UCL

THE ALAN TURING INSTITUTE

Understanding Information Weaponization via Data-Driven Analysis

Emiliano De Cristofaro
emilianodc.com

WARNING
CONTENT IN THIS TALK
IS OFFENSIVE
AND UNCENSORED

How is information weaponized?

Cyberbullying

Cyberaggression

Coordinated Hate Campaigns

Radicalization

Misogyny

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Cyberbullying

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Coordinated Hate Campaigns

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Misogyny

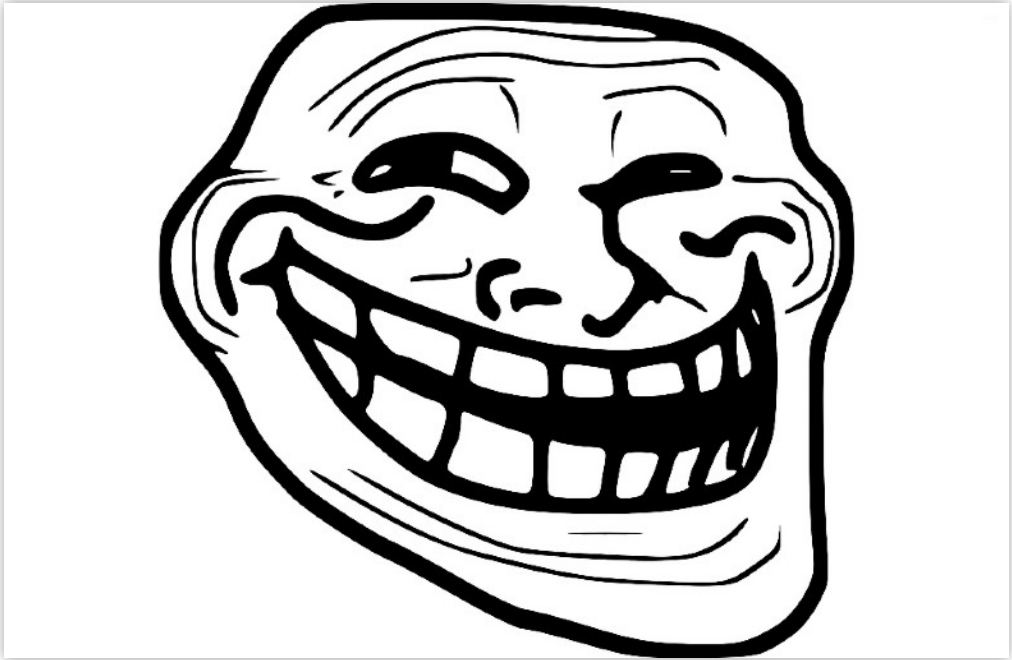
Mis/Disinformation

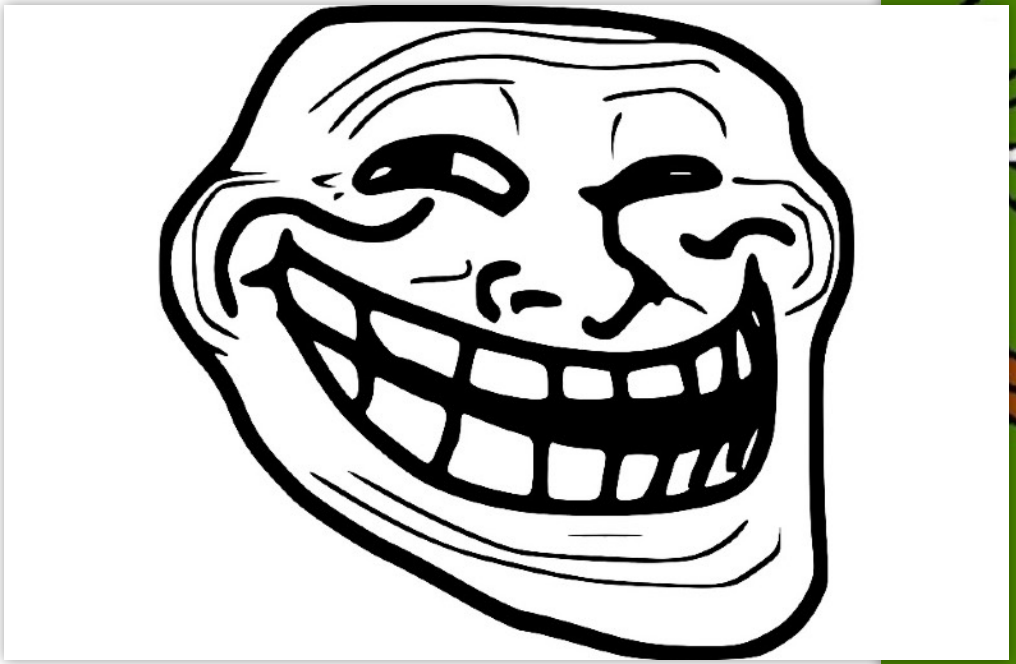
Propaganda

Sowing discord

Conspiracy Theories

Election Interference





How a racist, sexist hate mob forced Leslie Jones off Twitter

By Kristen V. Brown

FilmMagic

