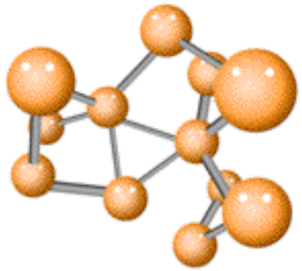


Reputation Network Analysis for Email Filtering

Jennifer Golbeck, James Hendler

Department of Computer Science
University of Maryland, College Park
MINDSWAP

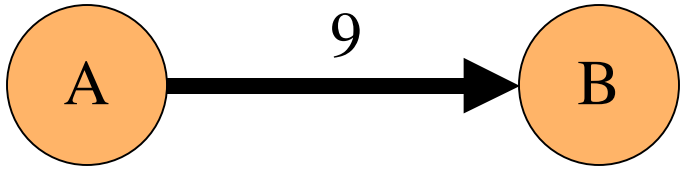
The Popularity of Social Networking

(i.e. "I like Kevin Bacon, too!")

- Lots of websites for social networking
  - Linked-in
  - Friendster
  - Orkut
  - Live Journal
  - Dogster ("Petworking")
  - FOAF
- Dimensions of Relationship
- How is this useful?

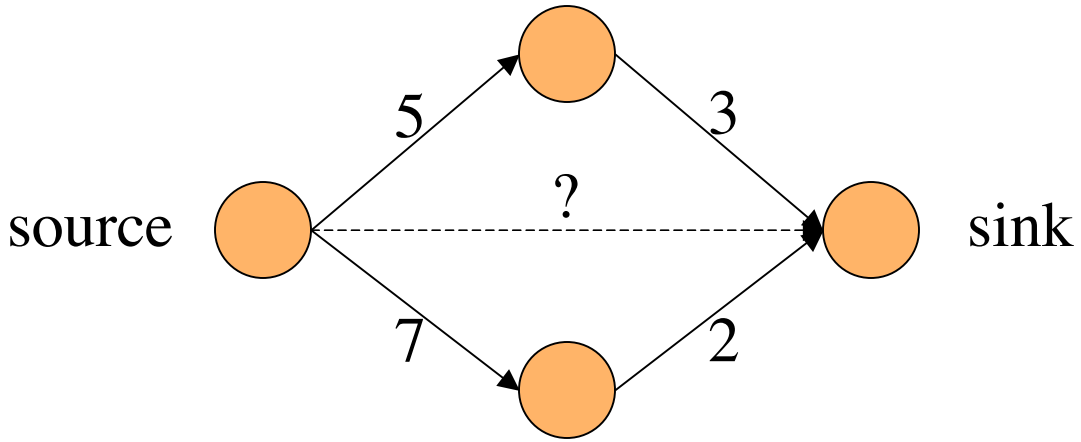
Reputation/Trust in Social Networks

- Connections between people are extended with ratings
- Ratings represent the reputation or trust that one person has for the other
- Trust definition / subject specific

