

COMPUTING TIE STRENGTH

Eric Gilbert, Georgia Tech

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I study and build social media.



 Eric Gilbert
View My Profile

-  News Feed
-  Messages (146)
-  Events (2)
-  Photos
-  Friends (1)
-  Applications
-  Games
-  Groups (1)
-  Goodreads Books →
-  What I'm Listening To →
- More ▾

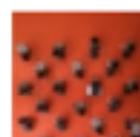
- Friends Online
-  Alejandro Gutierrez ●
 -  Andrew Harris ●
 -  Sarita Yardi ●
 -  Shakela Richardson ●
 -  Amy Bruckman ☾
 -  Ashley SoulStice L... ☾
 -  Dan Cosley ☾
 -  David Stolarsky ☾
 -  Kora Bonggen ☾
 -  Thomas Lento ☾
- See All →

News Feed

Top News · Most Recent **300+**

What's on your mind?

 Amanda Jo Layton Greep commented on Diana Colbert's photo.
4 hours ago

 Matthew Yapchaian Enjoying Karrie's talk, still time to join!
[@eegilbert](http://cyber.law.harvard.edu/interactive/webcast)
4 hours ago · Comment · Like

 Nancy Baym Thanks to so many of you for that flood of birthday greetings!
9 hours ago via Facebook for iPhone · Comment · Like

 View all 4 comments

 Laura Smith AAAUGH! Knew I was forgetting something yesterday... Happy (belated) Birthday, Nancy! Hope it was fabulous. xxoo
4 hours ago

 Steve Lawson I'd have bought you a massive present, but now that I'm only earning 5 mil a year, I'm just too poor to consider it... ;)
4 hours ago

Write a comment...

 Natalie Ljubicic Faster Kill Pussycat
8 hours ago via Facebook for BlackBerry · Comment · Like

 View all 4 comments

 Jordan Kane Lol. You gotta pet the kitty. Not stroke the kitty.
6 hours ago

 Jordan Kane Nice kitty. Nice kitty. Lmao
6 hours ago

Write a comment...

Requests See All

-  1 friend request
-  2 event invitations
-  1 group invitation
-  1 other request

Suggestions See All

-  John Pizzarelli ×
Chih-yu Chao is a fan.
 Become a Fan
-  Pavella Thomas ×
Say hello.
 Send her a message

Events See All

-  Summit for Someone! Now
-  Alex Lambert's birthday Today
Amanda Drehobl Llorens's birthday Today

Connect With Friends

-  Invite friends to join Facebook.
-  Use our contact importer to find friends you didn't know were on Facebook.
-  Use Facebook on your mobile phone to connect with friends on the go.

Computationally, we don't understand
the **RELATIONSHIPS** expressed in social media.

BACKGROUND: TIE STRENGTH

concept

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**

This talk shows how to **RECONSTRUCT** tie strength from digital traces, and how we can **UNDERSTAND** using it.

HEURISTICS

a sample of substitutes

communication reciprocity Friedkin 1980; Romero & Huberman 2009

one mutual friend Shi, Adamic & Strauss 2007

communication recency Lin, Dayton & Greenwald 1978

interaction frequency Gilbert, Karahalios & Sandvig 2008; Fischer 2006

PARTICIPANT INTERFACE

The image shows a screenshot of a Facebook profile page for a user named John Doe. The page is designed to collect data on the user's relationship with a specific person. The interface includes a navigation bar at the top with the Facebook logo and links for John Doe, Friends, Applications, and Inbox. On the right side of the navigation bar are links for Home and Settings. The profile header shows the name 'John Doe' and tabs for Wall, Info, and Photos. The main content area contains five survey questions, each with a horizontal Likert scale. The scales are marked with orange arrows indicating the selected position. The left sidebar contains a profile picture placeholder, a link to view photos (107), and options to send a message or poke John. Below these are network affiliations (CUNY Hunter Grad Student '09, Ullinois Alum, New York, NY), relationship status (Married to Jane Doe), birthday (May 19), and current city (Brooklyn, NY). At the bottom of the page, there are buttons for 'Write', 'Post Photo', 'Record Video', 'Share Link', and 'Give Gift', followed by a text input field labeled 'Write something...'. The 'Mutual Friends' section is partially visible at the bottom left.

facebook John Doe Friends Applications Inbox Home Settings

John Doe

Wall Info Photos

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!

Send John a Message

Poke John

Networks:
CUNY Hunter Grad Student '09
Ullinois Alum
New York, NY

Relationship Status:
Married to Jane Doe

Birthday:
May 19

Current City:
Brooklyn, NY

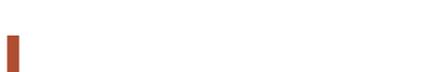
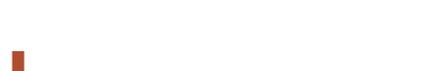
Write Post Photo Record Video Share Link Give Gift

Mutual Friends

Write something...

PREDICTIVE VARIABLES

intimacy

participant's friends		729
friend's friends		2,050
days since last comm.		1,115
wall intimacy words		148
inbox intimacy words		137
together in photo		73
miles between hometowns		8,182 mi

