

network science and social science on Twitter

mor naaman

rutgers SC&I | social media information lab



3800
CONTROL DATA

UNIVAC 1232



social media information lab?

social media research:

1. what are people doing
(and why)?

social media research:

2. understanding social
systems at scale

social media research:

3. creating new experiences



Alcatraz

Golden Gate Bridge

Treasure Island

Ghirardelli

Palace of Fine Arts

Coit Tower

Embarcadero

Presidio Japan Town

baseball

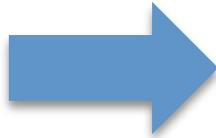
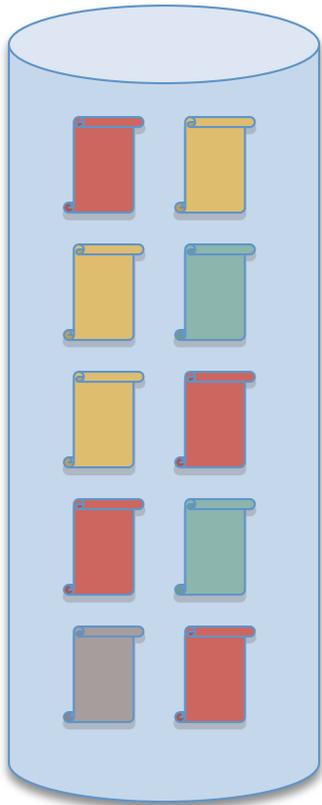
City Hall

flower

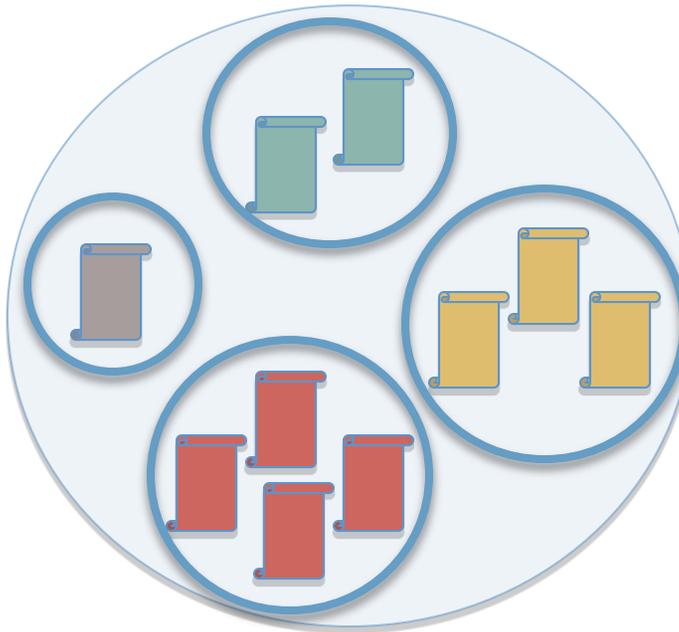
Golden Gate Park

YAHOO!

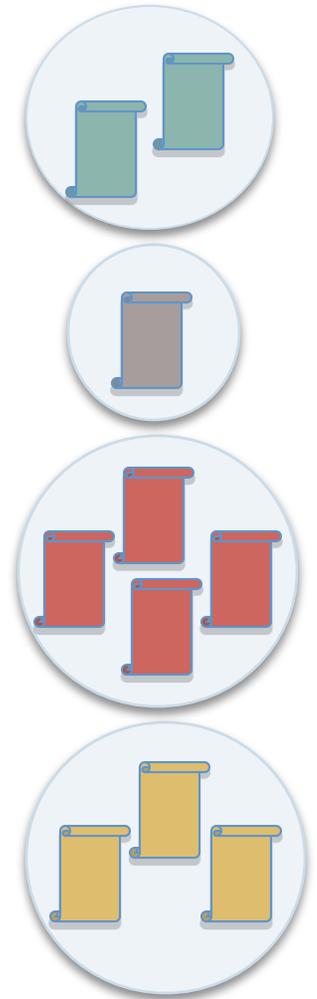
Social media documents



Document feature representation



Event clusters



Conan O'Brien Show June 1, 2010, Radio City Music Hall

User ID: P1ZI6

Conan O'Brien and Vampire Weekend (plus Stephen Colbert's *by laurenleialoha*)



6:08/19...

Multiplayer (w/ Coco)

A video player interface showing a progress bar at the top with a playhead at 6:08/19... Below the progress bar is a multiplayer overlay consisting of several horizontal bars of varying lengths and colors (blue, grey, white) representing other viewers' positions in the video.

Other Views



vox civitas

Show Tweets with

(101,518 Tweets from 98,663 people)

Keywords: OK

Clear Filters

Filters:

Video



Twitter Messages

(minute 0)

- [ruthgreenwood](#) i love how joe smiles...it's infectious #SOTU
- [AmadeusYDG](#) watching the state of the union
- [billkrausmann](#) @michellemalkin Is Obama wearing make-up?
- [313bpm](#) Finished studying, now watching our nations best man speak, President Obama.
- [MenaceTSociety](#) Say something good obama
- [stephenkruiser](#) The only human being who actually makes my skin crawl is the execrable Pelosi. #SOTU
- [erikwhittington](#) Did O just wink at his wife? Weird... #sotu
- [TheInDecider](#) RT @JoeMyGod: Some members of the House have waited since 9am to hear the "handshake" #SOTU #sotudinner

