

Collecting and Analyzing Social Media Data with R

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slides and code:
github.com/pablobarbera/social-media-workshop

February 2nd, 2015



Why should we care about social media?

1. Social media usage is widespread

Widespread use of social media sites

- ▶ One in every ten people in the world logged onto Facebook yesterday.
- ▶ 71% of online adults in the US use Facebook (84% use among ages 18–29)
- ▶ 400+ million tweets are sent everyday by 200+ million active users worldwide
- ▶ 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)

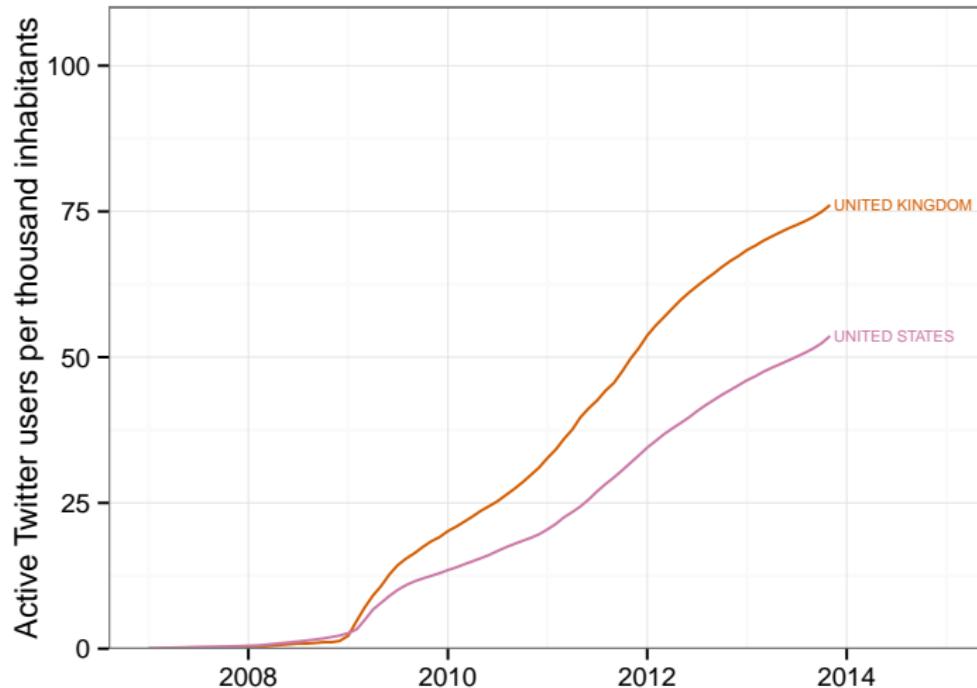


(Sources: Pew Research Center (2014), Twitter and Facebook official statistics)

Why should we care about social media?

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

Social media usage is increasing



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



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



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>

Like · Comment · Share

57

262 people like this.

Top Comments ▾



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

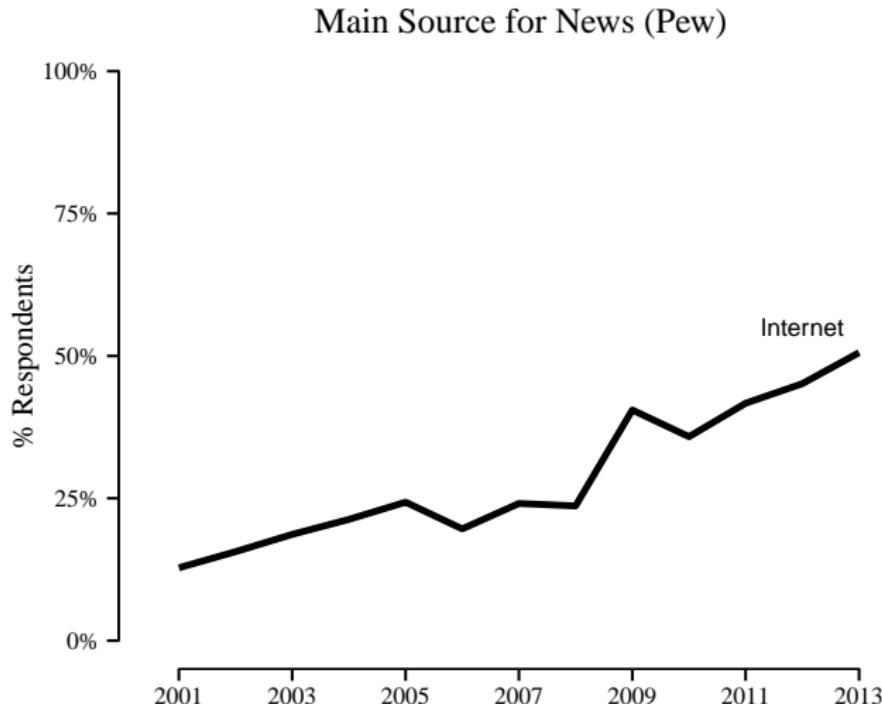
- ▶ 99% of Members of the US Congress have an active social media account
- ▶ 80% of governments have a presence on Twitter
- ▶ “Traditional” media outlets rely on social media to promote their content
- ▶ 50% of social media users in U.S. share information about news stories, images or videos about current events
- ▶ 46% have discussed a news issue or event on social media

