

On the Evolution of User Interaction in Facebook

Bimal Viswanath

Alan Mislove

Meeyoung Cha

Krishna P. Gummadi

MPI-SWS

Social network links

- * Lots of applications use social networks:
 - * Countering sybil attacks [SIGCOMM'06, NSDI'09]
 - * Web search [HotNets'06, VLDB'08]
 - * Recommendation systems [WWW'08]
- * But, social links could represent many things
 - * Close real world friends
 - * Casual acquaintances
 - * Even enemies [CHI'09]
- * In practice, people rarely delete social links

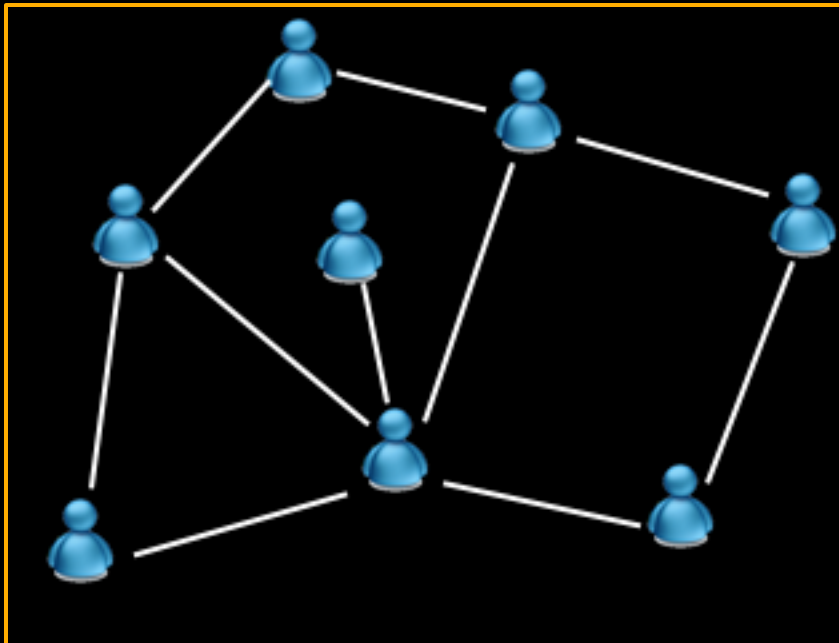
The logo for Orkut, featuring the word "orkut" in a lowercase, rounded, pinkish-purple font.The Facebook logo, consisting of the word "facebook" in white lowercase letters on a blue rectangular background.The LinkedIn logo, featuring the word "LinkedIn" in white lowercase letters, with the "in" part inside a blue square.The Myspace logo, featuring a blue icon of three stylized figures and the text "myspace.com" in blue, with the tagline "a place for friends" in a smaller font below it.

Is the current abstraction of links good enough ?

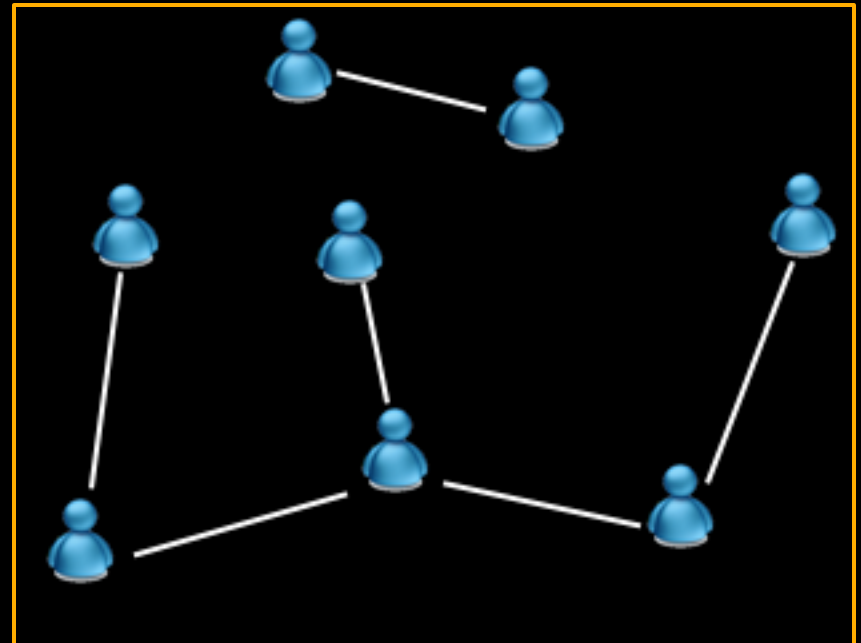
Gauging the strength of social links?

