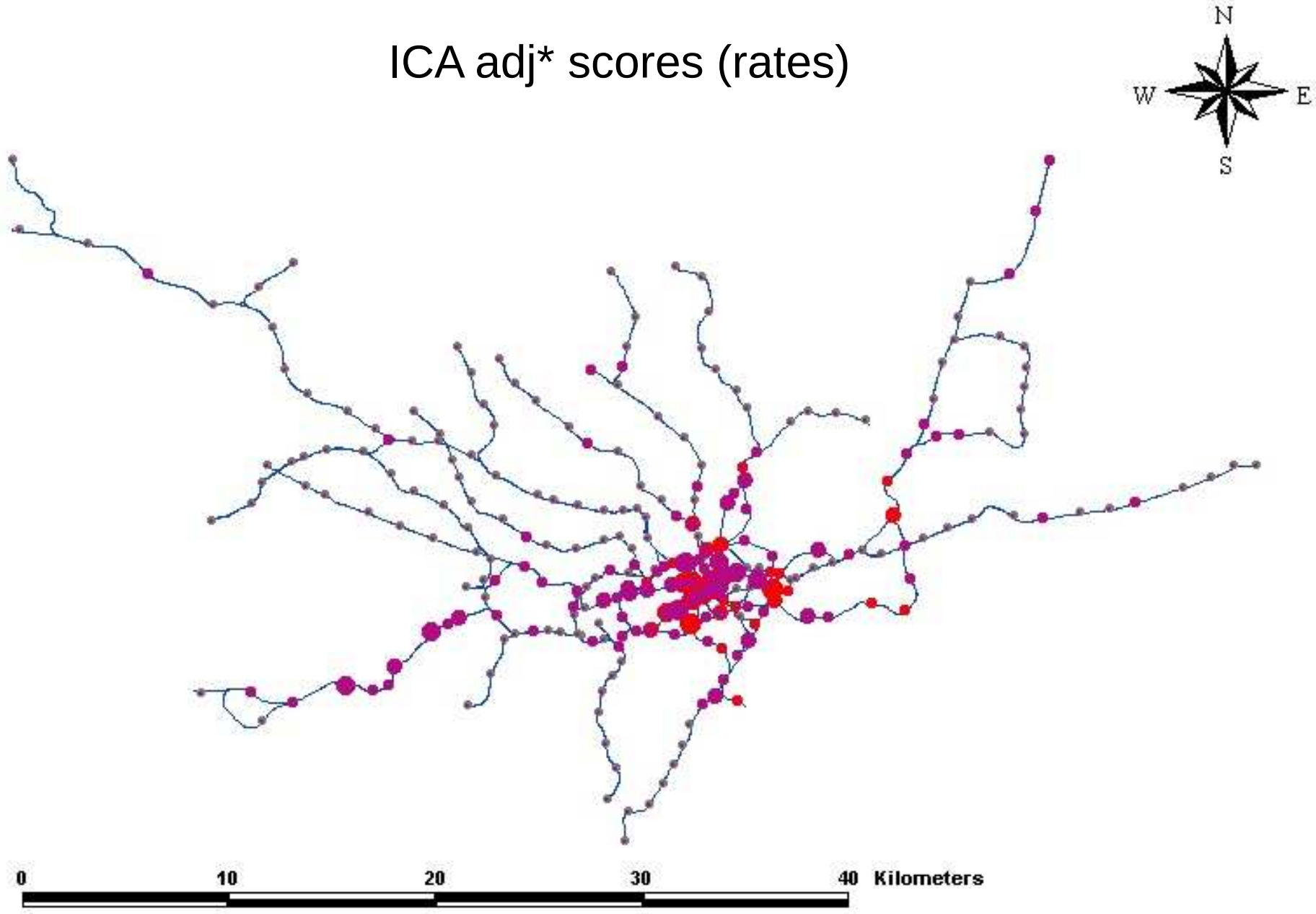

King's Cross St. Pancras
Euston
Warren Street
Oxford Circus
SEGMENTS
VALUE
Theft 1
0.2
0.2
0.2
0.2
0.2
5
0.2
Interchange
Theft 2
0.2
0.2
0.2
0.2
0.2
5
0.2
Theft 3
0.25
0.25
0.25
0.25
4
0.25
Theft 4
0.3
0.3
0.3
3
0.3
VALUE
0.4
0.4
0.75
0.95
0.5
0.45
0.45
End of line reporting
2
2