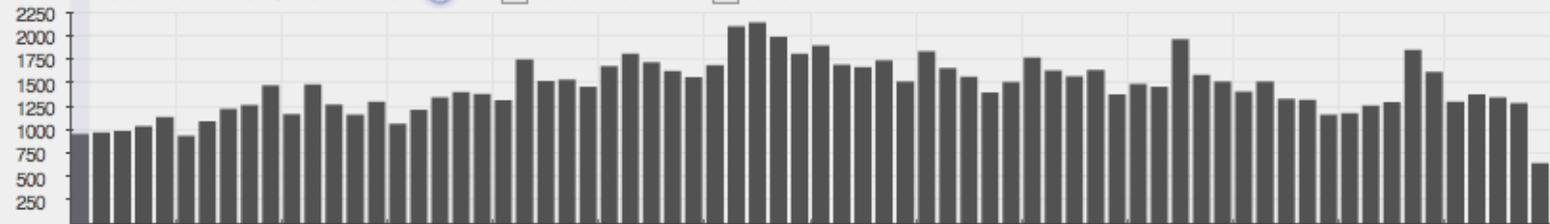


Topic Sections ?



Tweet Volume Over Time ?

Show Context Show Percent Unfiltered Volume Filtered Volume



Sentiment ?

Positive Negative Controversial Neutral



Key Words Over Time ?

hedge moly bailout focused desk accept evidence childhood budget scotus leadership iran equal
 20+ elkhart bail harry small china drill scientific forgive hcr freeze common ambitions muslim repeal
 telegraph canal reid focus overseas climate college walk tighten novel earmark troops haiti military

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70

S
O
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media

awareness streams

networks

today's big story

generate a better understanding of the
social dynamics

validate theories from social sciences in
these new and important settings



today's more specific story

Twitter and networks:

Part 1. social sharing of emotion and networks on Twitter

Part 2. unfollowing on Twitter



David A. Shamma

@ayman iPhone: 47.563553,-122.363365

research scientist. media artist. instructions: place in direct sunlight, water daily

<http://shamurai.com>

Following



Message



Timeline

Favorites

Following

Followers

Lists



AymanM Ayman Mohyeldin by ayman

The Birth of a New Egypt... <http://fb.me/HN1Lit3Y>

6 hours ago



ayman David A. Shamma

[@landay](#) 1password - slick, nice integration, and uses dropbox to autosync.

13 Feb



RawyaRageh Rawya Rageh by ayman

Dawn prayers in #Tahrir sq. I came so close to crying on air. Good morning from a new #Egypt

11 Feb



ayman David A. Shamma

Obama's gonna speak about #egypt #jan25 any minute now whitehouse.gov/live/president... #fb

11 Feb



About @ayman

2,124

Tweets

268

Following

1,211

Followers

53

Listed

Connections

Also followed by [@chkofler](#), [@uxrick](#), [@dwmcphd](#), and more.



You both follow [@dwmcphd](#), [@lyndonkennedy](#), [@cscw2011](#)



Following 268



Similar to @ayman · view all



dmrussell · Follow

dmrussell



chloester

Chloe Fan



bederson · Follow

Ben Bederson



drewww

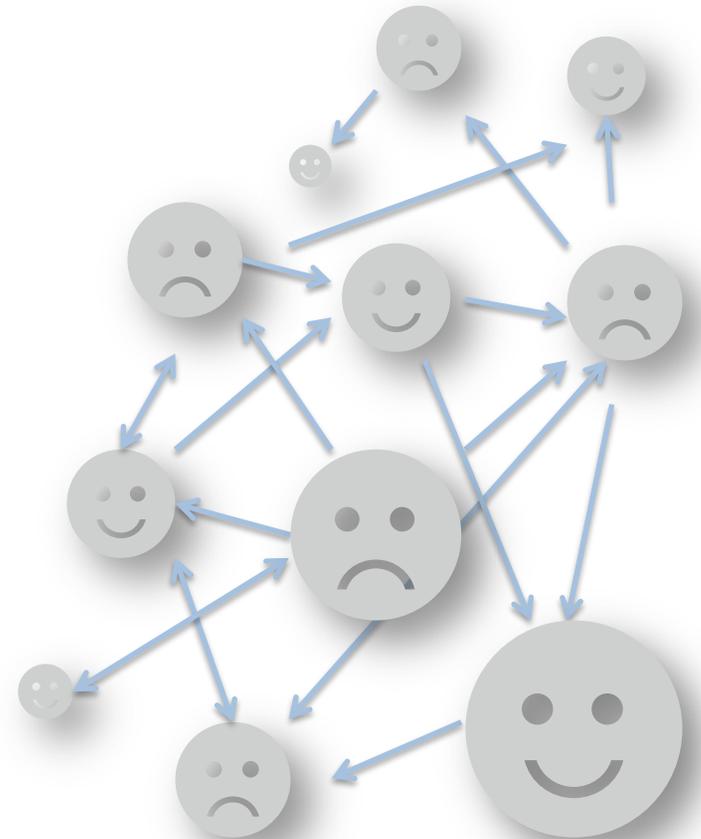
Drew

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study 1

emotion & social networks

Kivran-Swaine & Naaman. Network Properties and Social Sharing of Emotions in Social Awareness Streams. (CSCW 2011).





main question

How does users' social sharing of emotion in SAS relate to the properties of their social networks?

research questions

RQ1

What is the association between people's tendency to express emotion (joy, sadness, other) in their posts (updates or interactions) and their number of followers?

research questions

RQ2

What is the association between people's tendency to express emotion (joy, sadness, other) in their posts (updates or interactions) and their network characteristics like density and reciprocity rate?