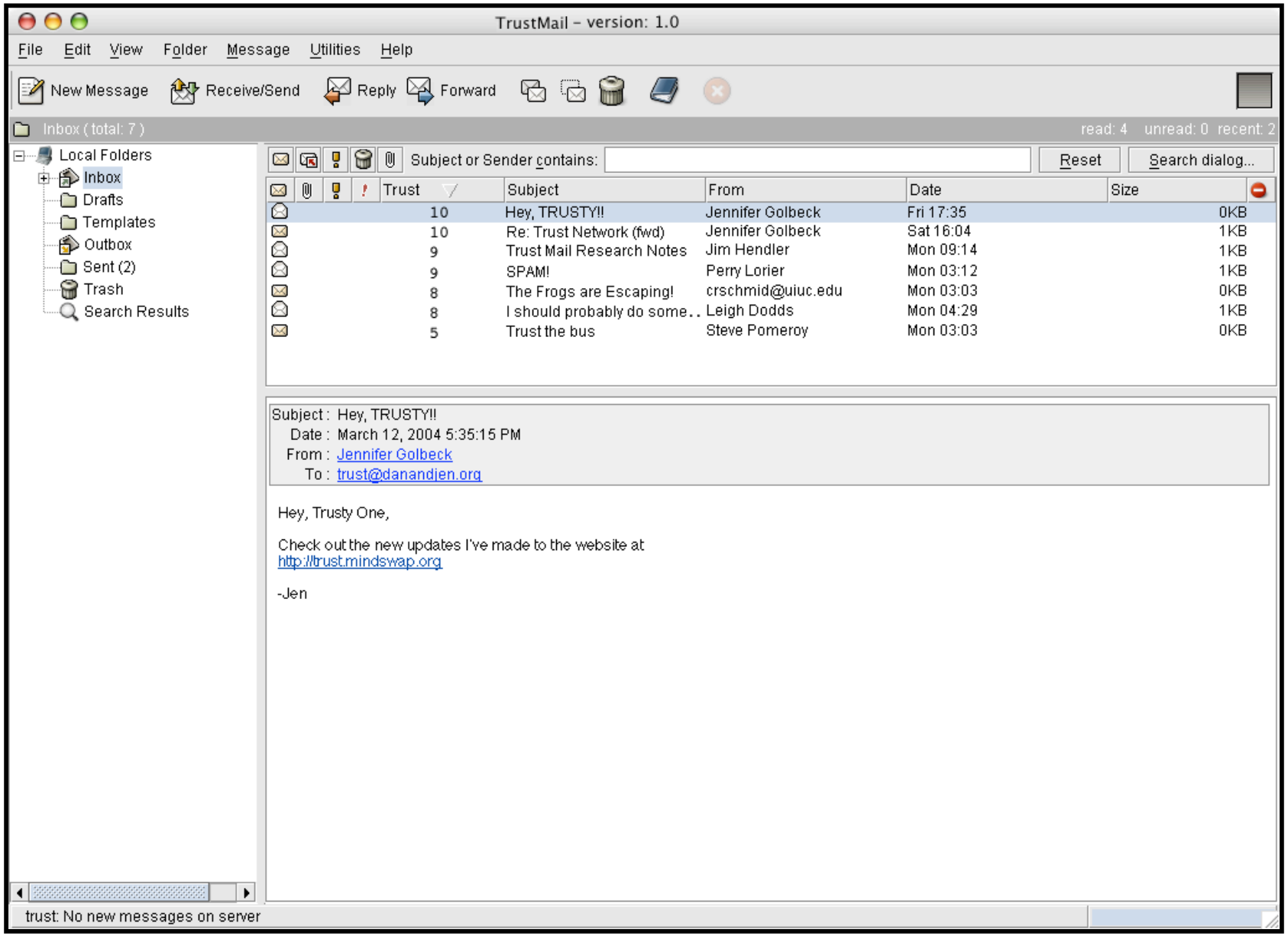


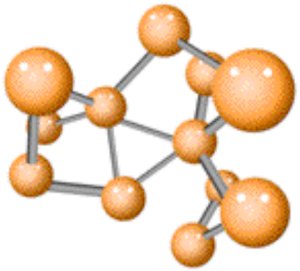
Inferring Trust

- Given two people, the *source* and *sink*, who are not directly connected, can we recommend to the *source* how much it should trust the *sink* based on the trust ratings assigned to the nodes that connect them?