PREDICTIVE VARIABLES

structural

mutual friends		206
groups in common		12
tf-idf of interests & about		73

emotional support

positive emotion words		197
negative emotion words		51

STATISTICAL METHODS

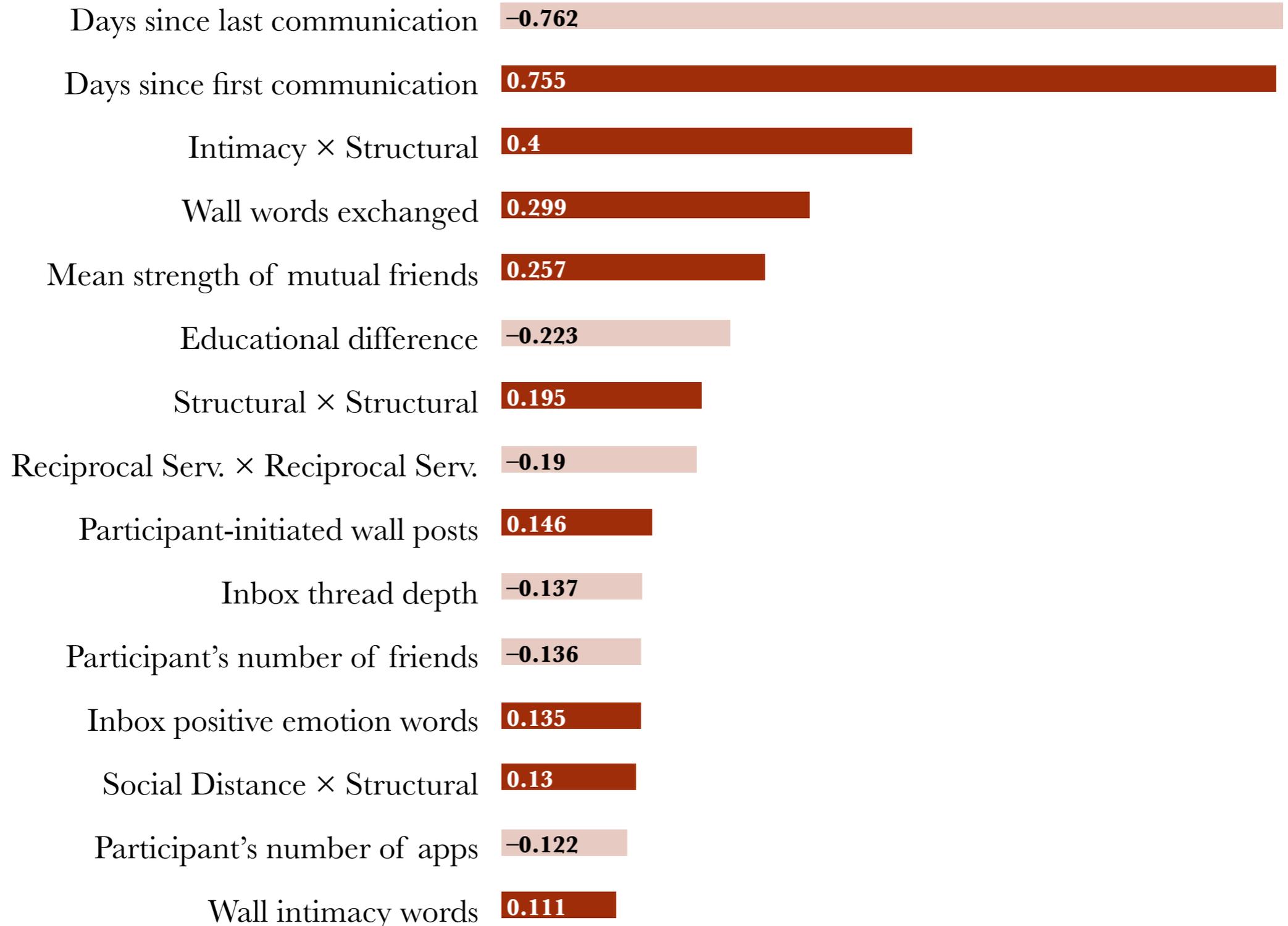
$$s_i = \alpha + \beta R_i + \gamma D_i + N(i) + \epsilon_i$$

$$N(i) = \lambda_0 \mu_M + \lambda_1 med_M + \sum_{k=2}^4 \sum_{s \in M} \lambda_k (s - \mu_M)^k \\ + \lambda_5 min_M + \lambda_6 max_M$$