1.5 step ego-centric network



in graph language

$G(V, E)$ directed graph

$(v_i, v_j) \rightarrow$ there is edge from v_i to v_j

edge is reciprocated if (v_i, v_j) and (v_j, v_i)

in graph language

density of network around v_i is defined as:

$$|E_i| / |N_i| * |N_i - 1|$$

where

$$N_i = \{v_j \mid (v_i, v_j) \text{ or } (v_j, v_i)\}$$

$$E_i = \{(v_j, v_k) \mid v_j \text{ in } N_i \text{ or } v_k \text{ in } N_i\}$$

(really, clustering coefficient)

1.5 step ego-centric network



data

content dataset from Naaman, Boase, Lai (2010)

social network dataset from Kwak et al. (2010)

105,599 messages from 628 users who:

- had no more than 5,000 followers or followees

- posted at least one Twitter update in July 2009 in English

- still had public profile in April 2010

pilot study



joy

on average 23% of a user's updates

*"First time at the last remaining fairgrounds reverts Yay!"
awesome. Sophia had a blast. Lucy said, "oooooh,"
over and over. Good times with my family.!"*



sadness

on average 10% of a user's updates

*"RIP Kathy. Live life for today. You never know how
long you have.!"*

study details

automated analysis of the users' tweets based on LIWC

"expression of emotion" => "existence of emotive words"

some gender differences



joy



sadness



other emotions

analysis

independent variables:

joy (updates-interactions)

sadness (updates-interactions)

emo (updates-interactions)

3 linear regression models for dependent variables:

number of followers

network density

reciprocity rate



results

... explaining number of followers ($R^2 = .22$)

@follower ...  joy-interactions .35 **

@follower ...  sadness-interactions .20 **

** $p < .01$

limitations & future work

better (real) emotion classifier

improve sampling, increase dataset

culture dependent

dyad-level analysis



today's more specific story

Twitter and networks:

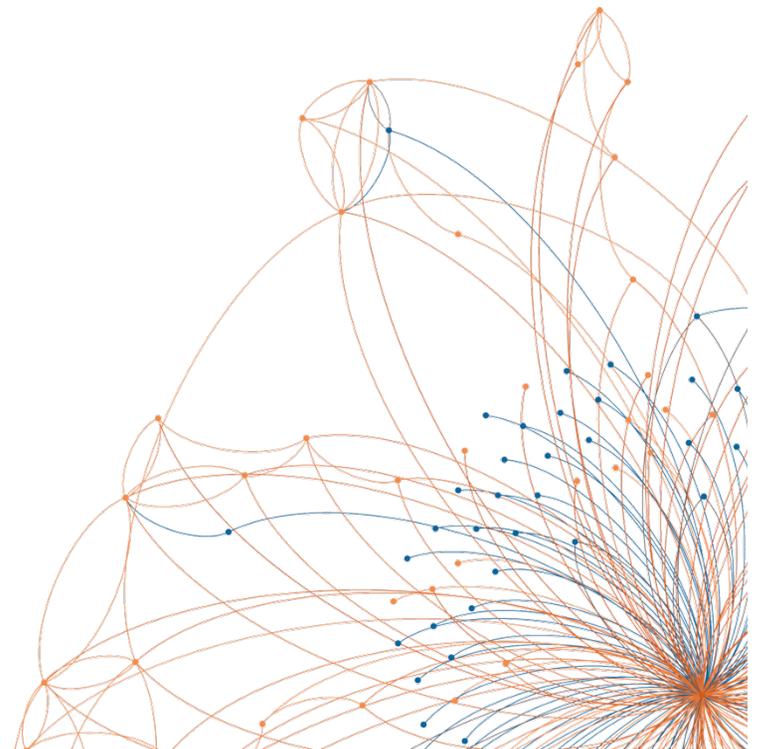
Part 1. social sharing of emotion and networks on Twitter