ICA: Results

ICA scores (counts)



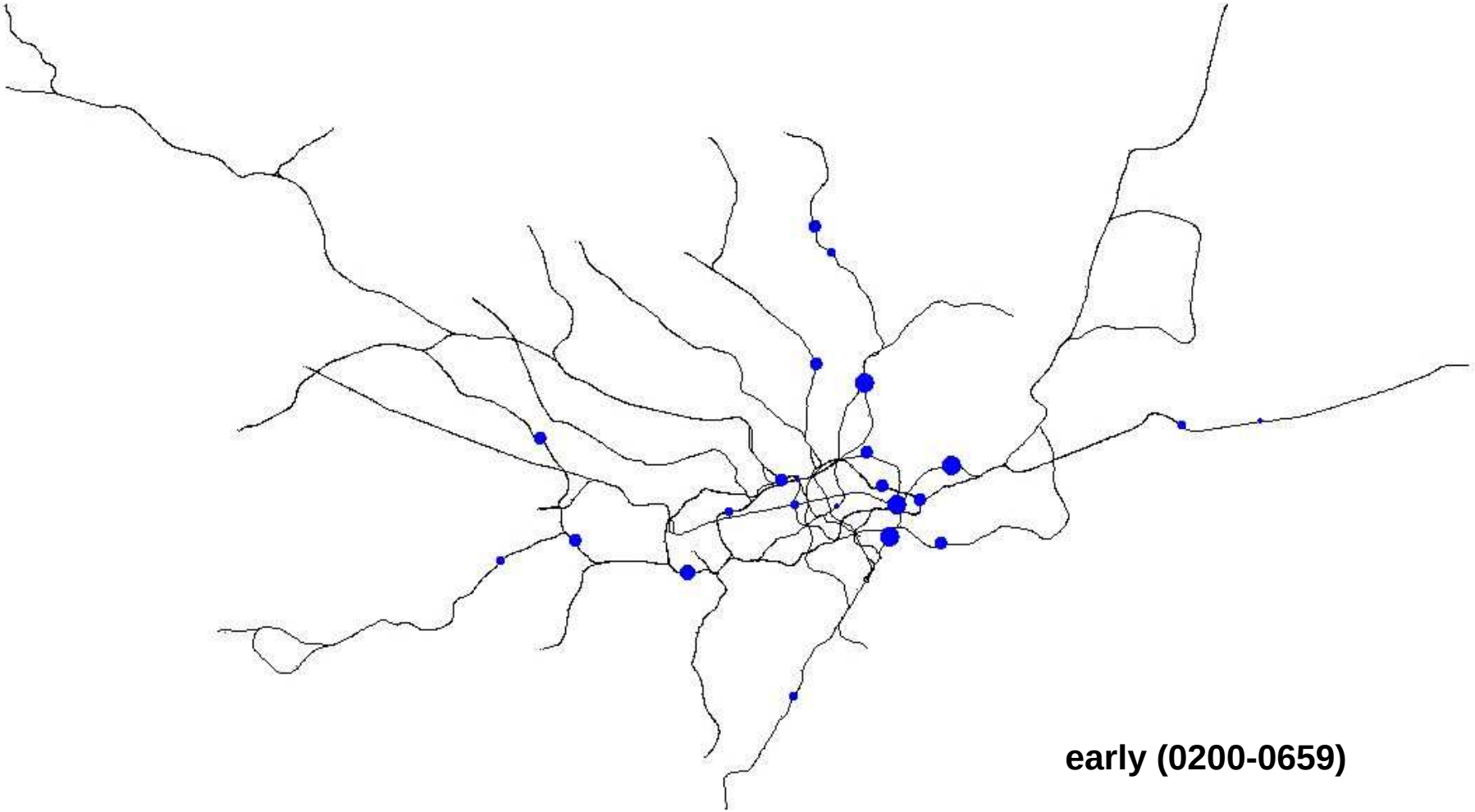
ICA adj* scores (rates)



