UNDERSTANDING VISIBLE AND LATENT INTERACTIONS IN ONLINE SOCIAL NETWORK

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Understanding Latent Interaction

OBJECTIVE:

- ✧ Online social networks are popular tool for social interactions & communication
- ✧ Understanding of OSN can provides insight into human social behavior
- ✧ Help improve social platform and applications
- ✧ *Latent interaction* is a passive action such as profile browsing
- ✧ *Visible interaction* is like posting comments on other users' profile, or liking their comments or tagging them in photos

Identifying Users

Features are useful for analyzing users across forums

- ✧ STRUCTURAL FEATURES

  It provides an indication of the communication between users
  It does not account for the actual amount of communication
  Examines who is replying to whom

- ✧ RECIPROCITY FEATURES

  It provides an indication of the reciprocal interaction between users
  Checks if two users have replied to each other's post in the thread

- ✧ PERSISTENCE FEATURES

  It provides an indication of the length of the interaction between users
  For how many times have they replied to each other's post

- ✧ POPULARITY FEATURES

  It provides an indication of how popular a user is
  More popular users are more likely to be replied to

- ✧ INITIALISING FEAUTRES

  It provides a measure of what percentage of threads are initiated by users
  Distinguish users who initiated many threads from the one who just replies

The Renren Social Network

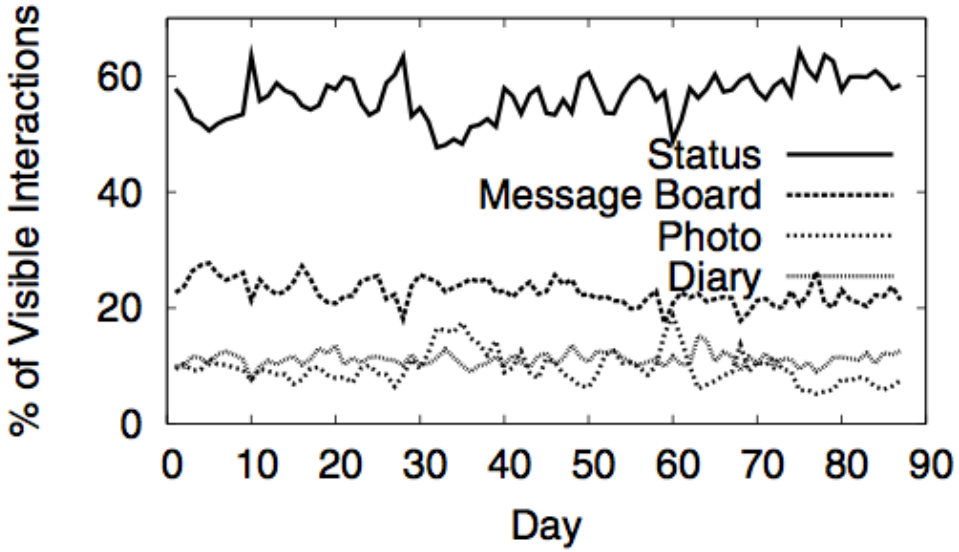
- The largest OSN in China with more than 150 million users to date
- Clone of Facebook, with similar structure, layout and features
- Organizes users into membership-based networks represented by Schools, companies etc
- Membership in networks require authentication.
- It shows a list of 8 "popular users" at the bottom of the page

- Renren has two unique features
  - The friend lists are public and unprotected by privacy mechanisms – allowed crawling an exhaustive snapshot of Renren's largest connected component, producing an extremely large social graph with 42.1 million nodes and 1.66 billion edges.
  - Renren user profiles make a variety of statistics visible to both the profile owner and the visitors

Data Collection

- Renren Social graph: Crawled entire network from April'09 - June'09
  - Data Collected: unique userIDs, network affiliations and friendship links

- PKU network: crawled PKU network between Sep'09 - Nov'09
  - Data Collected: Information about user's profile and interactions patterns like comments generated by users in message board posts, dairy entries, photos and status update