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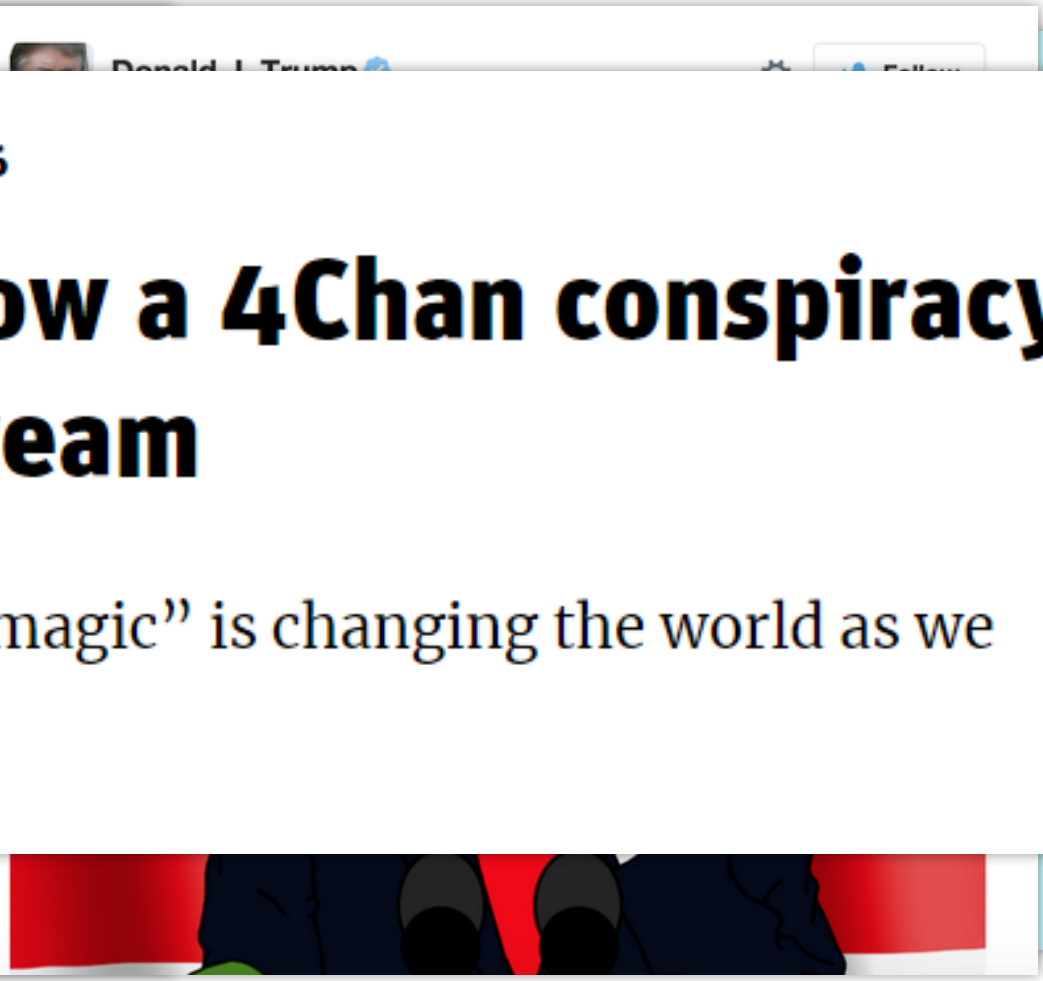
How a racist, sexist

INTERNET 8 DECEMBER 2016

Pizzagate: How a 4Chan conspiracy went mainstream

The power of "meme magic" is changing the world as we know it.

Over the past 24 hours, Leslie Jones has been inundated
hateful vitriol on Twitter.



What can we do?

We have experience with mitigating unwanted activity on social networks!

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- It's large-scale, synchronized, etc.

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We have experience with mitigating unwanted activity on social networks!

For instance, we can detect **bot activity** in social media:

- It's large-scale, synchronized, etc.
- We can build classifiers based on recognizable patterns (SynchroTrap, EvilCohort, Botometer, ...)

What can we do? Really.