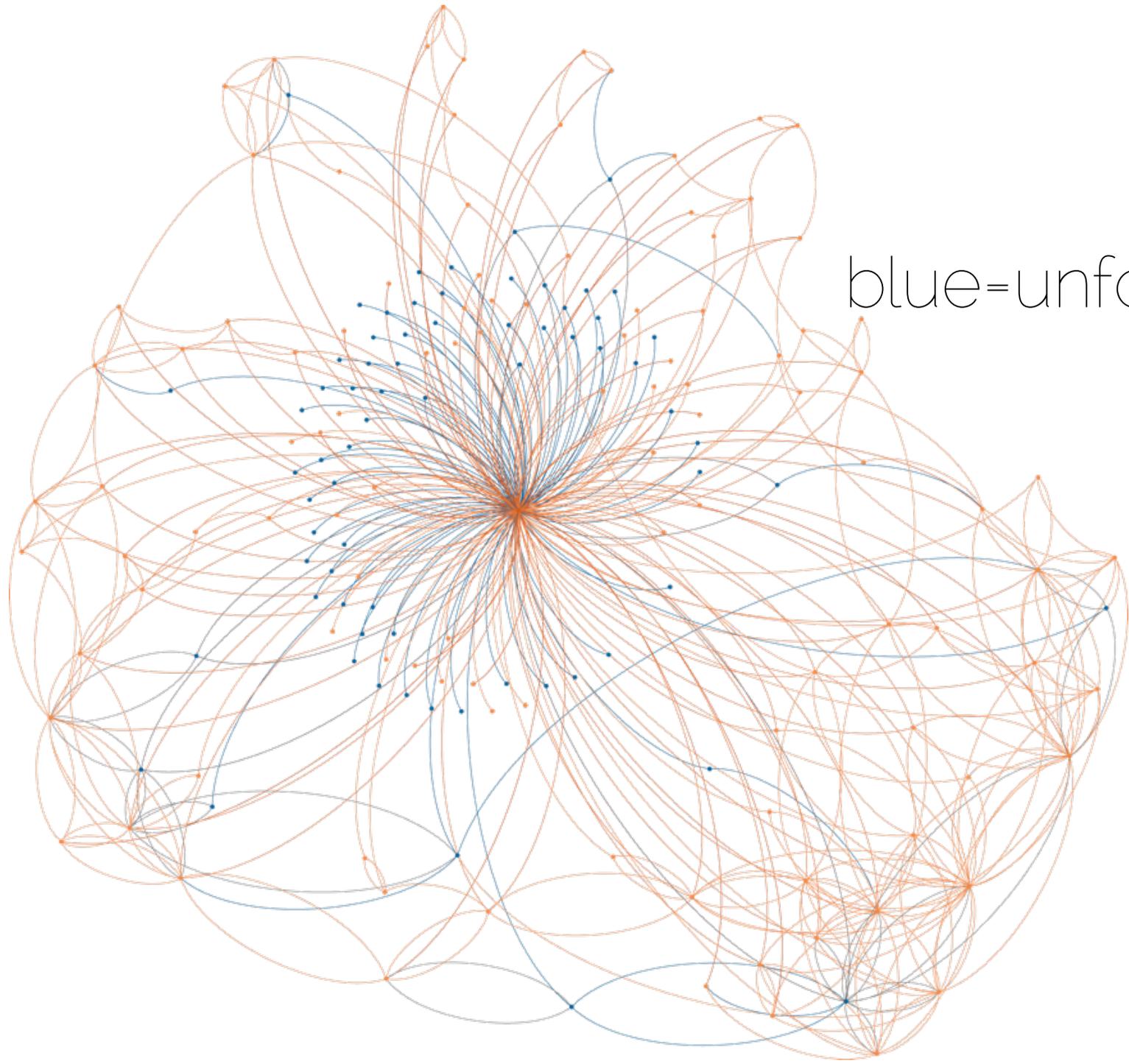
Part 2. unfollowing on Twitter

study 2

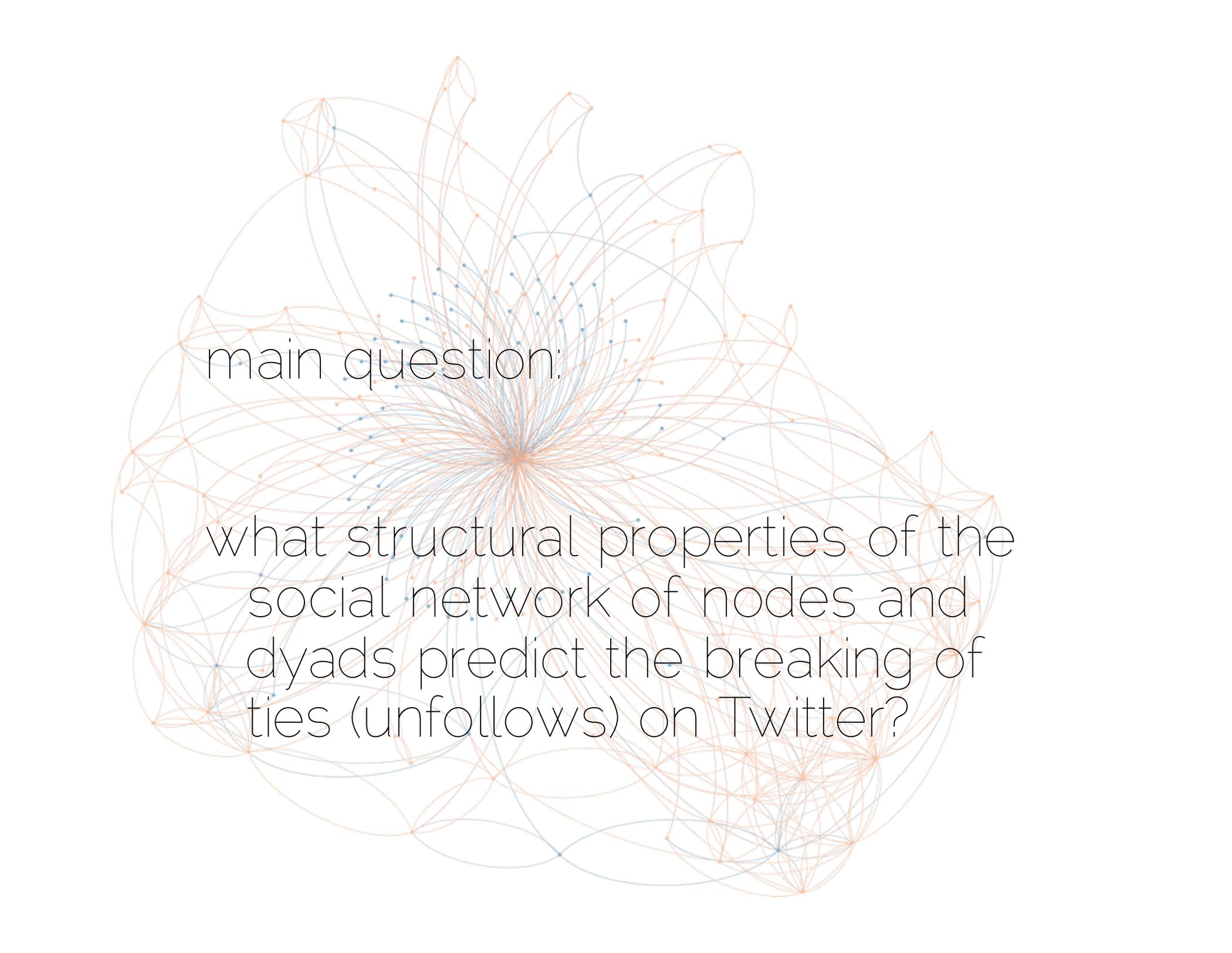
unfollowing on Twitter

Kivran-Swaine, Govindan & Naaman.
The Impact of Network Structure on
Breaking Ties in Online Social
Networks: Unfollowing on Twitter.
(CHI 2011).





blue=unfollow

A complex network graph with orange and blue nodes and edges, overlaid with text. The graph consists of numerous nodes connected by edges, forming a dense, interconnected structure. The nodes are colored in shades of orange and blue, and the edges are thin lines connecting them. The overall shape is roughly circular, with a central hub and many smaller clusters radiating outwards.

main question:

what structural properties of the social network of nodes and dyads predict the breaking of ties (unfollows) on Twitter?

theory background

tie strength

embeddedness within networks

power & status

data

content dataset from Naaman, Boase, Lai (2010)

social network dataset from Kwak et al. (2010)

Twitter API – connections still exist 9 months later?