$$M = \{s_j : j \text{ and } i \text{ are mutual friends}\}$$

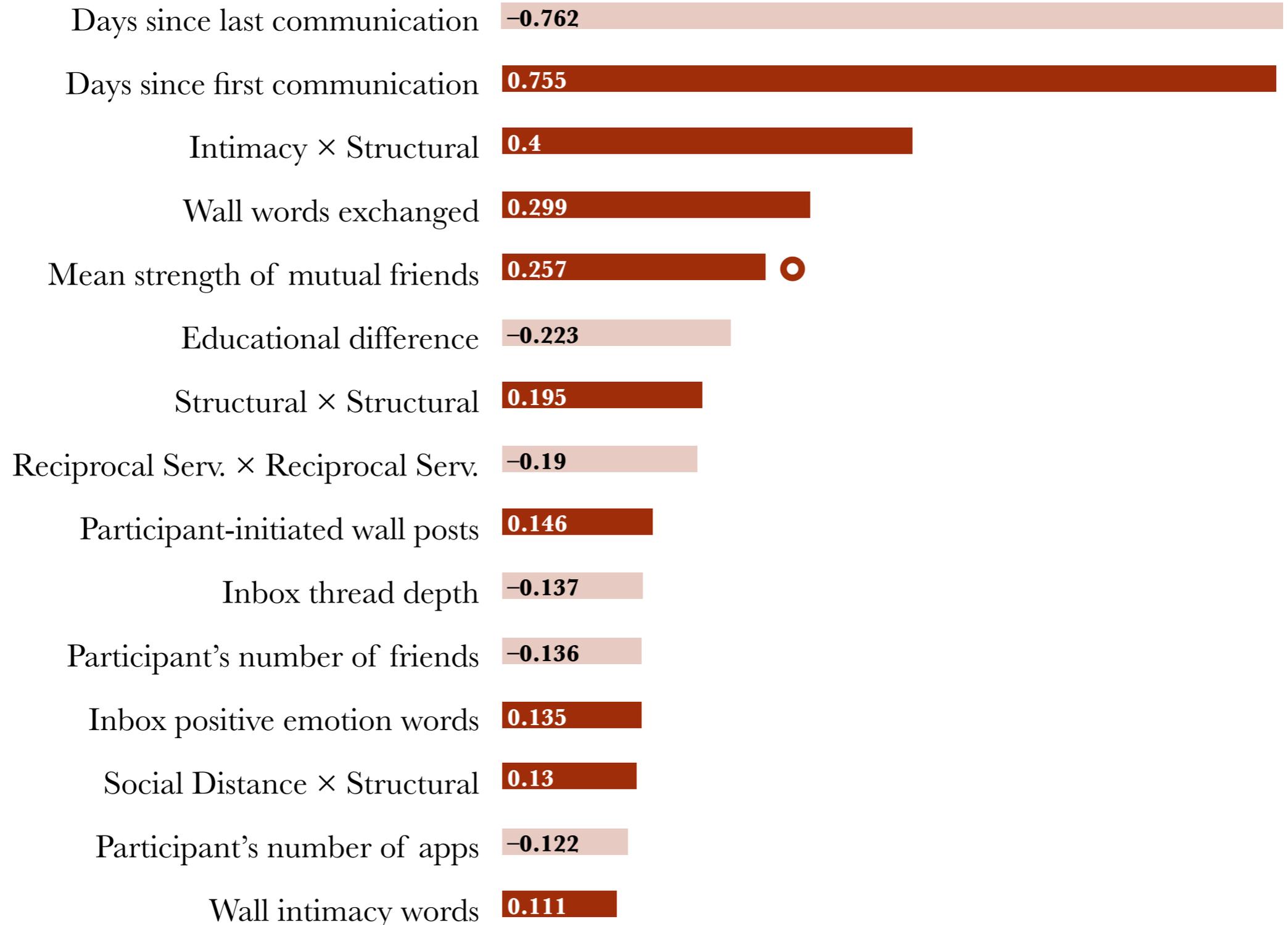
MOST PREDICTIVE

by | beta |



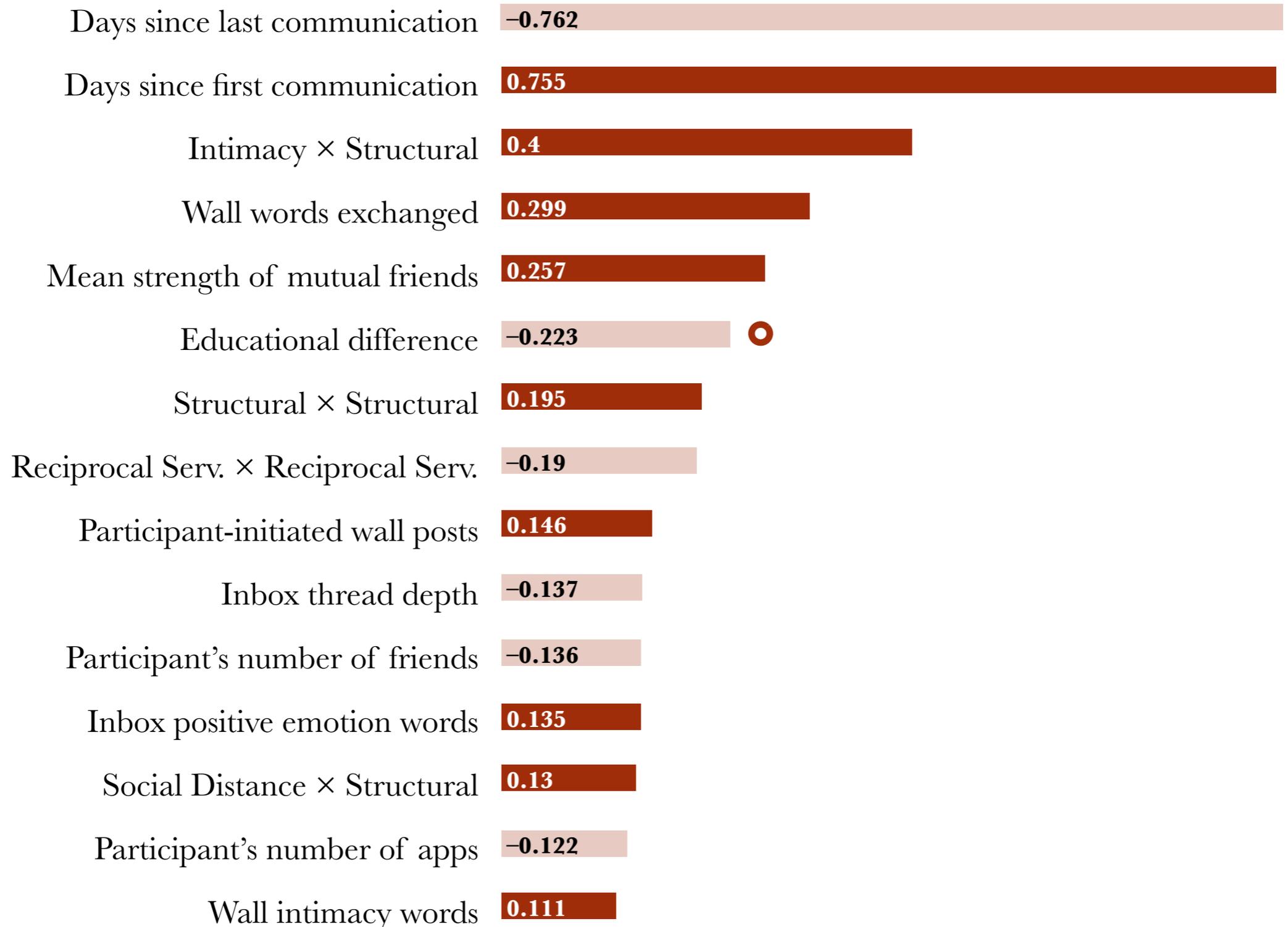
MOST PREDICTIVE

by | beta |



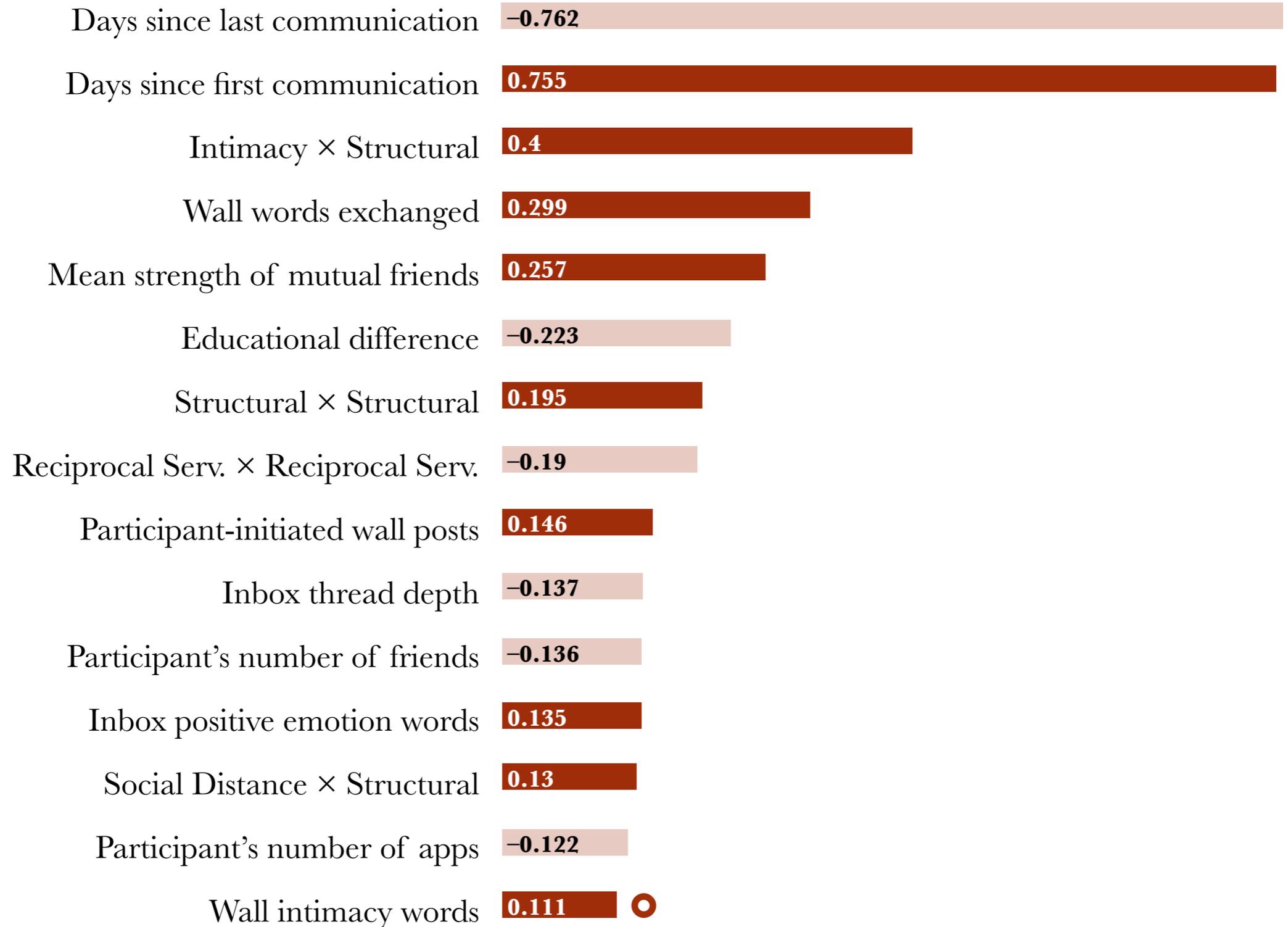
MOST PREDICTIVE

by | beta |



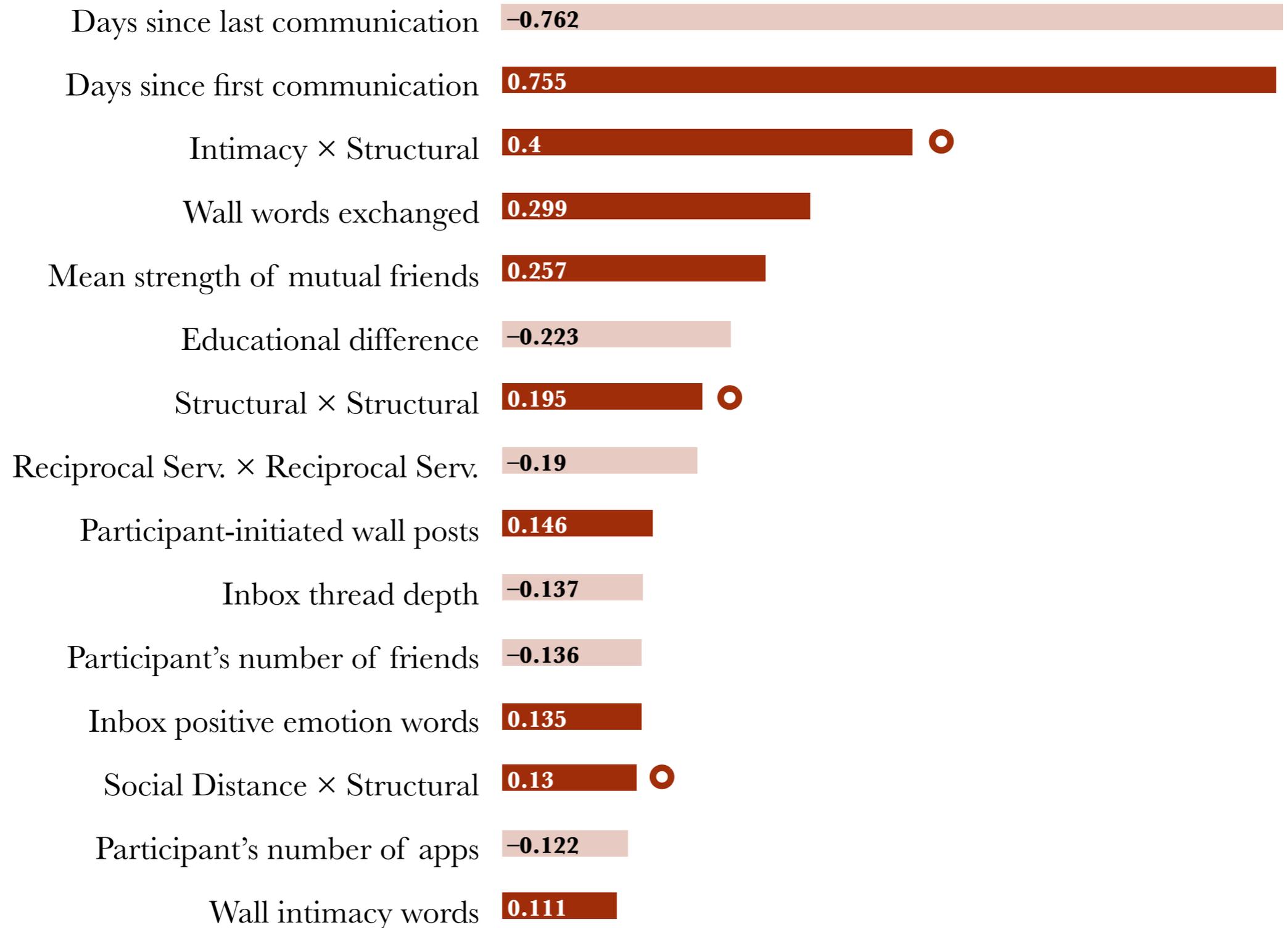
MOST PREDICTIVE

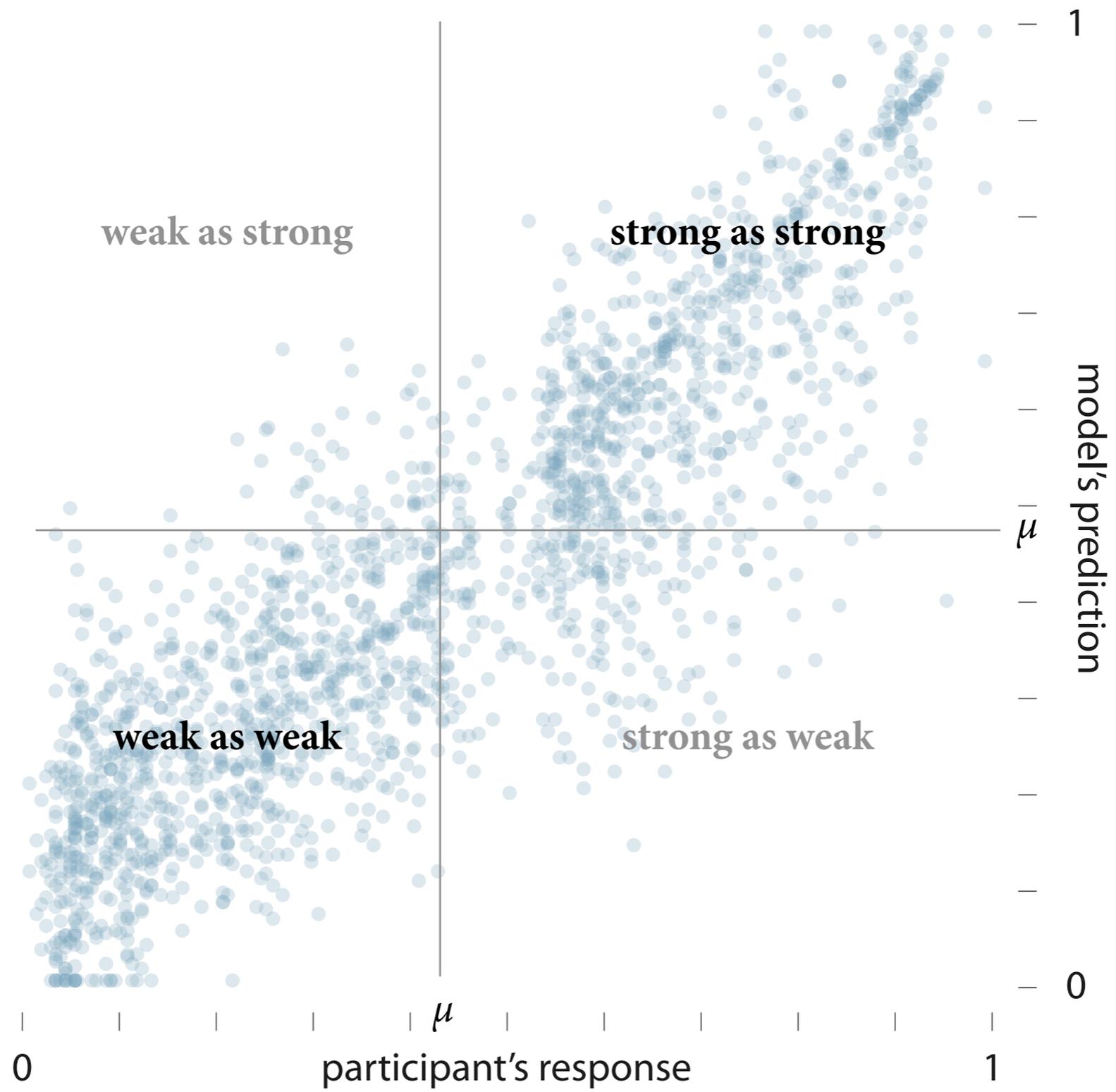
by | beta |



MOST PREDICTIVE