- * Idea: Use interaction to differentiate strong and weak links

Social network



Interaction network



This defines an **interaction network** [IMC'08]

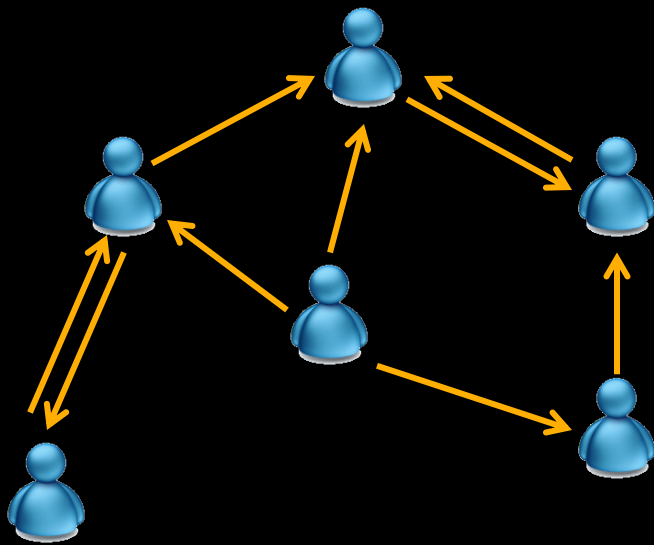
Prior studies

- * Previous studies looked at a **static snapshot of interaction network** [*IMC'08, Eurosys'09*]
- * Interaction network **changes with time**
- * Understanding dynamics important for applications

This talk

- * We characterize the evolution of user interaction
 - * Collected data of user interaction in Facebook
 - * Studied how pairwise interactions evolve over time
 - * Studied how interaction network as a whole evolve over time

