Preferred citation style

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Familiar strangers: A network of encounters

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Why is transport planning interested ?

DUE, SO & SUE in transport models

Wardrop (1952):

1. The journey times on all the routes actually used are equal, and less than those which would be experienced by a single vehicle on any unused route.
2. The average journey time is **a** minimum.

Daganzo and Sheffi's (1977) define SUE for the aggregate case:

> "In a SUE network, no user believes he can improve his travel time by unilaterally changing routes."

But how about the social context ?

e.g. how much is destination choice as a joint choice ?

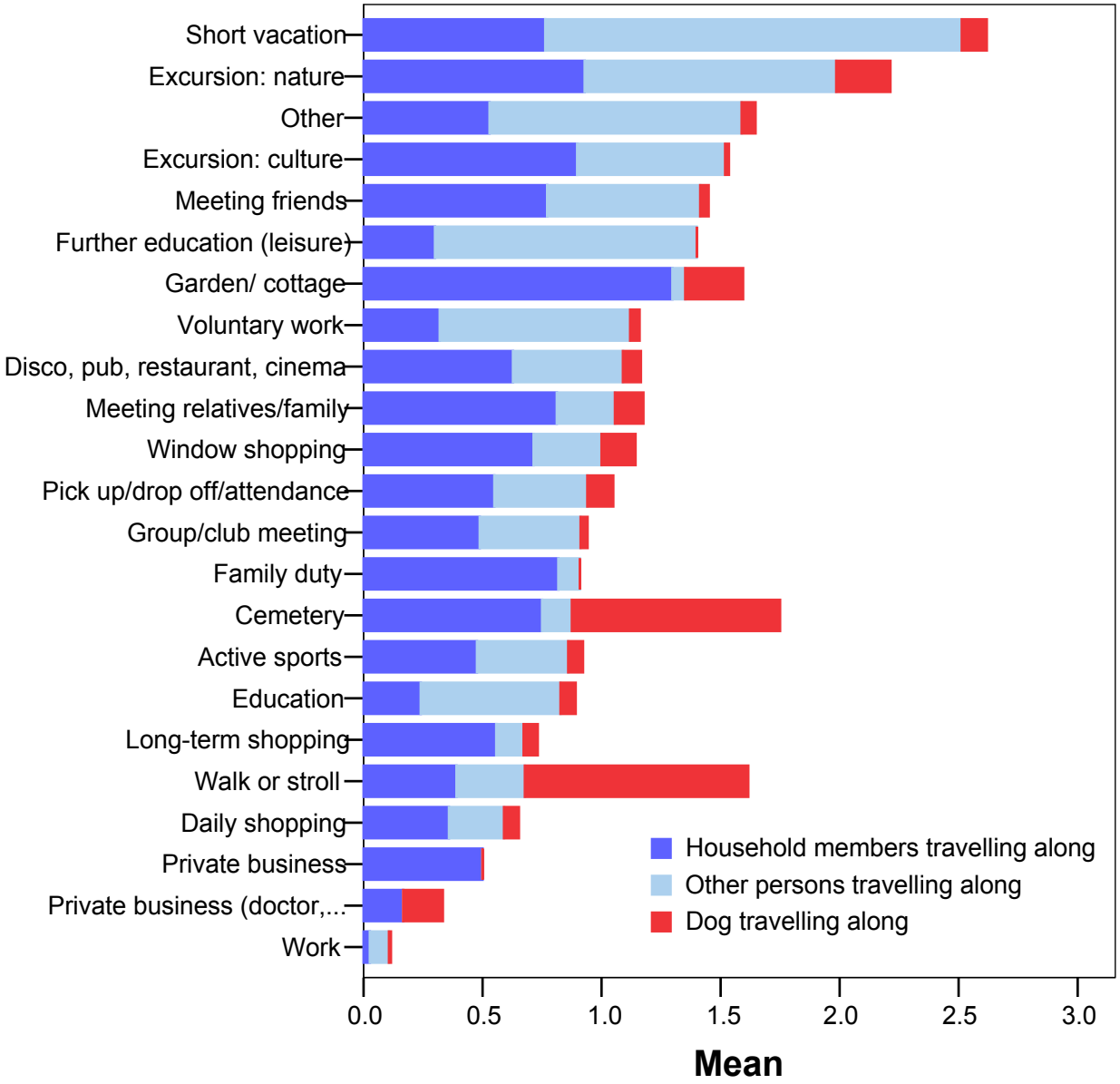
Destination choice:

- Awareness set of the agent
- Personal time and budget constraints
- Individual utility maximisation

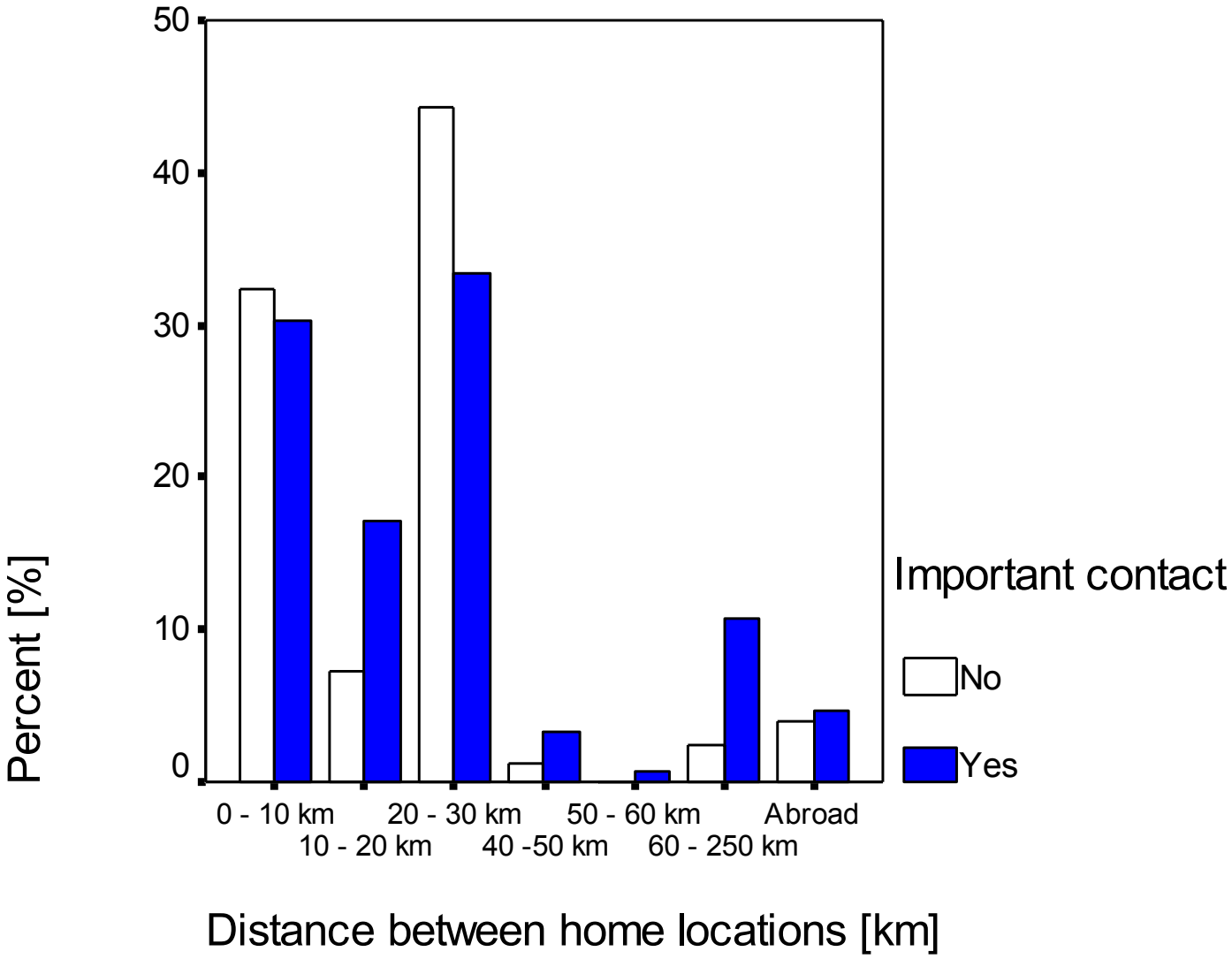
Or ?