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

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



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

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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Behavior, opinions, and latent traits

- ▶ Digital footprint: check-ins, conversations, geolocated pictures, likes, shares, retweets, ...
- Non-intrusive measurement of behavior and opinion

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.

0 1 1 5 5 3 7 6
People on Facebook 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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Interpersonal networks

- ▶ Political behavior is social, strongly influenced by peers
- ▶ Costly to measure network structure
- ▶ High overlap across online and offline social networks

OPEN  ACCESS Freely available online



Inferring Tie Strength from Online Directed Behavior

Jason J. Jones^{1,2*}, Jaime E. Settle², Robert M. Bond², Christopher J. Fariss², Cameron Marlow³, James H. Fowler^{1,2}

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*

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

- 1. Social media as data**

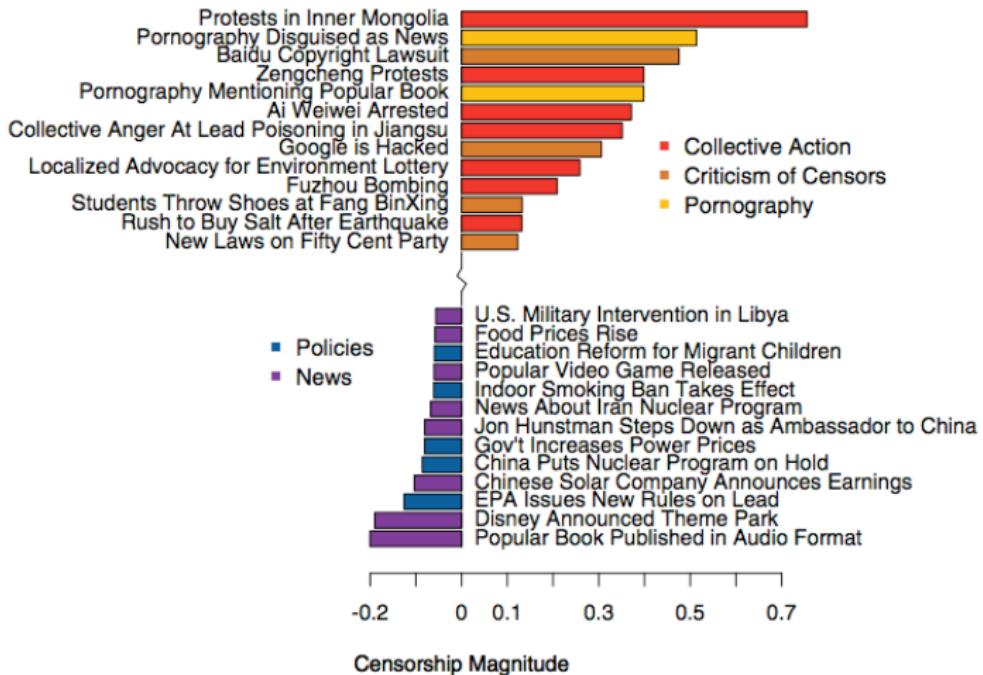
- ▶ Behavior, opinions, and latent traits
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- ▶ Mass protests
- ▶ Political persuasion
- ▶ Social capital
- ▶ Political polarization

Elite behavior

- ▶ Authoritarian governments' response to threat of collective action



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

- ▶ How legislators in democracies are responsive to their

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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



Follow

Four more years.



RETWEETS

756,411

FAVORITES

288,867



11:16 PM - 6 Nov 2012

Sections ≡

The Washington Post

Search



Sign In

Post Politics

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

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

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- 2. Social media as a variable**

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- ▶ Political persuasion
- ▶ **Social capital**
- ▶ Political polarization

Social capital

- ▶ Social connections are essential in democratic societies, but online interactions do not create social capital (Putnam, 2001)
 - ▶ Online networking sites facilitate and transform how social ties are established
-

