

# Collecting and Analyzing Social Media Data with R

**Pablo Barberá**  
Politics – SMaPP Lab  
New York University

slides and code:  
[github.com/pablobarbera/social-media-workshop](https://github.com/pablobarbera/social-media-workshop)

February 2nd, 2015



Why should we care about social media?

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1. Social media usage is widespread

## Widespread use of social media sites

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(Sources: Pew Research Center (2014), Twitter and Facebook official statistics)

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- ▶ 23% of online adults in the US use Twitter (31% use among ages 18–29)
- ▶ Instagram has 300+ million active users (26% of online adults in the US)

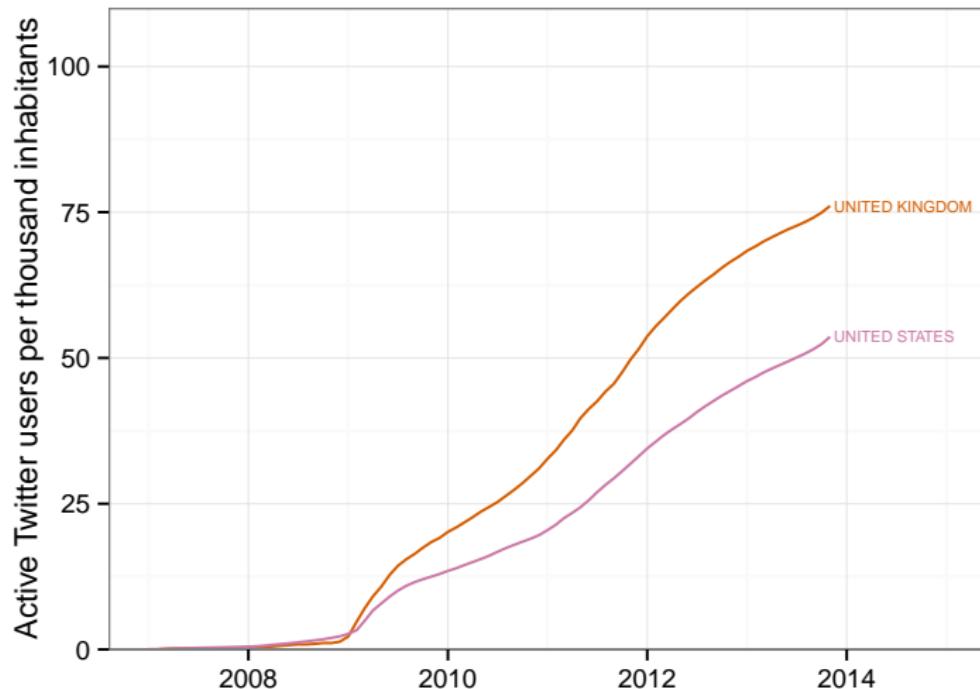


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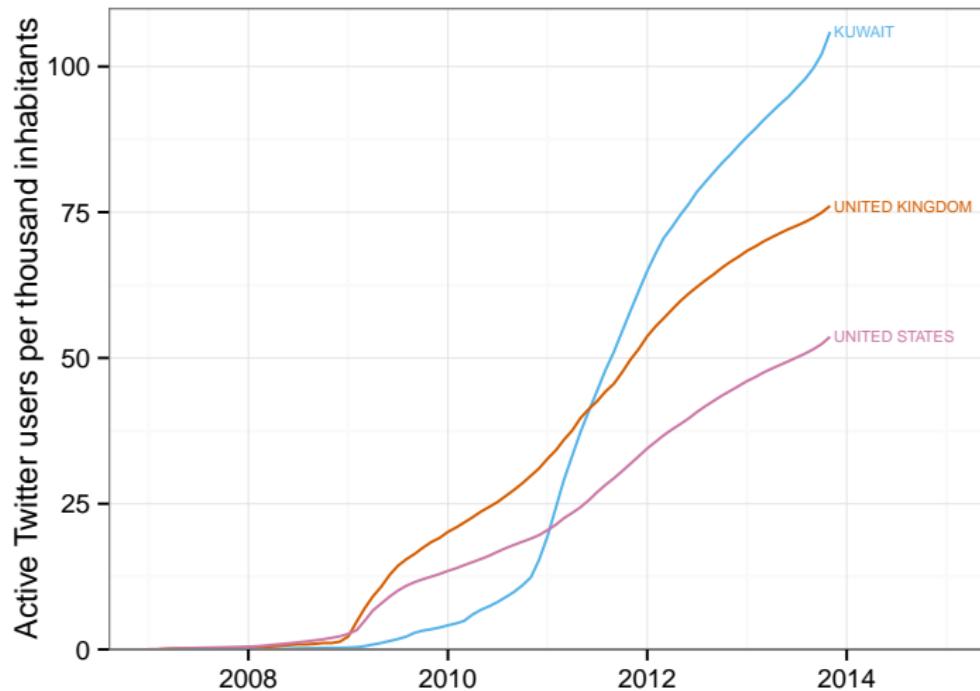
1. Social media usage is widespread
2. Social media usage is increasing