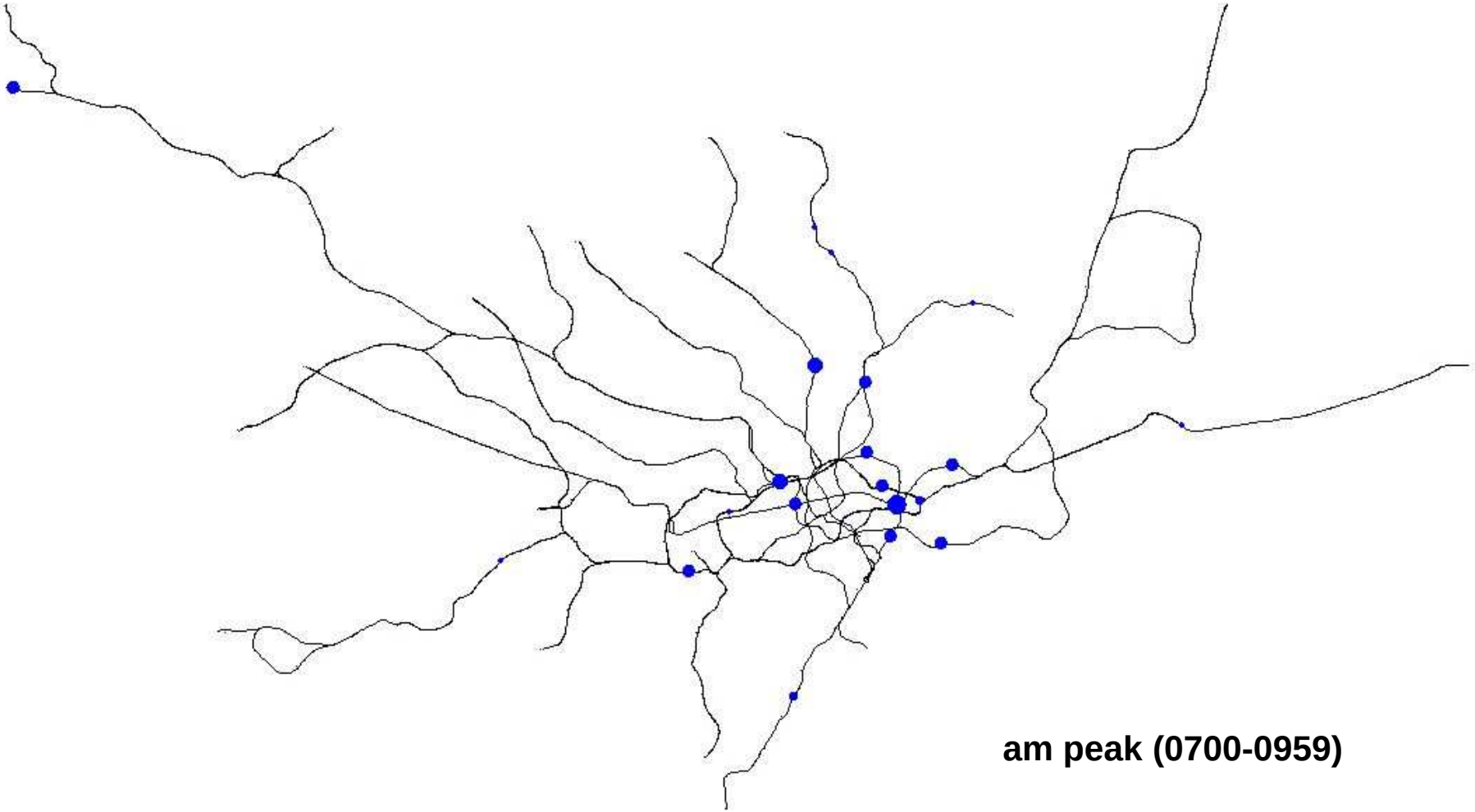
Time of Day and ICA

- Transient System; Dynamic; Time of Day Important
- Previous work – **theft higher at peak times**
- 6 time periods: Standardised rates
  - per hour of time category
  - and passenger counts (hourly available)
- Early (02.00-06:59)
- Inter-peak (10.00-15:59)
- Evening (19.00-21:59)
- AM peak (07.00-09:59)
- PM peak (16.00-18:59)
- Late (22.00-01:59)