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

American Politics Research

1–31

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apr.sagepub.com



**Javier Sajuria¹, Jennifer vanHeerde-Hudson¹,
David Hudson¹, Niheer Dasandi¹, and Yannis
Theocharis²**

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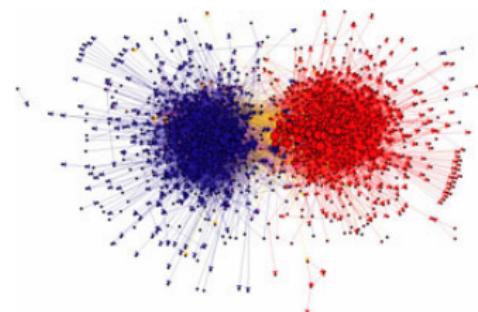
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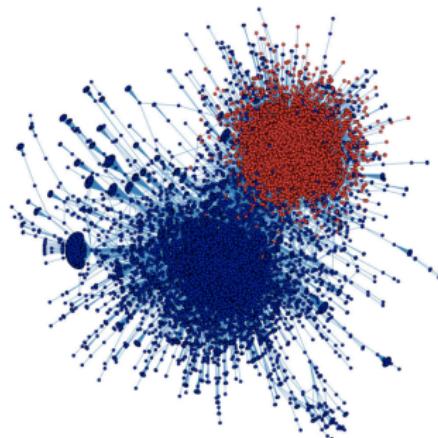
Political polarization

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

- ▶ communities of like-minded individuals (homophily)



Adamic and Glance (2005)



Conover et al (2012)

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

Political polarization

Social media usage induces political moderation (Barberá, 2015)

1. Inadvertent exposure to political messages
 - ▶ “Your friends deliver the news” (Messing and Westwood, 2014)
 - ▶ Less selective exposure
2. More frequent interactions beyond immediate personal network
 - ▶ “The strength of weak ties” in providing novel information (Granovetter, 1973; Bakshy et al, 2012)

...increases exposure to dissonant views

...and therefore mass political polarization decreases.

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Collecting Social Media Data

Two different methods:

1. Screen scraping: extract data from source code of website
2. Web APIs (application programming interface): use a set of structured https requests that return JSON or XML files

Types of APIs:

1. RESTful APIs: queries for static information in current moment (e.g. user profiles, posts, etc.)
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/>
- ▶ Parameters: ?ids=barackobama,johnmccain

Response often in JSON format. (example)

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
- ▶ Instagram: instaR (not on CRAN)

Why R? Most common programming language in data science, 5,000+ packages, great documentation, “it just works”

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

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Fork my repo! 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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Twitter APIs

Two different methods to collect Twitter data:

1. REST API:

- ▶ Queries for specific information about users and tweets
- ▶ Examples: user profile, list of followers and friends, tweets generated by a given user (“timeline”), users lists, etc.
- ▶ R library: twitteR

2. Streaming API:

- ▶ Connect to the “stream” of tweets as they are being published
- ▶ Three streaming APIs:
 - 2.1 Filter stream: tweets filtered by keywords
 - 2.2 Geo stream: tweets filtered by location
 - 2.3 Sample stream: 1% random sample of tweets
- ▶ R library: streamR