# Social media usage is increasing



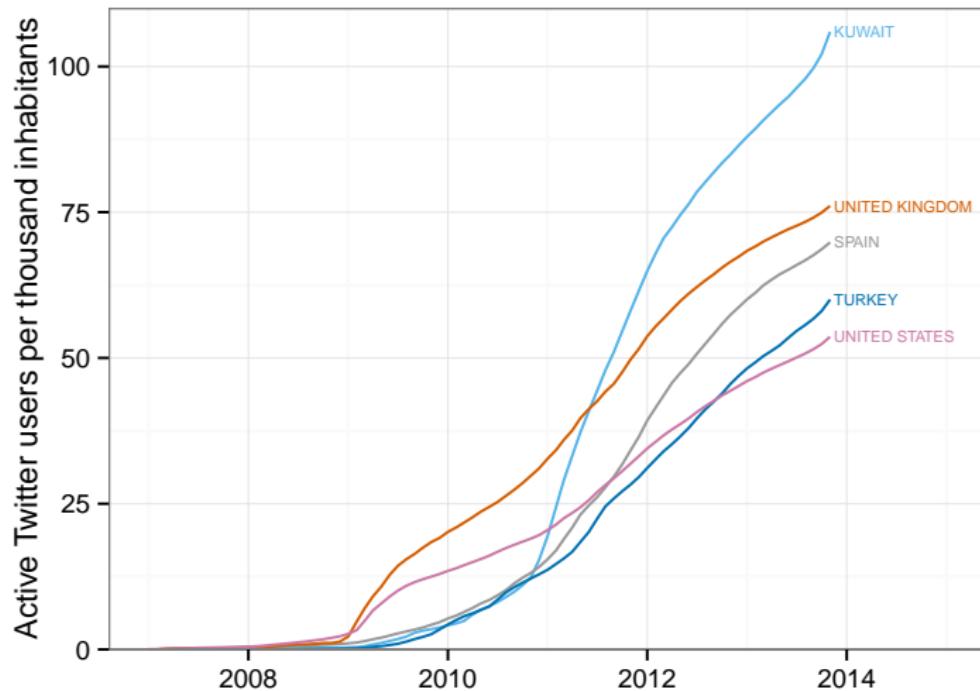
(Source: Zeitzoff and Barberá, MPSA 2014)

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Why should we care about social media?

1. Social media usage is widespread
2. Social media usage is increasing
3. Political content on social media



Dmitry Medvedev @MedvedevRussiaE

Follow

The harmonious development of Crimea and Sevastopol as part of our state is one of the main objectives of the Russian Government

Reply Retweet Favorite More

RETWEETS  
144

FAVORITES  
57



10:39 AM - 21 Mar 2014



Dmitry Medvedev

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10:39 AM - 21 Mar 2014



Justin Amash

December 10, 2014 ·

Sec. 309 of the new Intelligence Authorization Act permits the U.S. government to acquire, retain, and disseminate nonpublic telephone or electronic communications to or from a U.S. person. I demanded a roll call vote on the bill, and I will be voting NO.

[Like](#) · [Comment](#) · [Share](#) · 2,534 120 673



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RETWEETS 144 FAVORITES 57



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The New York Times

April 2

"Much of the foreign media coverage has distorted the reality of my country and the facts surrounding the events," writes Nicolás Maduro, the president of Venezuela, in Opinion: <http://nyti.ms/1gP5o2I>

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262 people like this.

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Donald J. Trump

@realDonaldTrump

Follow

This very expensive GLOBAL WARMING bullshit has got to stop. Our planet is freezing, record low temps, and our GW scientists are stuck in ice

Reply Retweet Favorite More

RETWEETS 2,007 FAVORITES 1,145



7:39 PM - 1 Jan 2014

## Social media and politics

- ▶ 99% of Members of the US Congress have an active social media account

(Sources: Electionista; Zeitzoff and Barberá, MPSA 2014; Pew Research Center)

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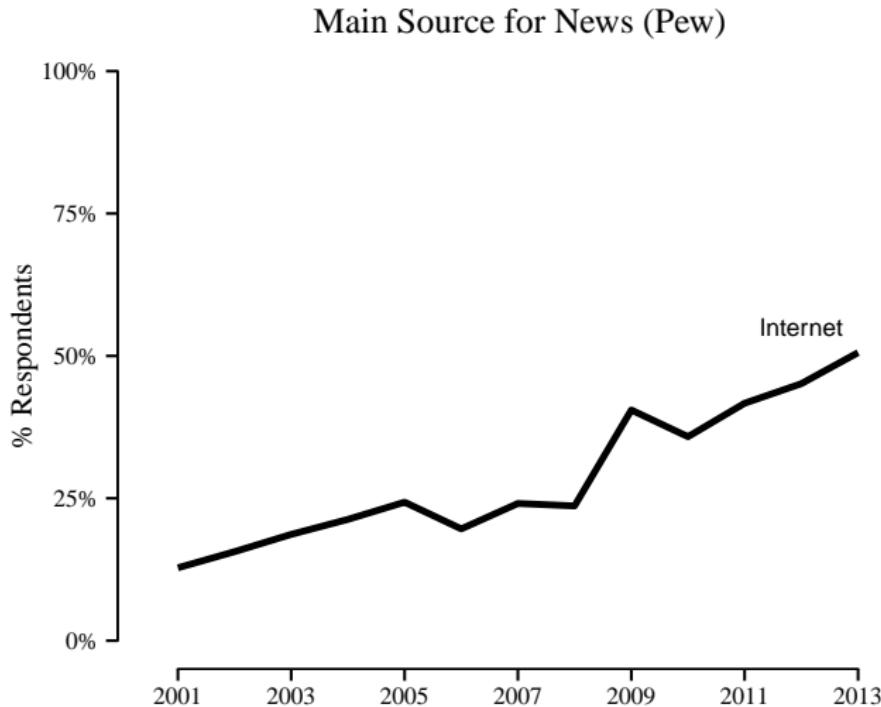
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Why should we care about social media?

