network science and social science on Twitter

mor naaman
rutgers SC&I | social media information lab
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
Conan O'Brien Show  June 1, 2010, Radio City Music Hall

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

Multiplayer (w/ Coco)
Social 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

AymanM Ayman Mohyeldin t³ by ayma
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 t³ by ayma
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
16 Feb

About @ayman

2,124 Tweets 268 Following 1,211 Followers 53 Listed

Connections
Also followed by @chkofler, @uxrick, @dwmcpdh, and more.

You both follow @dwmcpdh, @lyndonkennedy, @cscw2011

Following 268

Similar to @ayman · view all

dmrussell · Follow
chloestar · Follow
bederson · Follow

dmrussell
Chloe Fan
Ben Bederson

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study 1

emotion & social networks

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) → there is edge from v_i to v_j

directed 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:
\[
\frac{|E_i|}{|N_i| \times |N_i|-1}
\]
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

“Fireworks at the Cumming fairgrounds were awesome. Sophia had a blast. Lucy said, “ooooh,” 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

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

activities

language

interests

culture

physical spaces
mornaaman.com
mor@rutgers.edu
@informor
http://bit.ly/MorInfoSeminar

come work with us!
rutgers SC&I
social media information lab

thank you