- Joint awareness set of participants
- Joint set of constraints
- Negotiation of the emerging choice
- Or joint utility maximisation

Number of accompanying travellers



Required travel for leisure meetings of ego-alter



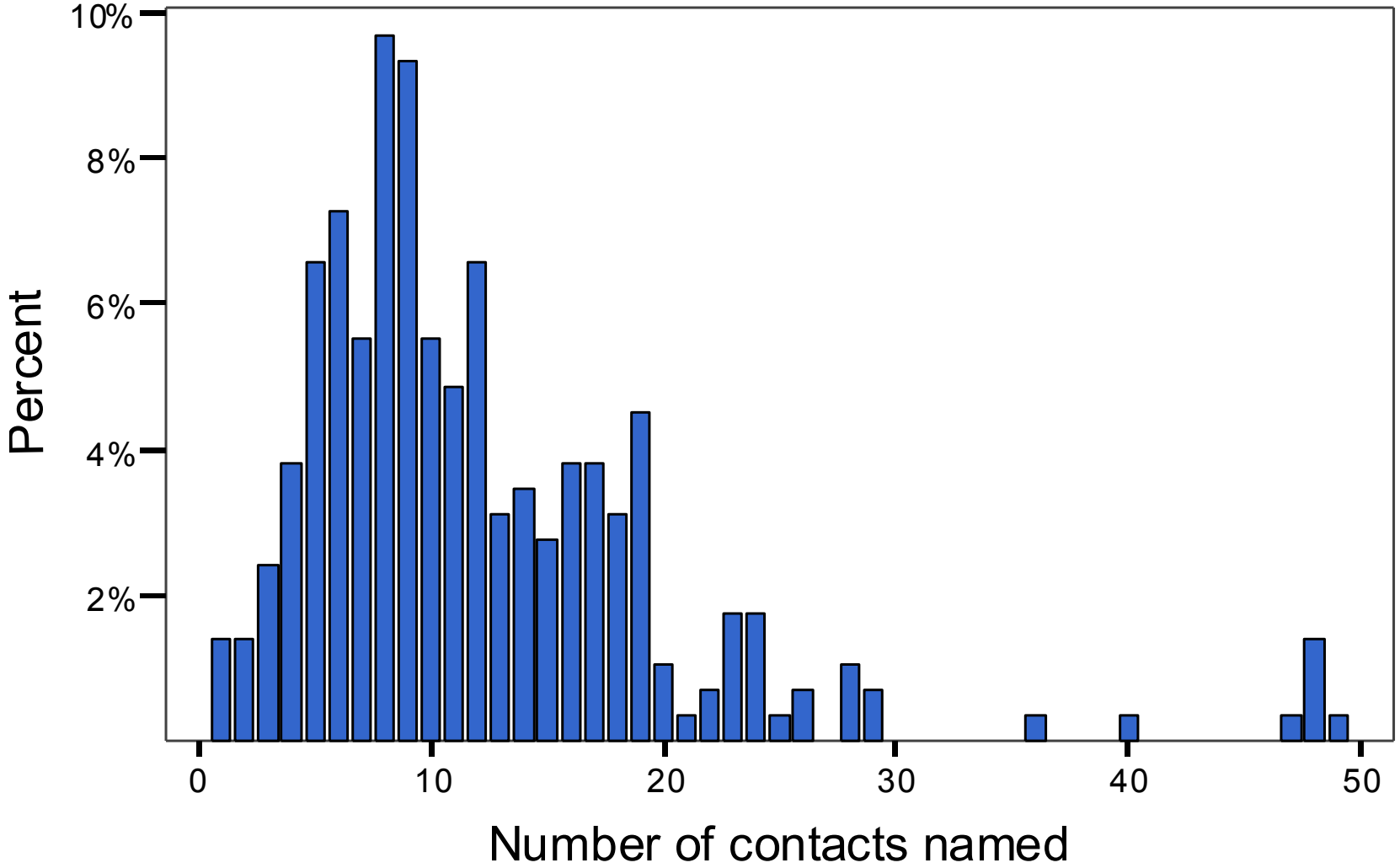
Schlich et al., 2002

Travel and social networks

Benchmarking the current state

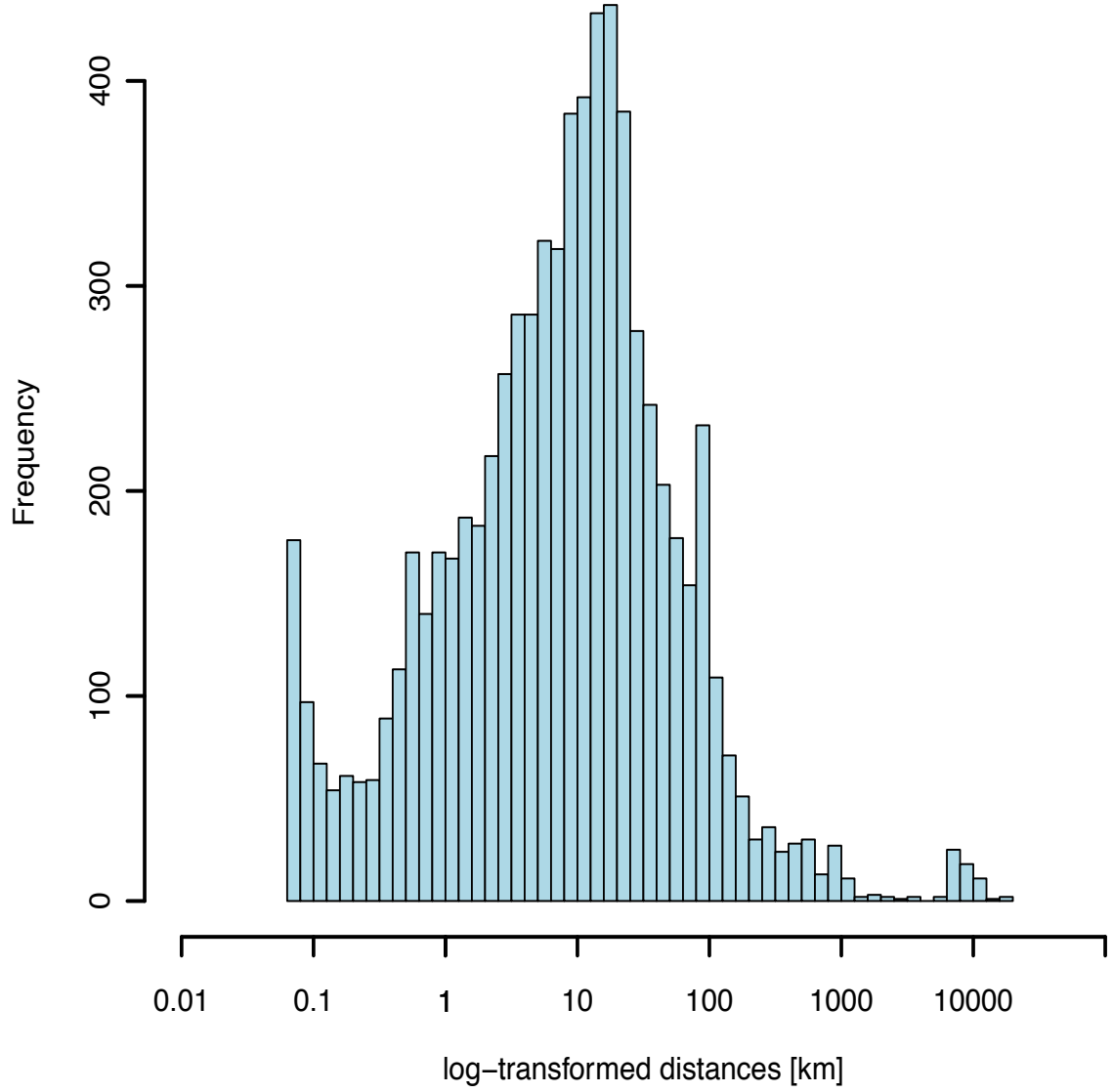
- Numbers of contacts
- Distance distributions
- Clustering
- Geographies
- Frequency and mode of contact