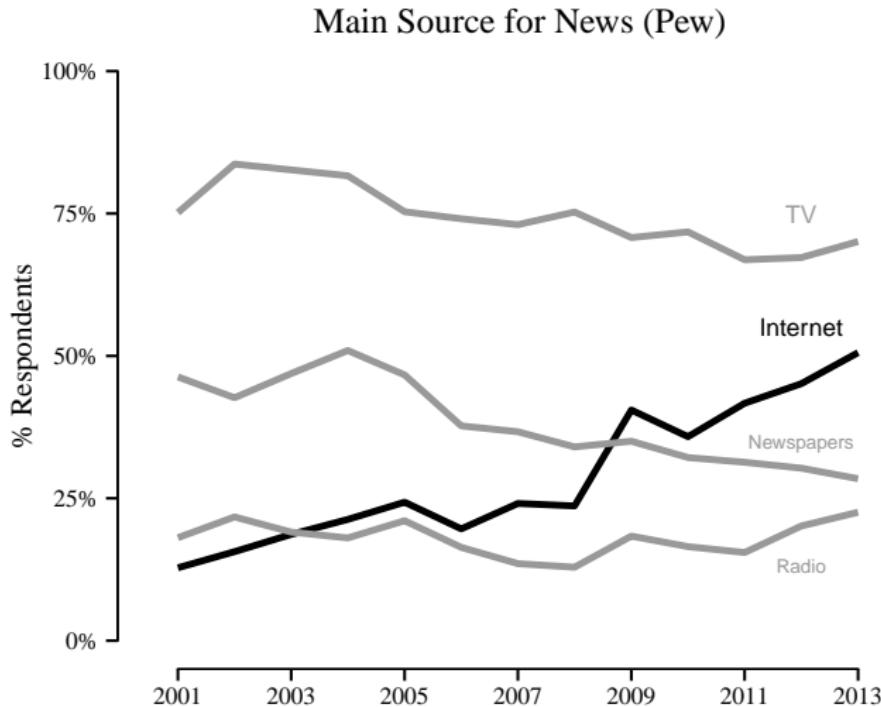
1. Social media usage is widespread
2. Social media usage is increasing
3. Political content on social media
4. Social media is a primary source of political information

- ▶ Large changes in citizens' news consumption habits



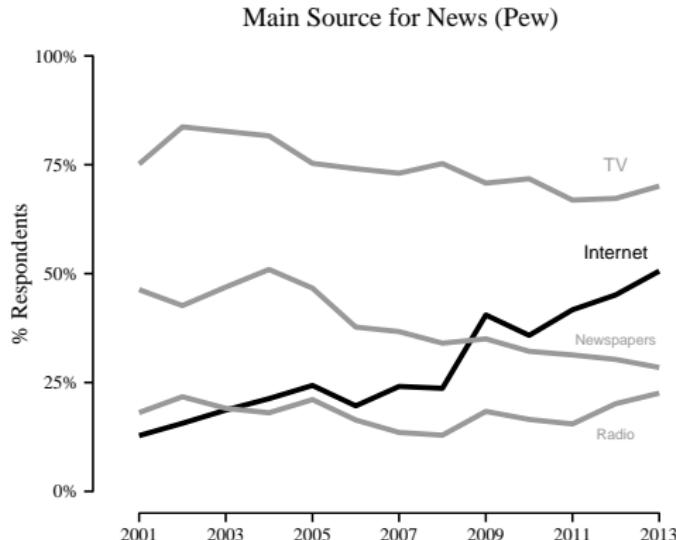
Data: Pew Research Center. Respondents were allowed to name up to two sources.