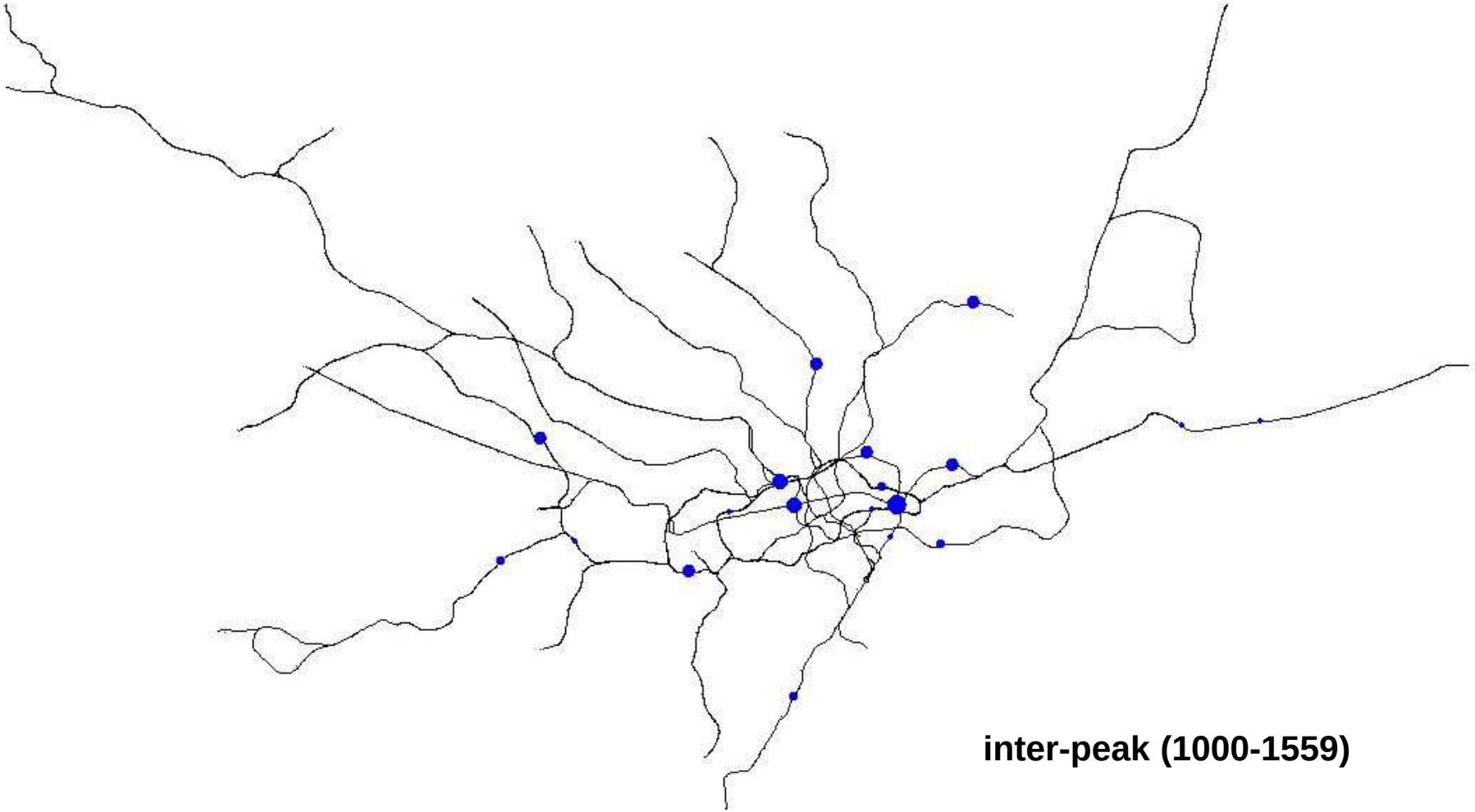
ICA adj* by time of day



