Hidden Agendas for Online Vaccination: Trolls, Bots & Misinformation
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Twitter admits far more Russian bots posted on election than it had disclosed

Company says it removed more than 50,000 accounts and reported them to investigators, marking latest upward revision of figures

▲ Twitter told Congress in October that it had found 36,746 Russian accounts that had posted about the election. Photograph: Anadolu Agency/Getty Images

Twitter has admitted that more than 50,000 Russia-linked accounts used its service to post automated material about the 2016 US election - a far greater number than previously disclosed.

How Unwitting Americans Encountered Russian Operatives Online

About a dozen people protested against what they called the threat of radical Islam in Houston in May 2016. They were met by a much larger crowd of counterprotesters. Both sides were organized by Russian groups. Jon Shapley/Houston Chronicle

By Scott Shane

Feb. 18, 2018

488

Malign Actors on Social Media are a Problem

- Practical: They can distort perceptions of public opinion
- Academic: They can distort attempts to measure public opinion
- National Security: They can be used to shape public opinion

What is a Bot?

- A device or piece of software that can execute commands, reply to messages, or perform routine tasks, as online searches, either automatically or with minimal human intervention. [1]

- In social networks, a bot is: An automated account, that is controlled by a program, automatically producing content, and interacting with other accounts.

1 Dictionary.com

What is a troll?

- Typically, a human user
- Trolls thrive on ANGER and try to intentionally promote discord for the purpose of ridiculing or baiting others
- Trolls often misrepresent their agenda, hiding behind the anonymity of internet accounts
  - *"Someone who posts inflammatory, extraneous, or off-topic messages in an online community, such as a forum, chat room, or blog, with the primary intent of provoking readers into an emotional response or of otherwise disrupting normal on-topic discussion."*

The Art Of Trolling, it's simple

First you mus
and then

memecenter.com MemeCenter
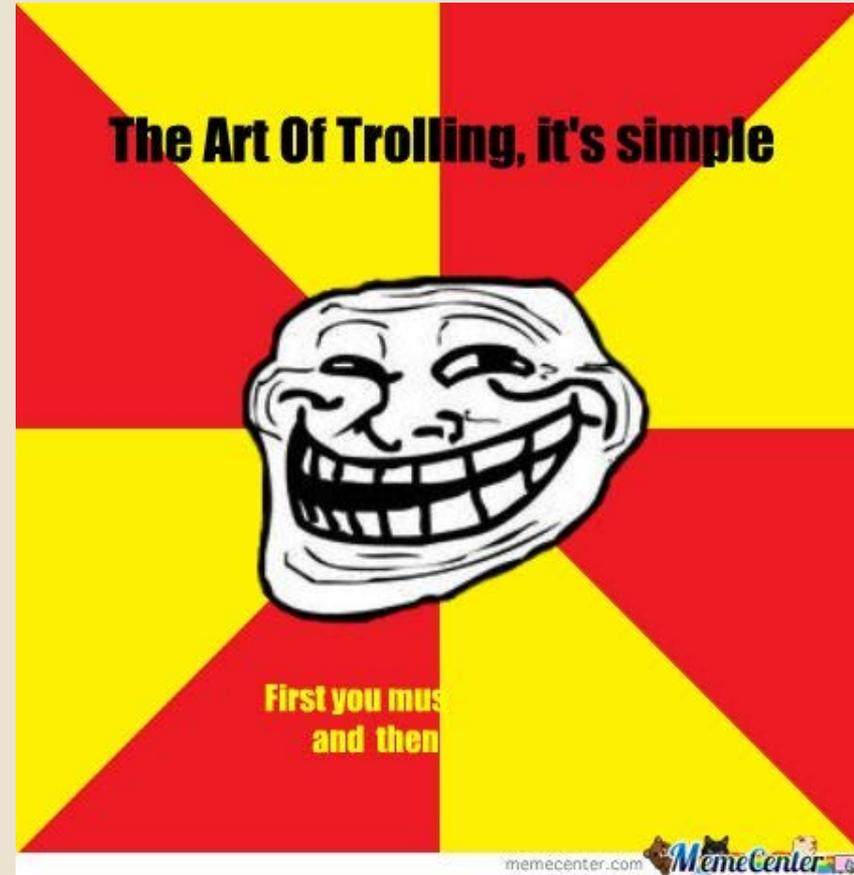
What is a cyborg?

