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Are You moved by Your Social Network Application?

Abderrahmen Mtibaa
Thomson Paris Research Lab

Joint works with:
Augustin Chaintreau, Anna-Kaisa Pietilainen, Jason Lebrun, Earl Olivier, Christophe Diot

Evolution in socializing techniques

- **Before the Internet: socialize by physical meeting**
  - People communicate only if they know each others AND if they are together
- **Today: Internet allows "virtual" socializing**
  - Chat, e-mail, Online Social Network
  - No need for locality
- **Tomorrow: MobiClique**
  - Meet your virtual community using opportunistic contacts and locality

Motivation

- Explore the relation between virtual social interactions and human physical meetings.
- Understand complex temporal properties based on simple social properties
- Forwarding based on social network properties.

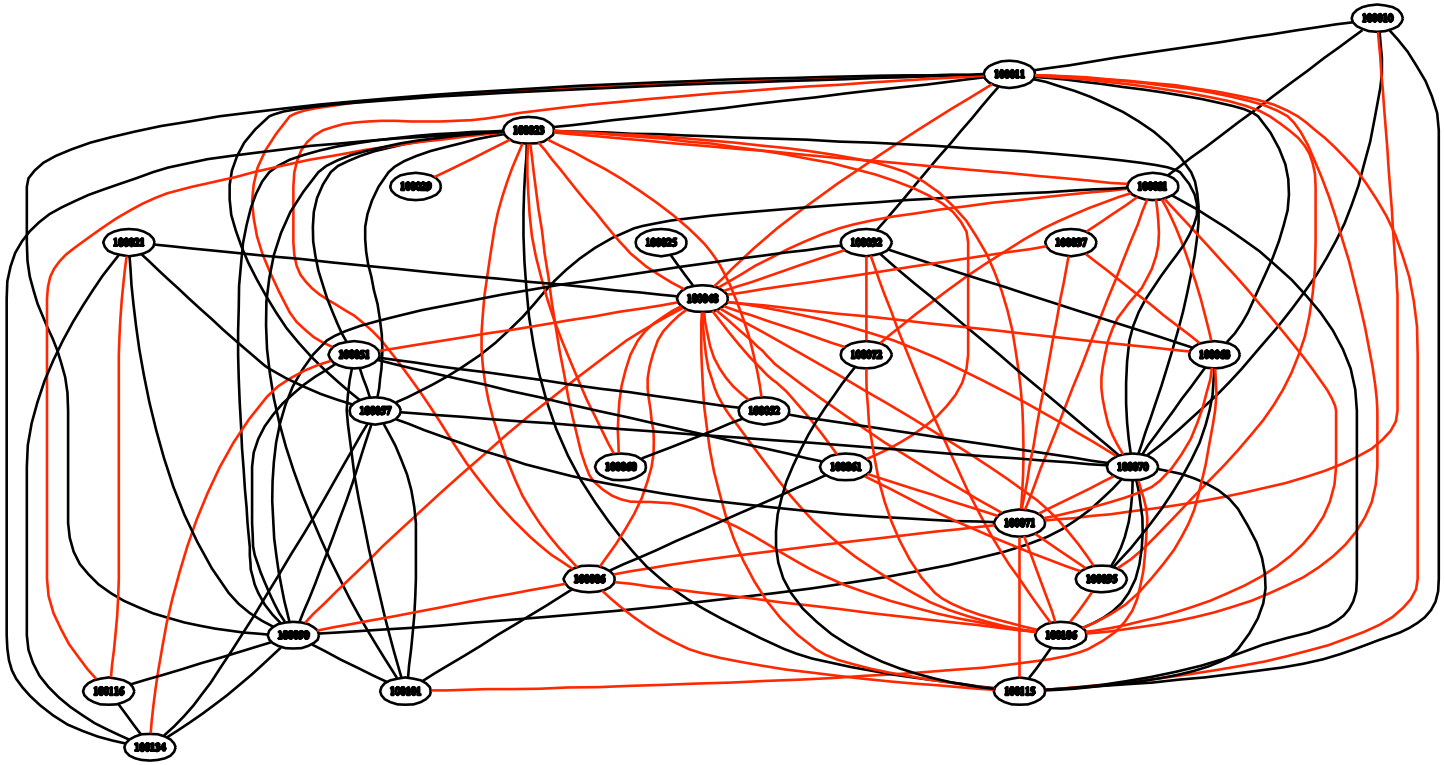
Structure of this talk

- **Overview of the MobiClique experiment**
- **Topological comparison**
  - Properties of nodes, contacts and paths
  - Is there any similarities?
- **Exploring social rules on opportunistic forwarding**
  - Overview of the opportunistic forwarding problem
  - Proposed social forwarding rules
- **Discussions**

