

# Making friends in life and online

## Equivalence, micro-correlation and value in spatial and transpatial social networks

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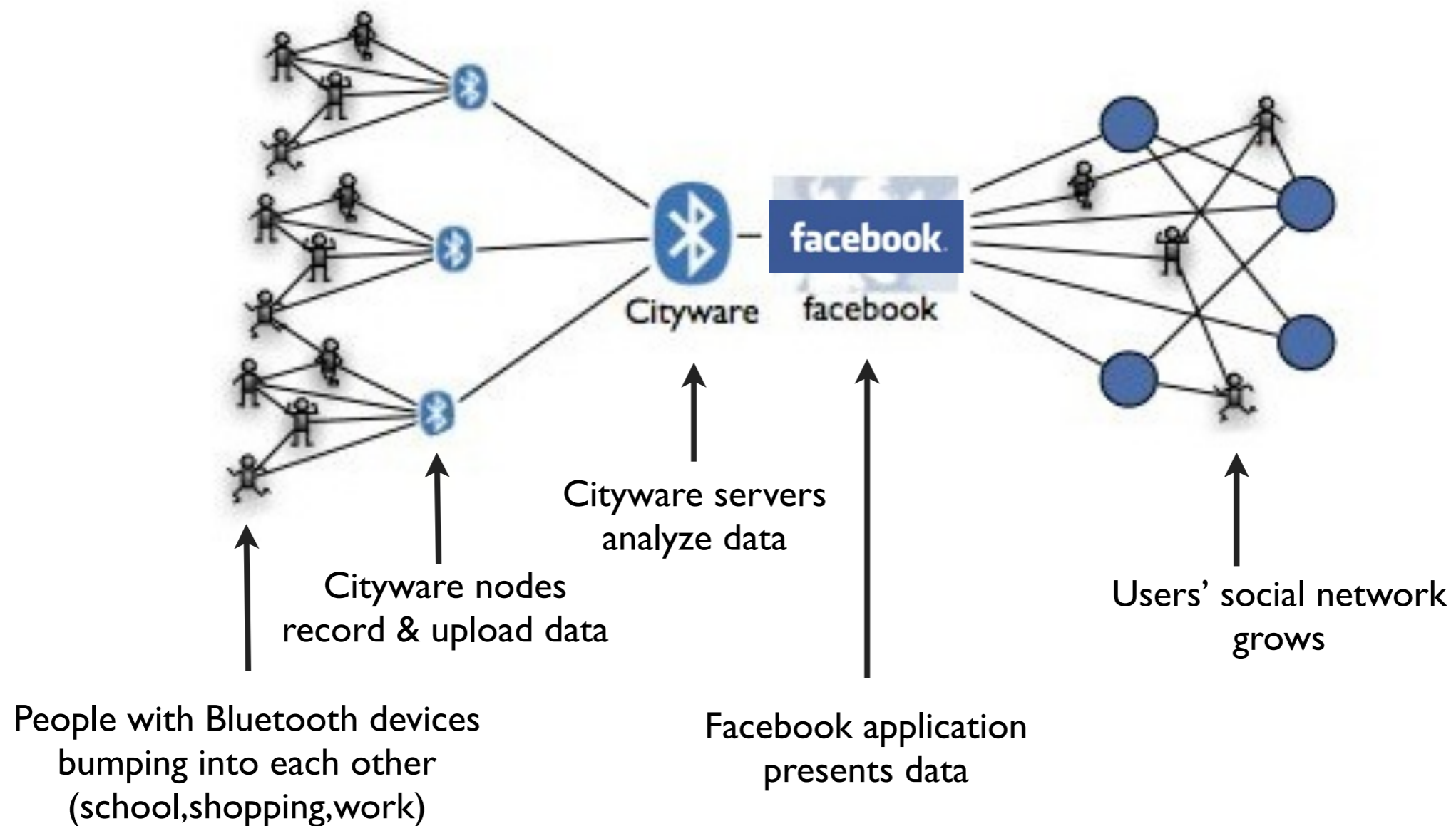
# Motivation

- Increasing adoption of online social networking
- Yet we still socialise face to face
- Looking beyond the issue of “does the internet make us antisocial?” ...
- Try to understand how online social networks extend our face-to-face interactions
  - online networks are transpatial, face-to-face are bounded by space

# Foci of analysis

- **Equivalence:** To what extent do transpatial networks resemble spatial networks? On the one hand we can expect similar structure due to human nature, but on the other hand the technological capabilities may allow for new structures to evolve.
- **Micro-correlation:** How do individuals position themselves in the context of both spatial and transpatial networks? Do individuals assume similar network “roles” in each network?
- **Value:** In terms of acquaintances and navigating through social ties, do transpatial networks offer greater value and opportunities than spatial networks?