What about **human activity**?

What can we do? Really.

What about **human activity**?

- Human activity is less coordinated

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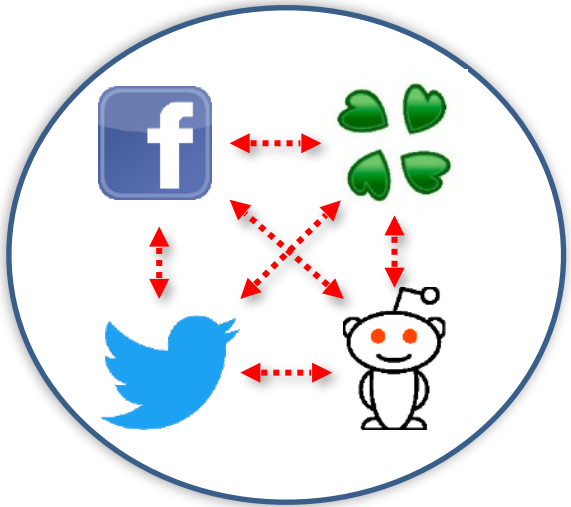
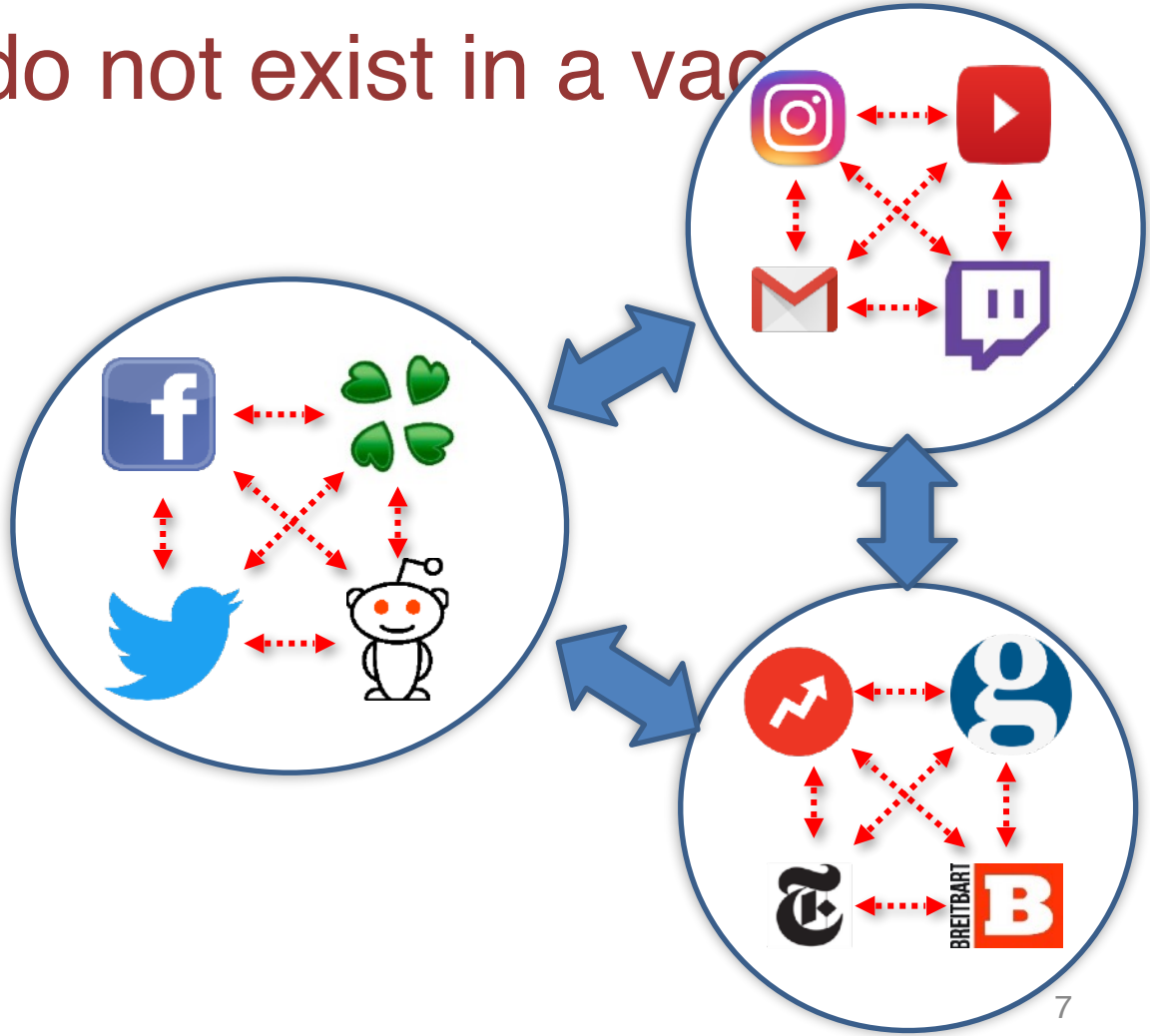
And, we can't take the fight on merely economic grounds

- Like for spam, fraud, etc.
- State-level adversaries have deep pockets!