715 seed nodes

245,586 “following” connections to seed nodes

30.6% dropped between 07/2009 & 04/2010

analysis

* independent variables (computed for our 245K dyads)

seed properties

follower-count, follower-to-followee ratio, network density, reciprocity rate, follow-back rate

follower properties

follower-count, follower-to-followee ratio

dyad properties

reciprocity, common neighbors, common followers, common friends, right transitivity, left transitivity, mutual transitivity, prestige ratio

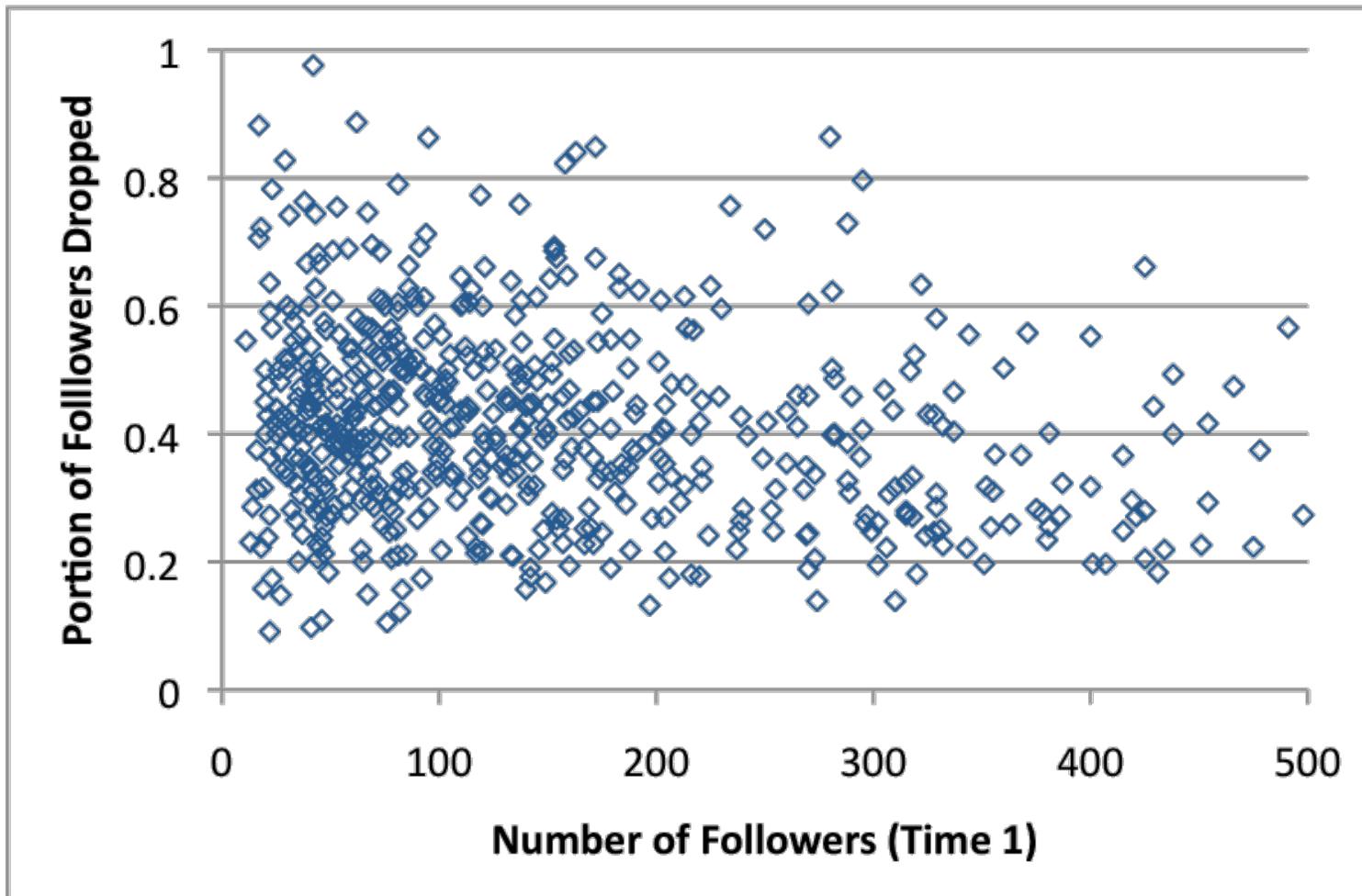
<disclaimer>

the following figures are NOT scientific evidence
and are shown here for illustration purposes