# The study



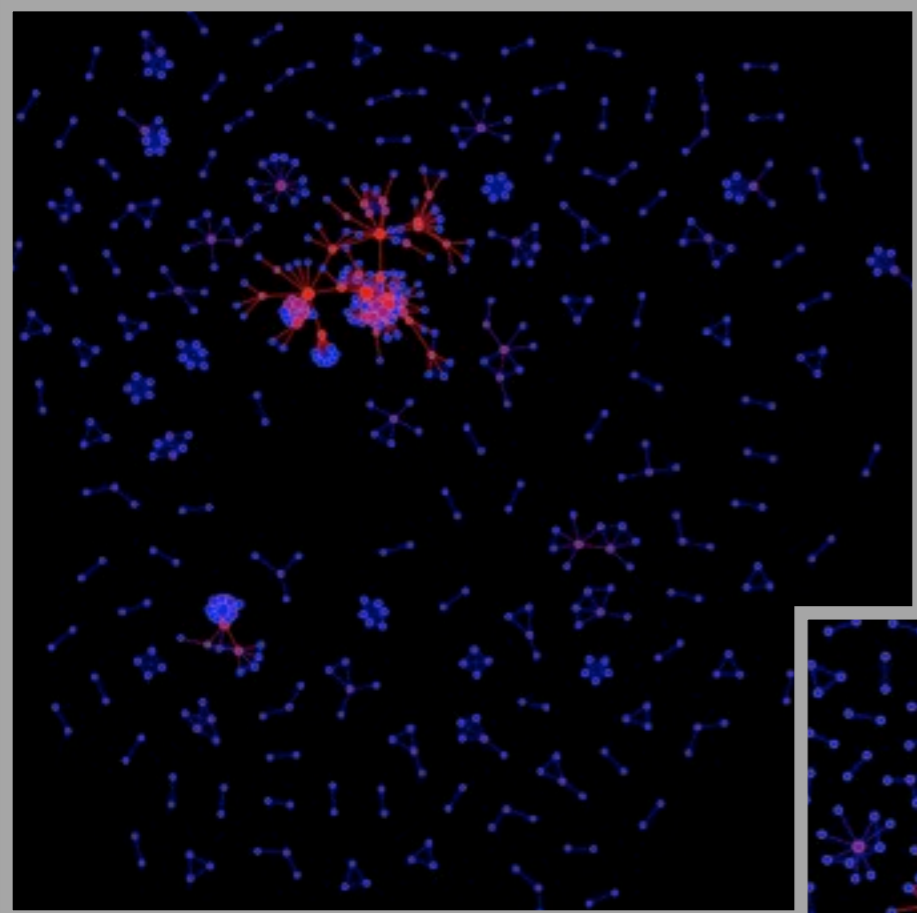
# Data

- 2602 participants
- Co-presence data ['A' was co-located with 'B']
  - Subset of actual physical encounters, March 2007
- Facebook friendship network ['A' is friends with 'B']
  - recorded after bluetooth data collection