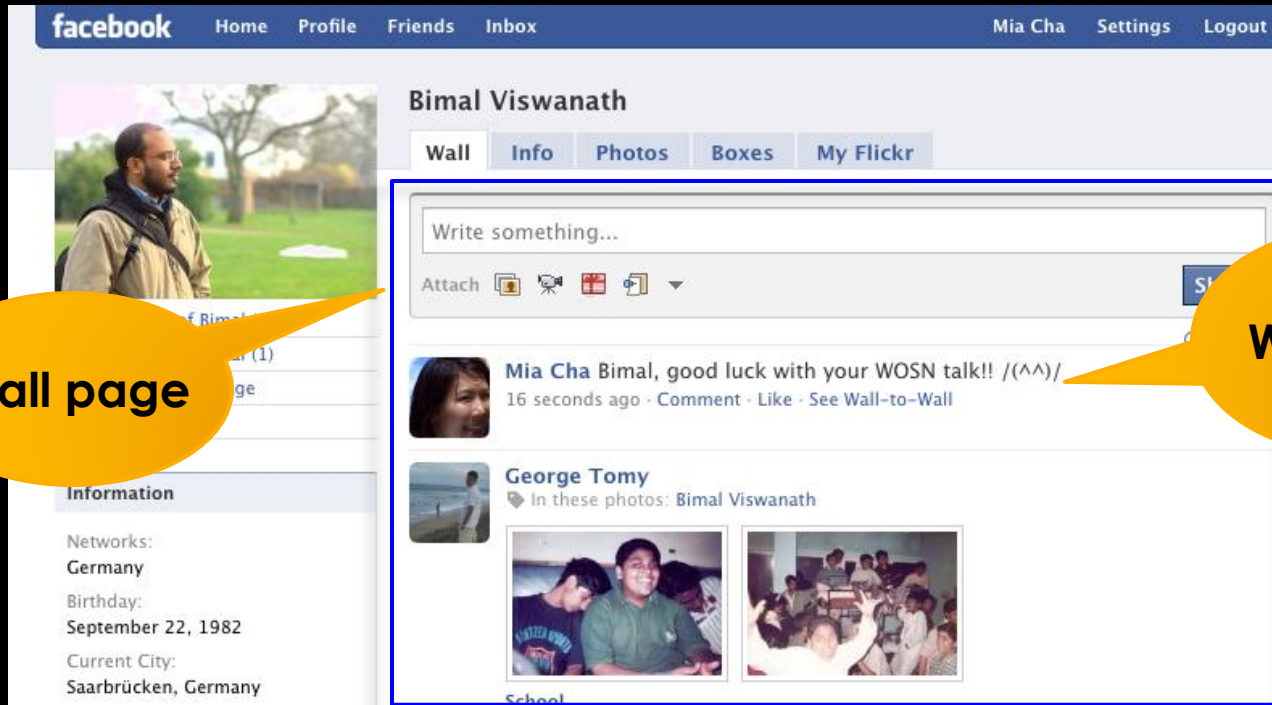
Crawling Facebook



- * Facebook reluctant to give out data
 - * Performed crawl of user graph
- * Picked known seed user
 - * Crawled all of his friends
 - * Add new users to list
- * Continued until all reachable users crawled

- * Crawled Facebook New Orleans regional network
 - * Over 90,000 users, 3M social links
- * We could create many crawling accounts

Collected interaction data

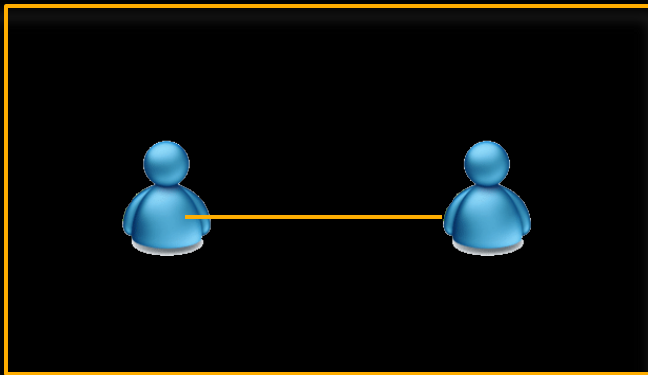


- * Able to download entire wall history
- * 800,000 wall posts
- * Link creation time known from wall page

Data collection challenges

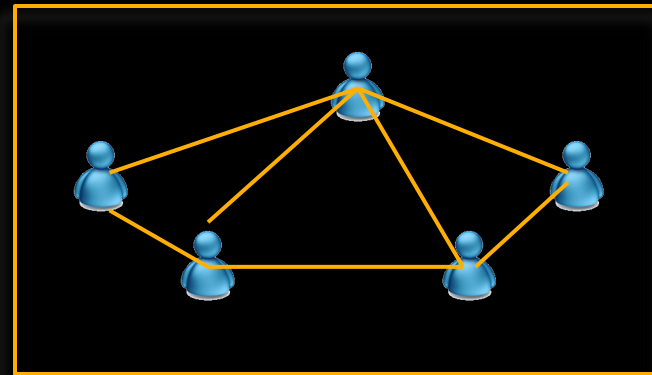
- * Could not capture all the users' interaction
 - * Only 76% profiles publicly visible
- * Only crawled the giant connected component
 - * Represents ~52% of users in New Orleans network
- * Users can interact in other ways also
 - * Messages, photo sharing, applications, chat

Rest of the talk



Local view:

Evolution of
pairwise interactions



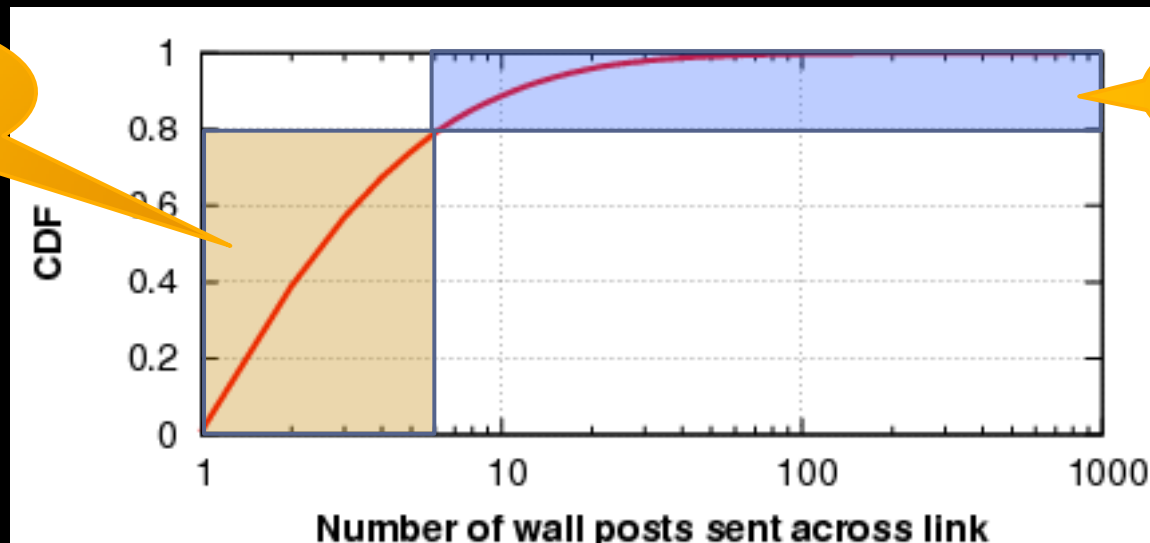
Global view:

Evolution of interaction
network over time

Frequency of interaction

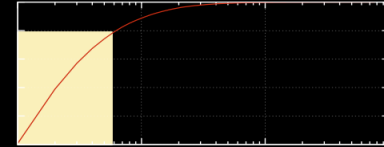
- * Only **23.7%** of the social links exhibit interaction
- * Focus on the 1st year of interaction for each pair
- * Wall posting distribution among users skewed
 - * **80%** of pairs exchange no more than 5 posts