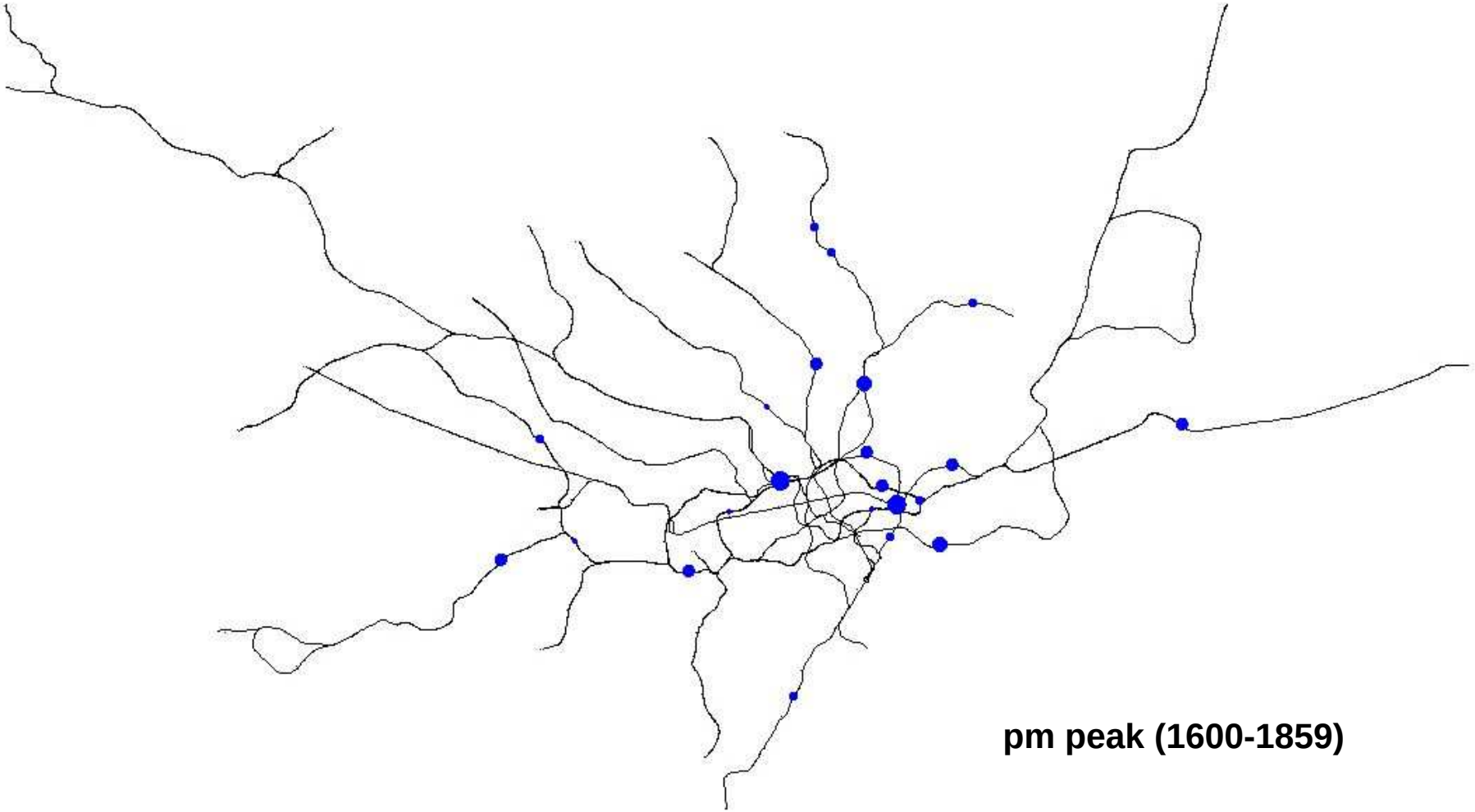
early (0200-0659)