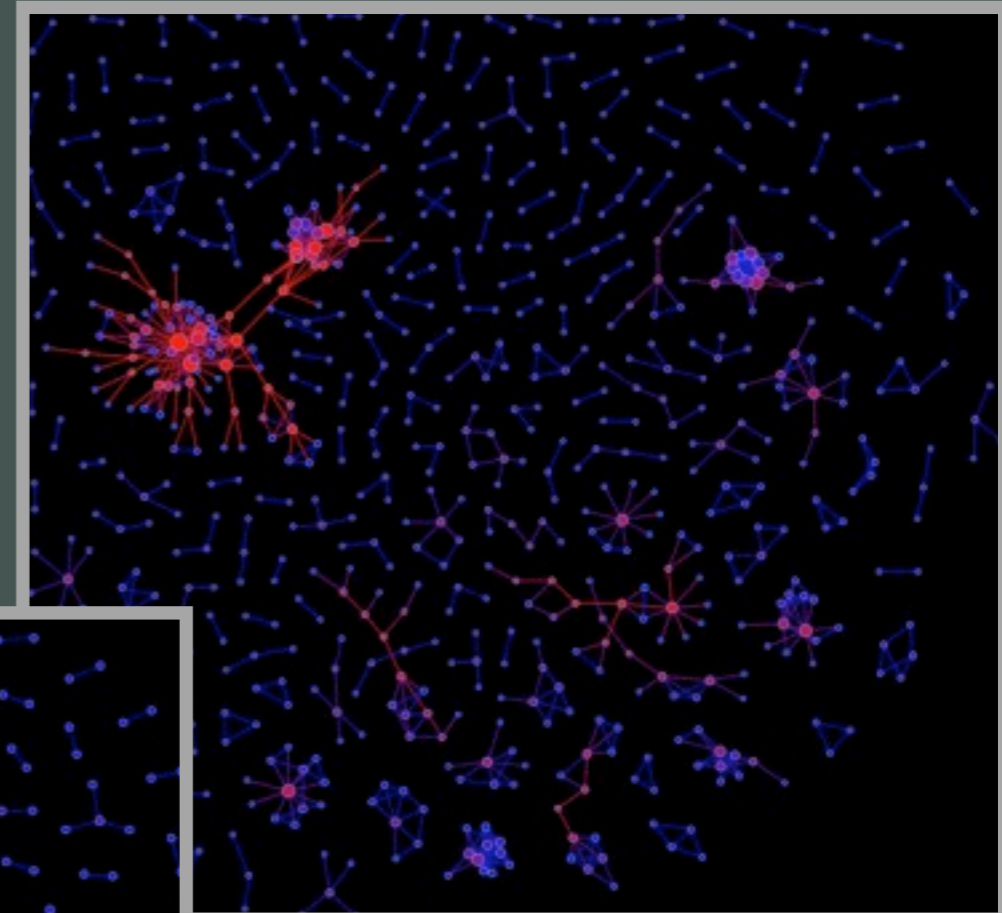
# Data coding

- **Encounter network (Spatial network)**
  - Users linked if they were co-located during the study
- **Facebook network (Transpatial network)**
  - Users linked if they were friends on Facebook
- **Fused network**
  - Encounter and Facebook networks fused
  - 3 types of ties : Encounter, Facebook & ‘Fused’