Light chatter

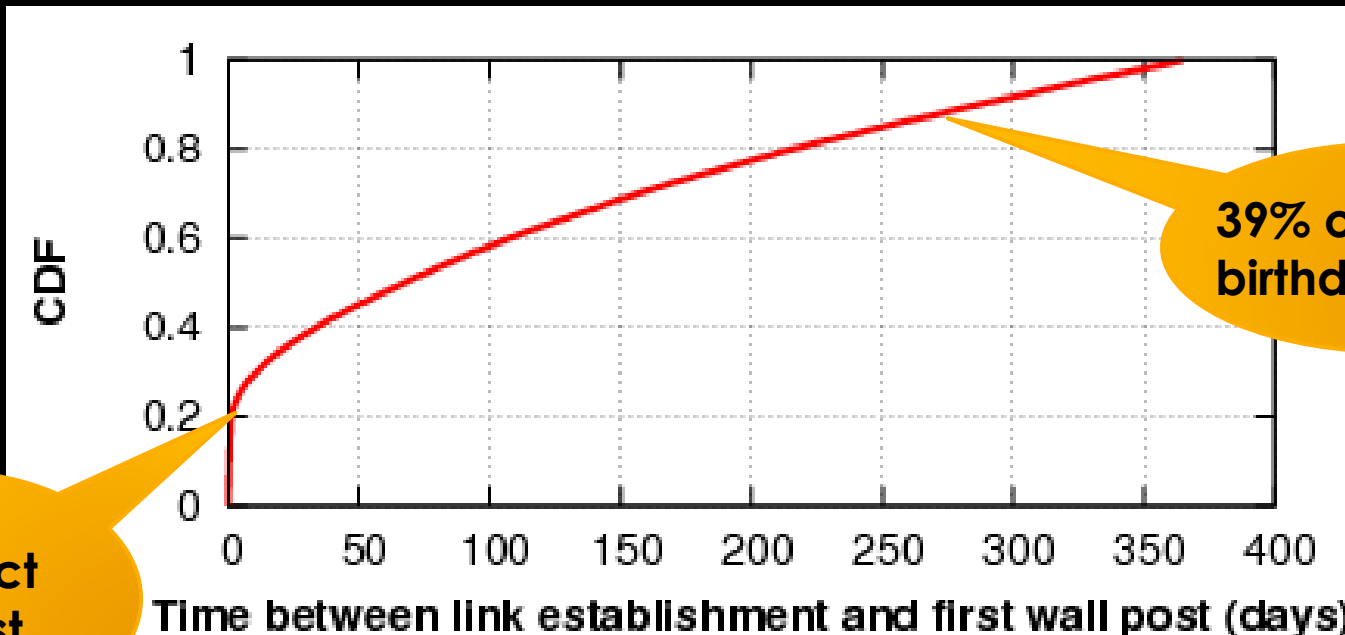


Heavy chatter

Light chatter patterns



- * What caused low level of interaction?
- * Did link creation trigger interaction?



