Comparative Analysis of Urban Areas through Mobile Phone Data signatures: a Case Study in the Amsterdam Metropolitan Region

Filippo Dal Fiore
Euro Beinat
Piet Rietveld
Bartosz Hawelka

Research framework

- Mobile phone activities as still novel opportunity to describe human spatial behavior on collective scale
- How different urban spaces create different conditions for human mobile communication ?
- Can we recognize an urban function of a place based on the mobile phone usage pattern?

Case Study: Comparison of 10 areas

- Representatives of Amsterdam's urban diversity

  - transportation hubs, business, residential, sport & leisure, touristic & nightlife areas
- Average patterns of mobile phone usage over time
- Relation to land use distribution for the certain area

Dataset

- GSM data from Dutch telecom operator
- Anonymous and aggregated
- Counters: New Calls, SMSes, Incoming Handovers
- Period: 27.12.07 – 6.06.08 (5 months)

  excluding:

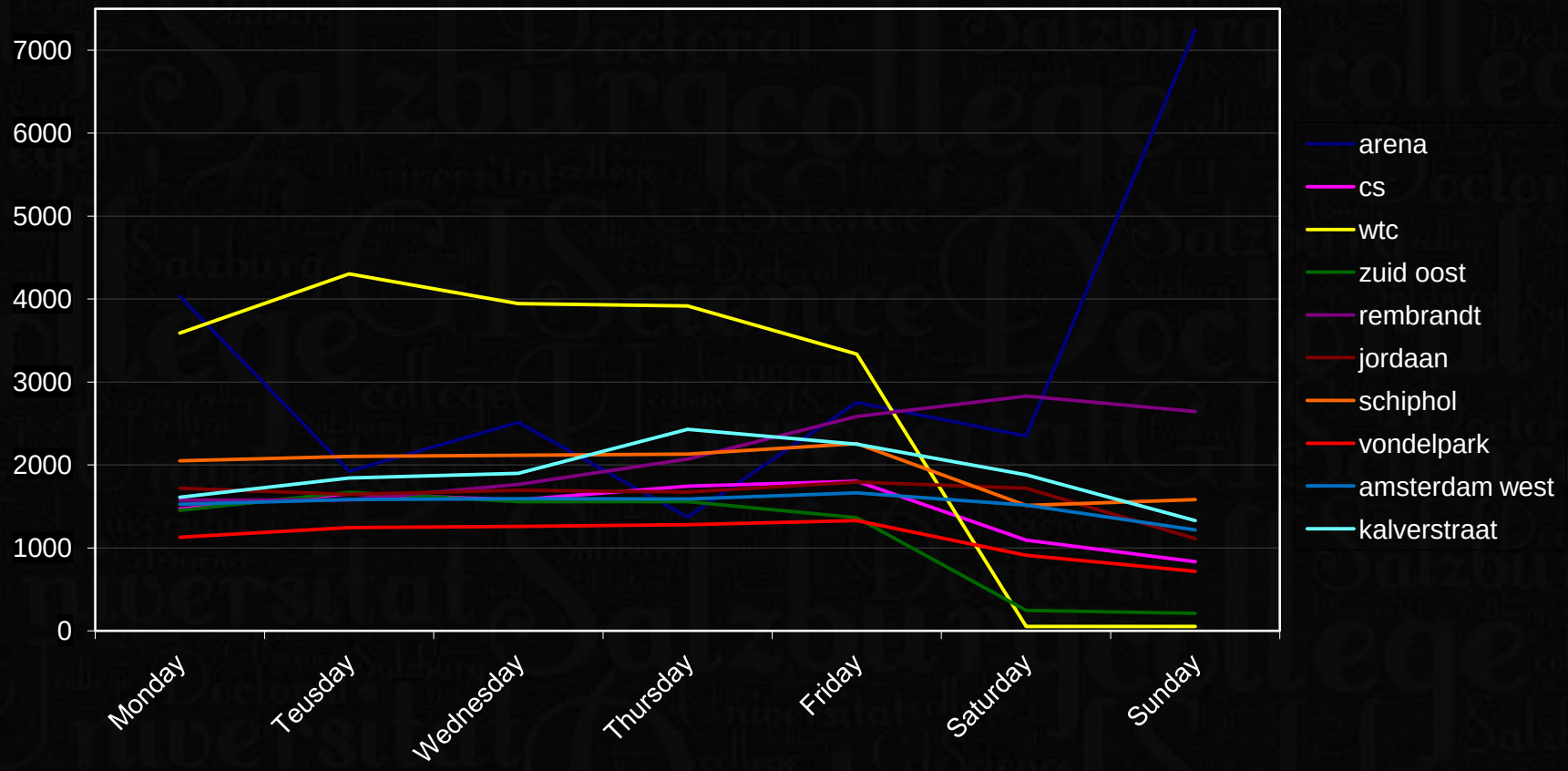
  - New Year's Eve (31.12.07 and 01.01.08)
  - Queen's Day celebration (29.04.08 and 30.04.08)