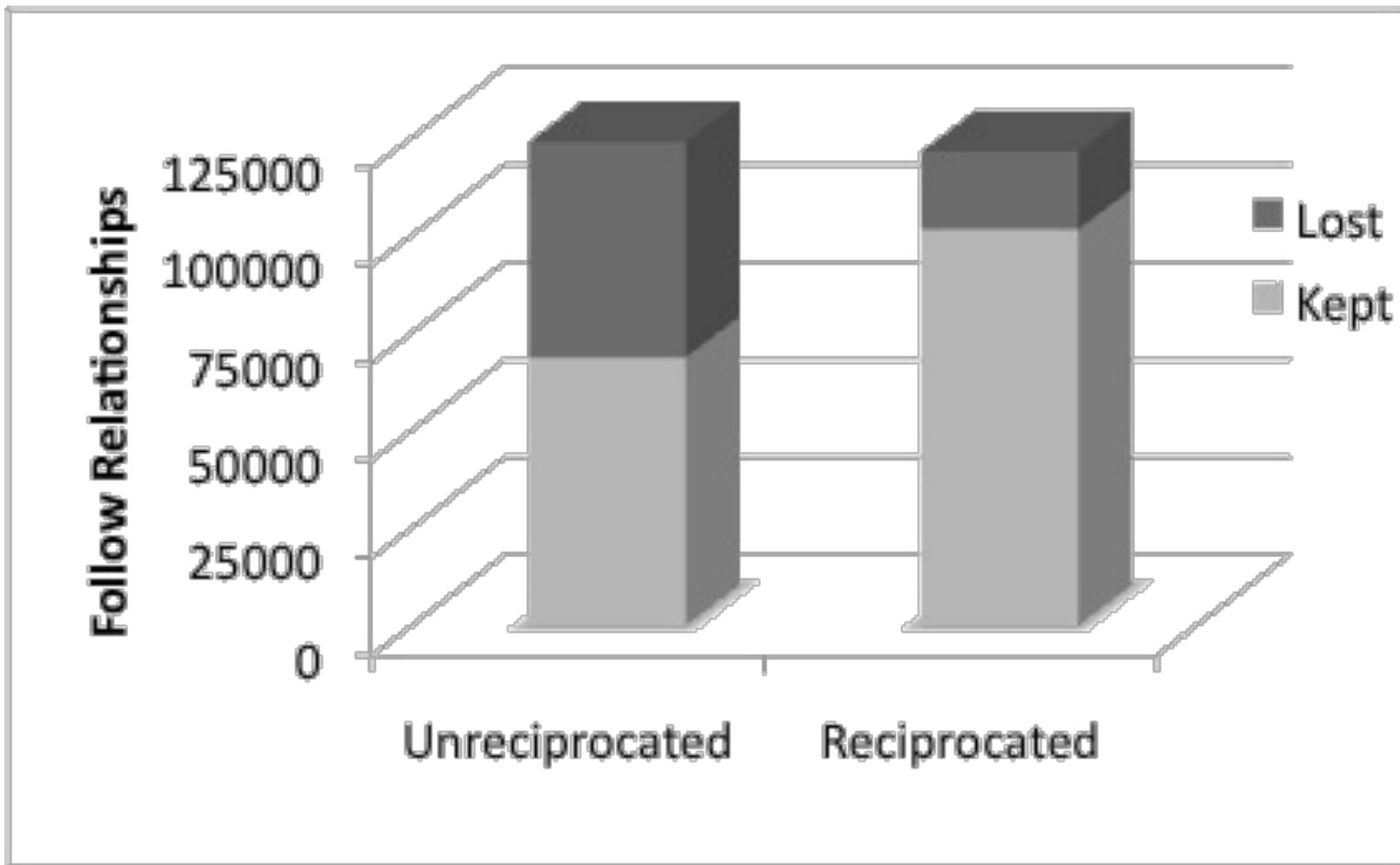
no control for intra-seed effects; no inter-variable
effects

no R installation was harmed in the making of the
following figures

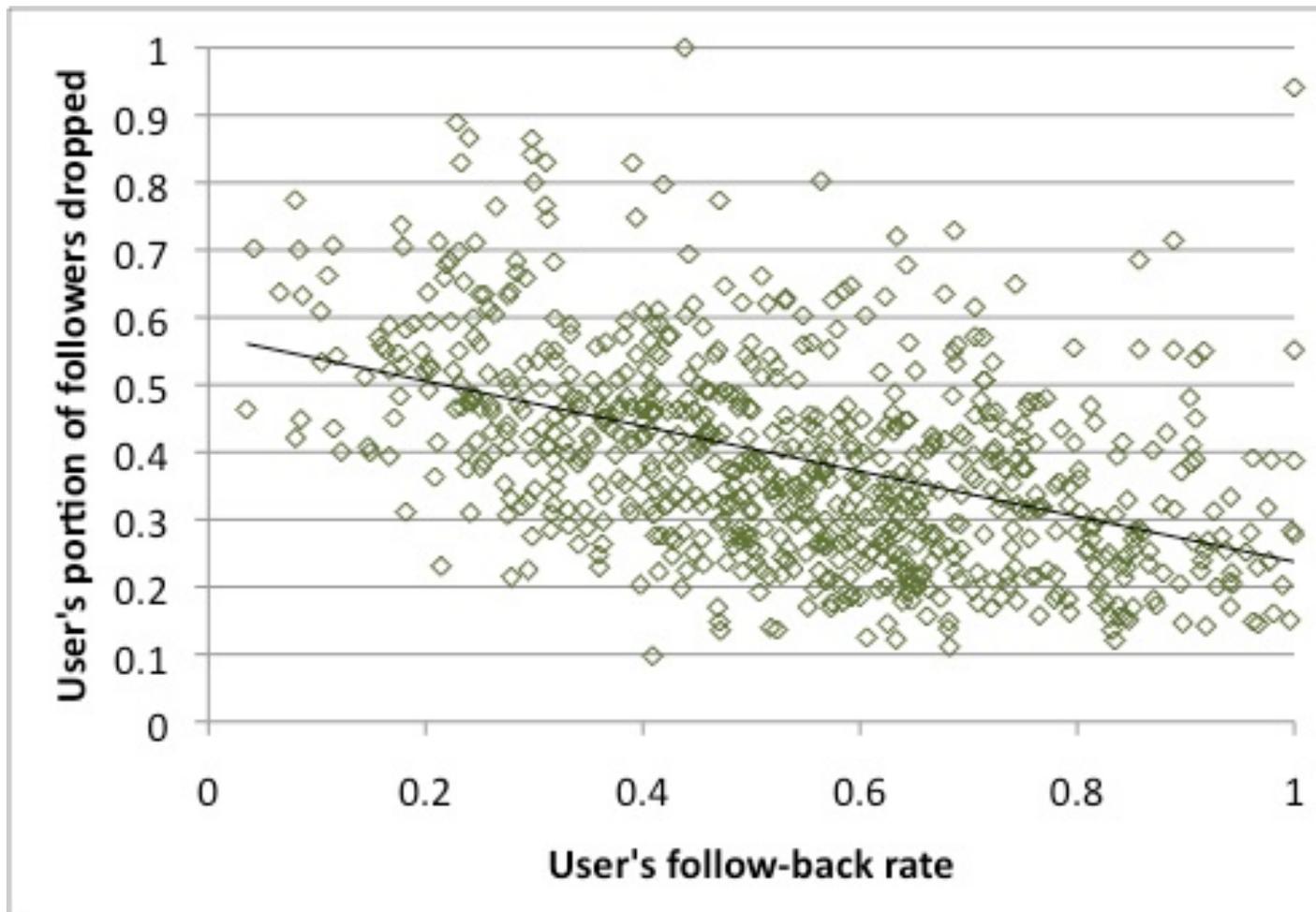
effect of number of followers (none):