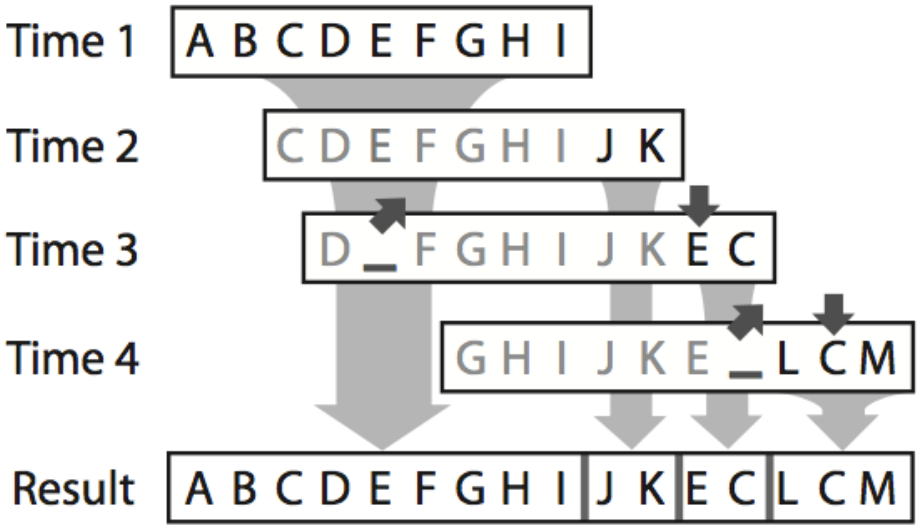


Daily distribution of comments across applications

Measuring Latent User Interaction

RECONSTRUCTING VISITORS HISTORIES:

- There are two types of visitors:
  - New Users – Who is visiting the owner's profile for the first time
  - Repeat Users – Who has visited the owner's profile before



- Integrate multiple visitor lists captured by multiple crawls of the same profile into a single history

Social Graph Analysis

Network	Users Crawled	Links Crawled	Avg. Degree	Cluster Coef.	Assortativity	Avg. Path Len.
Renren	42,115K	1,657,273K	78.70	0.063	0.15	5.38
Facebook [29]	10,697K	408,265K	76.33	0.164	0.17	4.8
Cyworld [1]	12,048K	190,589K	31.64	0.16	-0.13	3.2
Orkut [22]	3,072K	223,534K	145.53	0.171	0.072	4.25
Twitter [13]	88K	829K	18.84	0.106	0.59	N/A

COMMPLEMENTARY CUMMULATIVE DISTRIBUTION FREQUENCY:

It's the user social degree in the Renren network

CLUSTERING COEFFICIENT:

It's the ratio of number of links over all possible connections between one's friends
Renren friend relationships are loosely connected

ASSORTATIVITY COEFFICIENT:

Measures the probability for users to establish links to other users of similar degree
Renren's connections between like-degree users are numerous.
Chains of super-users form the back-bone of Social Network

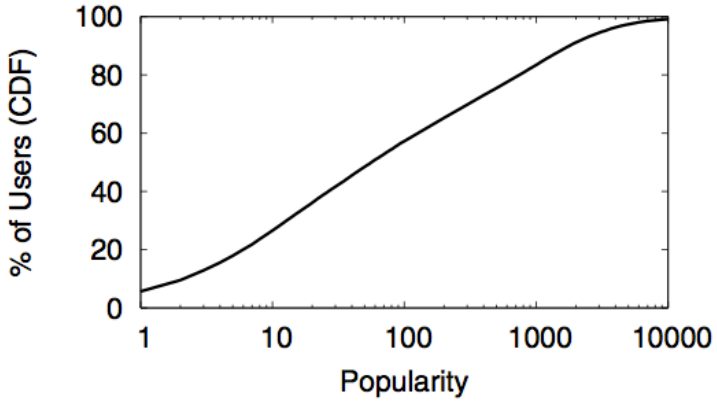
AVG. PATH LENGTH:

It's the average of all-pairs-shortest-paths in the social network

Properties of Interaction Events

POPULARITY

- Popularity is number of views a user's profile receives.
- Its in-degree of latent interaction

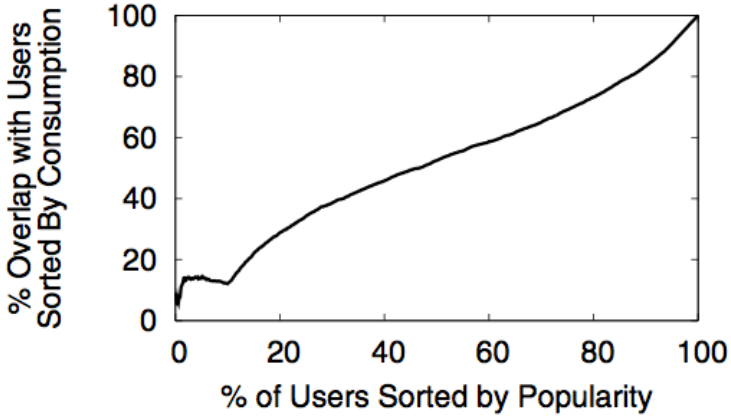


1% are popular enough to receive more than 10,000 views
57% exhibits very low popularity with less than 100 views

CONSUMPTION

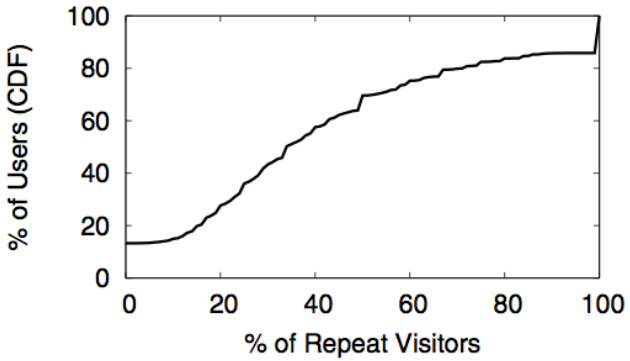
- Consumption is the number of other profiles a user views
- Its out-degree of latent interaction

1% most popular users have 9% overlap with top 1% biggest consumers



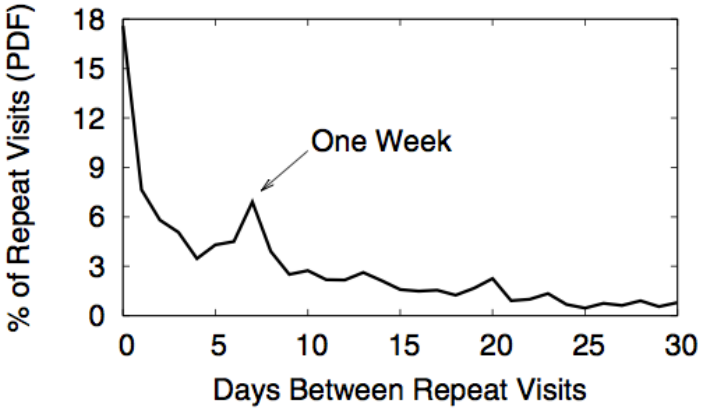
Composition of Visitors

1. What portion of profile visitors are repeat visitors?
   - ✧ Majority of visitors do not browse same profile twice



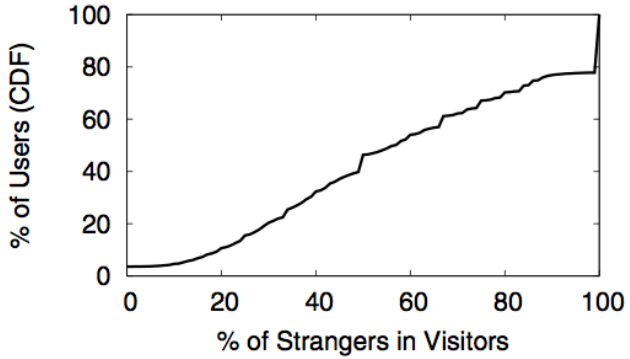
70% of users have less than 50% repeat visitors