Mobiclique experiment

- **Distribute smartphones to 28 participants**
- **3 days experiment at CoNext 2007**
- **Initially, each participant identifies its friends among the 150 CoNext participants**
- **Three applications:**
  - Opportunistic socializing: make new friends based on friends and interests
  - Epidemic newsgroup
  - Asynchronous messaging

Mobiclique experiment: Social Graph



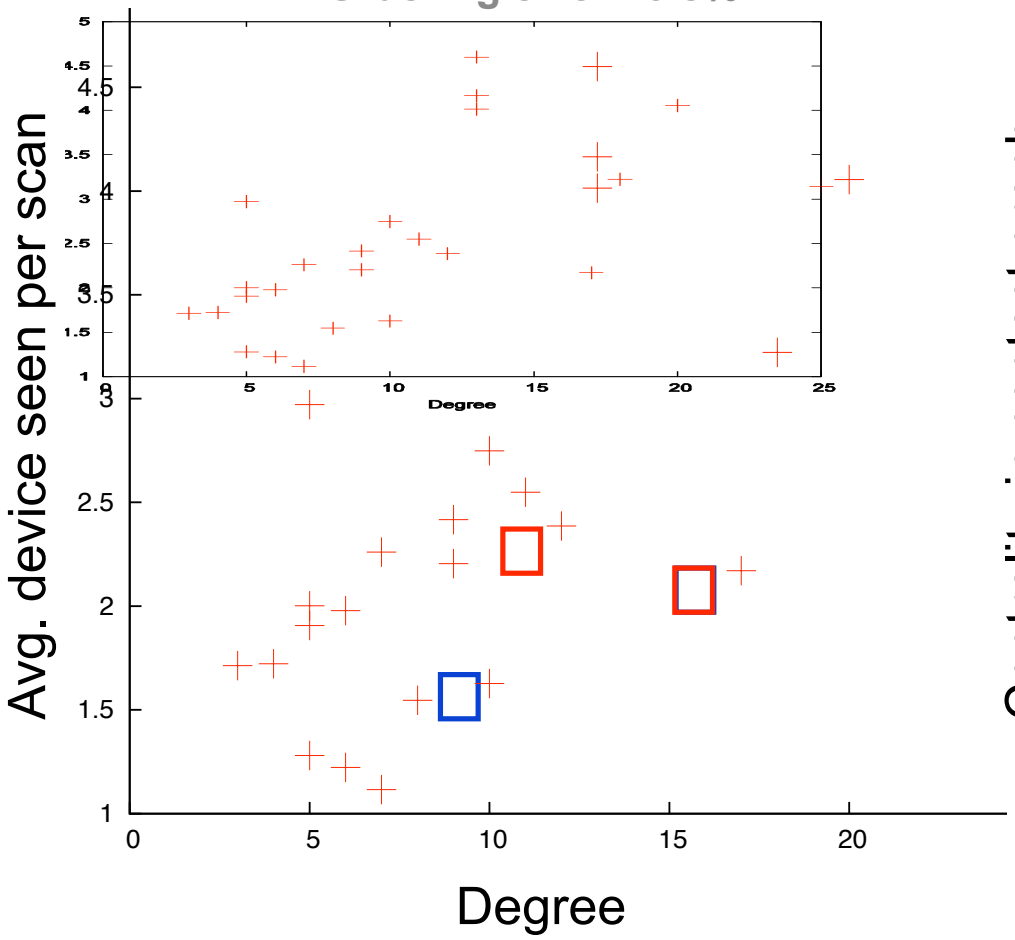
	Initial Graph	Final Graph
# connected nodes	26	27
# edges	56	115
average degree	5.2	9.5
clustering coefficient	0.2	0.36
diameter	7	4