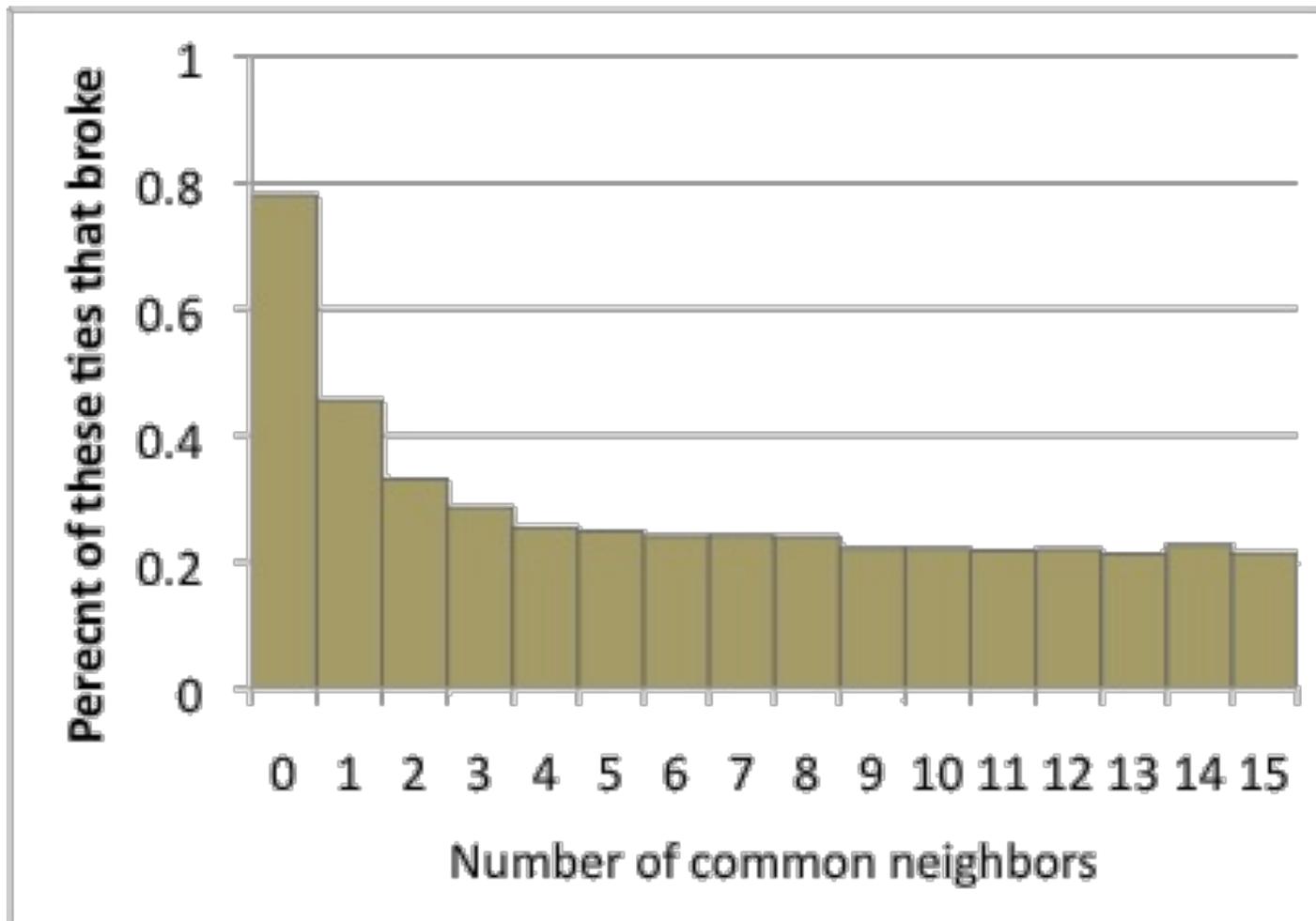
effect of reciprocity (large):



effect of follow-back rate



effect of common neighbors



</disclaimer>

back to scientific results (made R break sweat)
sparing you most details, though

in-depth analysis

multi-level logistic regression (dyads/edges nested within seed nodes)

three models; full one includes seed, follower, and dyadic/edge variables

complete details: in the paper

some results

effect of tie strength on breaking of ties

*** dyadic reciprocity (-)

*** network density (-)

*** highly statistically significant

limitations & future work

only two snapshots: add more

additional (non-structural) variables (e.g.,
frequency of posting!)