Additional dataset:

- Land use map of Amsterdam provided by CBS

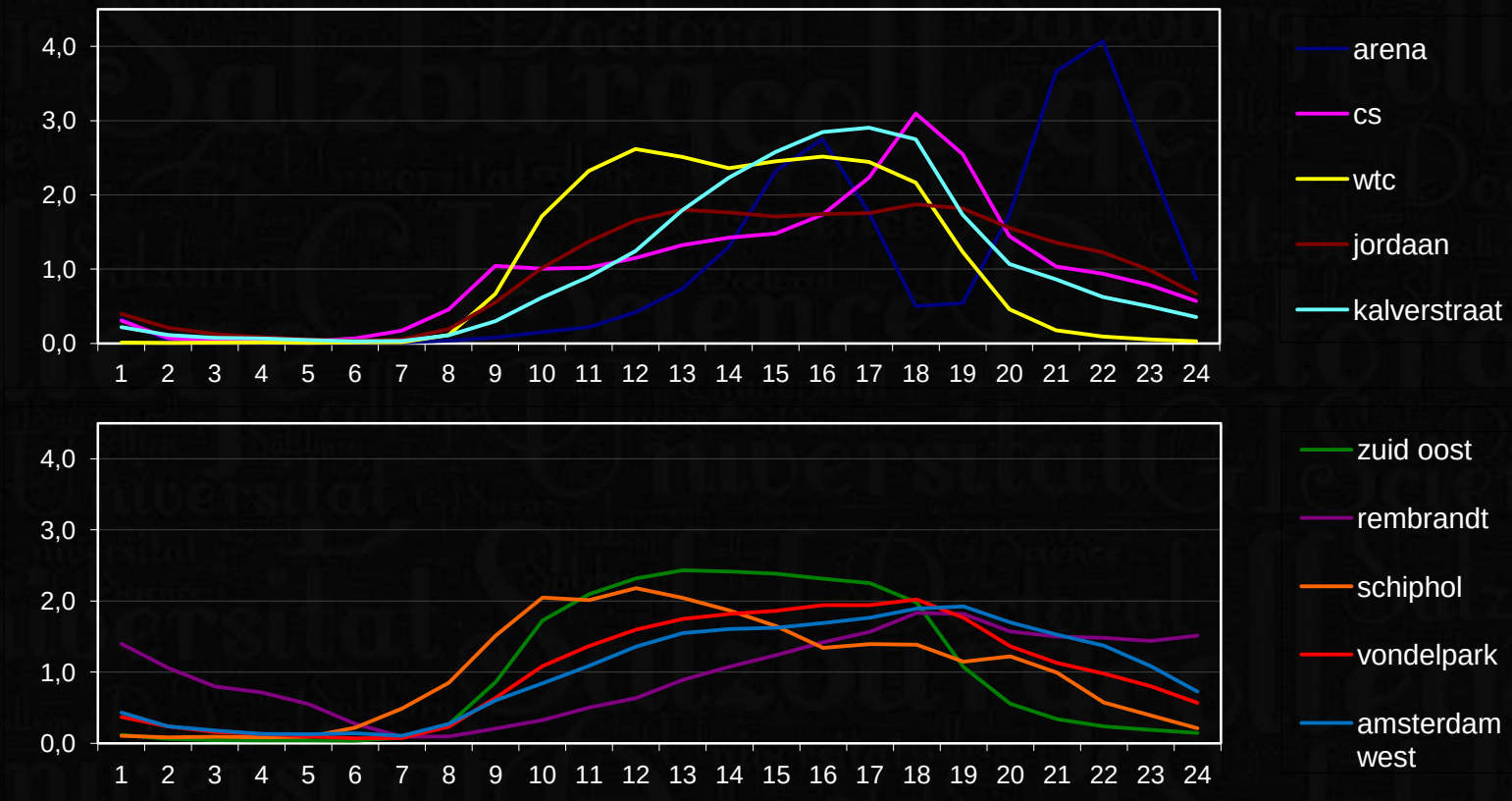
Comparative Analysis 1

- Weekly average New Calls patterns normalized over space