TrustMail


TrustMail - version: 1.0
File Edit View Folder Message Utilities Help
New Message Receive/Send Reply Forward
Inbox (total: 7)
read: 4 unread: 0 recent: 2
Local Folders
Inbox
Drafts
Templates
Outbox
Sent (2)
Trash
Search Results
Subject or Sender contains:
Reset
Search dialog...
Trust Subject From Date Size
10 Hey, TRUSTY!! Jennifer Golbeck Fri 17:35 0KB
10 Re: Trust Network (fwd) Jennifer Golbeck Sat 16:04 1KB
9 Trust Mail Research Notes Jim Hendler Mon 09:14 1KB
9 SPAM! Perry Lorier Mon 03:12 1KB
8 The Frogs are Escaping! crschmid@uiuc.edu Mon 03:03 0KB
8 I should probably do some.. Leigh Dodds Mon 04:29 1KB
5 Trust the bus Steve Pomeroy Mon 03:03 0KB
Subject : Hey, TRUSTY!!
Date : March 12, 2004 5:35:15 PM
From : Jennifer Golbeck
To : trust@danandjen.org
Hey, Trusty One,
Check out the new updates I've made to the website at
http://trust.mindswap.org
-Jen
trust: No new messages on server



Algorithms for Inferring Ratings

Unique Features

- Inferences are PERSONAL
- Calculations are made from the perspective of each individual
- Ratings are personalized - like real life
  - How trustworthy is President Bush?

Calculating Inferences

- Metric: return the weighted average of neighbors ratings.

$$t_{is} = \frac{\sum_{j=0}^{n} \begin{cases} (t_{js} * t_{ij}) & \text{if } t_{ij} >= t_{js} \\ (t_{ij}^2) & \text{if } t_{ij} < t_{js} \end{cases}}{n}$$

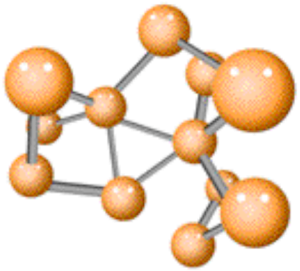
Experiment

- Check for accuracy of the metric alone and compared with other metrics
- Questions: How accurate is our metric? Is it better than other metrics (global metrics)?
- Look at each pair of connected nodes and compare the actual rating with the rating that is inferred with the direct connection is removed.

Experimental Analysis

	Control: Average Rating	**Weighted Average**	**Global: Authoritative Node** (advogato)	**Global: Average ratings Assigned to the sink**
$\|t_{ij} - t_{ij}'\|$	1.74	1.16	1.459	1.487
Std. Dev.	0.95	1.21	1.45	1.49
Accuracy	0.826	0.884	0.8541	0.8513

- Our metric was statistically significantly better implemented ($p<.001$) than the control.
- Neither authoritative node ($p<.11$) or average rating ($p<.36$) metrics were significantly better than control



Trust Ratings with Email

Trust Inferences in Email

- Use reputation ratings in social networks to infer ratings for unknown people
- Show ratings next to messages in a user's inbox
- Allow users to sort messages by their rating

What We Do

- Take advantage of existing data to rate messages from people to whom a user is connected in a social network