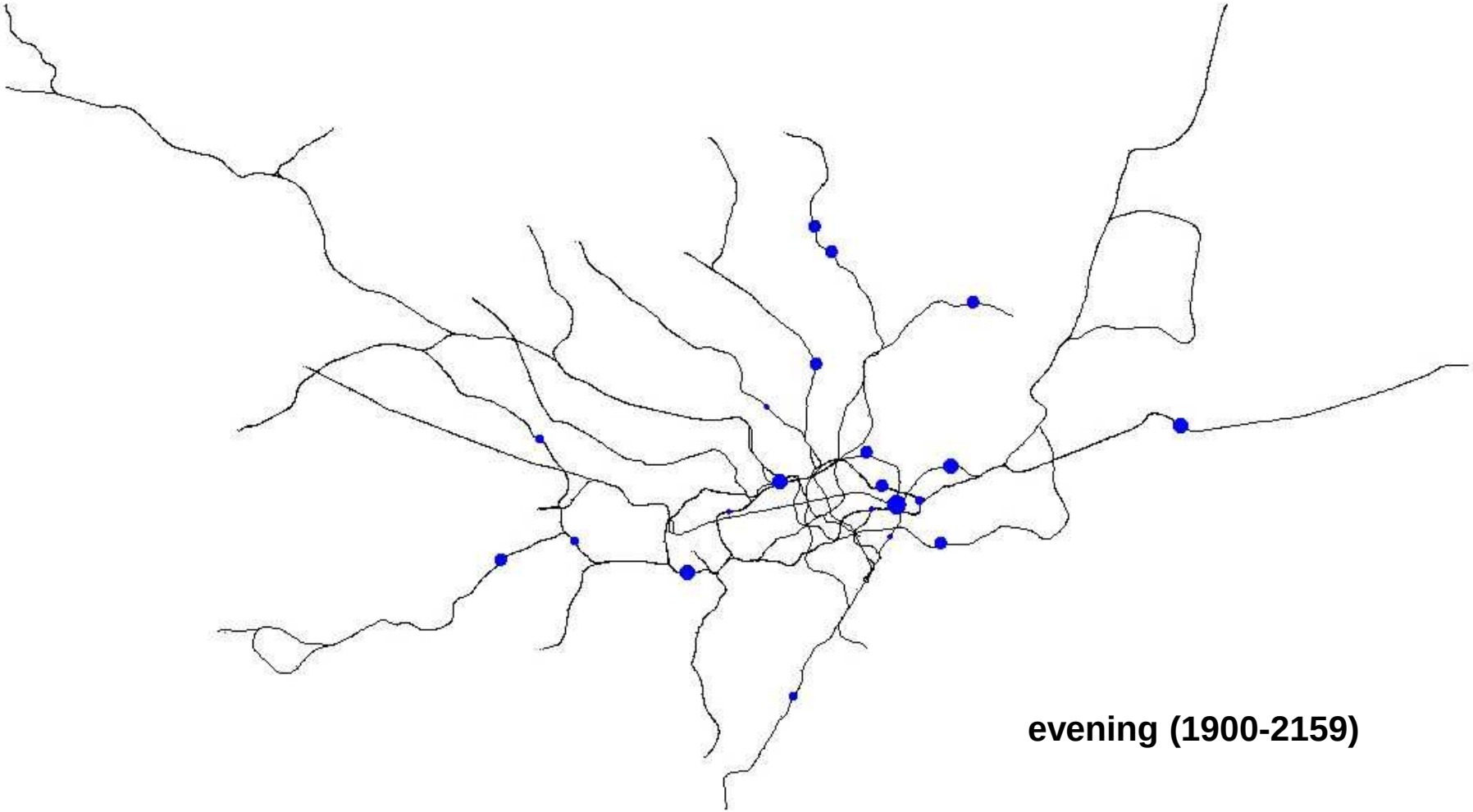
am peak (0700-0959)