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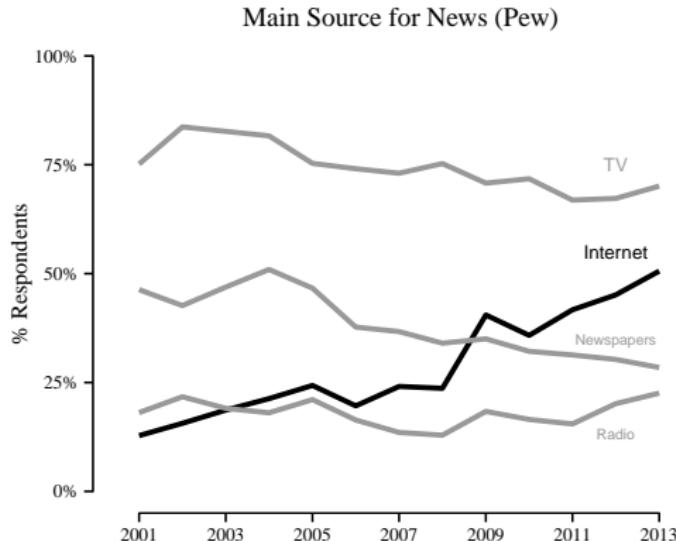
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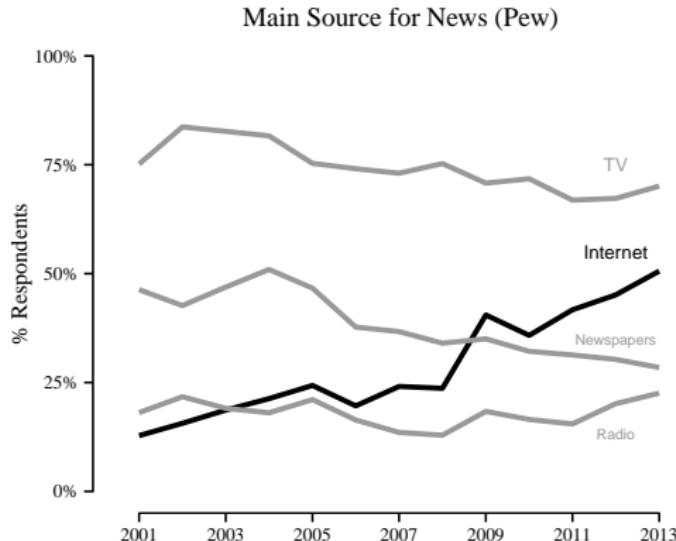
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- ▶ Social media: top source of news for U.S. young adults (Pew)

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2. Overview of social media research
3. Social media APIs
4. Tools and applications:
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  - 4.2 Facebook
  - 4.3 Instagram

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Two different approaches to the study of social media and politics:

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**1. Social media as data**

- ▶ Behavior, opinion, and latent traits
- ▶ Interpersonal networks
- ▶ Elite behavior

**2. Social media as a variable**

- ▶ Mass protests
- ▶ Political persuasion
- ▶ Social capital
- ▶ Political polarization

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Today is Election Day

What's this? • close

 Find your polling place on the U.S. Politics Page and click the "I Voted" button to tell your friends you voted.

**I Voted**

  Jaime Settle, Jason Jones, and 18 other friends have voted.

Bond et al, 2012, “A 61-million-person experiment in social influence and political mobilization”, *Nature*

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## SOCIAL SCIENCES

### *Social media for large studies of behavior*

Large-scale studies of human behavior in social media need to be held to higher methodological standards

By Derek Ruths<sup>1\*</sup> and Jürgen Pfeffer<sup>2</sup>

**O**n 3 November 1948, the day after Harry Truman won the United States presidential elections, the *Chicago Tribune* published one of the most famous erroneous headlines in newspaper history: "Dewey Defeats Truman" (1, 2). The headline was informed by telephone surveys, which had inadver-

different social media platforms (8). For instance, Instagram is "especially appealing to adults aged 18 to 29, African-American, Latinos, women, urban residents" (9) whereas Pinterest is dominated by females, aged 25 to 34, with an average annual household income of \$100,000 (10). These sampling biases are rarely corrected for (if even acknowledged).

*Proprietary algorithms for public data.* Platform-specific sampling problems, for example, the highest-volume source of pub-

The rise of "embedded research" (researchers who have special relationships with providers that give them access to platform-specific data, algorithms, and resources) is creating a diverse media research community. Such researchers, for example, can see a platform's workings and make accommodations that may not be able to reveal their own identities or the data used to generate their findings.

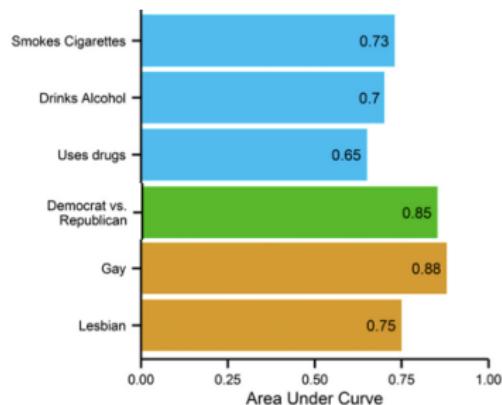
Ruths and Pfeffer, 2015, "Social media for large studies of behavior", *Science*

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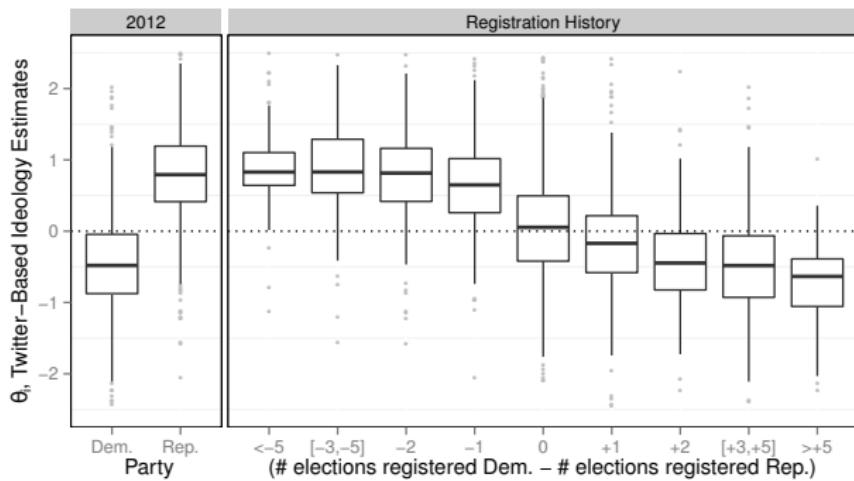


Kosinski et al, 2013, “Private traits and attributes are predictable from digital records of human behavior”, PNAS (also personality, PNAS 2015)

Fig. 2. Prediction accuracy of classification for dichotomous/dichotomized attributes expressed by the AUC.