Node properties

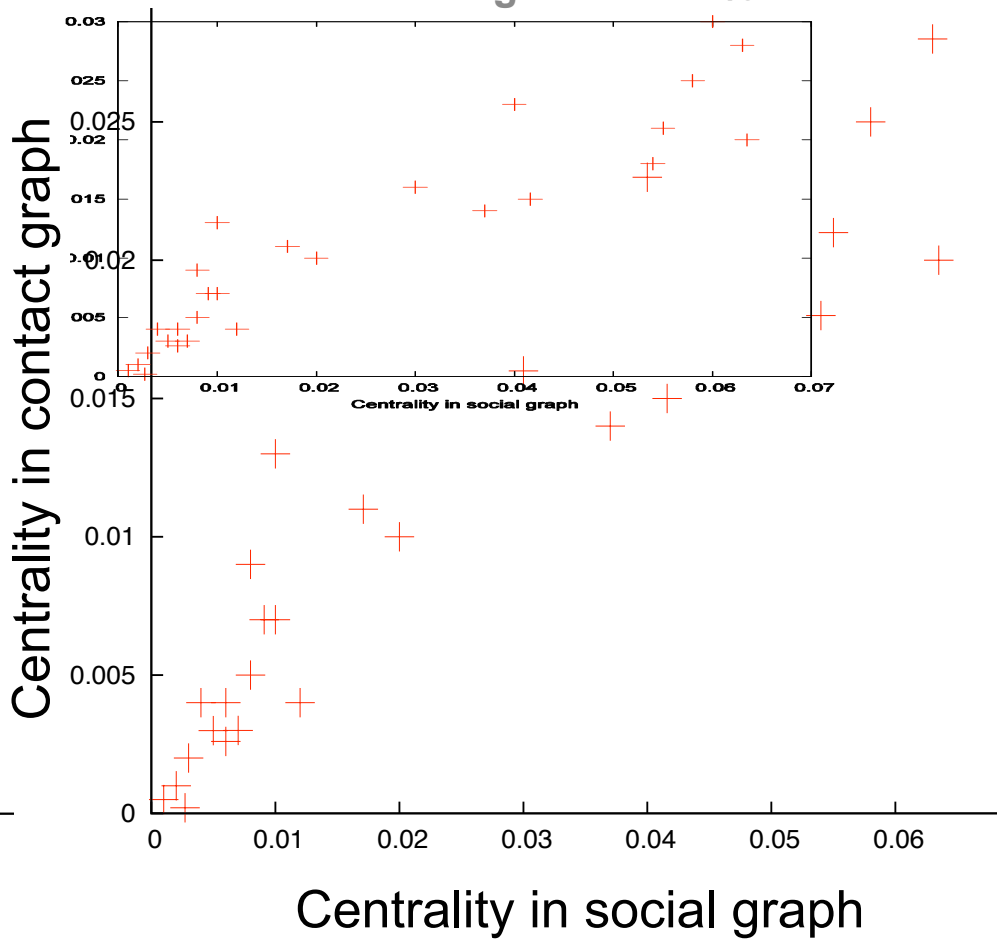
- **Characterize Node *heterogeneity***
  - High/low activity,
  - Popularity,
  - Contact rate
- **We measure two metrics**
  - Node degree:
    - Social Graph: number of friends
    - Contact Graph: average number of device seen per scan (every 2mn)
  - Centrality of nodes
    - Social Graph: measure the occurrence of the node inside all shortest paths
    - Contact Graph: measure the occurrence of the node at each time *t* inside all shortest paths