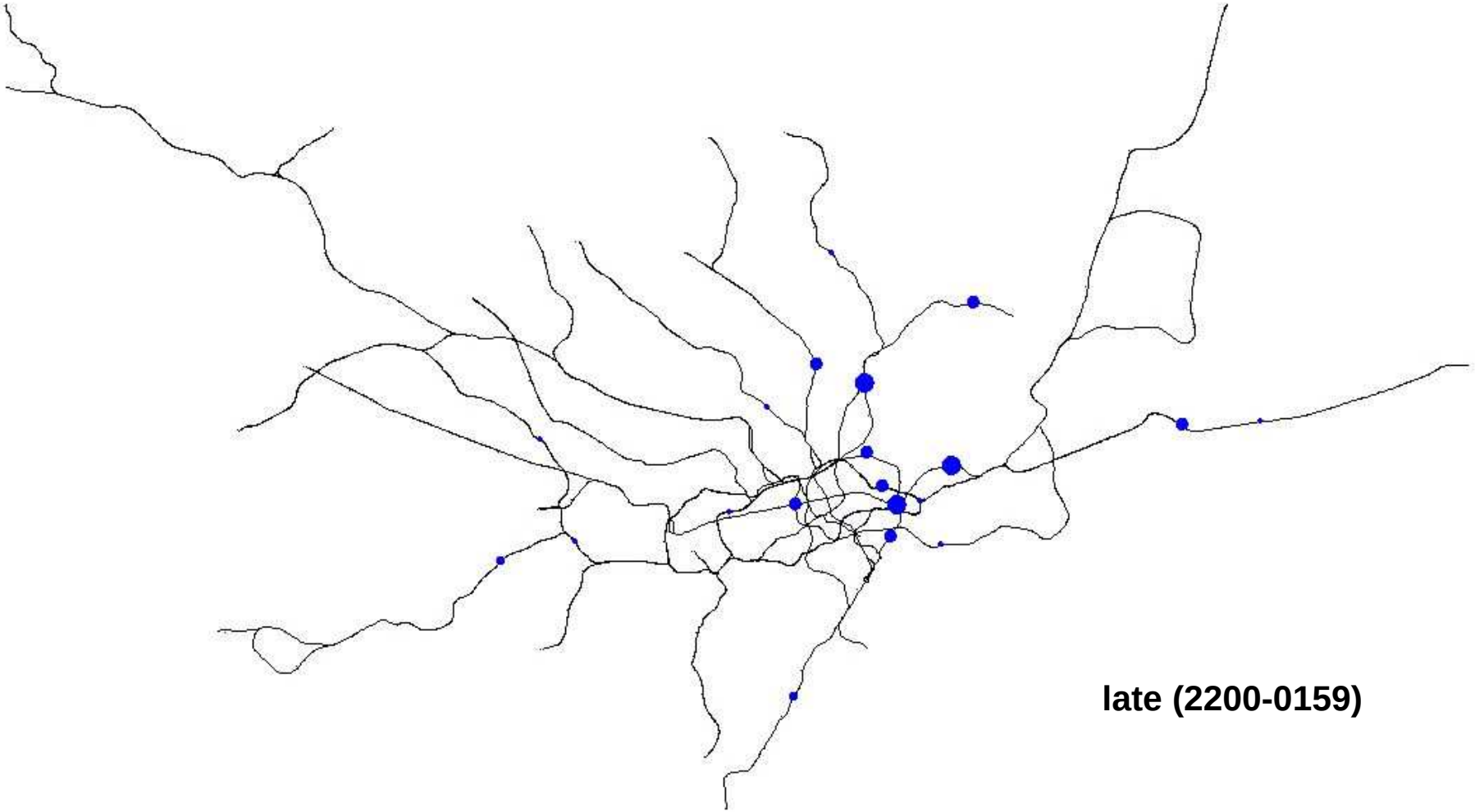
inter-peak (1000-1559)



pm peak (1600-1859)