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Data: 2,360 Twitter accounts,  
matched with Ohio voter file.

Barberá, 2015, "Birds of the  
Same Feather Tweet Together.  
Bayesian Ideal Point  
Estimation Using Twitter  
Data", *Political Analysis*

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- 1. Social media as data**

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- ▶ **Interpersonal networks**
- ▶ Elite behavior

- 2. Social media as a variable**

- ▶ Mass protests
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OPEN  ACCESS Freely available online



## Inferring Tie Strength from Online Directed Behavior

Jason J. Jones<sup>1,2\*</sup>, Jaime E. Settle<sup>2</sup>, Robert M. Bond<sup>2</sup>, Christopher J. Fariss<sup>2</sup>, Cameron Marlow<sup>3</sup>, James H. Fowler<sup>1,2</sup>

**1** Medical Genetics Division, University of California, San Diego, La Jolla, California, United States of America, **2** Political Science Department, University of California, San Diego, La Jolla, California, United States of America, **3** Data Science, Facebook, Inc., Menlo Park, California, United States of America

### Abstract

Some social connections are stronger than others. People have not only friends, but also *best friends*. Social scientists have long recognized this characteristic of social connections and researchers frequently use the term *tie strength* to refer to this concept. We used online interaction data (specifically, Facebook interactions) to successfully identify real-world strong ties. Ground truth was established by asking users themselves to name their closest friends in real life. We found the frequency of online interaction was diagnostic of strong ties, and interaction frequency was much more useful diagnostically than were attributes of the user or the user's friends. More private communications (messages) were not necessarily more informative than public communications (comments, wall posts, and other interactions).

Jones et al, 2013, “Inferring Tie Strength from Online Directed Behavior”, *PLOS One*

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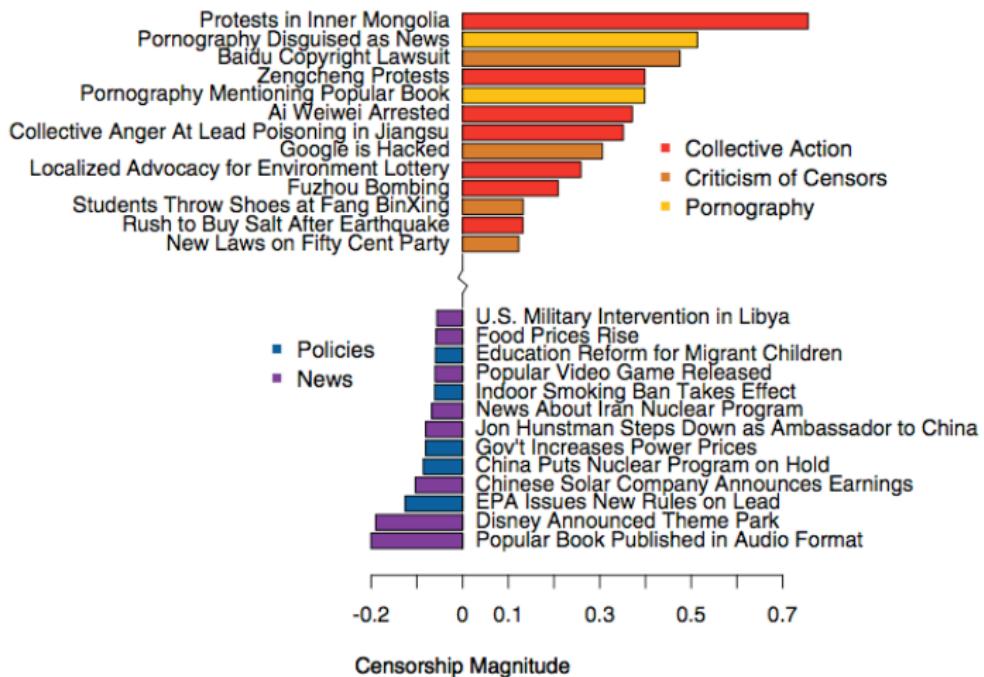
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## Elite behavior

- ▶ Authoritarian governments' response to threat of collective action

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- Authoritarian governments' response to threat of collective action