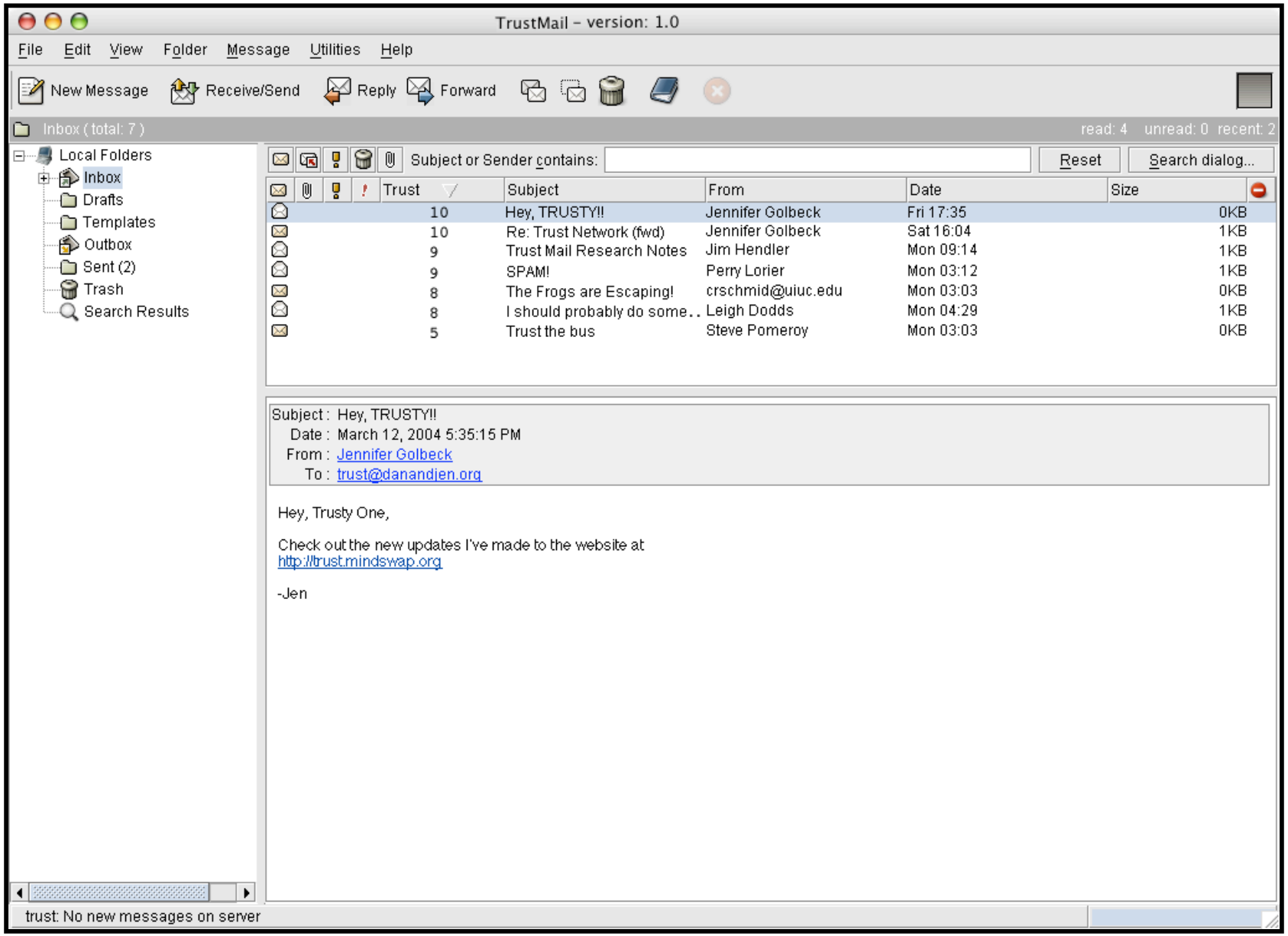
What We Don't Do

- Rate *every* message
- Anti-spoofing
- Spam filtering

Scenario

- Kate, the head of a research project at Corporation X is collaborating on a project with Emily, a professor at University Y.
- Tom, a graduate student of Emily, emails Kate with results from the project's latest experiments. Kate does not know Tom and has never received an email from him.
- How should Kate know, among all of her emails, that the one from Tom is worth reading?
- If Kate gave Emily a high rating, and Emily gave her graduate students high ratings, then we will infer a high rating from Kate to Tom, identifying his email in her mailbox.

TrustMail


TrustMail – version: 1.0
File Edit View Folder Message Utilities Help
New Message
Receive/Send
Reply
Forward
Inbox (total: 7)
read: 4 unread: 0 recent: 2
Local Folders
Inbox
Drafts
Templates
Outbox
Sent (2)
Trash
Search Results
Subject or Sender contains:
Reset
Search dialog...
Trust Subject From Date Size
10 Hey, TRUSTY!! Jennifer Golbeck Fri 17:35 0KB
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Future Work

- Refining the inference algorithm
- Comparison with other algorithms in the literature
- If a user sees a rating that is inaccurate, how does the user track down where the problem originated in the path?

References

- The Trust Project
- http://trust.mindswap.org

- golbeck@cs.umd.edu