Number of contacts reported



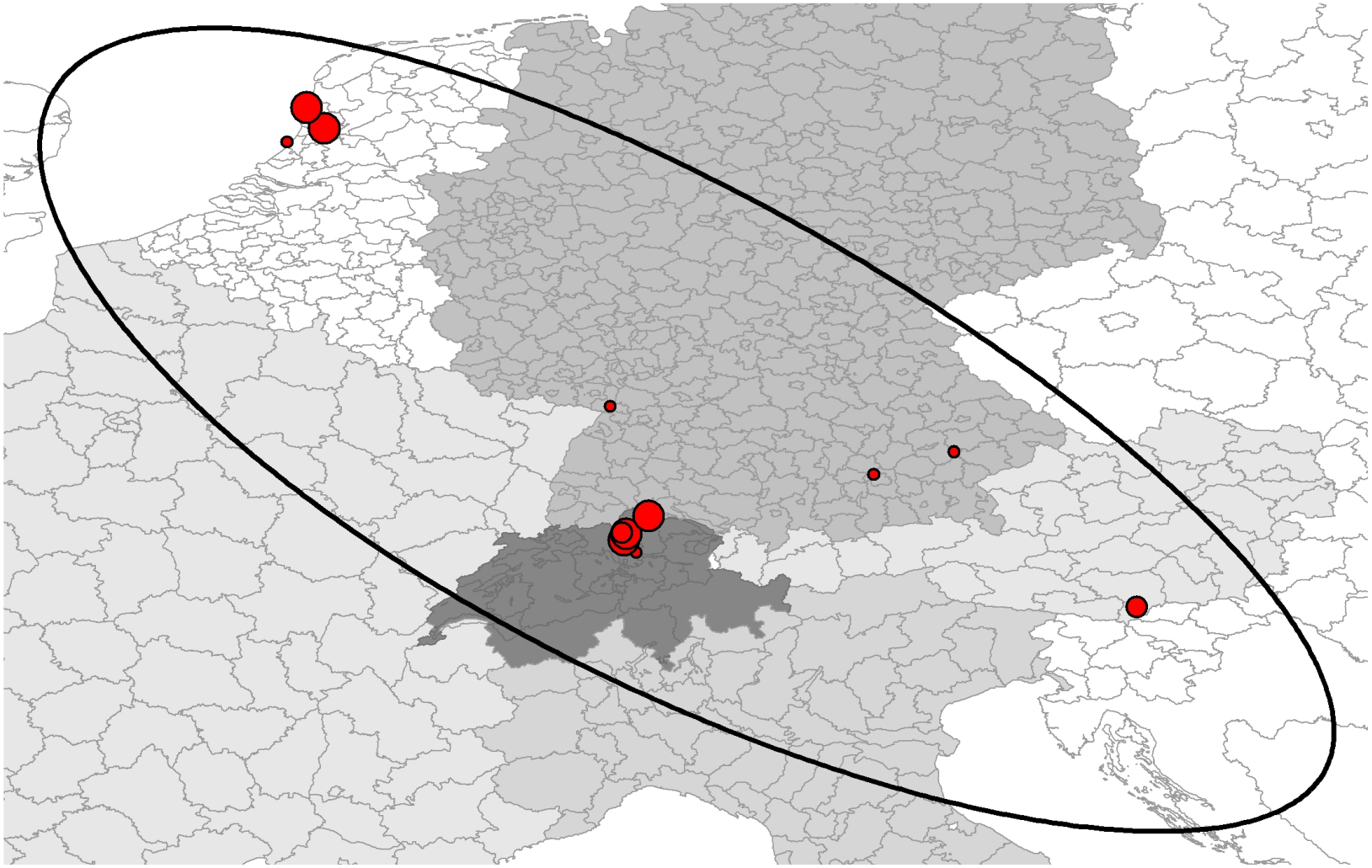
Frei and Axhausen, 2007

Great circle distances between “leisure” contacts: Snowball

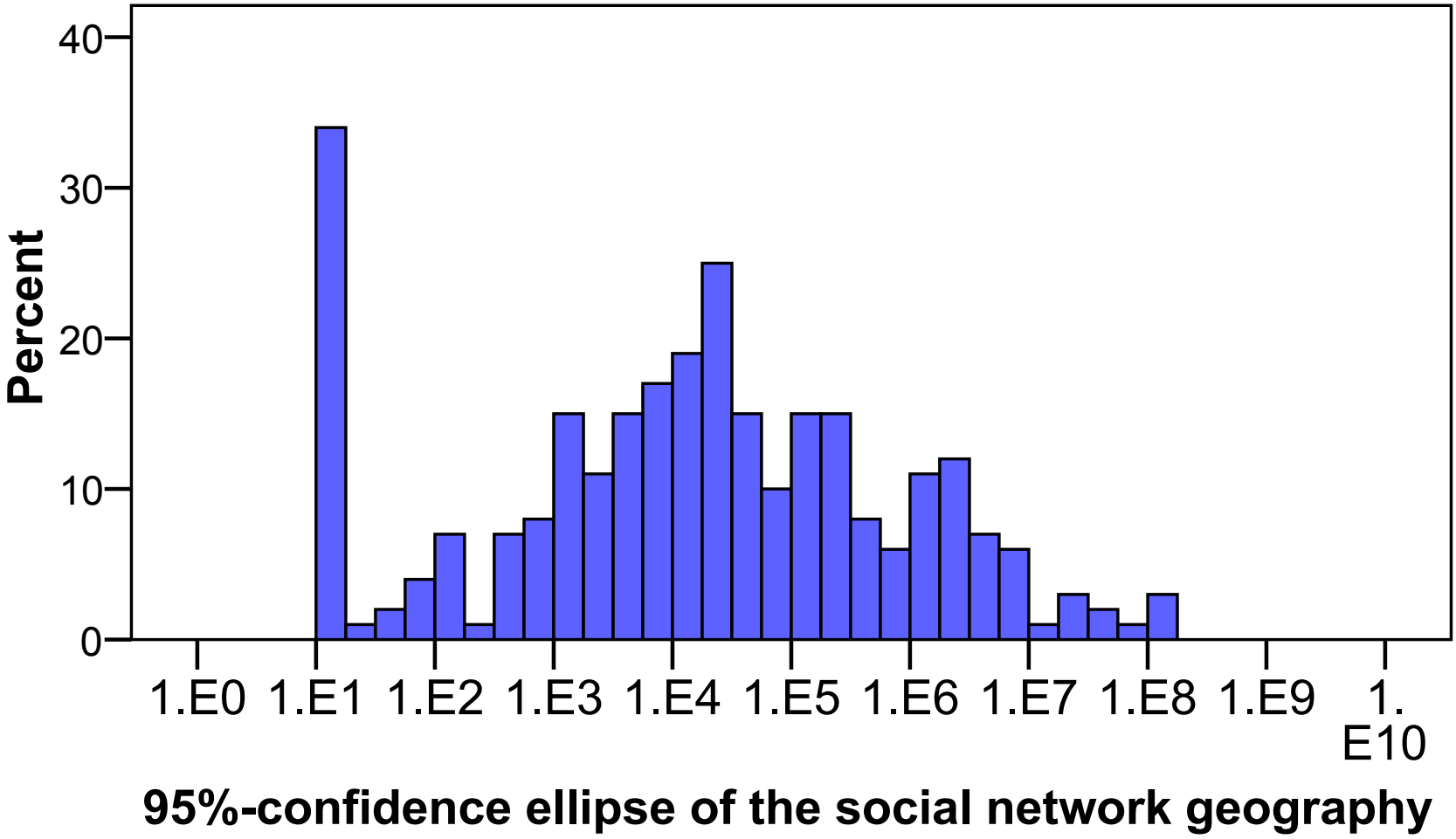


Daten: Schneeballbefragung IVT, Siehe Kowald et al. 2012

Example of a social network geography

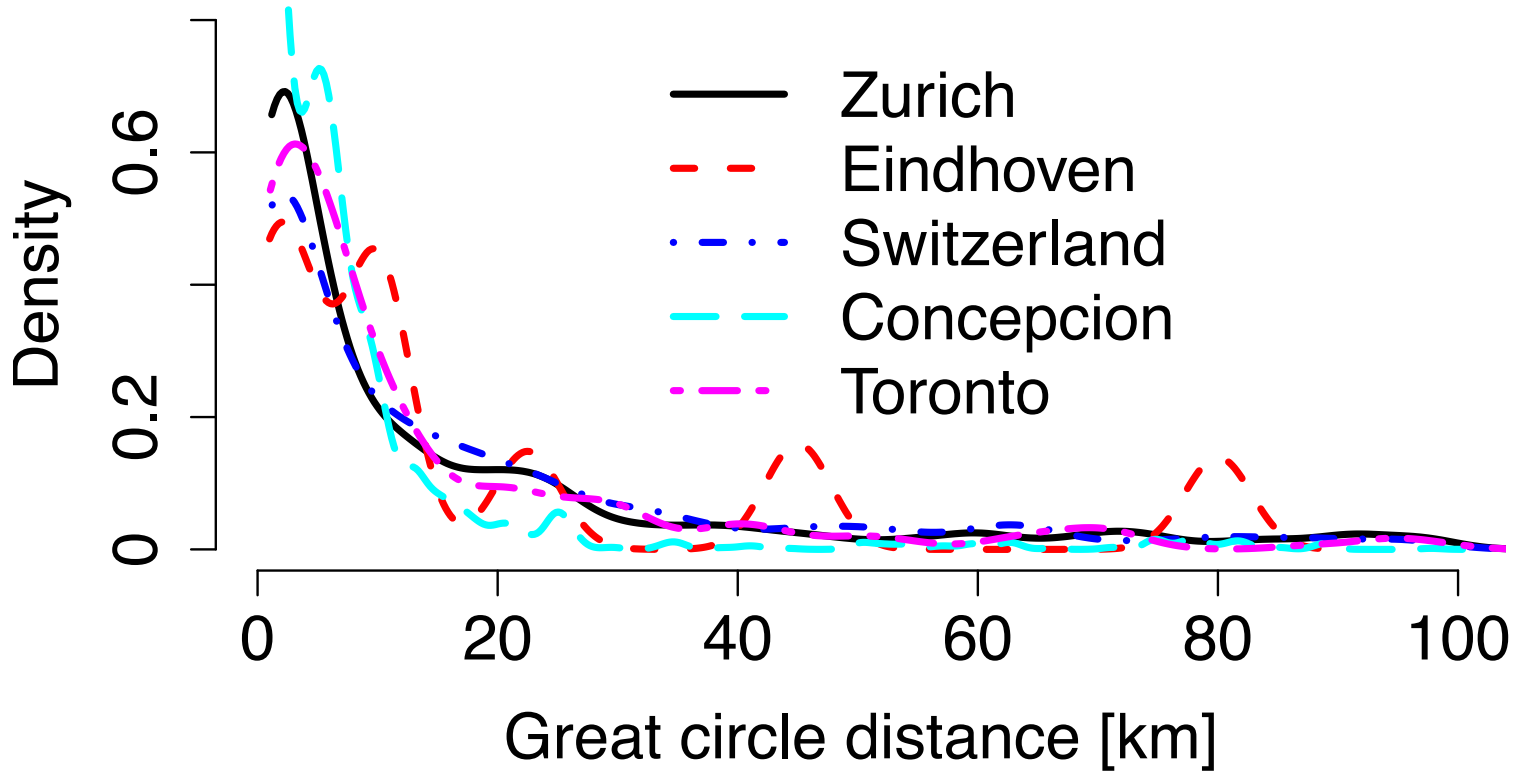


Size of network geometries



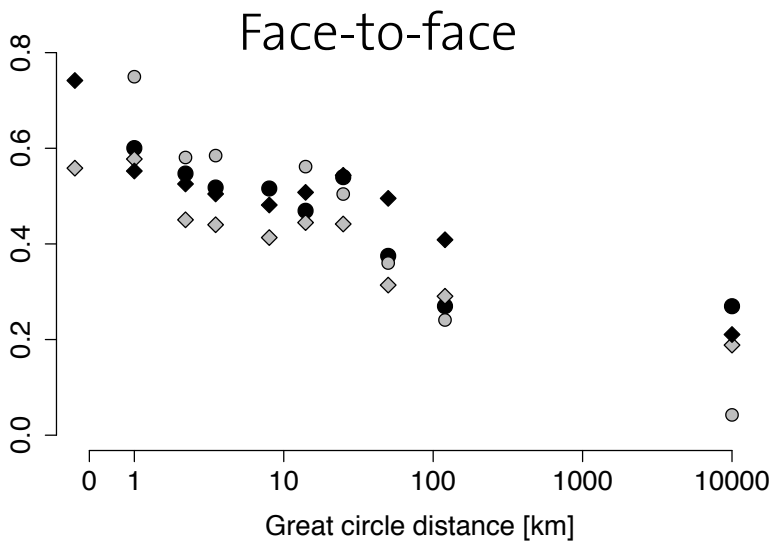
Comparisons

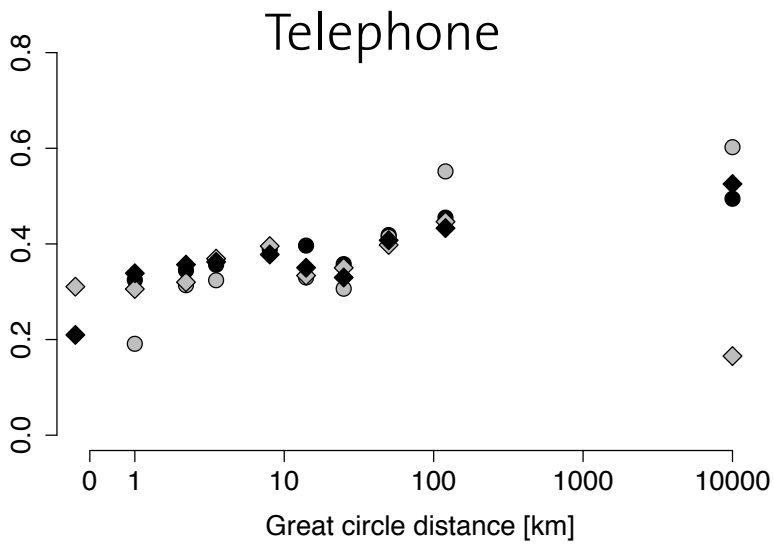
Contact “density” – shares by distance class