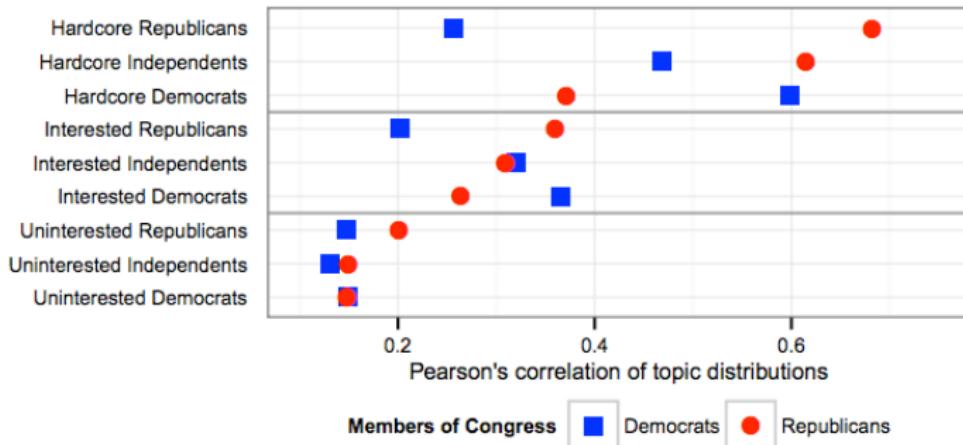
King et al, 2013, "How Censorship in China Allows Government Criticism but Silences Collective Expression", *APSR*

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Barberá et al, 2014, “Leaders or Followers? Measuring Political Responsiveness in the U.S. Congress Using Social Media Data”, APSA

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## **Using Social Media to Measure Conflict Dynamics: An Application to the 2008–2009 Gaza Conflict**

**Thomas Zeitzoff<sup>1</sup>**

Journal of Conflict Resolution  
55(6) 938-969  
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DOI: [10.1177/0022002711408014](https://doi.org/10.1177/0022002711408014)  
<http://jcr.sagepub.com>



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# THE NEW YORKER

ANNALS OF INNOVATION

## SMALL CHANGE

*Why the revolution will not be tweeted.*

by Malcolm Gladwell

OCTOBER 4, 2010



Social media can't provide what social change has always required.

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Barack Obama

@BarackObama



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Four more years.



RETWEETS

756,411

FAVORITES

288,867



11:16 PM - 6 Nov 2012

Sections ≡

The Washington Post

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Sign In

Post Politics

**By the end of the 2012 campaign,  
every Mitt Romney tweet had to be  
approved by 22 people**

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## **Tweeting Alone? An Analysis of Bridging and Bonding Social Capital in Online Networks**

American Politics Research

1–31

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DOI: [10.1177/1532673X14557942](https://doi.org/10.1177/1532673X14557942)

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**Javier Sajuria<sup>1</sup>, Jennifer vanHeerde-Hudson<sup>1</sup>,  
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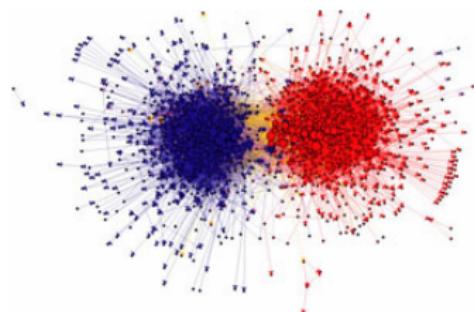
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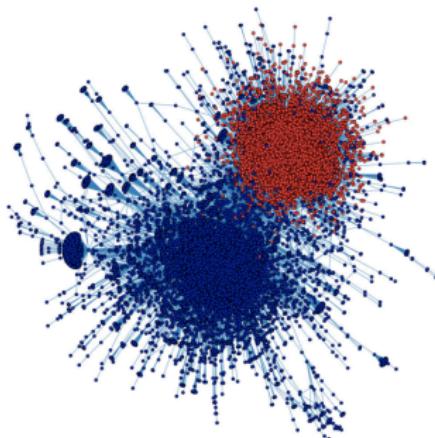
# Political polarization

Social media as *echo chambers* or *filter bubbles*:

- ▶ communities of like-minded individuals (homophily)



Adamic and Glance (2005)

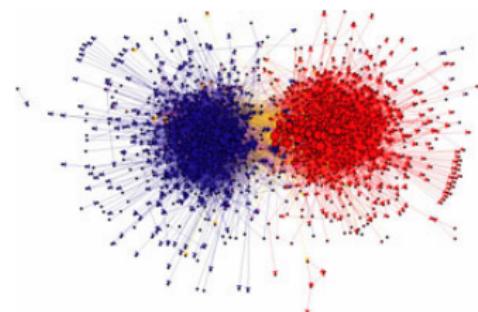


Conover et al (2012)

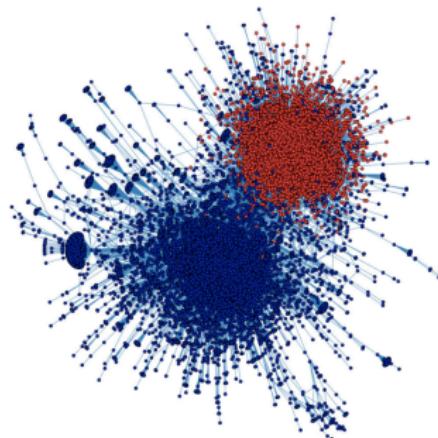
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Social media as *echo chambers* or *filter bubbles*:

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Conover et al (2012)

- ▶ ...generates selective exposure to congenial information
- ▶ ...increases political polarization (Sunstein, Prior)

# Political polarization

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...and therefore mass political polarization decreases.

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2. Streaming APIs: changes in users' data in real time (e.g. new messages, deletions, etc.)