emotion and tie breaks

meanwhile, in computer science

algorithms to predict tie breaks?

how do tie breaks impact network
dynamics?

relationships

interests

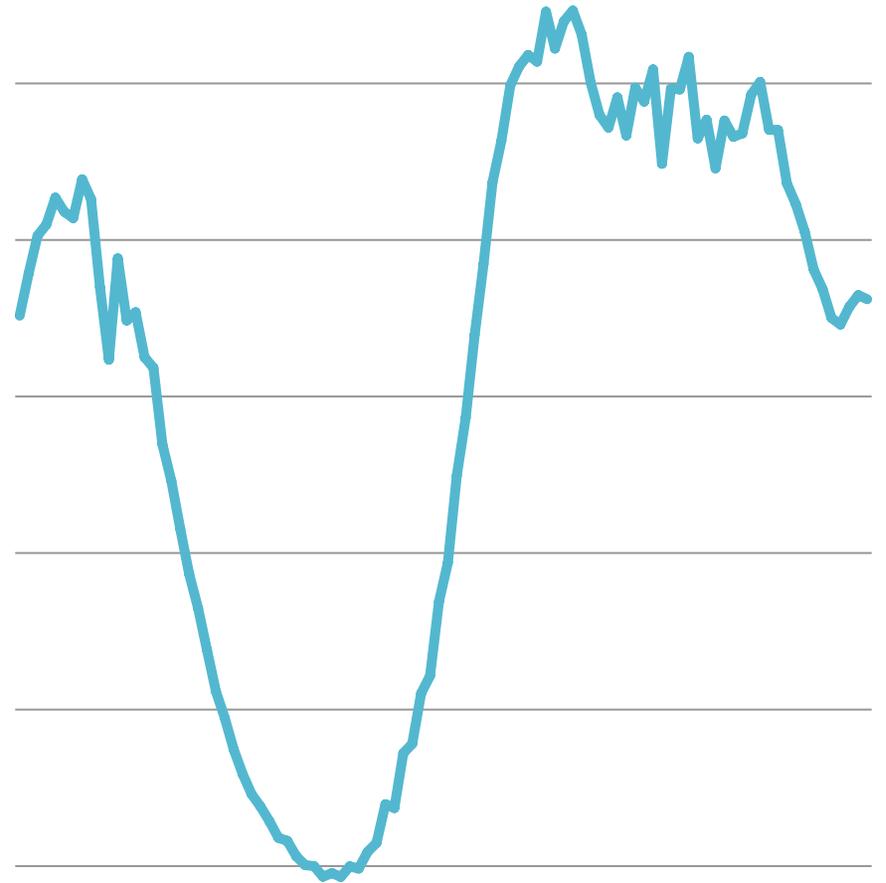
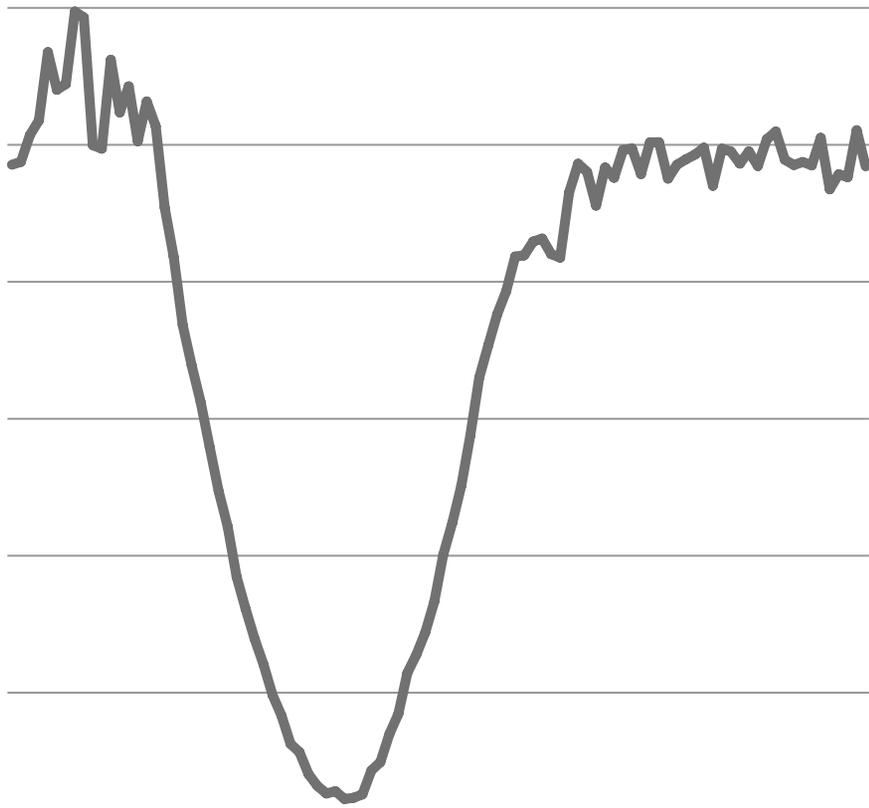
activities

culture

language

physical spaces

NYC vs. Washington DC



thank you

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@informor

<http://bit.ly/MorInfoSeminar>

come work with us!

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NOKIA
Connecting People