by | beta |





HEURISTICS

the difference

THIS MODEL 89% Adj. $R^2 = 0.53$

MSGs → FRIEND 61% Adj. $R^2 = 0.09$

BASELINE 52%

LIMITATIONS

high residuals

“ 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

LIMITATIONS

high residuals

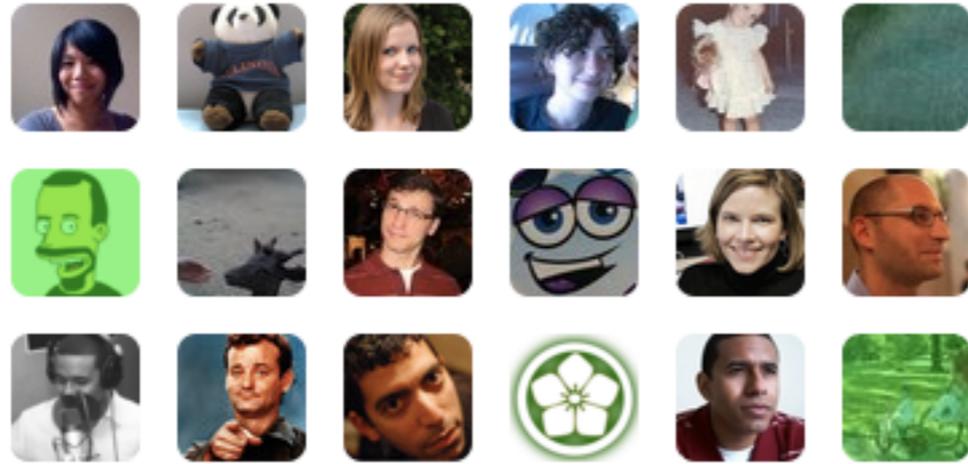
“ This friend is very special. He and I attended the same high school, we interacted a lot over 3 years and we are very very close. We trust