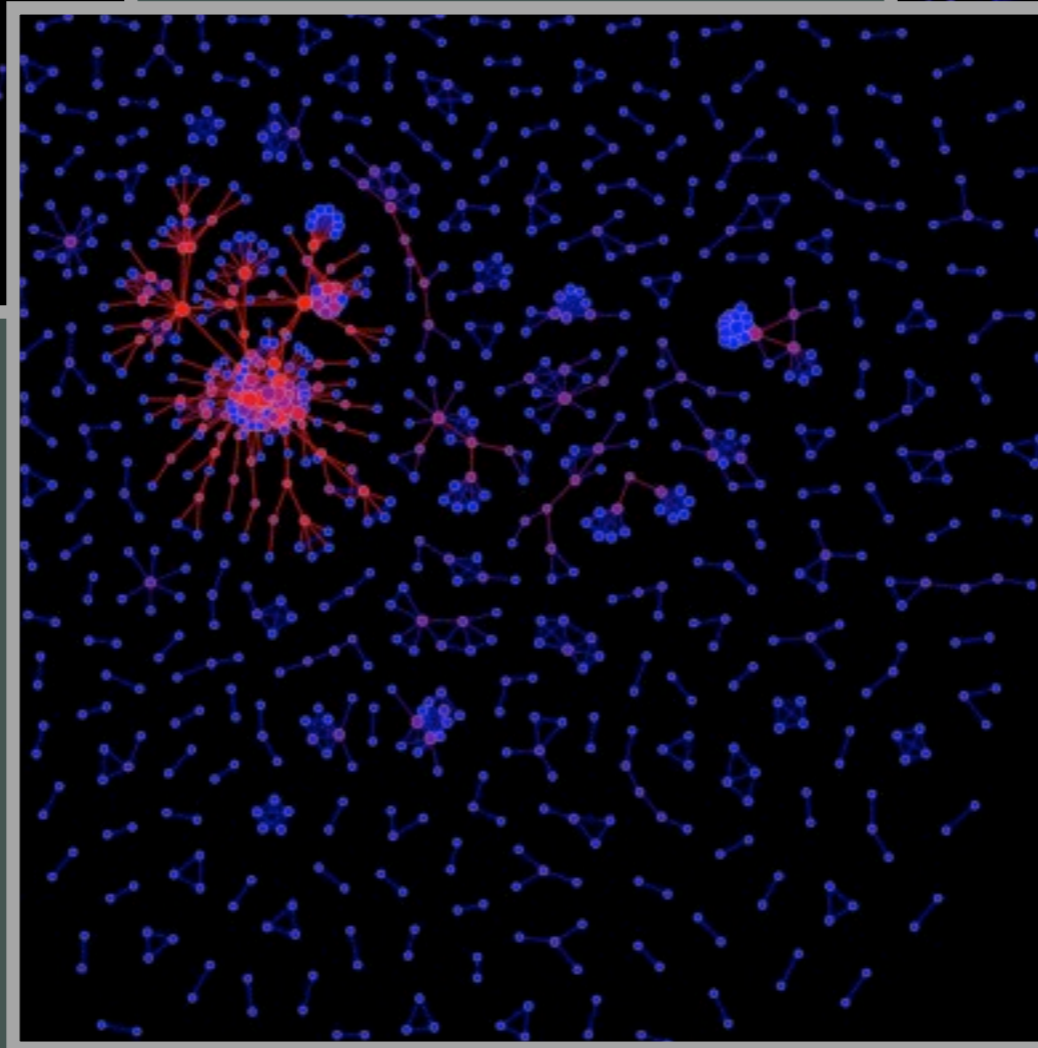
# Facebook



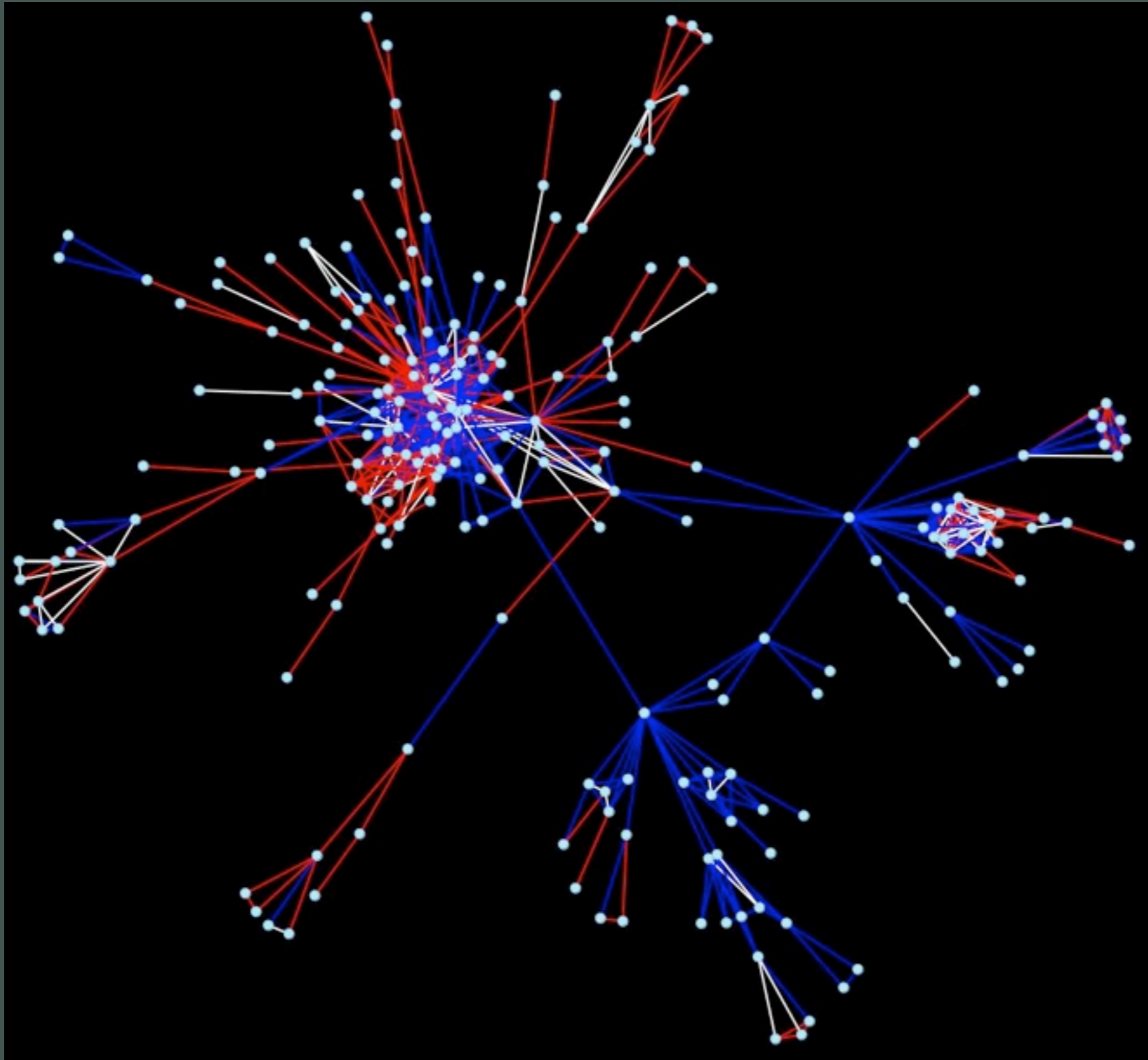
# Encounter



# Fused



# Fused

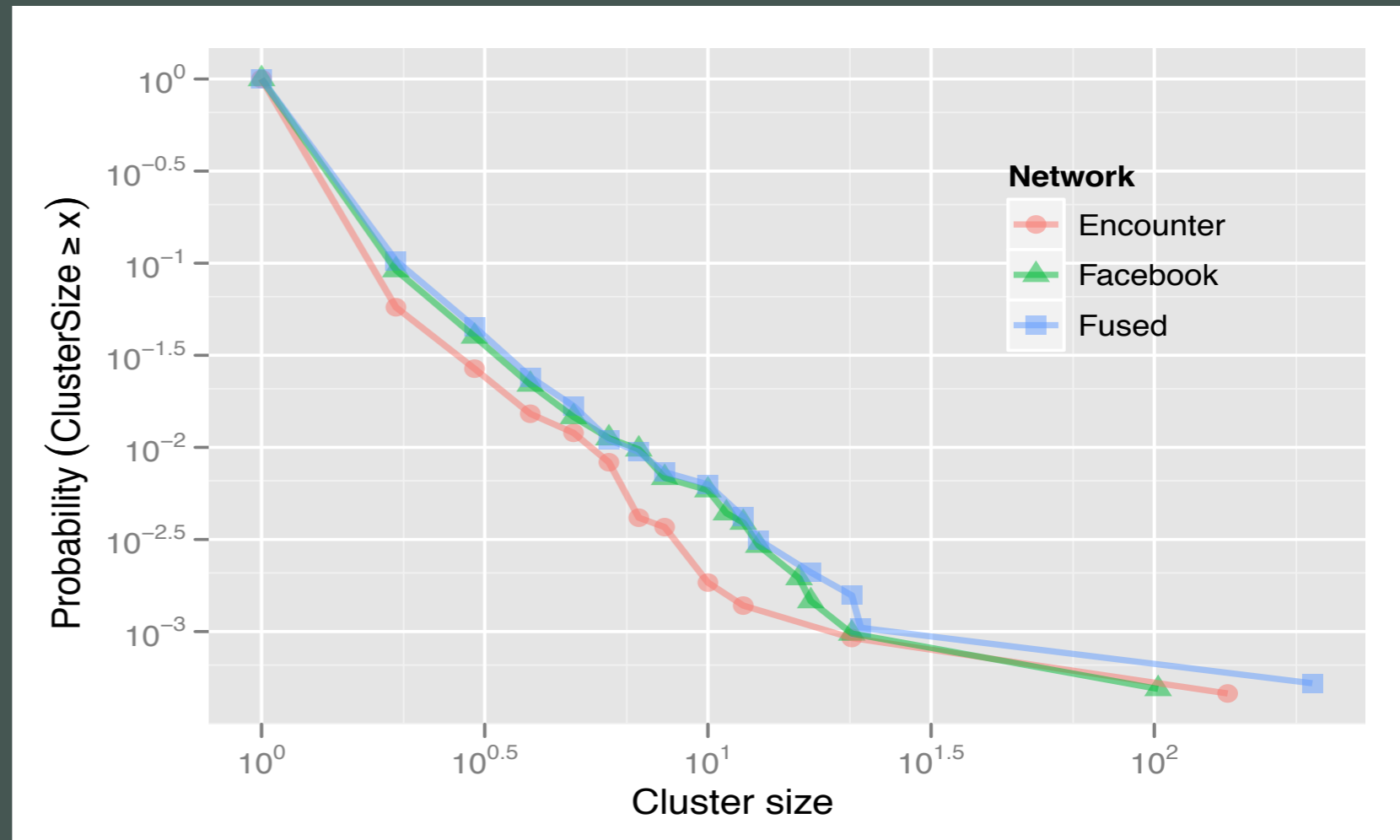




# Results

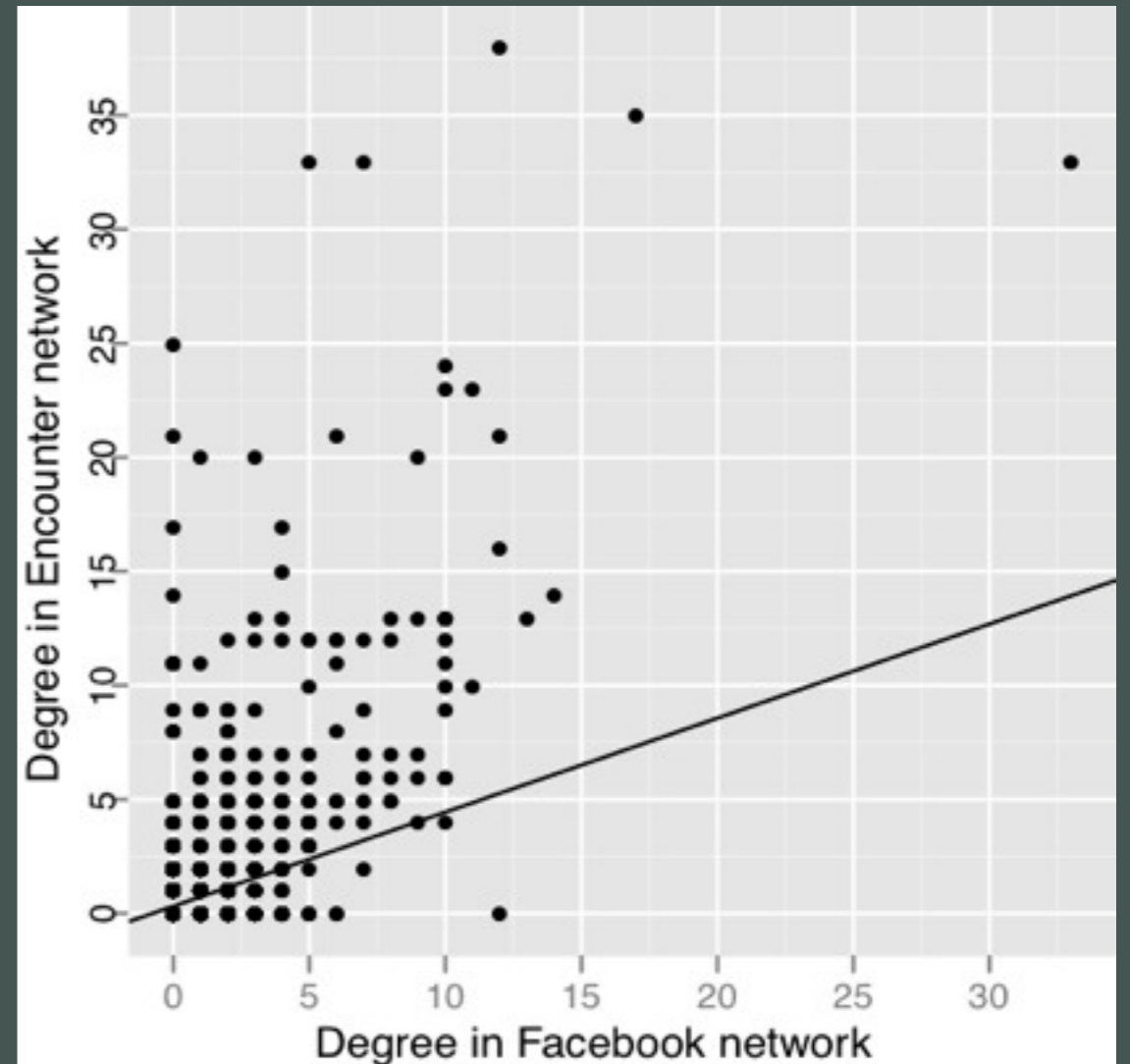
# Structural Characteristics

- Multiple connected components



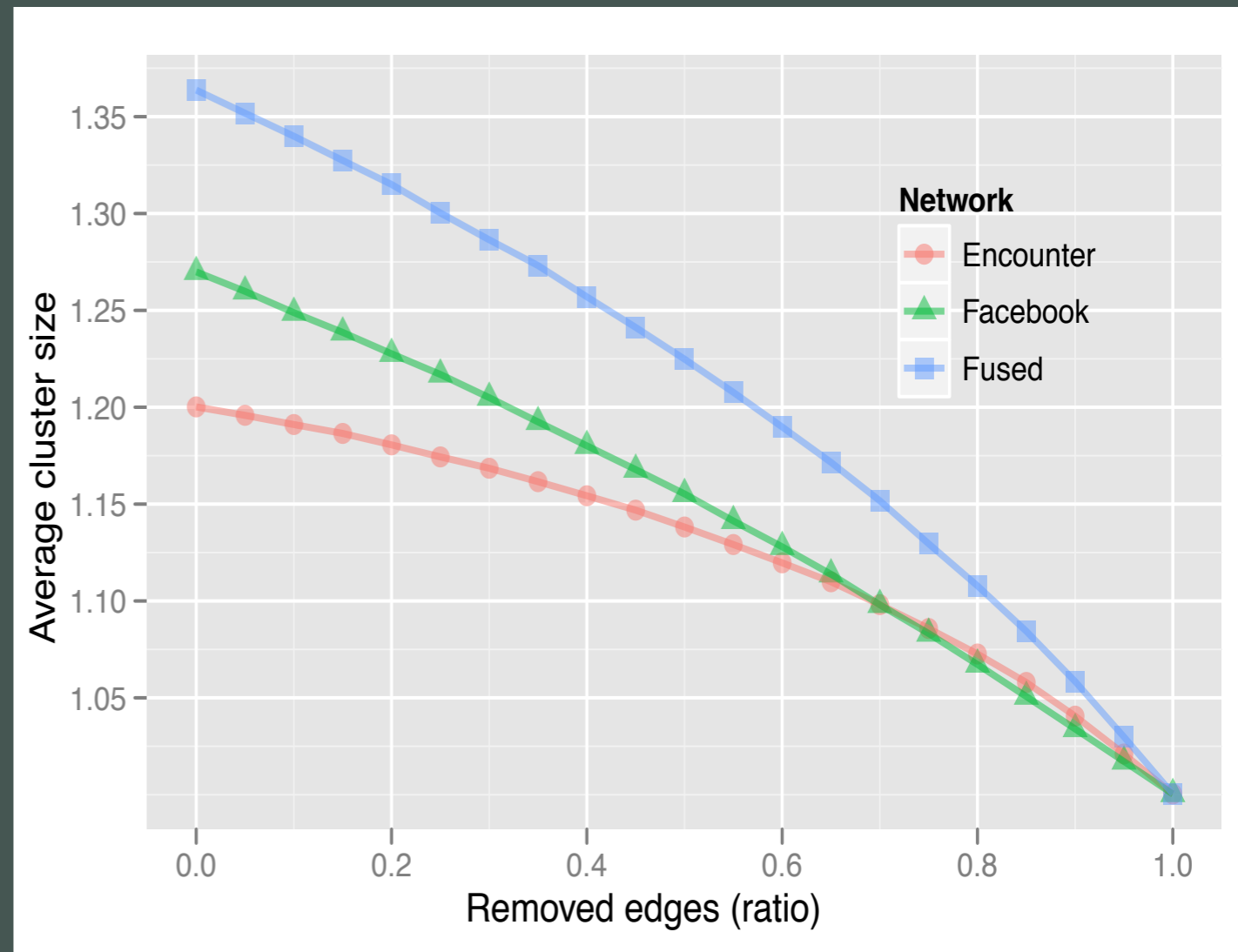
# Structural Characteristics

- Correlation of Structural Features of nodes
  - Degree - 0.68
  - Closeness - 0.46
  - Betweenness - 0.24
  - Clustering Coeff. - 0.46



# Resilience

- Average size of clusters as edges are removed


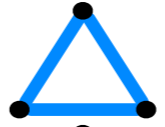
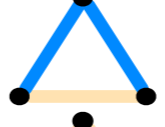




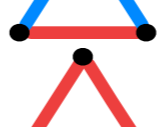

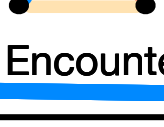



# Links

- Significant effect of link type on link betweenness ( $p < 0.0001$ )
  - In the fused network