Potential issues

1. Rate limits: restrictions on number of API calls by user and period of time (APIs are expensive!)
2. Ongoing debate on replication of social science research using social media data

# Connecting with an API

## Constructing a REST API call

- ▶ Baseline URL: <http://graph.facebook.com/>
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## Authentication

- ▶ Most common is an open standard called OAuth
- ▶ Connections without sharing username and password, only temporary tokens that can be refreshed
- ▶ httr package in R implements most cases (examples)

# Interacting with social media APIs

## R packages

- ▶ Twitter: twitteR for REST, streamR for Streaming
- ▶ Facebook: Rfacebook
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Other APIs: CRAN Task View for Web Technologies and Services

Equivalent libraries for python, java, ruby... whatever works for you!

# Collecting and Analyzing Social Media Data with R

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  - 4.1 Twitter
  - 4.2 Facebook
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Fork my repo! [github.com/pablobarbera/social-media-workshop](https://github.com/pablobarbera/social-media-workshop)

Code:

- ▶ Twitter
  - ▶ 01-twitter-data-collection.r
  - ▶ 02-twitter-data-analysis.r
- ▶ Facebook
  - ▶ 03-facebook-data-collection.r
  - ▶ 04-facebook-data-analysis.r
- ▶ Instagram
  - ▶ 05-instagram-data.r

Slides: [slides/social-media-workshop.pdf](#)

Data: [backup/](#)

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**Important limitation:** tweets can only be downloaded in real time  
(exception: user timelines,  $\sim 3,200$  most recent tweets are available)

# Anatomy of a tweet

 **Barack Obama**   
@BarackObama

Four more years.

◀ ▶ ★ ...