- A cyborg is an account nominally controlled by a human that is occasionally taken over by a bot
- Cyborgs may be used to assist trolls to post content
- Legitimate users may also exhibit bot-like behavior if login credentials are stolen by malicious actors

CLICKING ON THIS LINK COULD SOLVE ALL MY PROBLEMS

AAAAAND IT'S MALWARE

imgflip.com
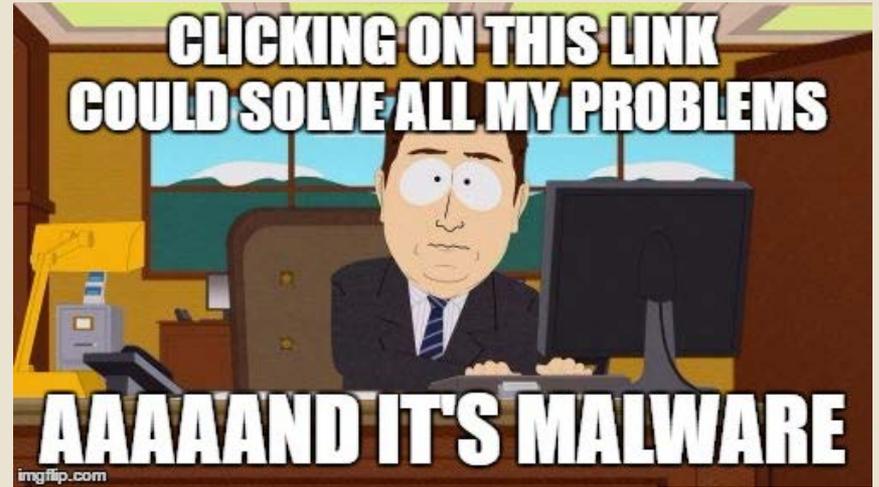
How many bots are there?

- A paper from University of Southern California and Indiana University suggests that 9% to 15% of twitter accounts are in fact social bots rather than people.
- They extracted a large collection of features from data and metadata about twitter users.

- The authors used these features to train models to identify bots.

- They used a dataset consisted of 15K bots using honeypots (discussed later) and 16K verified human accounts.

- Then they collected tweets from those accounts using the Twitter API.

- Facebook recently removed 3.2 billion (with a B) accounts

Varol, O., Ferrara, E., Davis, C. A., Menczer, F., & Flammini, A. (2017). Online human-bot interactions: Detection, estimation, and
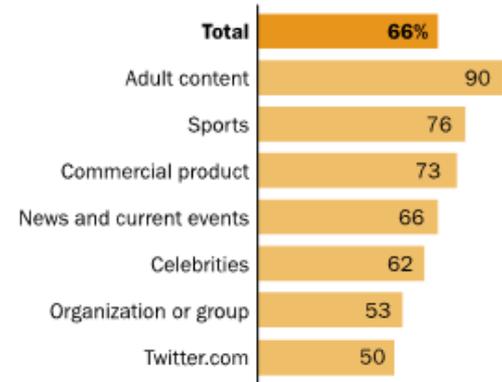
characterization. Retrieved from http://arxiv.org/abs/1703.03107

What are the different bot types?

"Good" Bots (self identified)	"Bad" Bots (violates TOS)
Monitoring Bots	Spam Bots
Search Engine Crawler Bots	Scraper Bots
Social Network Bots	Fake Followers
	Content Polluters

Pew Findings

- Broad definition of bots
  - "Accounts that can post content or interact with other users in an automated way and without direct human input"
- 66% of tweeted links to popular websites are shared by automated accounts
- Small number of highly active bots are responsible for significant proportion of share links.
  - 500 most active bots responsible for 22% tweeted links
- No clear political bias.