   - ✧ Users most likely to return to a viewed profile on the same day
   - ✧ Users periodically check on their friends on a weekly basis



Composition of Visitors

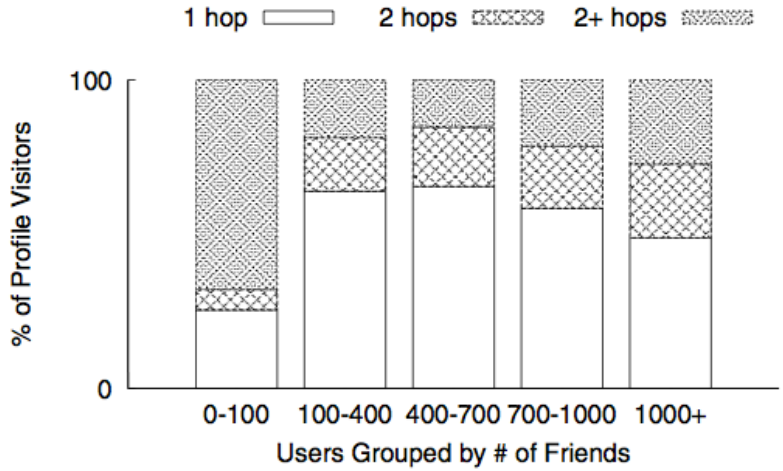
2. Are the repeat visitors only friends or complete strangers?
   - ✧ Majority of users receive a majority of their profile views from strangers



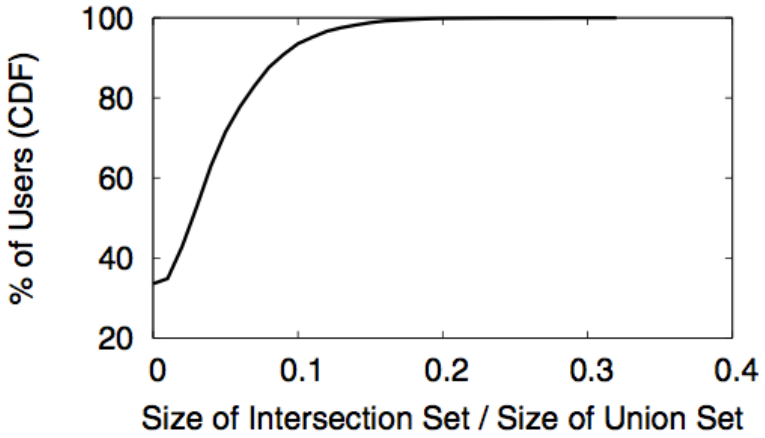
45% of users receive less than 50% of their profile visits from strangers

   - ✧ How far are the visitors from the profile owner in the social graph?

Users with <100 and >1000 friends, the majority of visits are by complete strangers



Reciprocity



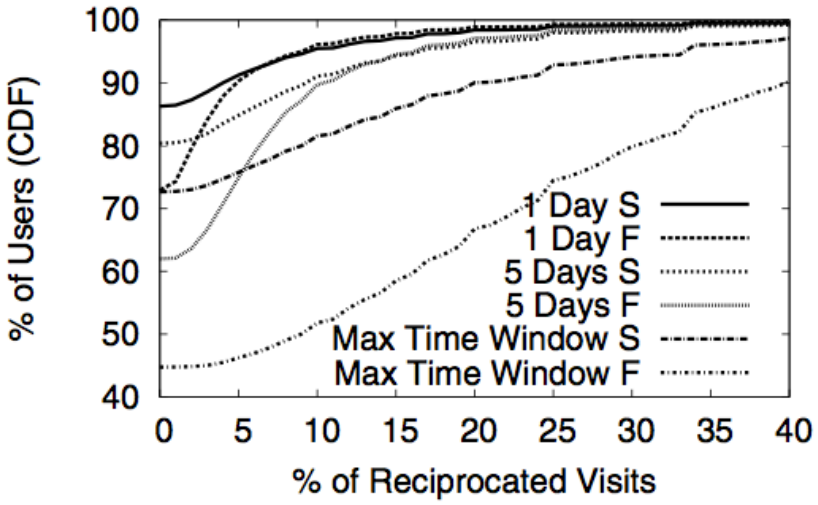
For more than 93% of users, less than 10% of latent relationships are reciprocated

