On the Evolution of User Interaction in Facebook

Bimal Viswanath  Alan Mislove  Meeyoung Cha  Krishna P. Gummadi

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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

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
Evolution of pairwise interactions

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

![Graph showing CDF of number of wall posts sent across link]

- **Light chatter**
- **Heavy chatter**
Light chatter patterns

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

![Graph showing time between link establishment and first wall post](image)

- 39% of posts on birthday wishes
- 20% interact on first day

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
How does the rate of interaction evolve?

General decreasing trend in rate of interaction observed

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
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