Node similarities

Ordering error 10.8%



Ordering error 3.97%



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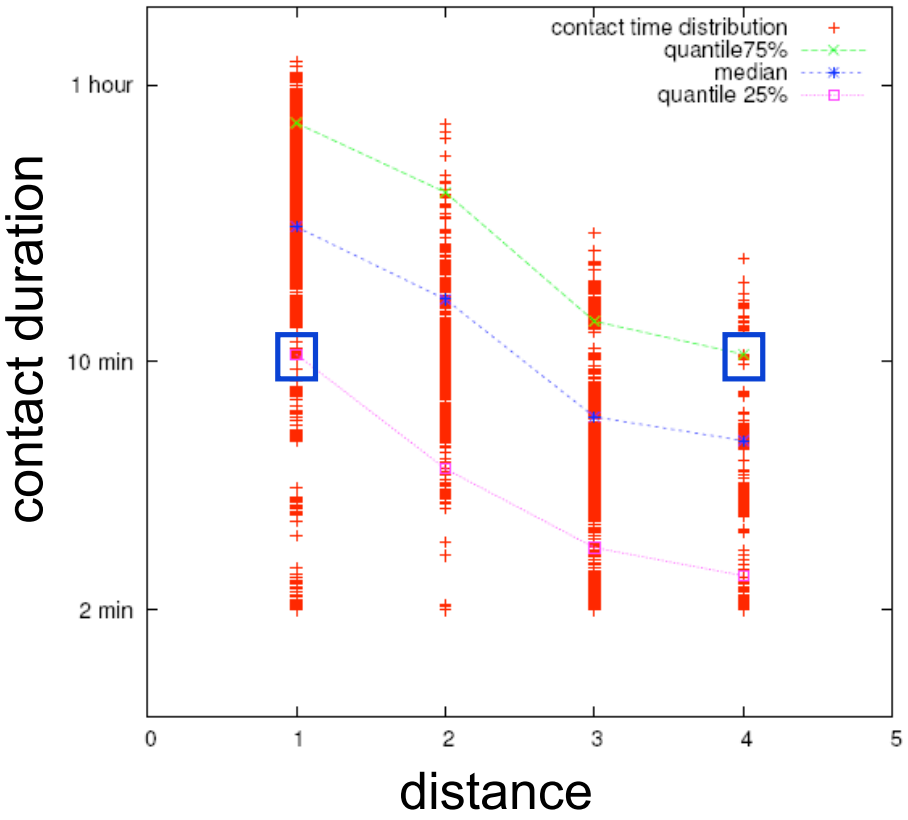
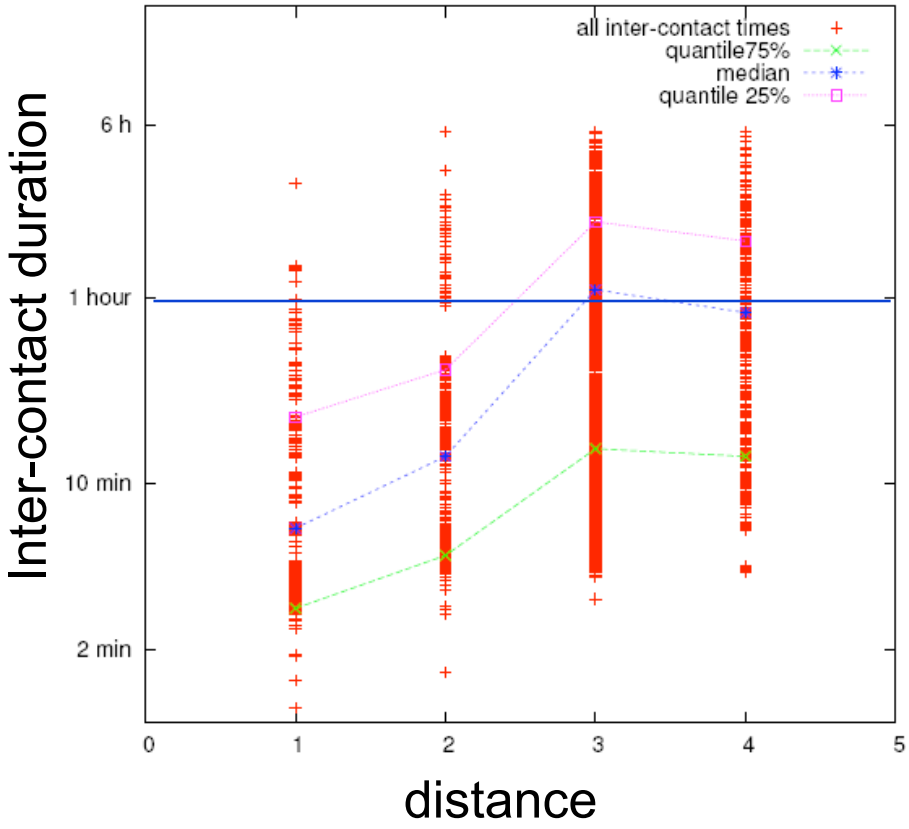
Contact properties