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"
}
```

Collecting Twitter Data

The R script 01-twitter-data-collection.r shows how to:

- ▶ Create an OAuth token to authenticate
- ▶ Extract basic user information
- ▶ Search tweets that contain a given keyword (REST)
- ▶ Collect tweets filtering by keywords and location (Streaming)
- ▶ Collect a random sample of tweets
- ▶ Download all tweets sent by a given user

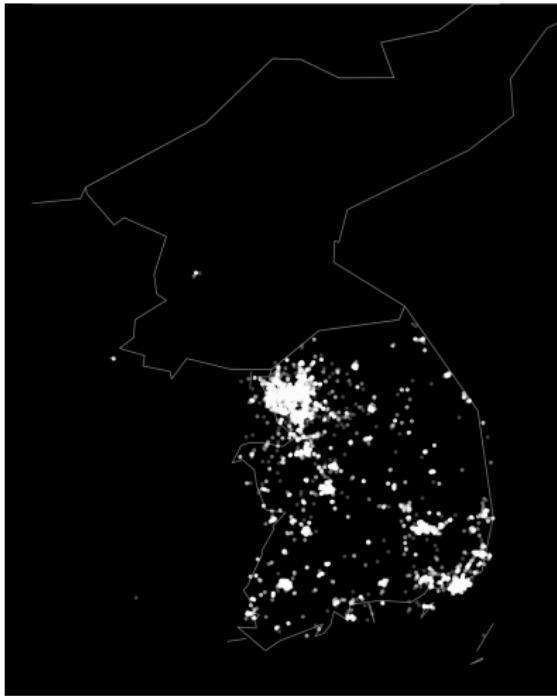
Streaming API

- ▶ 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)

Analyzing Twitter Data

The R script 02-twitter-data-analysis.r shows:

1. How to work with geolocated tweets
 - ▶ Map distribution of tweets
 - ▶ How many tweets from each country?
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

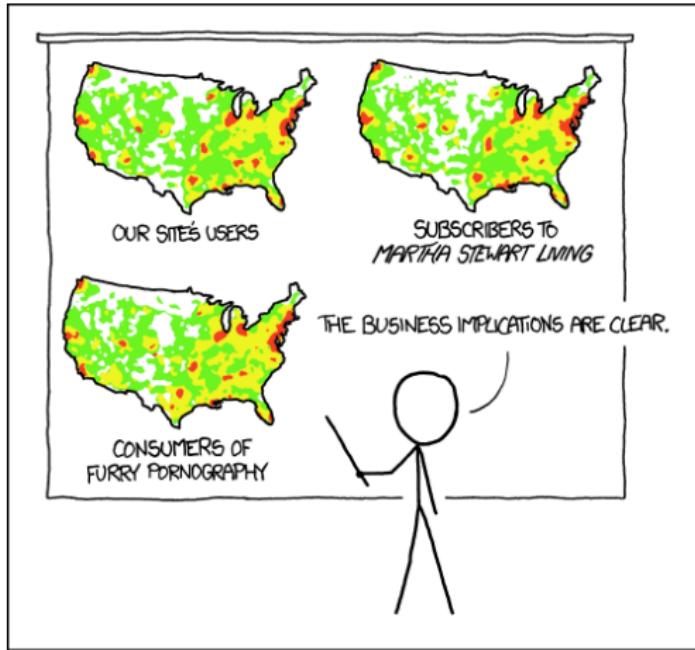
671 TWEETS	940 FOLLOWING	129 FOLLOWERS	Profile Follow
---------------	------------------	------------------	--

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
[Expand](#)

Twitter user: @uriminzok_engl

But remember...



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

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Collecting Facebook data

Facebook allows access to two different types of data through the public API:

1. Data from public Facebook pages (posts, likes, comments)
2. User's personal data (profile, checkins, likes...)

Some public user data (gender, location) was available through previous versions of the API (not anymore)

Access to other (anonymized) data used in published studies requires permission from Facebook

R library: Rfacebook

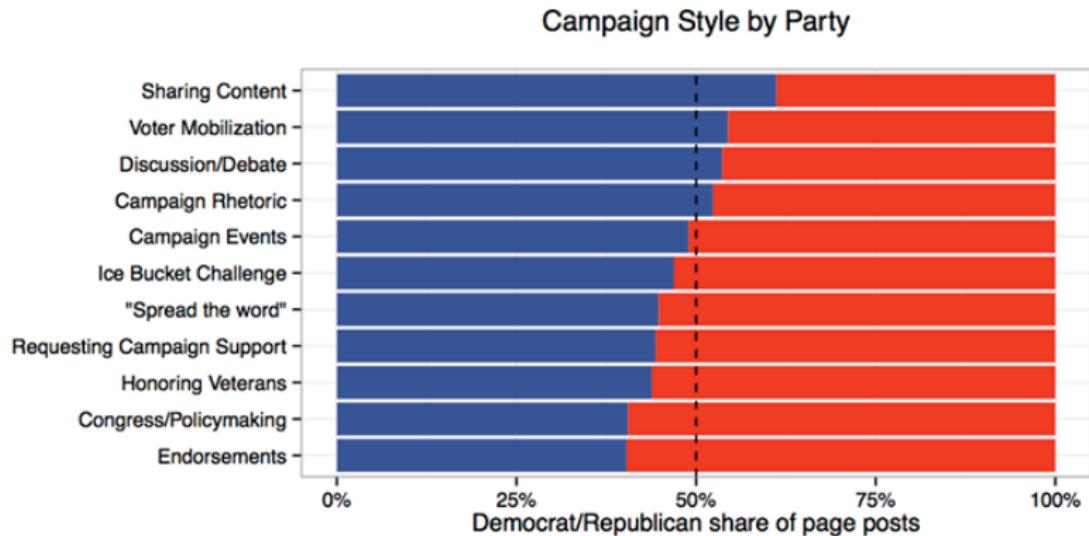
Collecting Facebook Data

The R script 03-facebook-data-collection.r shows how to:

- ▶ Use OAuth to authenticate
- ▶ Display your profile information
- ▶ 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)

Analyzing Facebook Data

The R script 04-facebook-data-analysis.r shows how to:

- ▶ Find a list of Facebook pages for Members of Congress using the NYTimes API
- ▶ Collect Facebook page data for each member
- ▶ Parse and clean text from their posts
- ▶ Run a topic modeling technique (LDA) to estimate the amount of time they discuss each issue
- ▶ Interpret the results of this model

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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

website: pablobarbera.com

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