Automated accounts post the majority of tweeted links to popular websites across a range of domains

Share of tweeted links to popular websites in the following domains that are posted by automated accounts

Total	66%
Adult content	90
Sports	76
Commercial product	73
News and current events	66
Celebrities	62
Organization or group	53
Twitter.com	50

Based on an analysis of 1,220,015 tweeted links to 2,315 popular websites collected over the time period of July 27 to Sept. 11, 2017. For comparison, links that redirect internally to Twitter.com are shown as a separate category.
"Bots in the Twittersphere"

PEW RESEARCH CENTER

http://www.pewinternet.org/2018/04/09/bots-in-the-twittersphere/
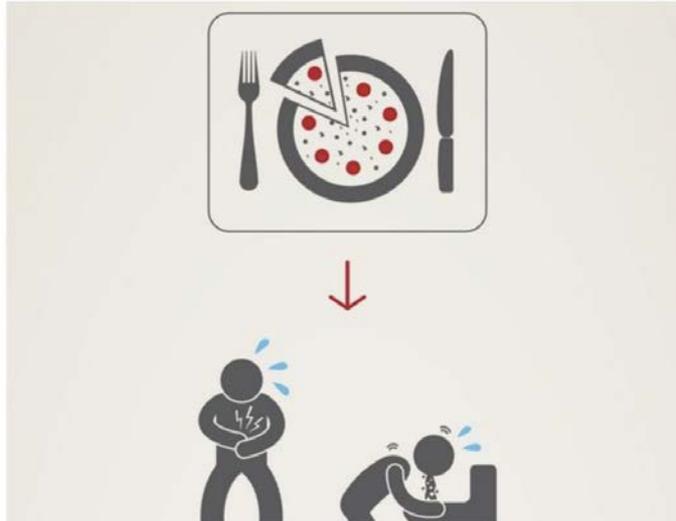
Legitimate bots

Many bots are not malicious users and, when identified, as such, may engage in helpful behaviors. Example:

Twitter Bot Helps Chicago Officials Find Dirty Restaurants

The bot led to 133 restaurant inspections and 21 shutdowns in a 10-month period.

By Francie Diep   August 19, 2014

Big Ben

@big_ben_clock

	Tweets	Followers
	73.8K	**484K**

Follow ⋮

The first, established November 2009 & entirely unofficial. Copyright details here: tinyurl.com/ylqbey3, but still apparently imitated everywhere.

◎ Up a tower.

▦ Joined October 2009

Tweet to Big Ben

👤 1 Follower you know

Tweets   **Tweets & replies**

Big Ben @big_ben_clock · 41m   ⌄
BONG BONG BONG BONG
💬   ⟲ 16   ♡ 44   ✉

Big Ben @big_ben_clock · 2h   ⌄
BONG BONG BONG
💬   ⟲ 28   ♡ 59   ✉

Big Ben @big_ben_clock · 3h   ⌄
BONG BONG
💬 1   ⟲ 16   ♡ 64   ✉

Big Ben @big_ben_clock · 4h   ⌄
BONG
💬 2   ⟲ 26   ♡ 88   ✉

Big Ben @big_ben_clock · 5h   ⌄

Who to follow · Refresh · View all

Elizabeth Windsor @Que... ✕
Follow

Jessie J ✔ @JessieJ   ✕
Follow

Al Yankovic ✔ @alyankovic   ✕
Follow

👥 Find people you know

Trends for you · Change

Pruitt
728K Tweets

Accidental Haiku
@accidental575

I am a robot / that finds haiku on Twitter /
made by accident

🔗 lab43.com
🗓 Joined April 2014

Tweet to Accidental Haiku
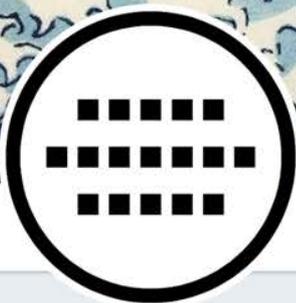
🖼 Photos and videos

Tweets **1,690**	Following **1**	Followers **3,754**	Likes **10**

Follow

Tweets   **Tweets & replies**   **Media**

Accidental Haiku @accidental575 · Jul 2
Just writing to let /
everyone know I have a /
new profile picture /
#accidentalhaiku by @BHump_12

> **Brett Humphrey** @BHump_12
> Just writing to let everyone know I have a new profile picture