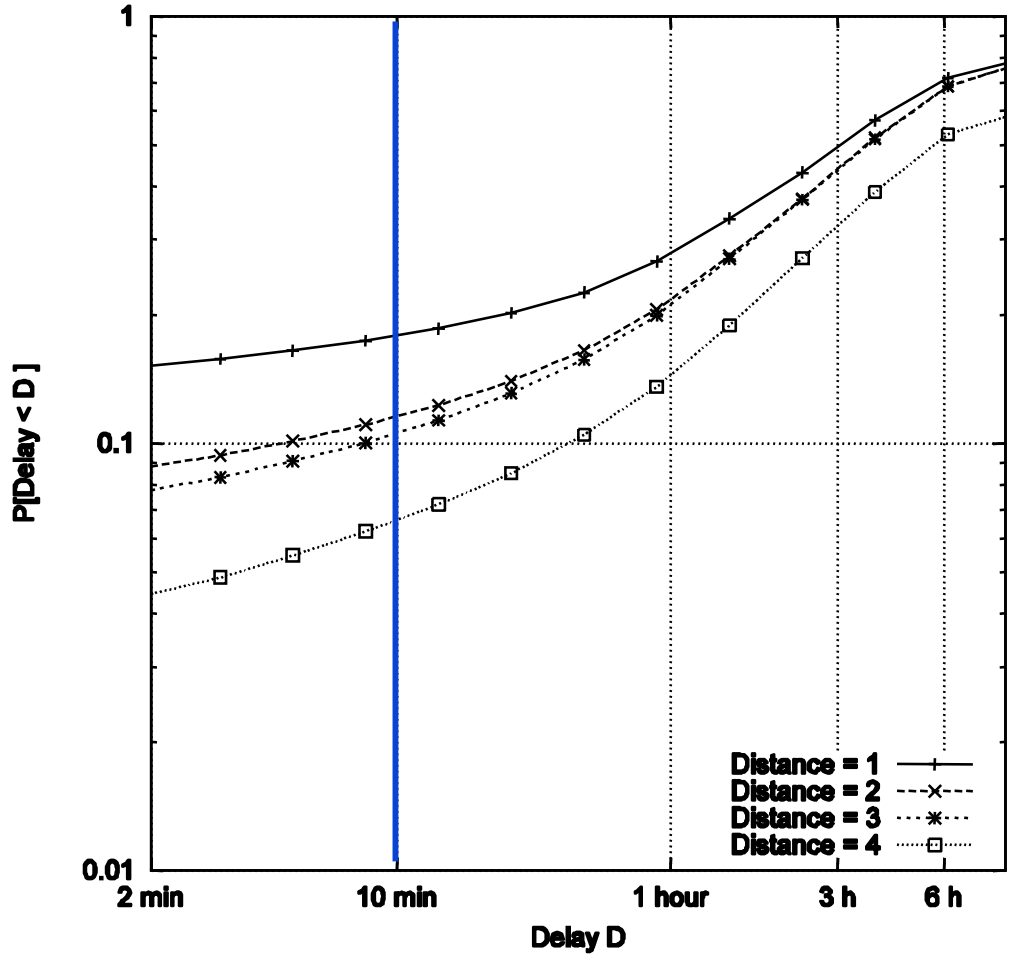
- **Compare contacts according to:**
  - *social* distance (friends have distance 1, friends of friends have distance 2, etc.).
  - *contact* duration, and time between two successive contacts





Path properties

Delay-optimal paths as a function of the **social distance** between the source and the destination