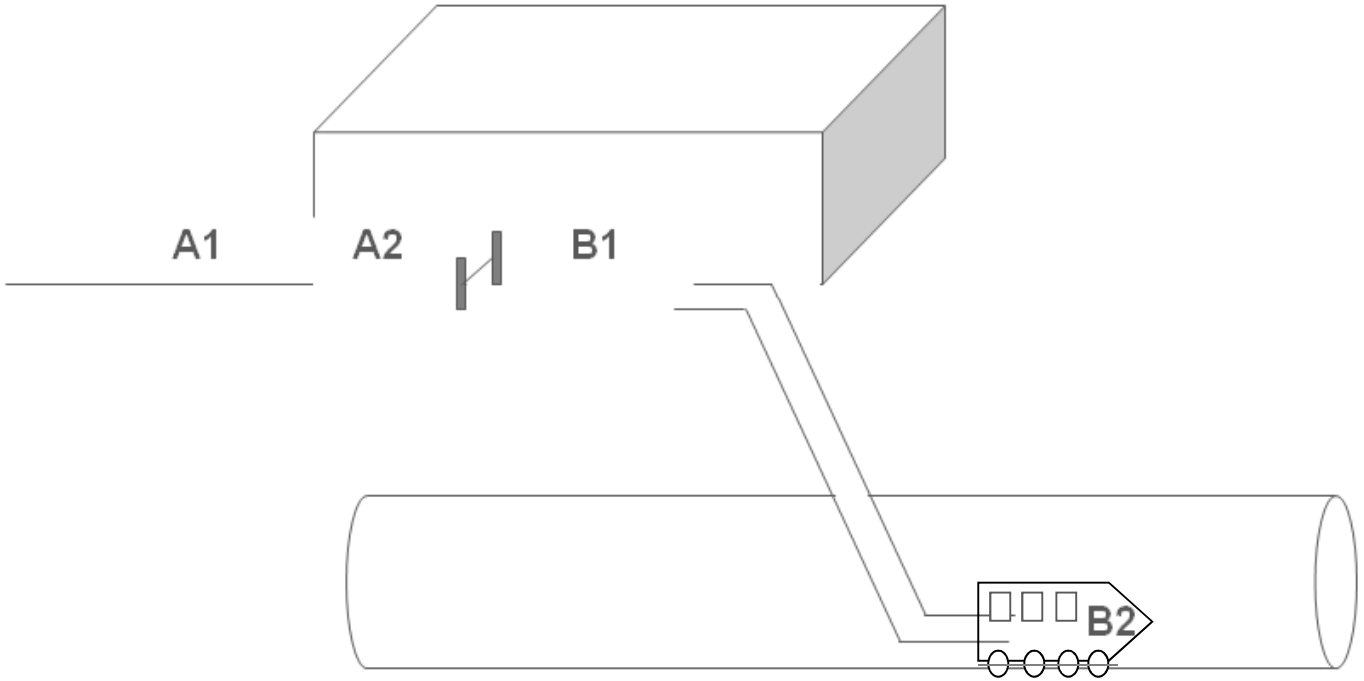


evening (1900-2159)



late (2200-0159)

Public Transport Settings



ICA: Above and Below

- A1 :Theft MPS (above)
- A2 : British Transport Police (BTP) (above)
- B1 and B2: ICA adj* (below) – BTP (below)
- Tested relationship between above and below
  - Compare 4 models
  - End of Line and ICA models (counts and rates)
- ICA adj* model most appropriate
- +ve **correlations** theft at and above, not other crime
- **strongest** at peak time, little or no correlation off peak

Newton et al, in press:

In and Around:
Attractors and Generators

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- Q2**: In and Around** – What factors influence theft
- Settings: A1, A2, B1, B2
- Internal features?
- External characteristics?
  - Cecatto (2011), Bernasco and Block (2009)

In and Around: Attractors and Generators?

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- Internal Design

- No gates and ticket machines;
- lifts and escalators, surface and sub surface platforms,
- Amenities – cash machines; shop + kiosk rentals
- Waiting rooms
- Surface and sub-surface platforms
- Theft<250m or ‘at’ station

- **Not** CCTV/Staffing* - to add

- External Characteristics

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

In and Around: Attractors and Generators

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- Negative Binomial Regression
  - Model 1* –internal only
  - Model 2* –external only
  - Model 3* - internal and external predictors
  - 44 variables reduced to 25* (first round *simulation)*
- Based on ICA
  - Offset variable – population (passenger per million)

- * preliminary findings as previous model OLS regression

	Model 1	Model 2	Model 3
Above ground theft (<250m)	XX		XX
At station theft (above)	X		XX
Above ground shoplifting (<250m)	X		
At station shoplifting (above)	X		
Number waiting rooms	X		XX
Number surface platforms	XX		XX
Number subsurface platforms	X		XX
Number ticket machines	XX		
Number Cash Machines			XX
% domestic buildings		XX	XX
% roads		XX	XX
% paths		XX	XX
Index Multiple Deprivation		X	
% unauthorized school abs			XX

** 99%

* 95%

red-negative

blue-positive

In and Around: Attractors and Generators

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- Predictor variables
- Mix of internal and external
  - Accessibility
    - external -% of roads/paths versus Internal -number platforms
  - Nearby crime
    - internal <250m versus external -ward level no impact – removed
  - Features/Land Use/Design
    - internal waiting rooms versus internal cash points
    - external % domestic buildings and external % truancy

Implications

- Appears to be factors both internal and external drive crime
- Transmission of risk:
  - **above** and **below**
  - **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*?
- Q: Station attractor/generator
- Q: Nearby land use attractor/generator

Limitations

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- Influence of spatial lag?
- Time of day: Peak v Non Peak
  - Weekend v Weekday
  - Schools v School Holidays
- Can we identify sub types of station Clarke and Eck (2003)
  - Difference in top 20 ICA and ICA adj*
  - Crime **generators**: having **high count** of crime but a **low rate** per population
  - Crime **attractors** as experiencing a **high volume** and **high rate** of crime

Next Steps:
Attractors and Generators

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- Devised 6 typology of stations
- **Type I:** High risk of theft: counts only: All times (**generator**?)
- **Type II:** High risk of theft: rates only: All times
- **Type III:** High risk of theft: counts and rates: All times (**attractor**?)
- **Type IV:** Intermittent high risk of theft: some times
- **Type V:** Intermittent medium risk of theft: some times
- **Type VI:** Low risk: all times (control)

- Next step – run model against these? Any differences?