💬 1   🔁 2   ♡ 7   ✉

Who to follow · Refresh · View all

Auto Charts @AutoCharts
Follow

Dane DeHaan ✔ @daned...
Follow

This Is Just to Say @Just...
Follow

Malicious Bot Behaviors

Amplification

TWITTER RETWEETS 1K FOR 1.7$ ONLY

Vendor	▓▓▓▓▓ (4.87⭐) (ⓐ 67/1/3)
Price	฿0.000157 ($1.768)
Ships to	Worldwide, Worldwide
Ships from	WORLDWIDE
Escrow	Yes

Image 1: _A vendor on a DDW marketplace advertises "1000+ TWITTER FOLLOWERS [USA][HQ]" at a price of $1.77 USD. The vendor claims to be able to provide an "unlimited number of Twitter followers" and offer the "cheapest prices on the market."_

Content Pollution -- spreading malware and spam

Many Twitter accounts include shortened URLs designed to disguise the destination.
Can be used for spreading computer viruses, spam, and other malicious content

https://www.pandasecurity.com/mediacenter/social-media/the-bots-on-twitter-arent-harmless-cybercriminals-use-them-to-steal-your-information/

Astroturfing

Grassroots: A bottom-up movement inspired by popular opinion

Astroturf: Fake grassroots

Bots are frequently used to create the false impression of grassroots support for a cause
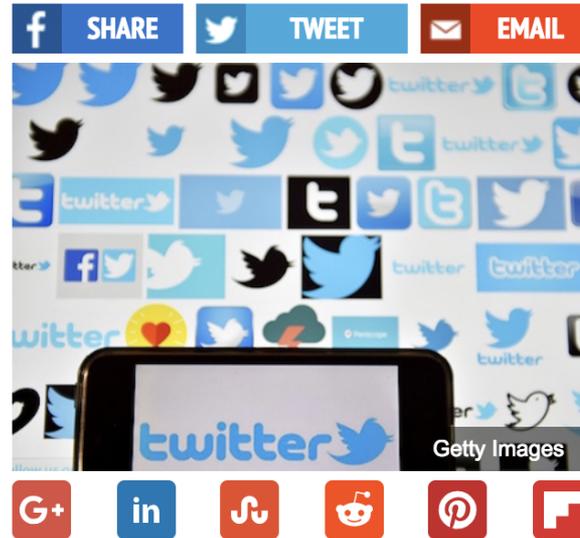
Trolling

Networks of bots may be used to harass users and attempt to disrupt adversaries' activities

Russian Twitter Bots Troll NATO

Report says automated tweets targeting alliance military activities in E. Europe traced to Moscow trolls

SHARE   TWEET   EMAIL

BY: **Bill Gertz**   Follow @BillGertz

September 1, 2017 3:55 pm

Seventy percent of Russian-language tweets targeting NATO military activities in Eastern Europe are generated by automated Russian trolls, according to a survey done by the military alliance.

"Two in three Twitter users who write in Russian about the NATO presence in Eastern Europe are robotic or 'bot' accounts," the NATO Strategic Communications Centre of Excellence stated in a report made public this week.

The Russian bots sent 84 percent of all Russian language messages. English language tweets against the alliance also were found to be automated, with some 46 percent generated by automated Twitter accounts.

The report criticized the global social media platform for not doing enough to counter Russian bot activities on Twitter. "Our impression is that Twitter in Russian is policed less effectively than it is in English," the report said.

Getty Images

The "50 cent army"

The Chinese government has been known to use internet trolls (paid 0.5 RMB per message) to disrupt anti-government messages.

https://www.theatlantic.com/technology/archive/2017/01/trolling-by-distraction/514589/