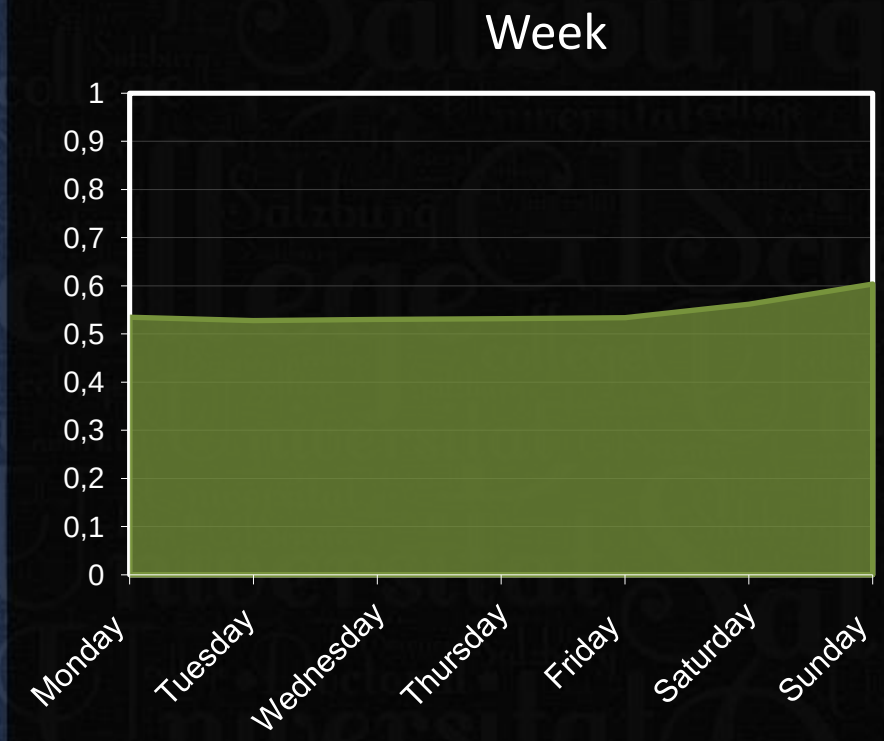
Comparative Analysis 2

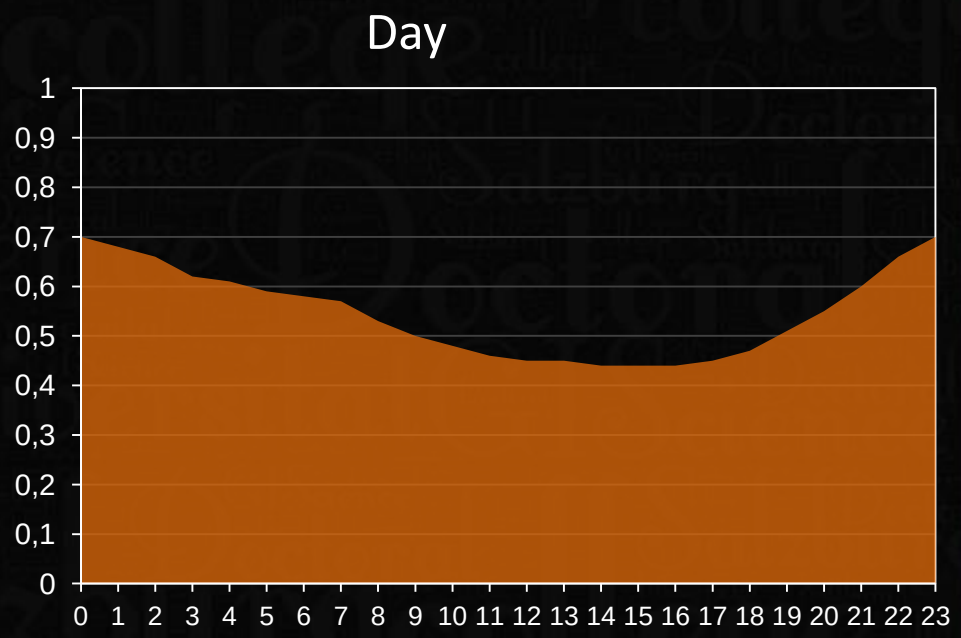
- Daily average New Calls patterns normalized over time



Comparative Analysis 3

- Average SMS share over New Calls during:

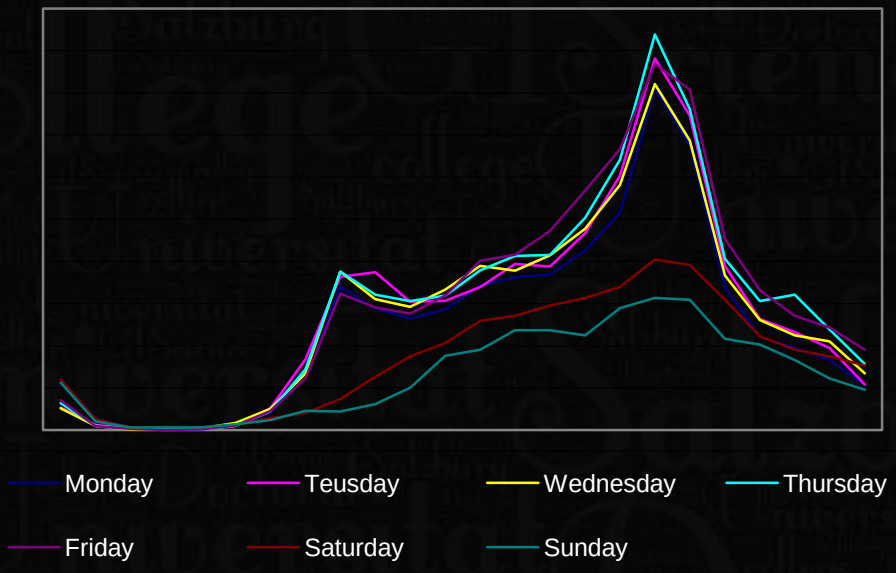




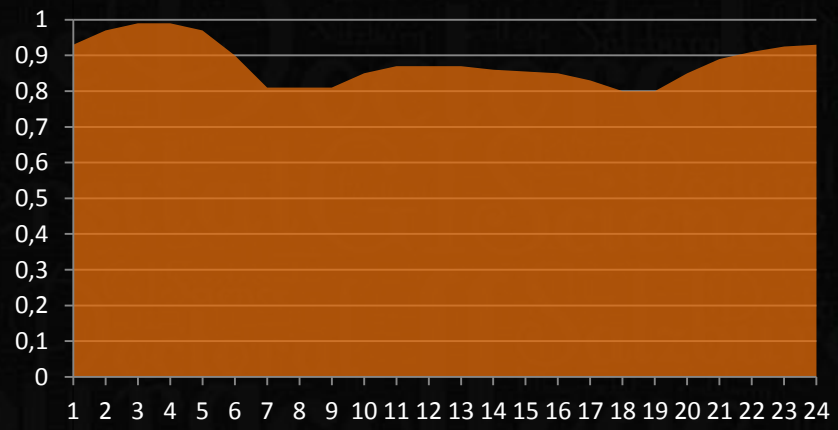
Zoom into specific area – Centraal Station

- 67.5 % of water
- 12 % of railways

Composite Pattern