20%
interact
on first
day

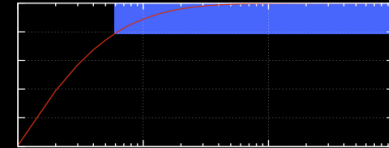
39% of posts on
birthday wishes

80% of pairs post first message evenly over the year

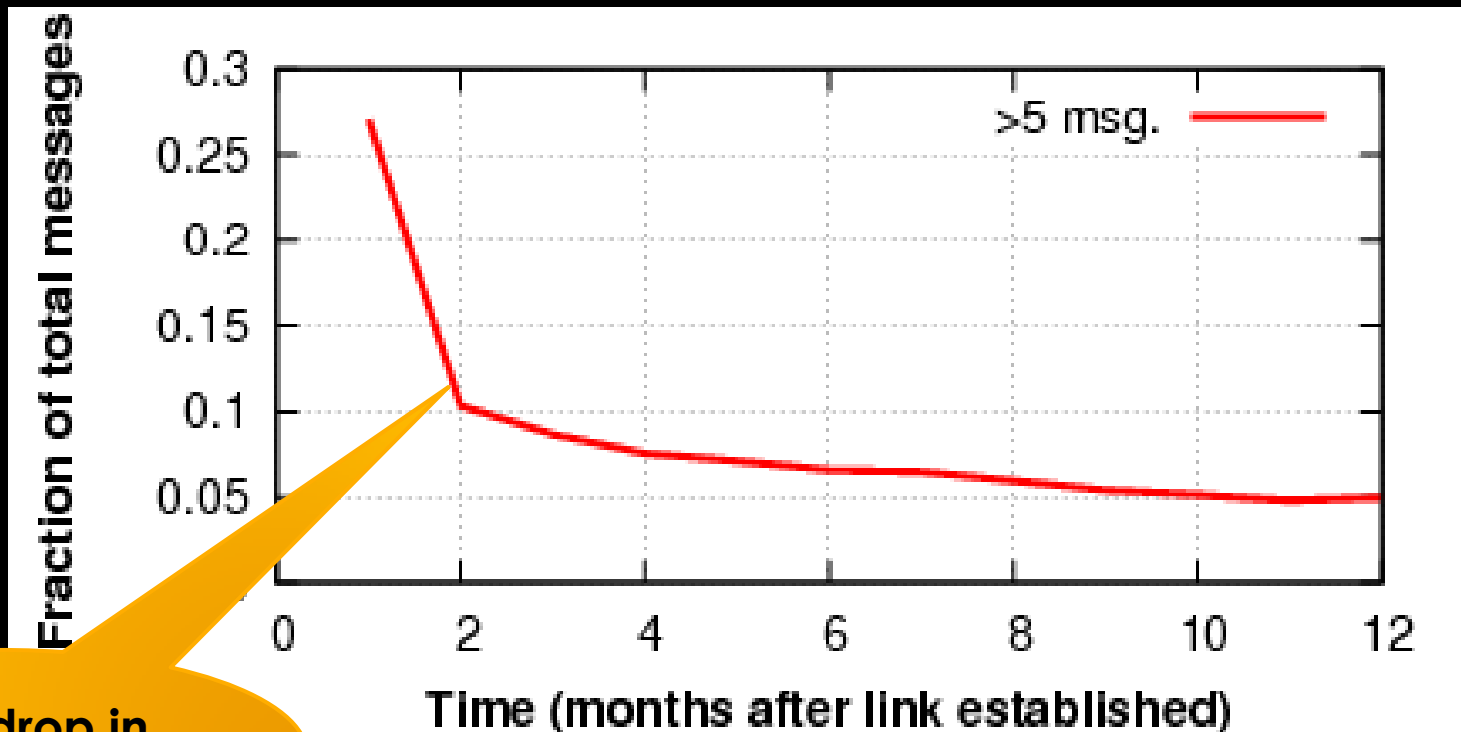
Implications of light chatters

- * Likely users who are acquainted with each other, though not close friends
- * Large fraction of such links to be considered while building applications
 - * E.g. Maybe not good for recommendation systems
- * OSN site features could cause interaction
 - * E.g. Birthday reminders

Heavy chatter patterns



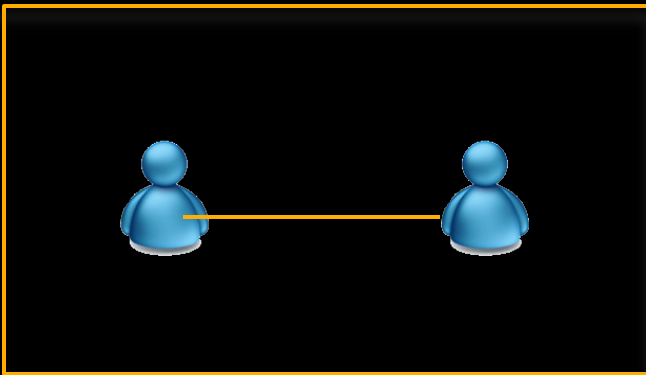
* How does the rate of interaction evolve?



Sharp drop in interaction after 1 month

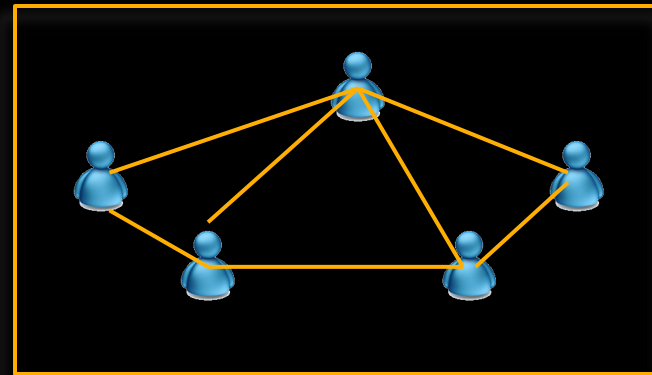
General decreasing trend in rate of interaction observed

Rest of the talk



Local view:

Evolution of
pairwise interactions



Global view:

Evolution of interaction
network over time

Evolution of interaction network

- * Constructed multiple snapshots of interaction network
 - * 30, 60, 90, and 180 days intervals