TECHNOLOGY

'Look, a Bird!' Trolling by Distraction

Rather than debating critics directly, the Chinese government tries to derail conversation on social media it views as dangerous.
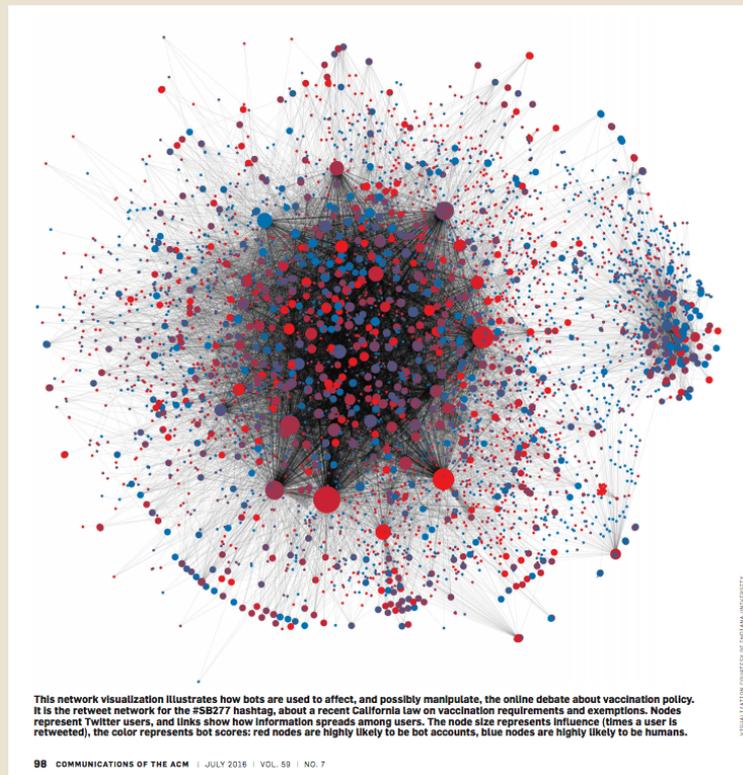
KAVEH WADDELL   JAN 27, 2017

A post on the Weibo account of Zhou Xiaoping, a Chinese pro-government blogger (ANDY WONG / AP)

Botnets to create echo chambers and false consensus

Networks of bots "botnets" retweet one another with the goal of creating "echo chambers" and otherwise creating the impression that many independent users agree on the content of a given message

Ferrara, E., Varol, O., Davis, C., Menczer, F., & Flammini, A. (2016). The rise of social bots.

Communications of the ACM, 59(7), 96–104.

This network visualization illustrates how bots are used to affect, and possibly manipulate, the online debate about vaccination policy. It is the retweet network for the #SB277 hashtag, about a recent California law on vaccination requirements and exemptions. Nodes represent Twitter users, and links show how information spreads among users. The node size represents influence (times a user is retweeted), the color represents bot scores: red nodes are highly likely to be bot accounts, blue nodes are highly likely to be humans.

Who is Tweeting Anti-Vaccine Topics?

- Pew data suggest that there is broad consensus regarding the safety and efficacy of vaccination

- However, social media are a "hotbed" of anti-vaccine activity

- Are these media representative of actual opinions?

- Are bots amplifying the anti-vaccine discourse?
  - How would we know?

- Can we identify bot-like behavior relevant to vaccination?

#VaccinateUS results

- Unusual # appeared 25 times in the NBC Russian Troll dataset
- Searching Twitter on 2/20/2018 found only 5 appearances
  - Suggests users had been suspended and tweets purged
- Archival data revealed 253 messages with #VaccinateUS
  - Tweeted from over 100 different accounts
  - Accounts used common American names
    - Daniel Turner, Jessica Bowers, Kevin Scott, Kimberly Floyd, etc.
  - Geolocated in the United States
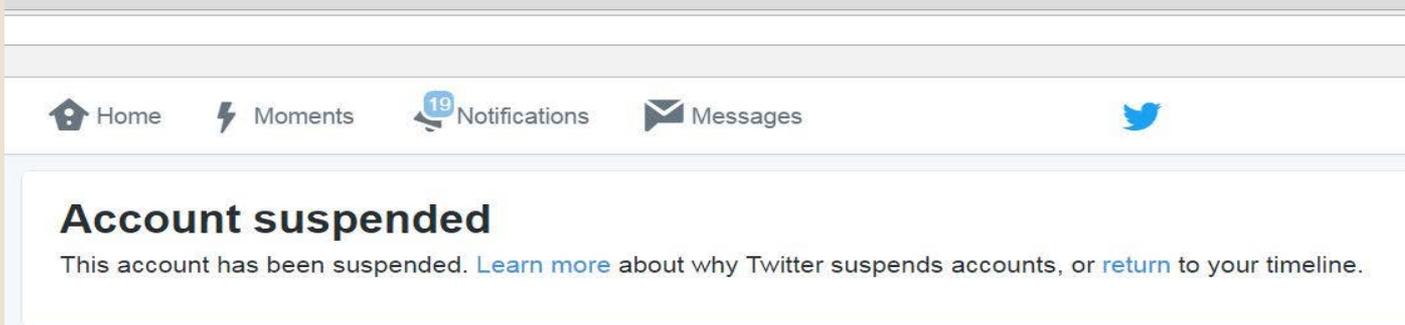
#VaccinateUS results