each other. My friend and I are still interacting in **ways other than Facebook** such as IM, emails, phones. Unfortunately, that friend and I rarely interact through Facebook so I guess your predictor doesn't have enough information to be accurate.

error:

~0.5

... building this into a Twitter tool.

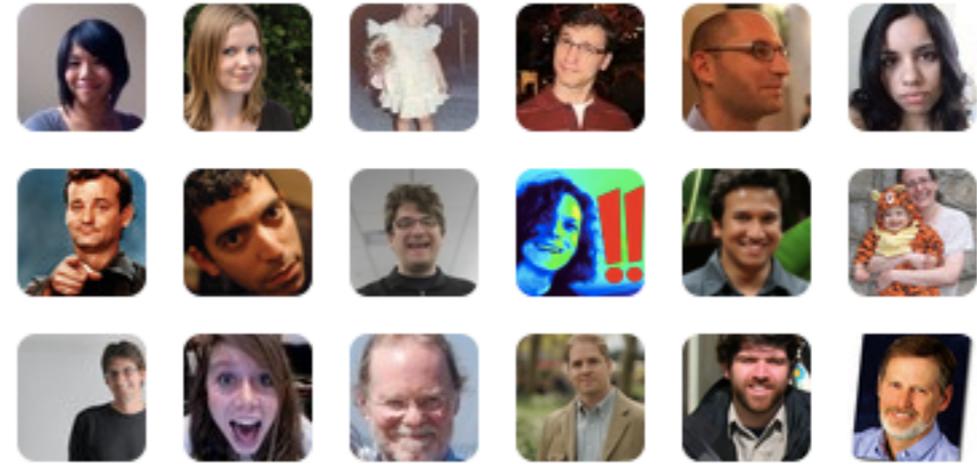
INNER CIRCLE



& 4 more

make

BIRDS OF A FEATHER



& 3 more

make

OUTER CIRCLE



& 13 more

make

FLOCK TOGETHER



make

I am trying out @wemeddle 

11:34 AM Mar 2nd via Tweetie

 [Reply](#)  [Retweet](#)



mariagrineva

Maria Grineva

i didn't like wemeddle ☆

11:40 AM Mar 2nd via web

[↩ Reply](#) [↻ Retweet](#)



mariagrineva
Maria Grineva

wemeddle.com is a very cool idea for making twitter lists. It was good enough to re-create the lists I made myself!
Worth checking out.