1. Construct two set of visitors
   - ✧ Fist set contains the user who view each user profile
   - ✧ Second set contains the user who are visited by each user

2. Compute intersection and union of these 2 sets
   - ✧ Intersection include people who view a given user profile and are also visited by that user – Latent interaction is reciprocated
   - ✧ Unions contains all user who viewed them or they viewed

3. Compute the ratio of Intersection size to Union size

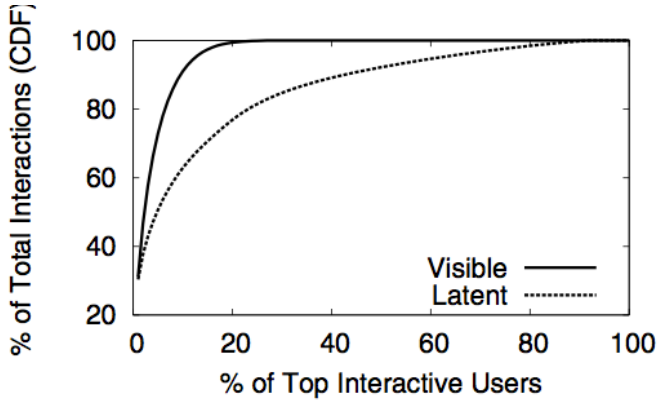
Reciprocity



73% of users receive no reciprocal page views from stranger
45% of users obtain no reciprocal page views from friends

- Compute the number of reciprocal visits that take place within 't' days after initial visit
- For larger time window size, the profile visits being reciprocated are more
- Compared to strangers, friends have higher probability of reciprocal visits

Latent Vs. Visible Interactions

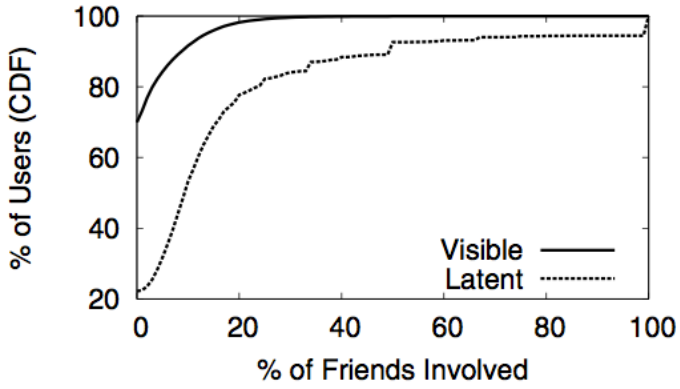


Distribution of total interaction

Top 28% users contribute to visible interaction
93% of users contribute to latent interaction

- Majority of visible interaction is attributed to very small, highly interactive portion of the user-base
- Latent interaction are quite prevalent across the entire population

80% of users interact visibly with 5% of their friends
A user interacts with at most 40% of their friends
80% of users view 20% or more of their friends' profile



- Compare latent and visible interactions in coverage of friends
- Small portion of population views all their friends' profile

Conclusion

- Profile visits have extremely low reciprocity.
- Compared to visible interactions, latent profile browsing is far more prevalent and more evenly distributed across a user's friends. Profile visits are less likely to be repeated than visible interactions, but are more likely to generate visible comments than other content such as photos and diary entries.
- For all users, regardless of their number of friends, profile popularity is not strongly correlated with frequency of new profile content.