- Unusual in that is used by both sides of "debate"
  - 43% Pro-Vaccine
  - 38% Anti-Vaccine
  - 18% Neutral
- Major themes mirror the actual discourse on Twitter
  - Pro: Vaccines Work; Anti-Vax is Stupid; Herd Immunity; Trust the government; Vaccine Safety
  - Anti: Parental Choice; Mistrust of Government; Anti Pharmaceuticals; Vaccines causing Autism; Natural Health is Better; Conspiracy Theories: Ingredients are toxic
- Some themes uncommon on Twitter
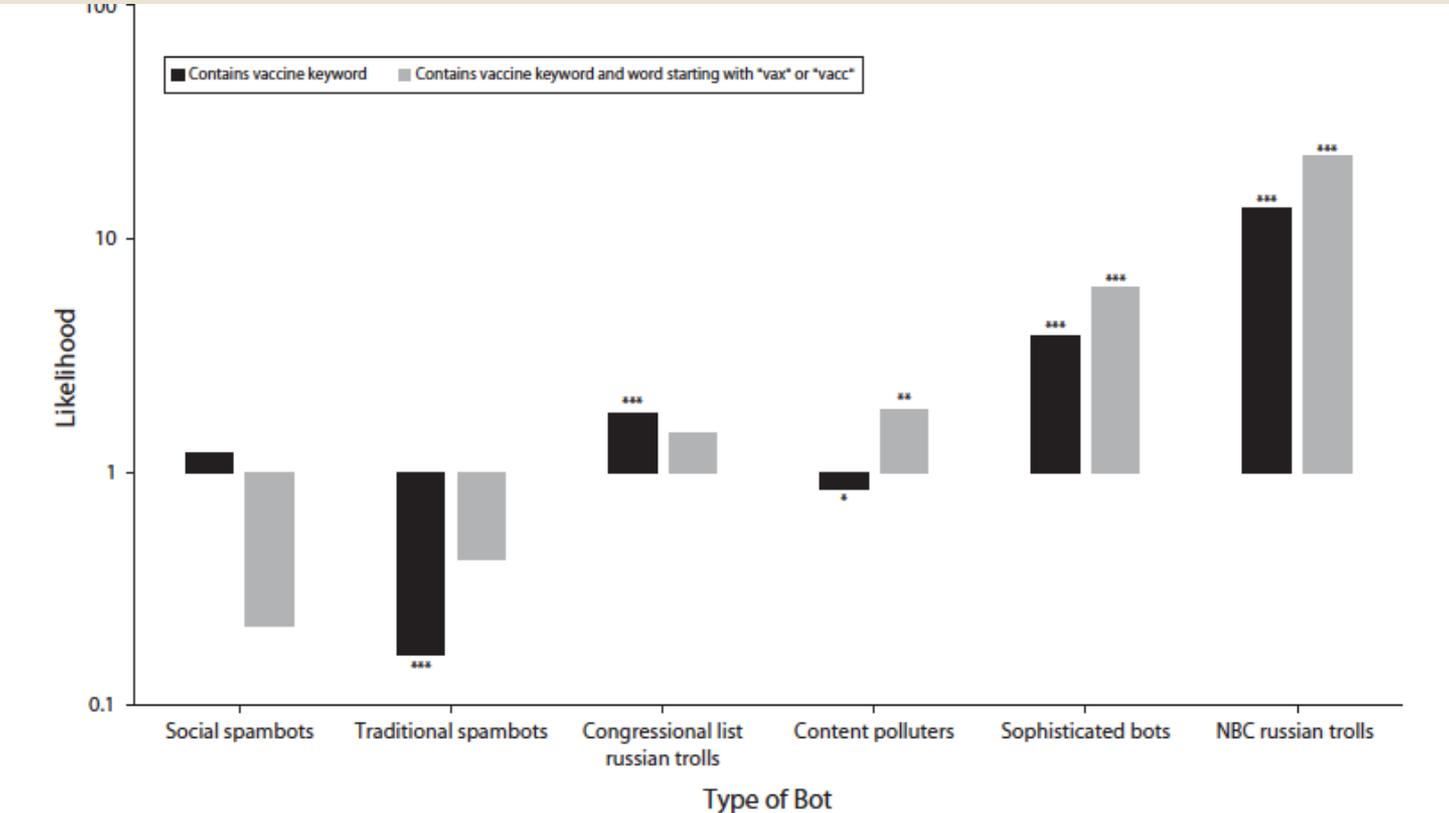 - God's Will; Class Comparisons; Animal Comparisons