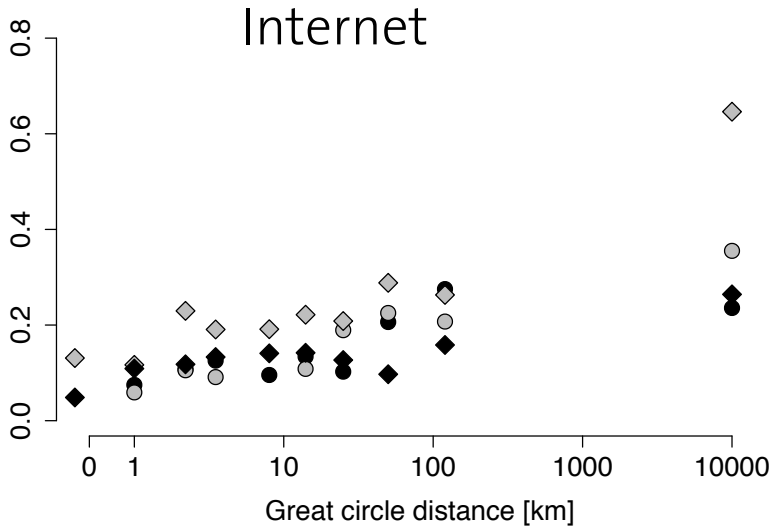


Kowald et al., forthcoming

Shares of contact by mode



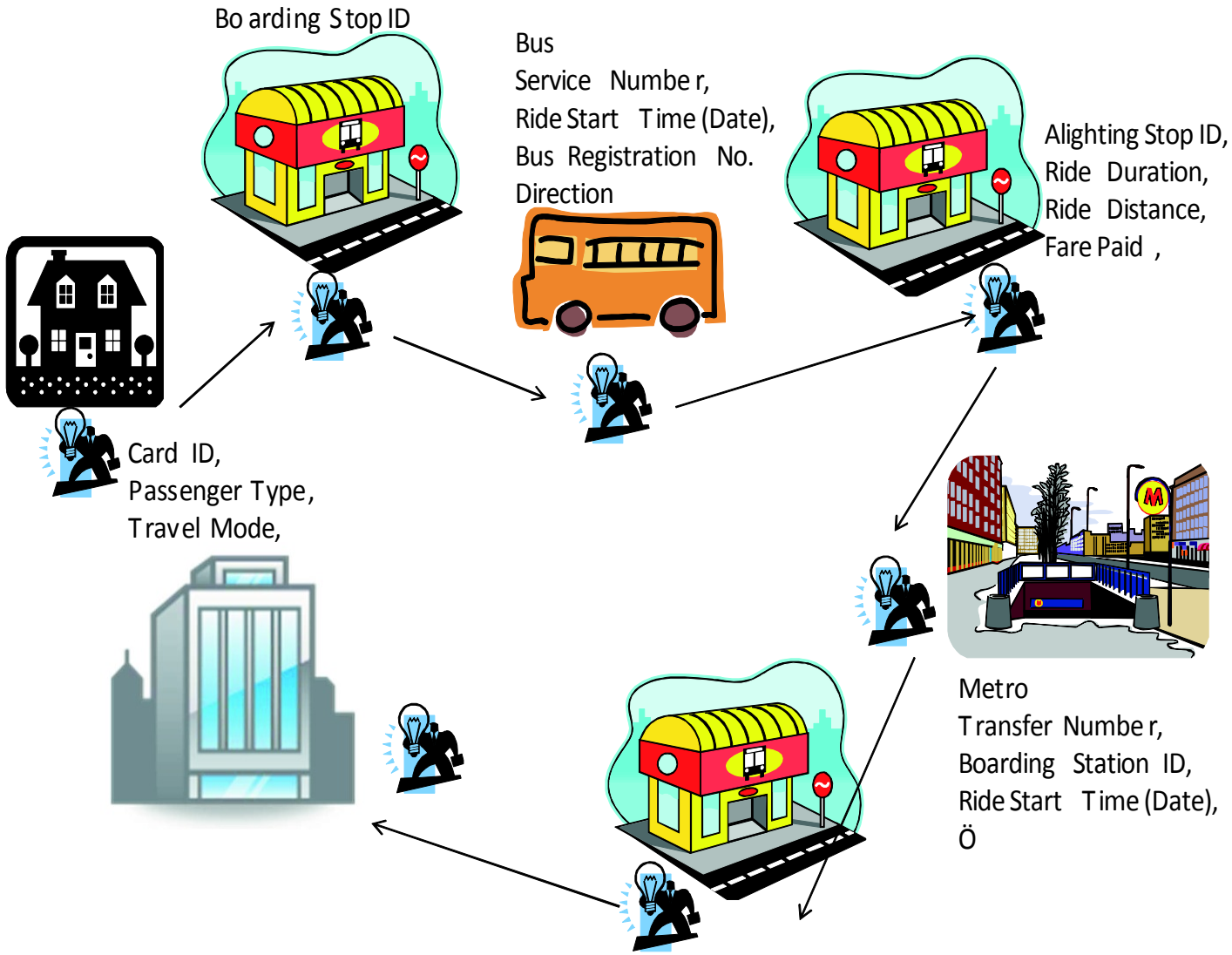




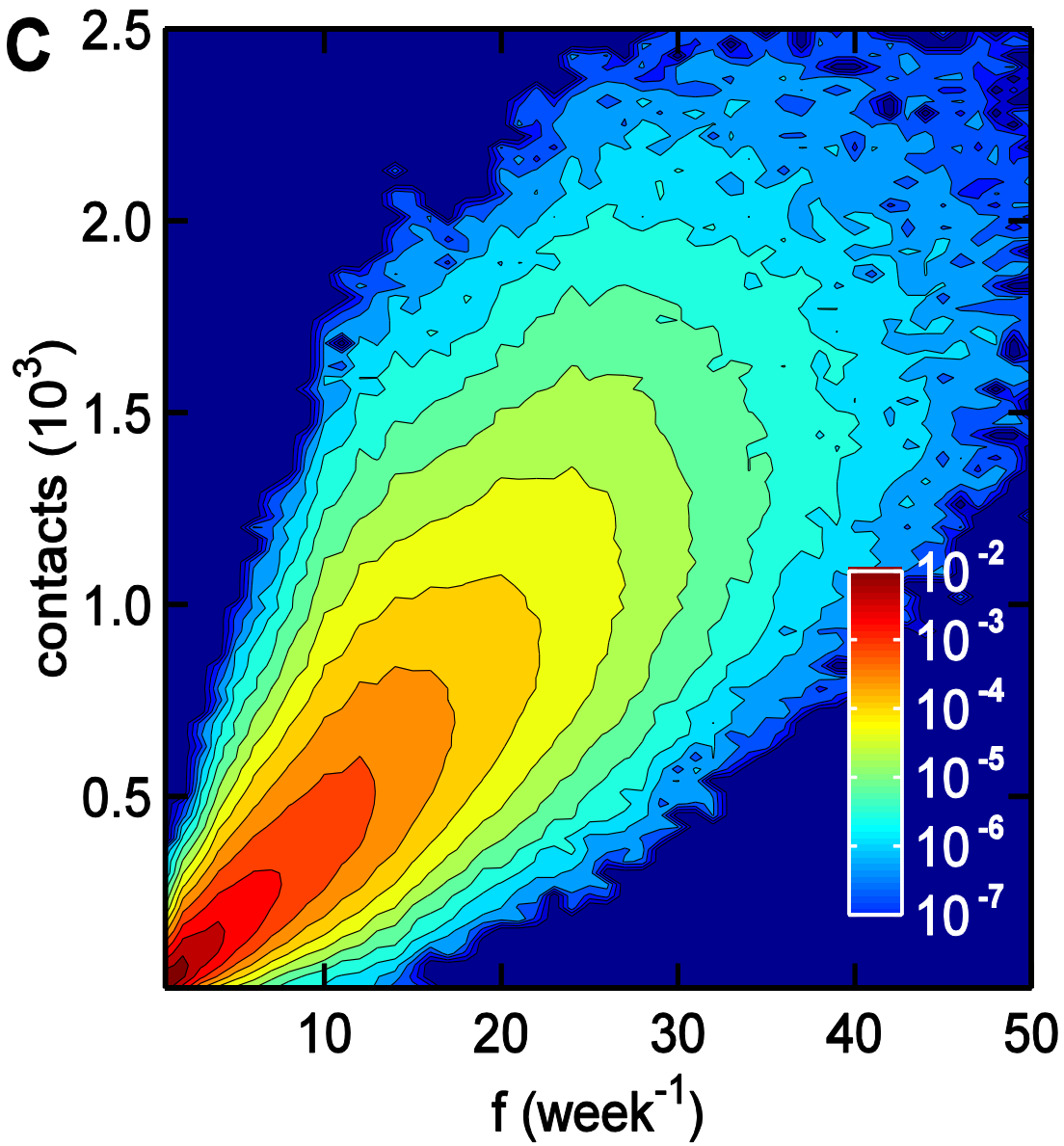
Kowald et al., forthcoming

A low level network as a building block

Smart card records as a source

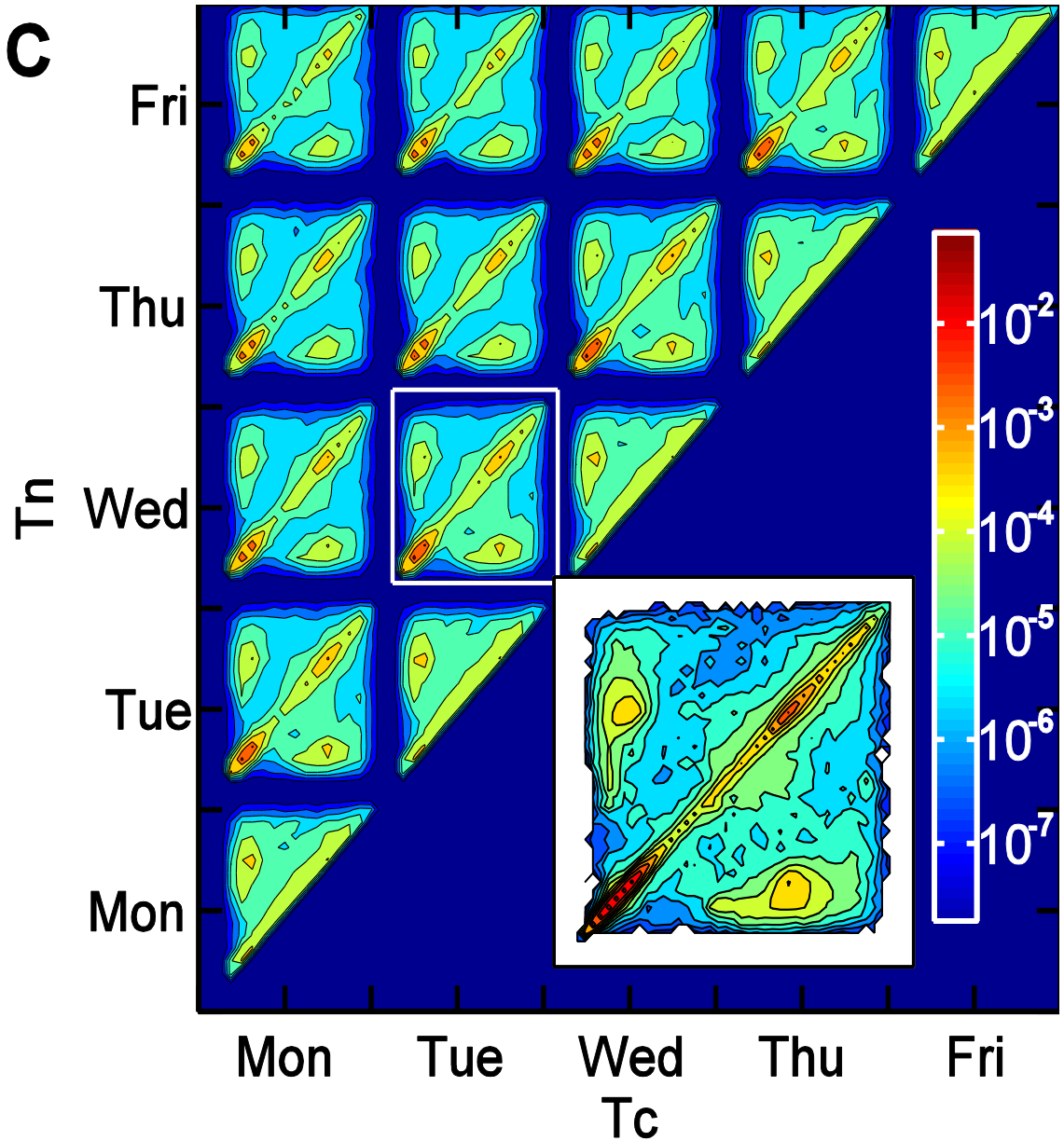


Number of contacts versus usage frequency



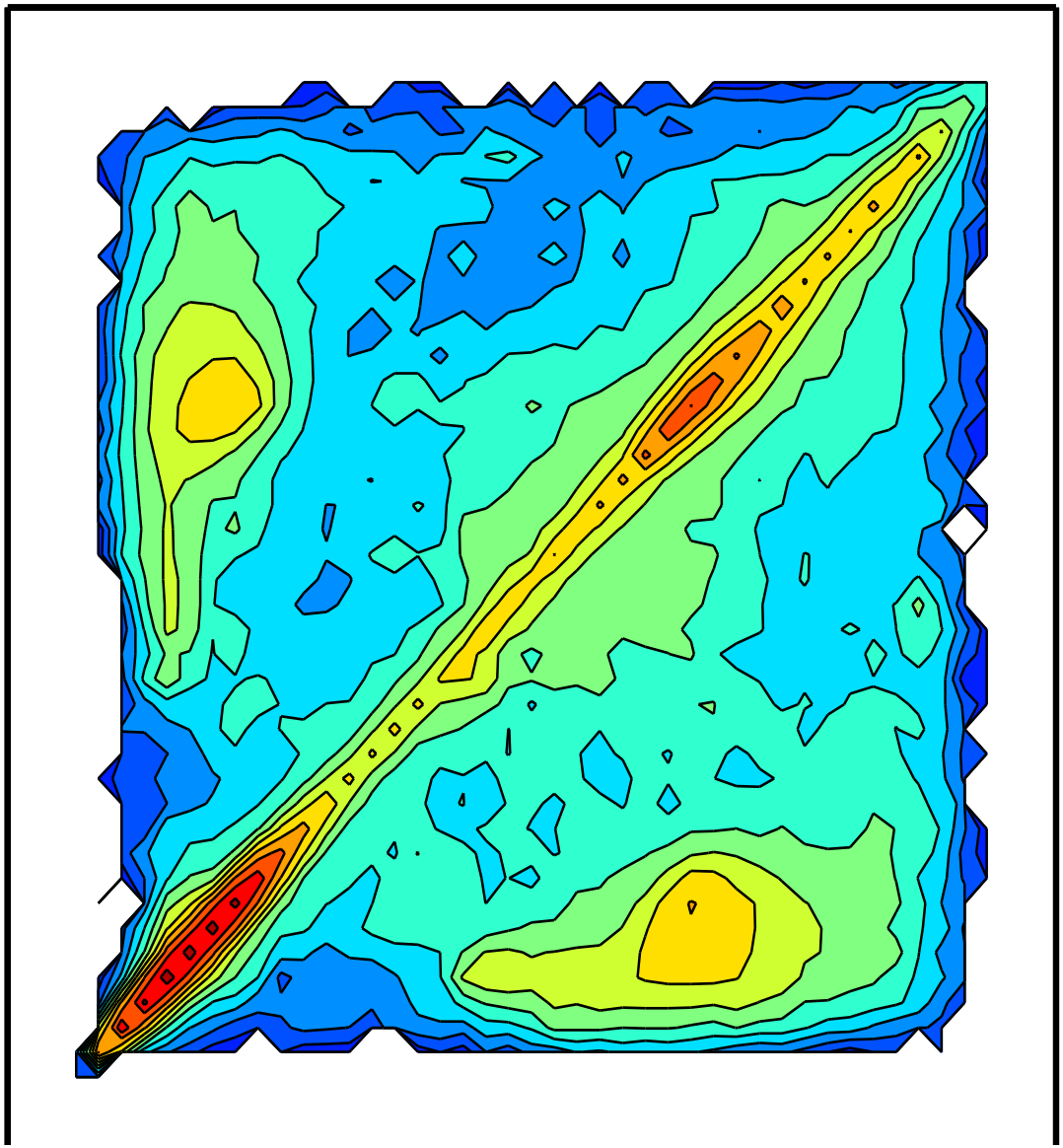
Sun et al., 2013

Encounter density over the days



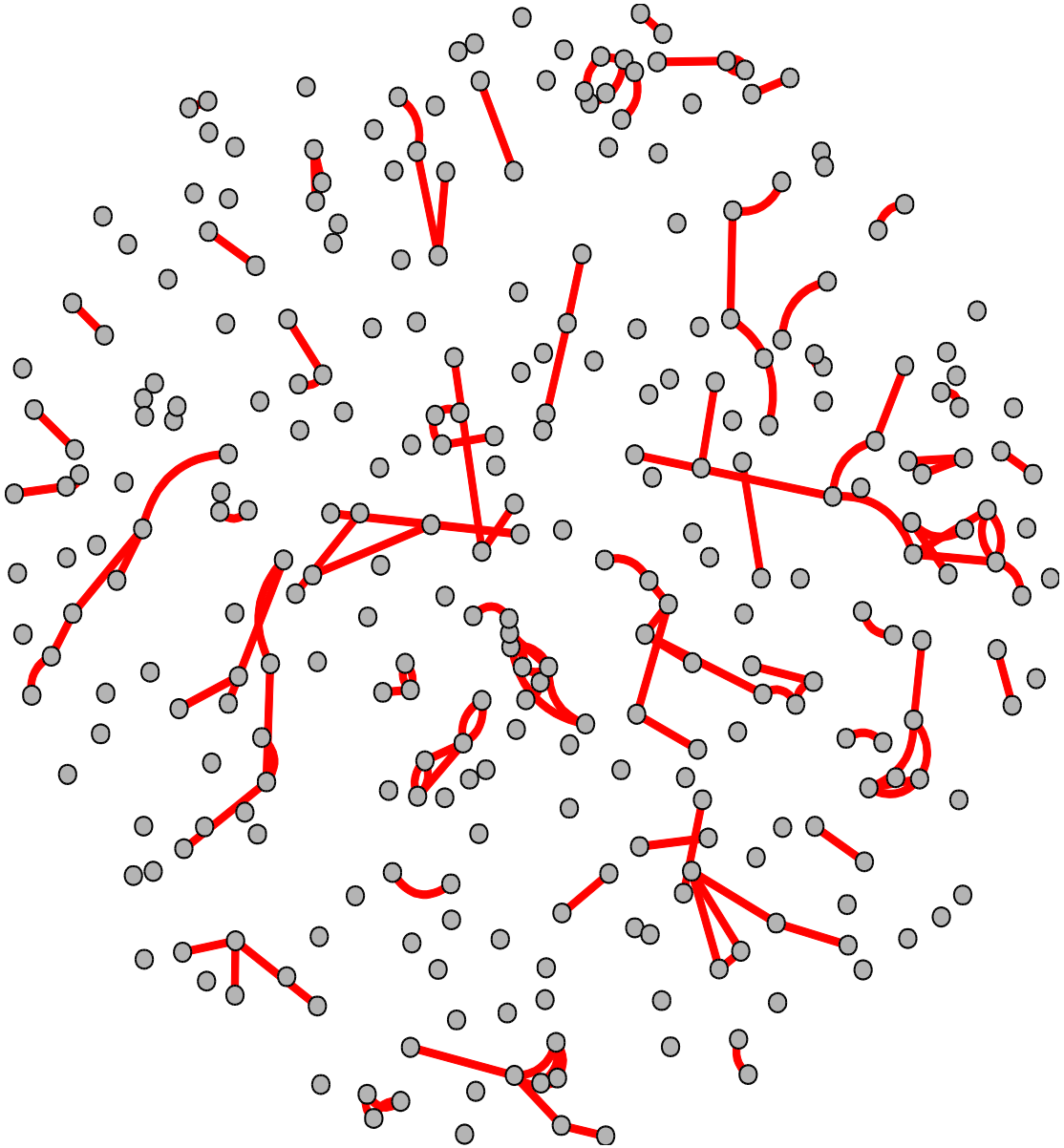
Sun et al., 2013

Encounter density of the days: Cut-out