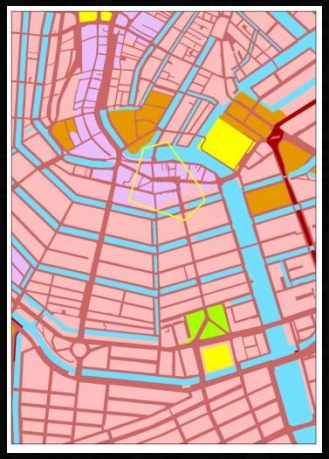


SMS over NC

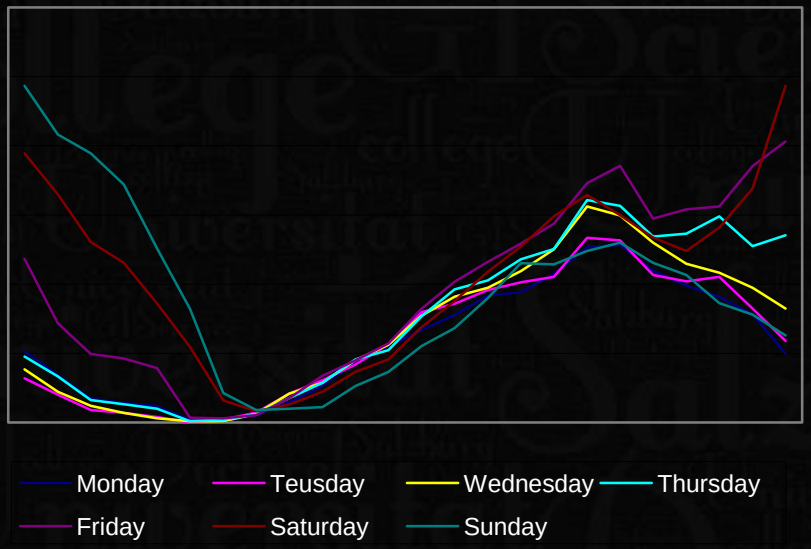


Zoom into specific area – Rembrandt square

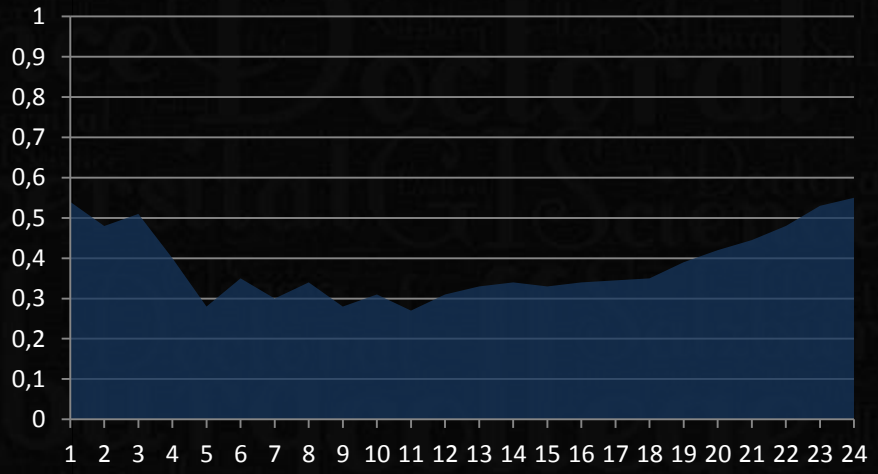
- 52.5 % of trade retail
- 17.8 % of water