about 17 hours ago via TweetDeck

[Reply](#) [Retweet](#)



jerrygulla
Jerry Gulla

listening to this talk [@berkmancenter](#) on 
& tie strength <http://wemeddle.com>
-surprisingly accurate brkdwn 4me

11:05 AM Mar 2nd via web

 [Reply](#)  [Retweet](#)



[amarashar](#)

Amar Ashar

這是從 <http://wemeddle.com/client/> 發的tweet. wemeddle真不錯, 自動把我的推友分群, 這樣就不怕重要朋友的偶爾一推的淹沒在一片汪洋裡... ☆

about 14 hours ago via We Meddle

Retweeted by 1 person

[Reply](#) [Retweet](#)



vgod

Tsung-Hsiang Chang

this is a tweet from this link... 

<http://wemeddle.com/client/>
wemeddle is pretty good, it automatically divides my friends into groups, so that occasional tweets from my important friends won't be buried in oceans of other tweets.

about 14 hours ago via We Meddle

Retweeted by 1 person

 [Reply](#)  [Retweet](#)



vgod

Tsung-Hsiang Chang

<http://wemeddle.com/client/> 这个东西
太神奇了，我很想知道工作原理，它甚至
把我从未发过推的GF的帐号也算入Inner
Circle，而把一些我不是特别关心的算到
outer circle里。而且按照它的四种分类准
确率我可以认为是100%。太神奇了



about 13 hours ago via web

[Reply](#) [Retweet](#)



gh05tw01f

ayanamist

<http://wemeddle.com/client/> 

This thing is miraculous, I want to know how it works very much. It even classifies my GF's account into Inner Circle, but I never send tweets to her account, and it also classifies accounts that I don't care about into outer circle. The 4 categories are very accurate, almost 100%. It is miraculous.

about 13 hours ago via web

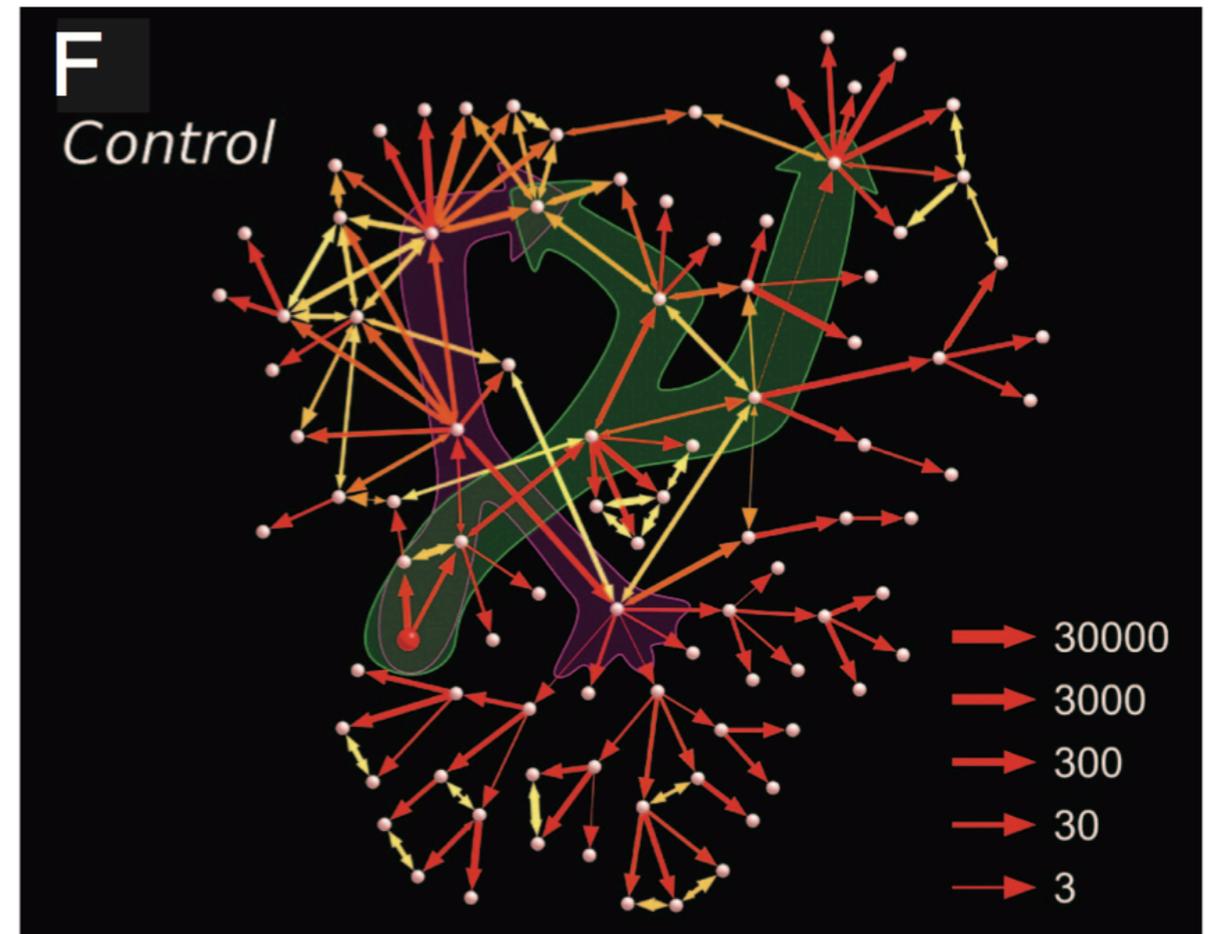
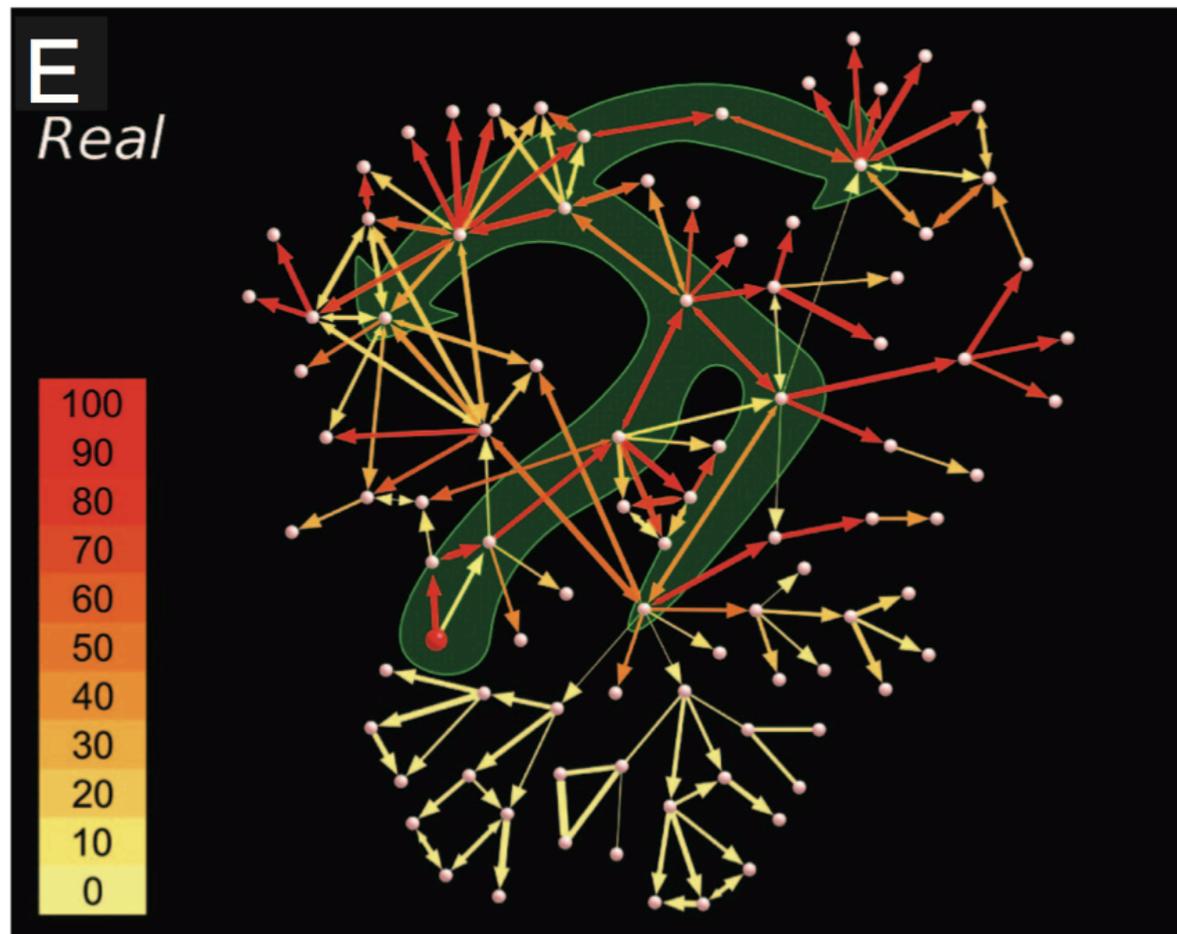
[Reply](#) [Retweet](#)