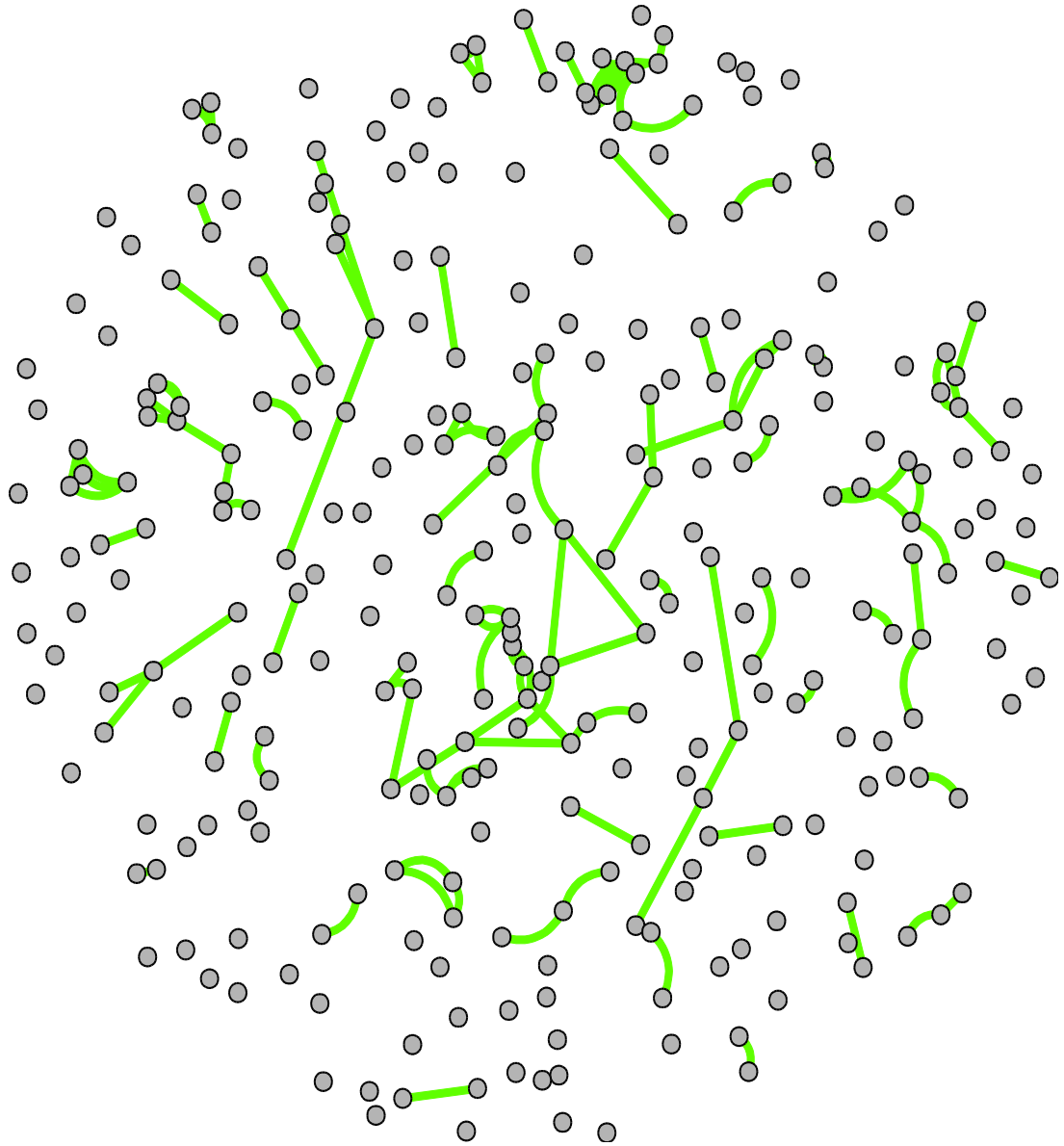


Sun et al., 2013

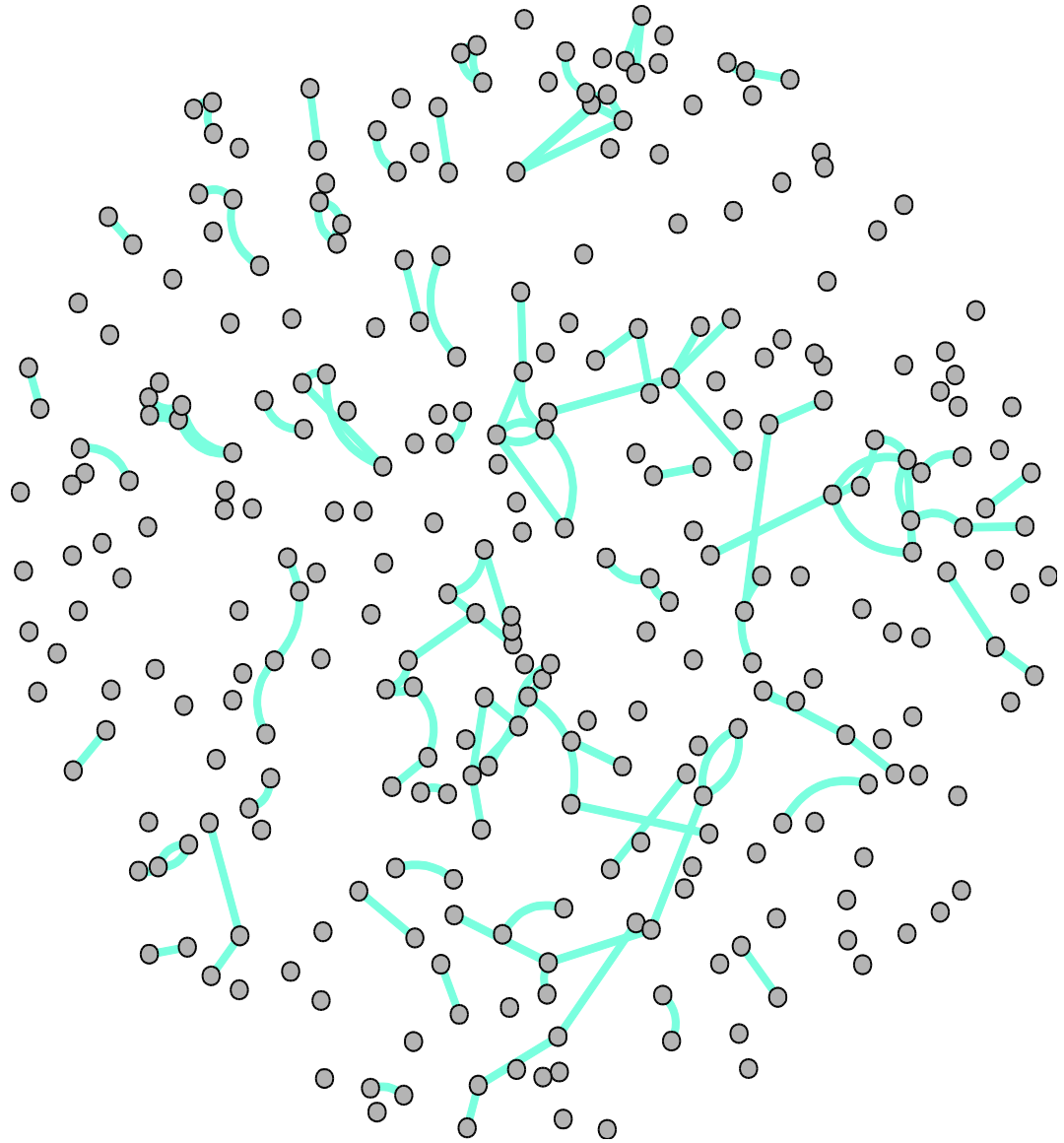
Monday



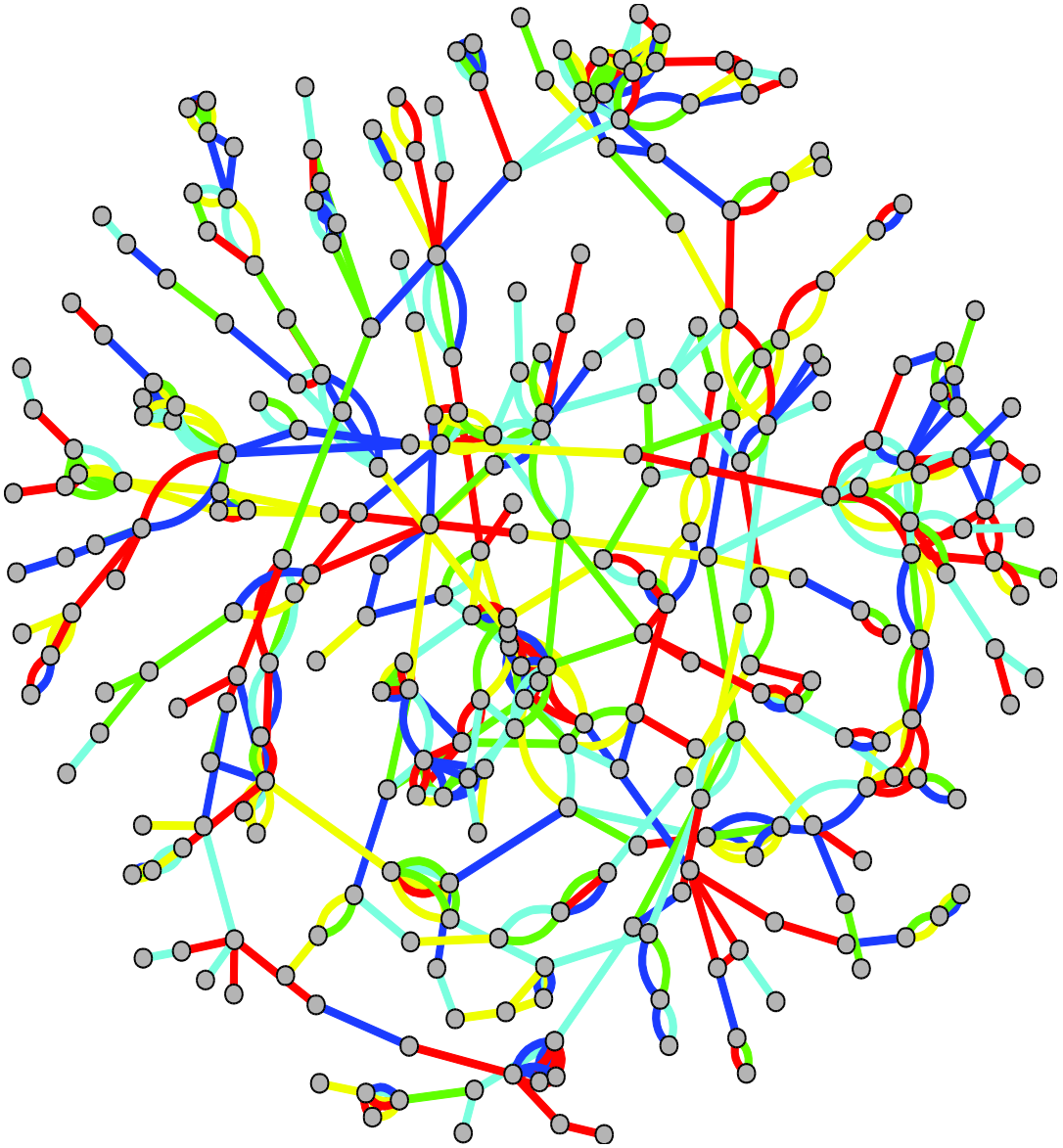
Tuesday



… Friday



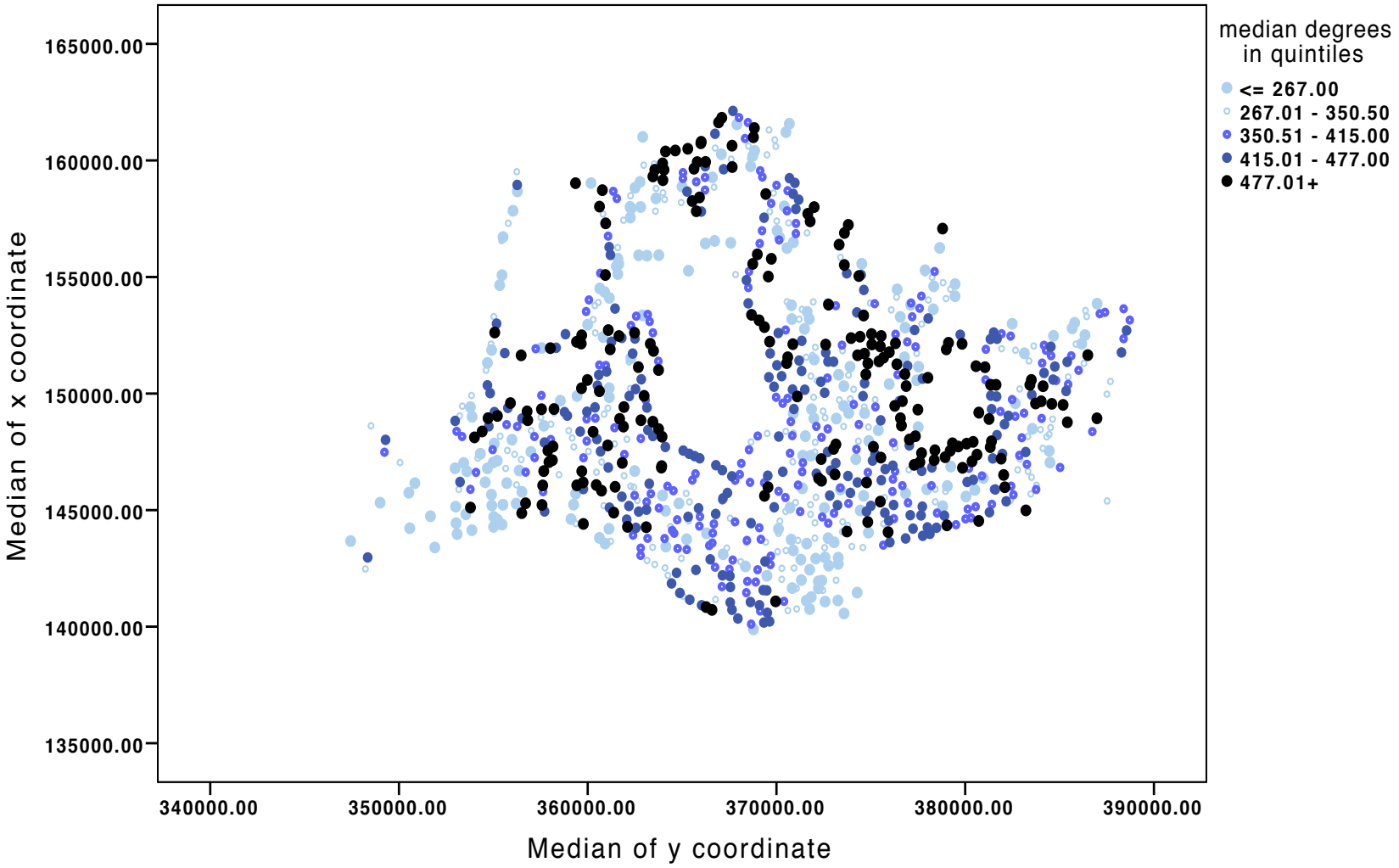
… the weekly summary



A small world network in Singapore‘s busses

- One component by Wednesday
- Diameter: 6
- Characteristic path length: 2.95
  - (random: 2.63)
- Average clustering coefficient: 0.19
  - (random: 4.5×10^{-4})
- Small-world
  - Watts DJ & Strogatz SH (1998) Collective dynamics of ‘small-world’networks. Nature 393:440-442.