Composite Pattern



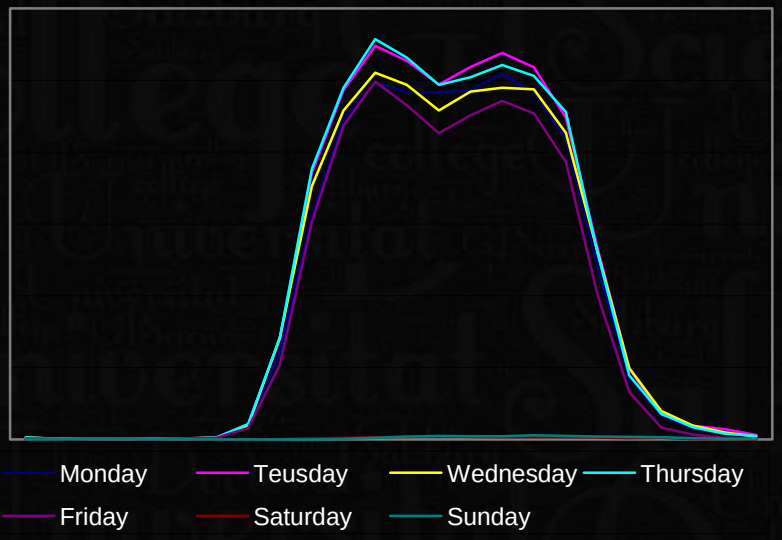
SMS over NC



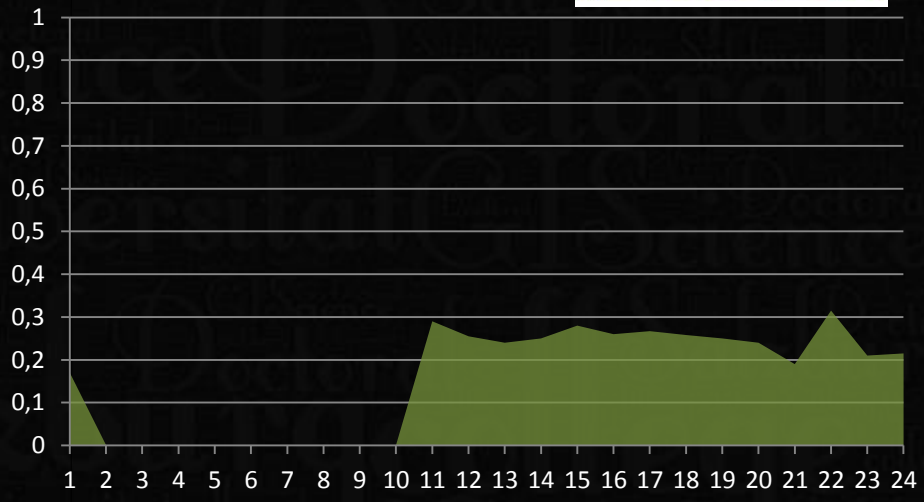
Zoom into specific area – WTC Amstedam

- 53.9 % of business area
- 16.3 % of local roads
- 8.7 % of main roads

Composite Mobile Pattern



SMS over NC



Conclusions

- Spatio-temporal variability and complexity of mobile phone behavior
- Evolution of traffic volumes over time (day/night rhythm, working schedules)
- SMS share over New Calls was often very unpredictable
- Favor of SMS in the evening and at night
- SMS could be preferred in more noisy places because they are less intrusive

Thank you for your attention ☺