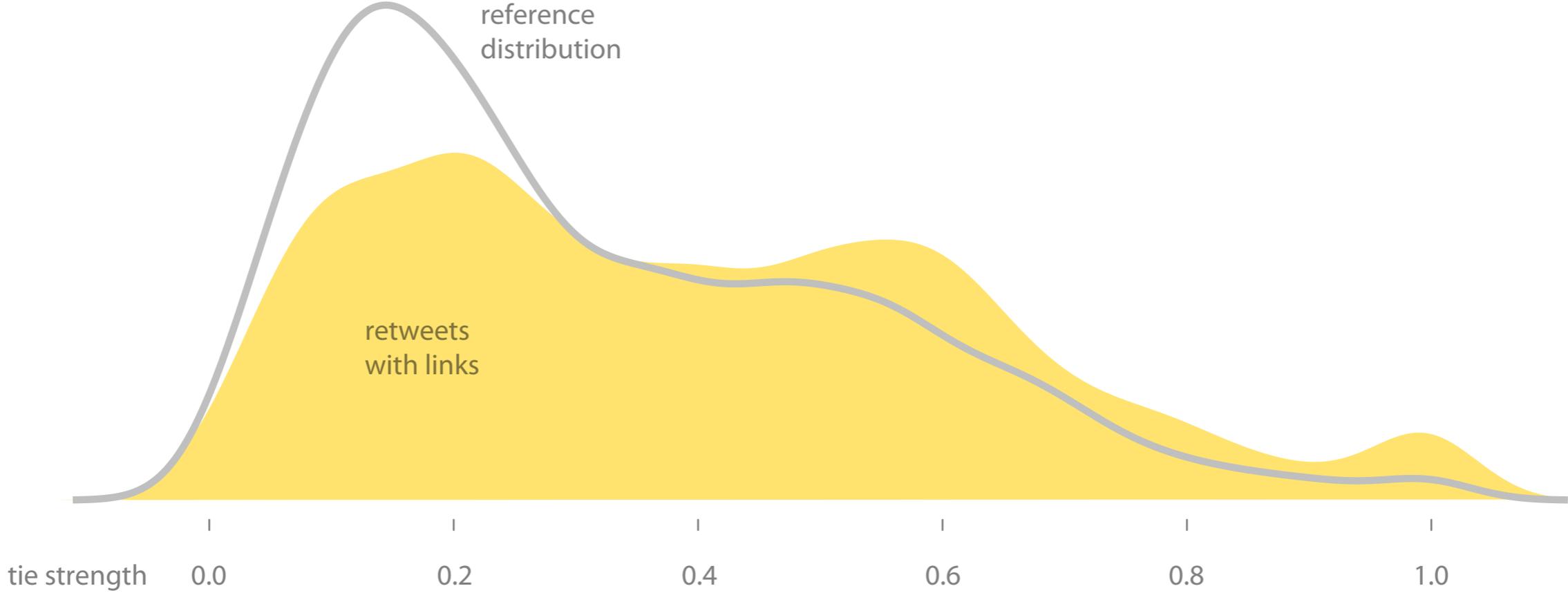
gh05tw01f
ayanamist

INFLUENCE THROUGH WEIGHTED NETWORKS

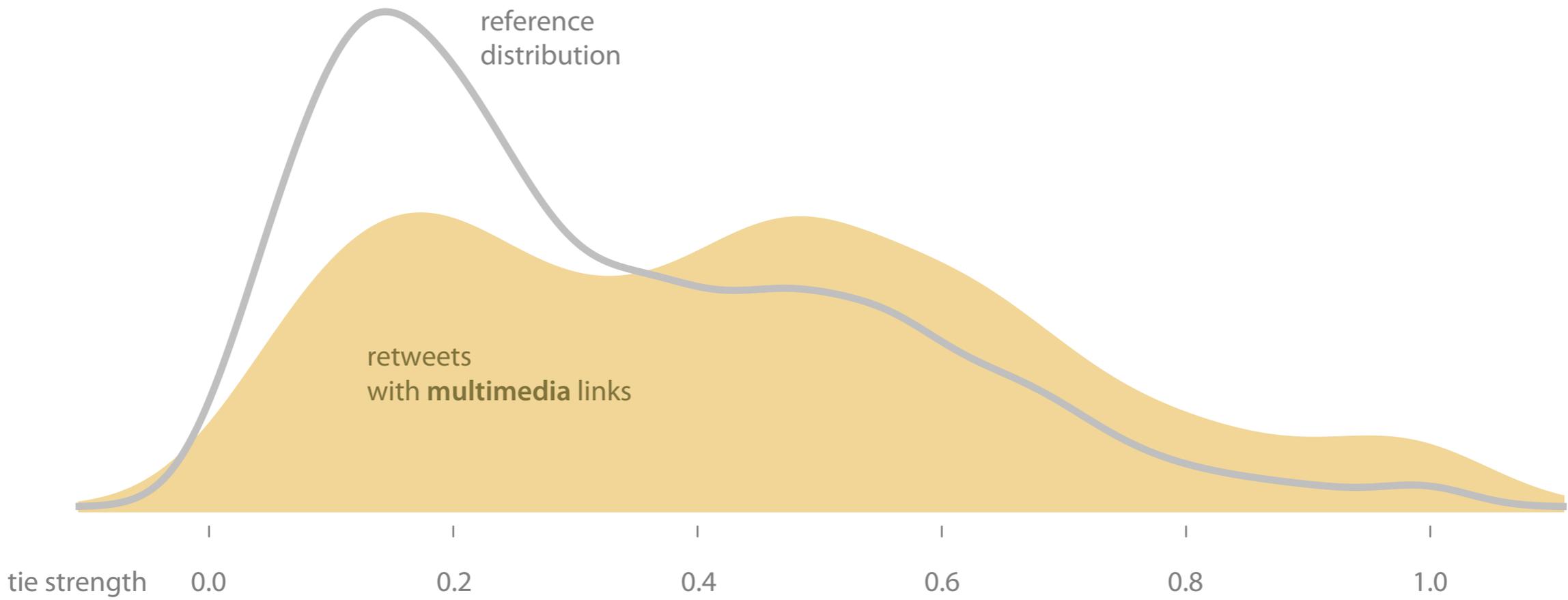
from Onnela, et al.



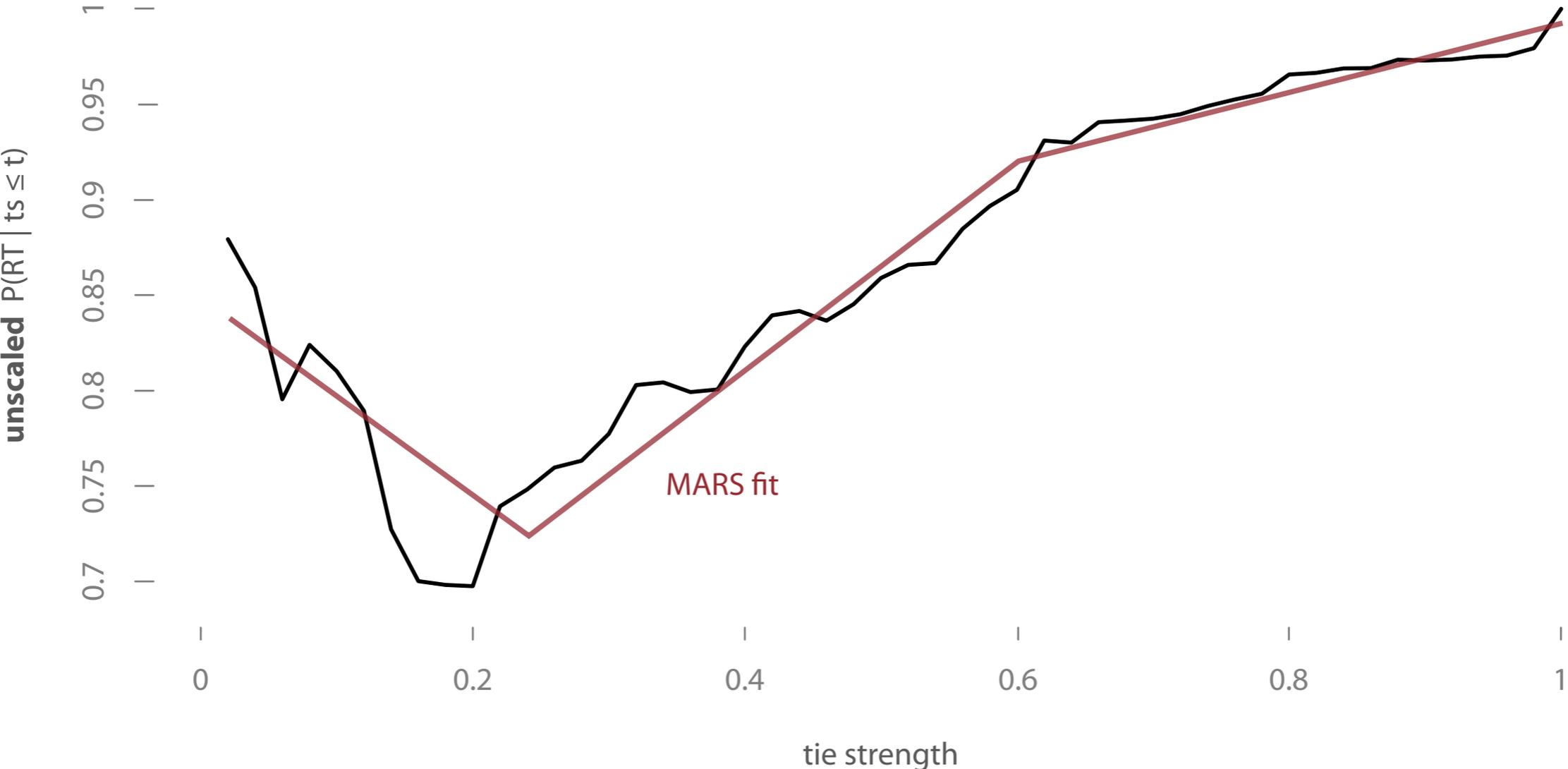
TIE STRENGTH AFFECTS INFLUENCE



TIE STRENGTH AFFECTS INFLUENCE



$$P(\text{RT} \mid \text{ts} \leq t)$$



What's next?

COMPUTING TIE STRENGTH

Eric Gilbert / Georgia Tech / @eegilbert