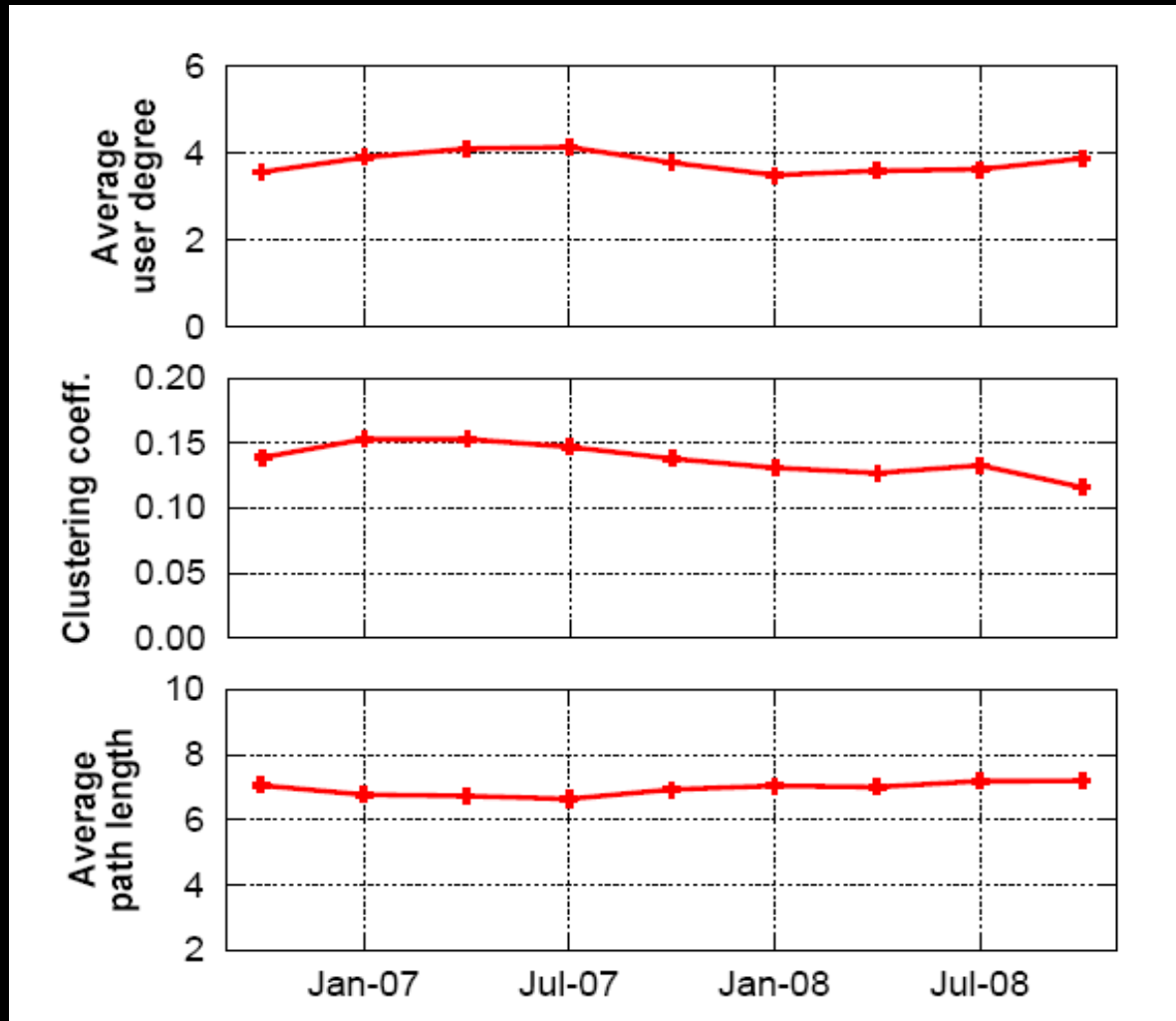
- * We compare network properties of successive snapshots

Churn in the interaction network

- * Examine network at 3 months intervals
- * What fraction of links are not present in the next snapshot?
 - * 55% [Min = 22% , Max = 61%]
- * What fraction of links were not present in previous snapshot?
 - * 27% [Min = 19%, Max = 31%]
- * In contrast, social network links hardly deleted

Interaction network changes dramatically!

Evolution of structural properties



Graph properties remarkably stable

Summary

- * Many applications are built using social networks
 - * But social links mean many things
- * Idea: Use interaction to differentiate links
 - * Previous studies only looked at static snapshots
- * Examined both local and global properties of network
 - * Many links backed by very little interaction
 - * Interaction network changes dramatically
 - * But, graph properties remarkably stable

Questions?

Data sets available at:

<http://socialnetworks.mpi-sws.org>