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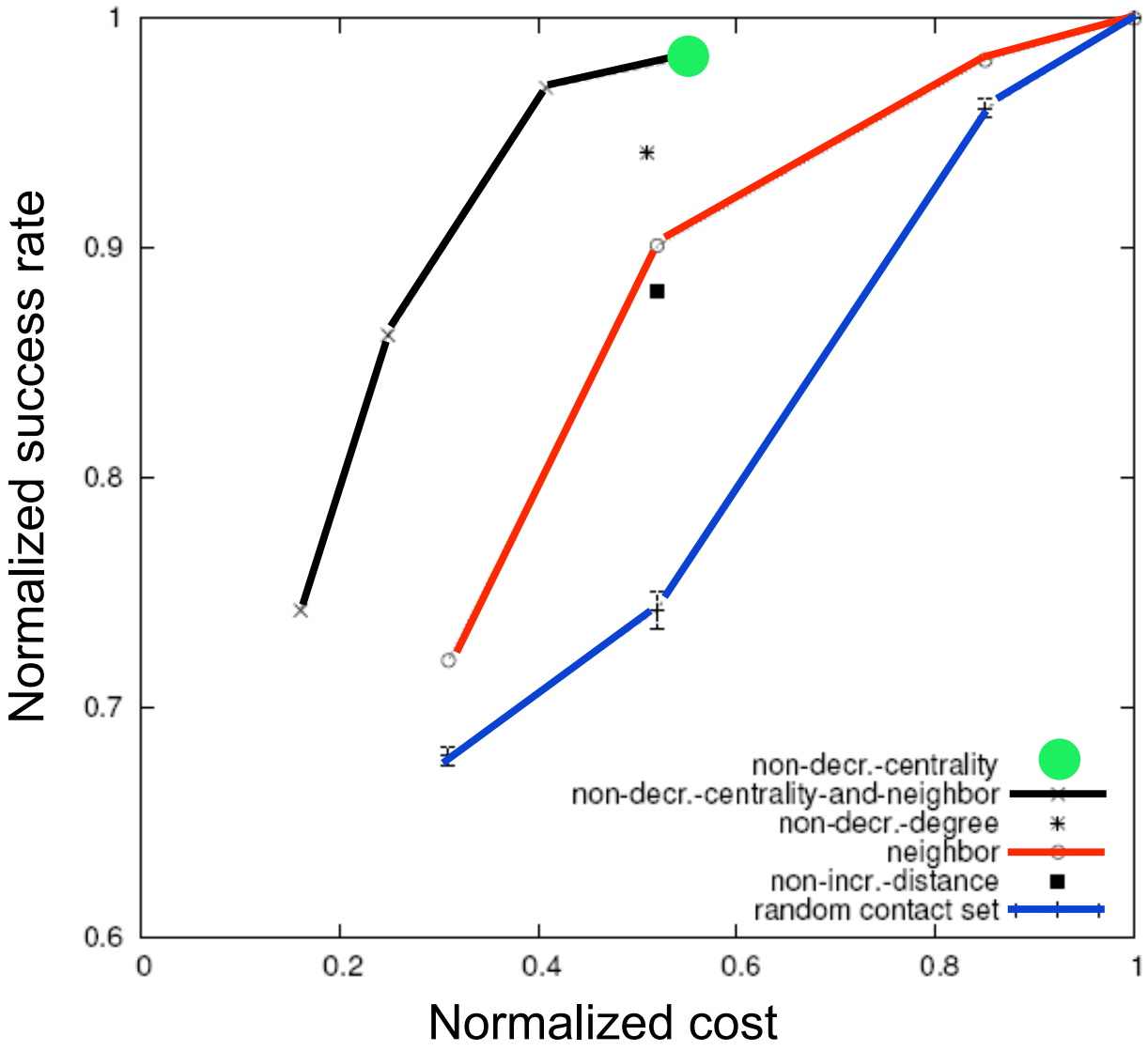
Social forwarding paths

- **Path construction rules:**
  - ***neighbor(k):***
    - (u → v) is allowed if and only if u and v are within distance k in the social graph.
  - ***non-decreasing-centrality:***
    - (u → v) is allowed if and only if C(u) < C(v).
  - ***non-decreasing-degree:***
    - (u → v) is allowed if and only if d(u) < d(v).
  - ***non-increasing-distance:***
    - (u → v) is allowed if and only if the social distance from v to d is no more than the one from u to d.

Comparison of rules



- The neighbor rule performs reasonably well
- The rule based on centrality outperforms all the rules we have tested
- The combination of neighbor and centrality rules reduces the cost (best trade-off).

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Summary of results

- **Beyond local divergence, nodes have heavy relation in the two graphs.**
  - Similarities in the properties of nodes, contacts, and paths.
  - Nodes may be ranked according to their centrality
- **Use central nodes and social neighbors to communicate can be effective**
  - improves selectivity
  - offers more flexibility
  - best trade-off
  - Difficult to compute in real-time
- **Limitations and future work:**
  - single event inside a community
  - more traces, more social graphs

Thank You

abderrahmen.mtibaa@thomson.net
http://thlab.net/~mtibaa
http://haggleproject.org

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