RETWEETS FAVORITES  
**756,411** **288,867**



11:16 PM - 6 Nov 2012

# Anatomy of a tweet

Tweets are stored in JSON format:

```
{ "created_at": "Wed Nov 07 04:16:18 +0000 2012",
  "id": 266031293945503744,
  "text": "Four more years. http://t.co/bAJE6Vom",
  "source": "web",
  "user": {
    "id": 813286,
    "name": "Barack Obama",
    "screen_name": "BarackObama",
    "location": "Washington, DC",
    "description": "This account is run by Organizing for Action staff.

    Tweets from the President are signed -bo."
  },
  "url": "http://t.co/8aj56jcemr",
  "protected": false,
  "followers_count": 54873124,
  "friends_count": 654580,
  "listed_count": 202495,
  "created_at": "Mon Mar 05 22:08:25 +0000 2007",
  "time_zone": "Eastern Time (US & Canada)",
  "statuses_count": 10687,
  "lang": "en",
  "coordinates": null,
  "retweet_count": 756411,
  "favorite_count": 288867,
  "lang": "en"
}
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- ▶ Collect a random sample of tweets
- ▶ Download all tweets sent by a given user

# Streaming API

- ▶ Recommended method to collect tweets
- ▶ Potential issues:
  - ▶ Filter streams have same rate limit as spritzer (1% of all tweets)
  - ▶ Stream connections tend to die spontaneously. Restart regularly.
  - ▶ Lots of invalid content in stream. If it can't be parsed, drop it.
- ▶ My workflow:
  - ▶ Amazon EC2 Ubuntu micro instance (free tier)
  - ▶ Cron jobs to restart R scripts every hour.
  - ▶ Save tweets in .json files or in MongoDB.
  - ▶ For large .json files, preprocess with python (see:  
[github.com/pablobarbera/pytwools](https://github.com/pablobarbera/pytwools))

# Analyzing Twitter Data

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1. How to work with geolocated tweets

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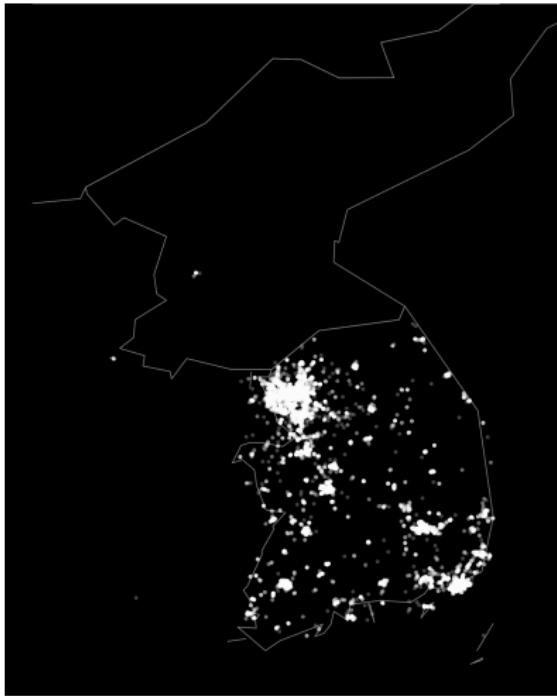
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2. How to measure opinions on Twitter
  - ▶ Supervised sentiment analysis using a dictionary of positive and negative words



Tweets from Korea: 40k tweets collected in 2014 (left)  
Korean peninsula at night, 2003 (right). Source: NASA.

# Who is tweeting from North Korea?



**North Korea English**  
@uriminzok\_engl  
An English translation of @uriminzok - the official North Korea Twitter feed  
[uriminzokkiri.com](http://uriminzokkiri.com)

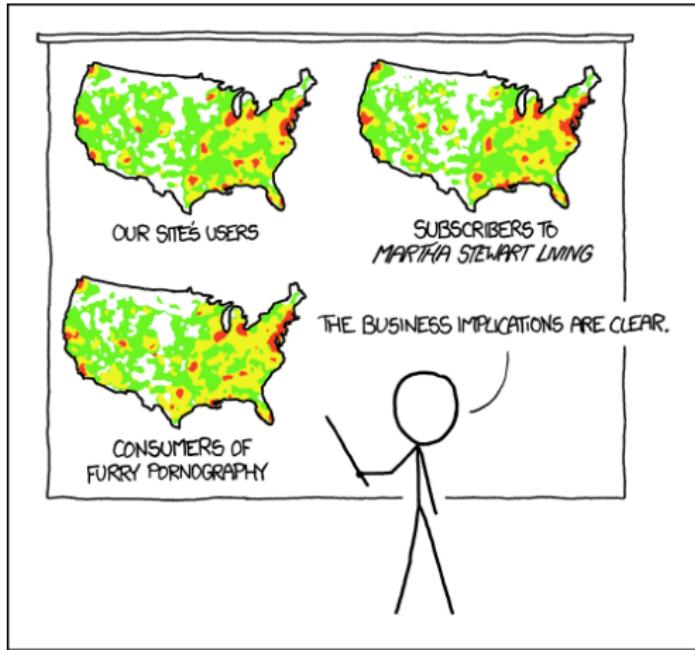
671 TWEETS	940 FOLLOWING	129 FOLLOWERS	<a href="#">Profile</a> <a href="#">Follow</a>
---------------	------------------	------------------	--

**Tweets**

 **North Korea English** @uriminzok\_engl 13h  
Beloved Comrade Kim Jong-un to stay in the national light industry competition attended by Code speeches do was [goo.gl/eJWsJ](http://goo.gl/eJWsJ)  
[Expand](#)

Twitter user: @uriminzok\_engl

But remember...



PET PEEVE #208:  
GEOGRAPHIC PROFILE MAPS WHICH ARE  
BASICALLY JUST POPULATION MAPS

## Sentiment analysis

Sentiment, tone, valence, affective score... = % positive messages about a subject

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In practice, accuracy over 80% is impossible (and that's ok)

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## Collecting Facebook data

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- ▶ Capture data from a Facebook page

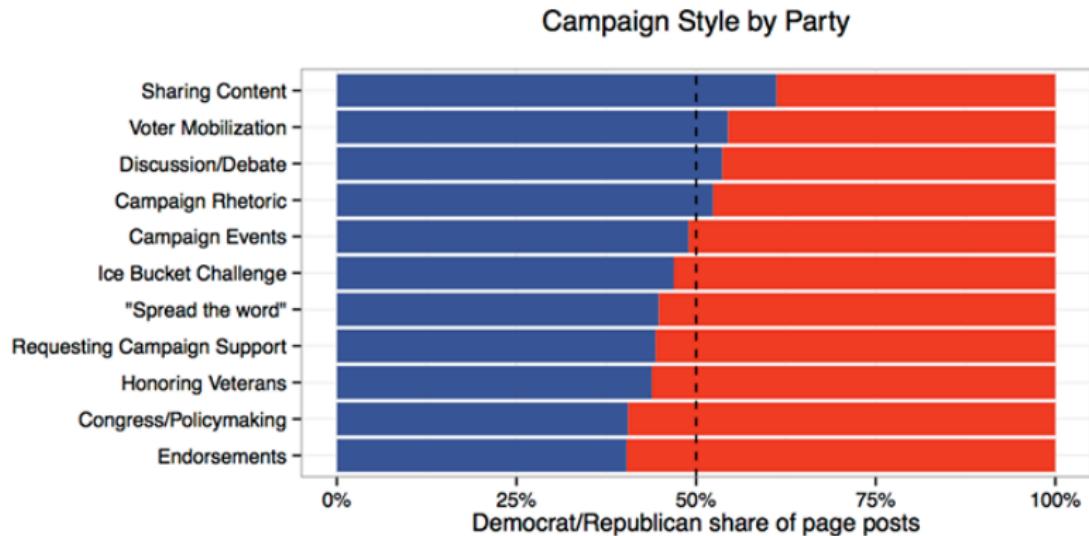
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- ▶ Capture data from a Facebook page
- ▶ Collect likes and comments data from a public post

# Facebook data analysis

What issues do Members of the U.S. Congress discuss on Facebook?



Messing et al, 2014, "Campaign Rhetoric and Style on Facebook in the 2014 U.S. Midterms" (Facebook Data Science Blog)

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## Instagram data

What is available through Instagram API:

- ▶ Search and download pictures that mention a given hashtag on its caption, or that were sent from a specific location
- ▶ Collect information about these pictures (creation date, caption, author, filter, hashtags ...)
- ▶ Download pictures sent by a given user
- ▶ Count number of photos that mention a specific hashtag

Examples: 05-instagram-data.r

**Thanks! Questions?**

materials: [github.com/pablobarbera/social-media-workshop](https://github.com/pablobarbera/social-media-workshop)

website: [pablobarbera.com](http://pablobarbera.com)

twitter: [@p\\_barbera](https://twitter.com/@p_barbera)