A small world network in Singapore‘s busses, but uneven



Integration

Schedule detail possibilities (in current stable MATSim)

Number and type of activities **(Feil)**
Sequence of activities **(Ordonez)**

- **Start and duration of activity**
- Composition of the group undertaking the activity **(Kowald, Tan, Fourie)**
- Expenditure division
- **Location of the activity** **(Horni)**
  - Movement between sequential locations
    - **Location of access and egress from the mean of transport**
      - Parking search and type **(Waraich)**
    - **Vehicle/means of transport** **(Ciari)**
    - **Route/service** **(Chakirov)**
    - Group travelling together **(Dubernet, Fourie)**
    - Expenditure division

Integration and future work

- Generation of artificial social networks (Arentze et al., 2012) (degree, clustering, distances)
- Repeat of Switzerland Snowball
- Measurement of network size (leisure, work, civic engagement)
- Measurement of network dynamics (Timmerman's ERC project)
- Integration of network choice/decision making model (Dubernet)

Travel and social networks: Contributors to our work

Social networks and their geographies:

- Timo Ohnmacht
- Andreas Frei
- Matthias Kowald
- Lijun Sun
- Andreas Diekmann, ETH Zürich
- Jonas Larsen, Roskilde/John Urry, Lancaster

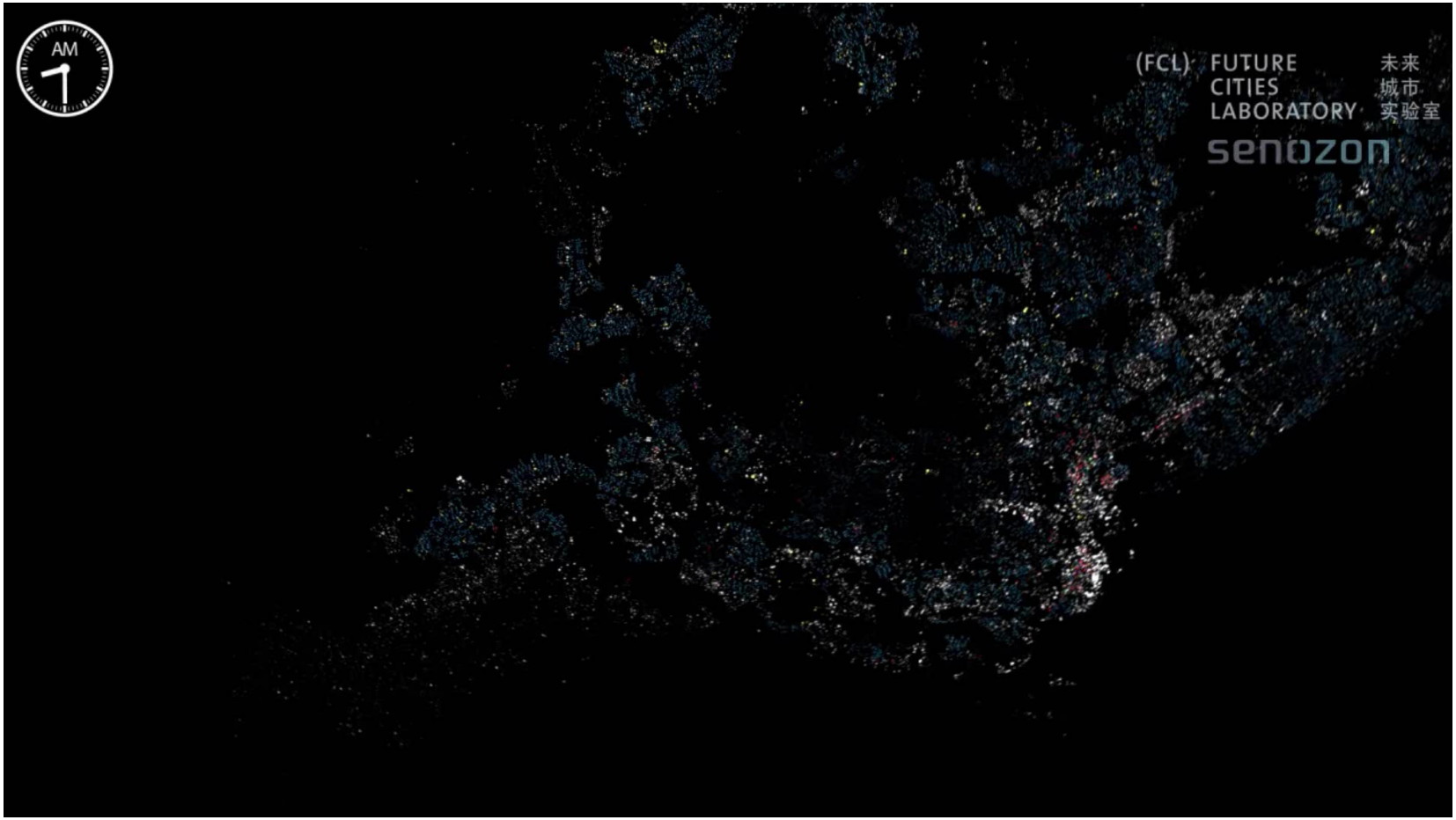
Integration into agent-based models

- Thibaut Dubernet
- Pieter Fourie

Social network generation

- Theo Arentze, TU EIndhoven

Questions ?



Questions ?

www.matsim.org

www.ivt.ethz.ch
www.futurecities.ethz.ch

www.senozon.com

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