  - Types of links in order of importance: Encounter, Facebook, Fused

# Triads

- **Triad:** A set of nodes that are mutually connected
- **Observed:** Frequency of each type in our network
- **Expected:** Frequency in a random assignment of edge types

Triad	Observed	Expected	Popularity
A 	220	45	4.9
B 	587	171	3.4
C 	650	329	2.0
D 	270	211	1.3
E 	103	152	0.7
F 	34	54	0.6
G 	85	143	0.6
H 	81	349	0.2
I 	43	237	0.2
J 	64	447	0.1


Encounter
Facebook
Encounter & Facebook

# Discussion

# Equivalence

- Bluetooth and Facebook networks exhibit similar structural characteristics
  - Global: Sparsity, Similar Diameter, Average Path Length
  - Low Average Degree, Clustering Coefficient
- Suggests that as users' proxies to actual social networks, they reflect similar aspects



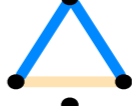










# Micro-correlation

- High correlation of degree (0.696)
- Poor correlation of Clustering Coefficient (0.124)
- Closeness (0.555) correlates better than betweenness (0.382)
  - Nodes' relative importance varies between two networks, but relative distance more similar

# Micro-correlation

- Some triad types highly over-represented
- Triads with 'only-Facebook' edges all under-represented
- Indicates that extent of triadic closure in OSN's is lower than in space-bound networks
  - Verified by clustering coefficient of Facebook (0.40) vs. Encounter (0.54)

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# Value

- Fused ties least important
  - Further reflects Granovetter’s ties strength hypothesis: Fused ties are more likely with close relatives or colleagues
- Spatial ties more ‘important’ than transpatial - might sound counterintuitive
  - Bluetooth has the potential to record “familiar strangers” relationships
  - Users do not explicitly indicate, but can potentially activate

# Validity of data

- Facebook & Bluetooth datasets are partial
- How to assess validity?
  - Simulation
  - Construct an intuitive model describing the underlying processes captured by our data
  - Examine whether the simulation suggests our data is valid
    - Compare triad frequency of our data vs. our model

# Model (fixed locations & people)

1. At each location people encounter each other randomly
2. If two people encounter each other, there is a probability that they become friends on Facebook
3. People may become friends on Facebook even if they have not met face to face
4. Some Facebook friends may visit each other
5. People may travel to locations even if they know no-one there

# Model results vs. Data

- The model was run with fixed parameters
- High correlation of relative ratios of triads generated by model and captured during study (R-square 0.965)
- The model is a simplified description of underlying dynamics
- Supports methodological validity of relying on bluetooth and facebook as proxies for spatial and transpatial networks.

# Conclusion

- Emerging technologies have potential to act as bridge between spatial and transpatial networks
- Important to develop fundamental understanding of such networks
- Study highlights high-level structural similarities, but underlying differences in how individuals participate in each network
- Validity of collected data supported by generative random graph model

It still pays to interact face to face!



# The end

Questions?

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