#VaccinateUS Examples

- #VaccinateUS Mandatory #vaccines infringe upon constitutionally protected religious freedoms
- Did you know there was a secret government database of #vaccine-damaged children? #VaccinateUS
- Do you still treat your kids with leaves? No? And why don't you #vaccinate them? Its medicine! #VaccinateUS
- if you're meant to die-you will, no #vaccine will help you #VaccinateUS
- Dont get #vaccines. Iluminati are behind it. #VaccinateUS
- Apparently only the elite get 'clean' #vaccines. And what do we, normal ppl, get?! #VaccinateUS
- Your kids are not your property! You have to #vaccinate them to protect them and all the others! #VaccinateUS
- #VaccinateUS CDC state that #vaccines are safe
- weird that such a huge amount of people refuse to #vaccinate their children #VaccinateUS

Hypotheses

- Do bots post about vaccines more than the average Twitter user?

- Are bots more likely to be pro-vaccine or anti-vaccine?

- Methods
  - Identified public lists of different types of bot and troll accounts
  - Searched through vaccine stream for their tweets
  - Examined relative proportions of neutral, pro-vaccine, and anti-vaccine tweets
  - Used Bot-o-Meter API to measure the "bot scores" of 9,994 randomly sampled tweets

Broniatowski, D. A., Jamison, A. M., Qi, S., AlKulaib, L., Chen, T., Benton, A., Quinn, S. C., Dredze, M. (2018). Weaponized Health Communication: Twitter Bots and Russian Trolls Amplify the Vaccine Debate. *American Journal of Public Health*, *108*(10), 1378–1384.

Trolls play both sides; content polluters and cyborgs are anti-vaccine

Broniatowski, D. A., Jamison, A. M., Qi, S., AlKulaib, L., Chen, T., Benton, A., Quinn, S. C., Dredze, M. (2018). Weaponized Health Communication: Twitter Bots and Russian Trolls Amplify the Vaccine Debate. *American Journal of Public Health*, *108*(10), 1378–1384.

TABLE 1—Proportions of Polarized and Antivaccine Tweets by User Type: July 14, 2014–September 26, 2017

User Type	Polarized, %	Antivaccine, %
Assorted users, bot score, %		
< 20	31	35
20–80	39***	60***
> 80	26	49*,a
Unknown	37*,a	62***
Known bots and trolls		
NBC Russian trolls[20]	20*,a	47
Content polluters[21]	38	60***
Fake followers[22]	0	NA
Traditional spambots[23,24]	3***	0
Social spambots[23,24]	18**	56*,a
Sophisticated bots[25]	28	44
Congressional list Russian trolls[26]	39	48

Conclusions

- The social media landscape combines automated and "sincere" account-holders

- These account holders may have a range of hidden-agendas.
  - State-sponsored trolling
  - Marketing alternative products
  - Spreading spam
  - Spreading malware

- Public health communicators must know and adapt to this changing landscape

- Questions?: broniatowski@gwu.edu