PREDICTING TIE STRENGTH WITH SOCIAL MEDIA

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TIE STRENGTH

concept & impact

The strength of a tie is a (probably linear) combination of the amount of TIME, the emotional INTENSITY, the INTIMACY (mutual confiding), and the reciprocal SERVICES which characterize the tie. — Granovetter

STRONG TIES are the people you really trust.

WEAK TIES, conversely, are merely acquaintances.
TIE STRENGTH
concept & impact

7,000+ papers cite TSOWT
firms with right mix of ties get better deals
strong ties can affect mental health
TIE STRENGTH

dimensions

AT WHAT POINT is a tie to be considered weak? … Do all four indicators count equally toward tie strength? — D. Krackhardt

GRANOVETTER’S intensity, intimacy, duration & services

WELLMAN’S emotional support

LIN’S social distance

BURT’S structural
THE MAPPING PROBLEM
RESEARCH QUESTIONS

R1. The literature suggests seven dimensions of tie strength: INTENSITY, INTIMACY, DURATION, RECIPROCAL SERVICES, STRUCTURAL, EMOTIONAL SUPPORT and SOCIAL DISTANCE. As manifested in social media, can these dimensions predict tie strength? In what combination?

R2. What are the limitations of a tie strength model based SOLELY on social media?
THE DATA

overview

2,184 assessed friendships

from 35 university students & staff

described by 70+ numeric indicators
DATA COLLECTION

methodology
ASSESSING TIE STRENGTH

participant interface
ASSESSING TIE STRENGTH

participant interface

How strong is your relationship with this person?
barely know them ------------ we are very close

How would you feel asking this friend to loan you $100 or more?
would never ask ------------ very comfortable

How helpful would this person be if you were looking for a job?
no help at all ------------ very helpful

How upset would you be if this person unfriended you?
not upset at all ------------ very upset

If you left Facebook for another social site, how important would it be to bring this friend along?
would not matter ------------ must bring them
ASSESSING TIE STRENGTH

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Current City:
Brooklyn, NY

Mutual Friends

Write something...
# PREDICTIVE VARIABLES

**intensity**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>part.-initiated wall posts</td>
<td>55</td>
</tr>
<tr>
<td>friend-initiated wall posts</td>
<td>47</td>
</tr>
<tr>
<td>wall words exchanged</td>
<td>9,549</td>
</tr>
<tr>
<td>inbox messages together</td>
<td>9</td>
</tr>
<tr>
<td>inbox thread depth</td>
<td>31</td>
</tr>
<tr>
<td>part.’s status updates</td>
<td>80</td>
</tr>
<tr>
<td>friend’s status updates</td>
<td>200</td>
</tr>
</tbody>
</table>
## Predictive Variables

*Intimacy*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant’s friends</td>
<td>729</td>
</tr>
<tr>
<td>Friend’s friends</td>
<td>2,050</td>
</tr>
<tr>
<td>Days since last comm.</td>
<td>1,115</td>
</tr>
<tr>
<td>Wall intimacy words</td>
<td>148</td>
</tr>
<tr>
<td>Inbox intimacy words</td>
<td>137</td>
</tr>
<tr>
<td>Together in photo</td>
<td>73</td>
</tr>
<tr>
<td>Miles between hometowns</td>
<td>8,182 mi</td>
</tr>
</tbody>
</table>
PREDICTIVE VARIABLES

social distance

- age difference: 5,995 days
- # occupations difference: 8
- educational difference: 3 degrees
- political difference: 4
### PREDICTIVE VARIABLES

**structural**

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<thead>
<tr>
<th>Variable</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>mutual friends</td>
<td>206</td>
</tr>
<tr>
<td>groups in common</td>
<td>12</td>
</tr>
<tr>
<td>tf-idf of interests &amp; about</td>
<td>73</td>
</tr>
</tbody>
</table>
PREDICTIVE VARIABLES

reciprocal services

- links exchanged by wall
- applications in common

emotional support

- positive emotion words
- negative emotion words
PREDICTIVE VARIABLES

\textit{duration}

days since first comm. 1,328
STATISTICAL METHODS

\[ s_i = \alpha + \beta R_i + \gamma D_i + N(i) + \epsilon_i \]

\[ N(i) = \lambda_0 \mu_M + \lambda_1 med_M + \sum_{k=2}^{4} \sum_{s \in M} \lambda_k (s - \mu_M)^k \]

\[ + \lambda_5 min_M + \lambda_6 max_M \]

\[ M = \{s_j : j \text{ and } i \text{ are mutual friends}\} \]
THE MODEL
structure & performance

- **STRUCTURE**
  - mutual strength
  - interest overlap
  - common groups
  - 4.5%

- **EMO. SUPPORT**
  - inbox pos words
  - wall pos words
  - 4.8%

- **SERVICES**
  - links shared
  - apps shared
  - 7.9%

- **SOCIAL DISTANCE**
  - educational diff
  - political diff
  - occupational diff
  - 13.8%

- **DURATION**
  - first comm
  - 16.5%

- **INTENSITY**
  - wall words
  - outbound posts
  - thread depth
  - 19.7%

- **INTIMACY**
  - last comm
  - num friends
  - intimacy words
  - 32.8%

TIE STRENGTH
- Adj. $R^2 = 0.534$
- MAE = 0.0994
## MOST PREDICTIVE

**by beta**

<table>
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<tr>
<th>Variable</th>
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<tbody>
<tr>
<td>Days since last communication</td>
<td>-0.762</td>
</tr>
<tr>
<td>Days since first communication</td>
<td>0.755</td>
</tr>
<tr>
<td>Intimacy × Structural</td>
<td>0.4</td>
</tr>
<tr>
<td>Wall words exchanged</td>
<td>0.299</td>
</tr>
<tr>
<td>Mean strength of mutual friends</td>
<td>0.257</td>
</tr>
<tr>
<td>Educational difference</td>
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<td>0.195</td>
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THE MODEL

details

prediction

participant
THE MODEL
details

prediction

participant
THE MODEL

details

87.2% accuracy

χ²(1, N=4368) = 700.9
p < 0.001
Ah yes. This friend is an old ex. We haven't really spoken to each other in about 6 years, but we ended up friending each other on Facebook when I first joined. But he's still important to me. We were best friends for seven years before we dated. So I rated it where I did (I was actually even thinking of rating it higher) because I am optimistically hoping we’ll recover some of our “best friend”-ness after a while. Hasn't happened yet, though.

error: ~0.5
“We were neighbors for a few years. I babysat her child multiple times. She comes over for parties. I'm pissed off at her right now, but it's still 0.8. ;) Her little son, now 3, also has an account on Facebook. We usually communicate with each other on Facebook via her son's account. This is our “1 mutual friend.”

error: ~0.5
IMPLICATIONS for theory

1. Social network analyses of large-scale phenomena
2. Weights on dimensions & importance of structure
3. Is there an upper bound? Do important things get left out?
IMPLICATIONS for practice

MODEL TIE STRENGTH TO...

① prioritize activity updates.
② broadcast especially novel information.
③ make better friend introductions.
④ build more informed privacy controls.
48 of your 203 friends
21 get backstage

------------------
drag to reassign

27 get in

next 48 >
CONTRIBUTIONS
of our work

A MODEL of tie strength
SPECIFIC WEIGHTS on tie strength’s dimensions
THE ROLE OF STRUCTURE in modulating tie strength