Online services do not exist in a vacuum



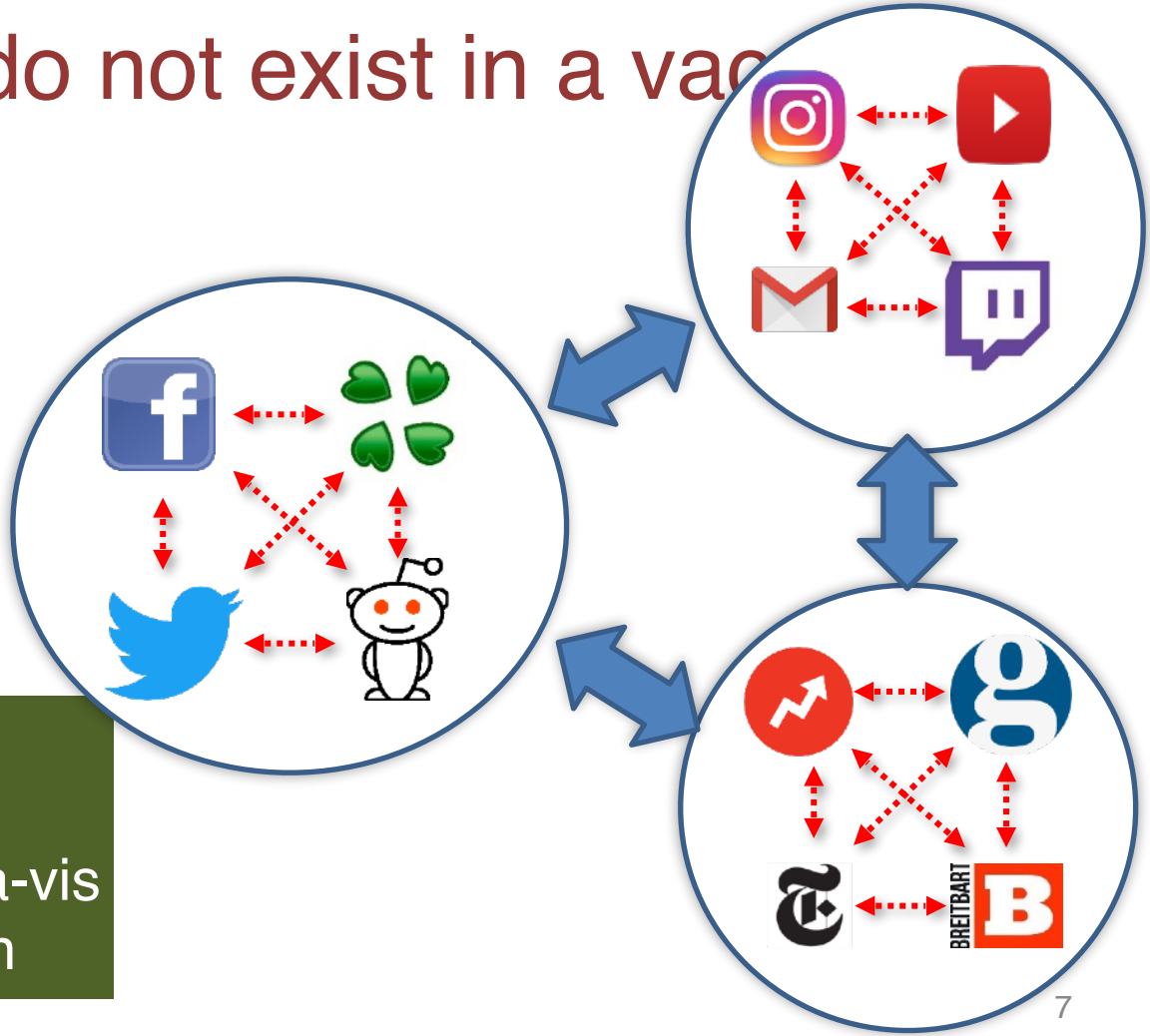
Online services do not exist in a vac



Online services do not exist in a vac

Looking at a single service at a time is not enough

Anecdotal evidence of "fringe" web communities playing a crucial role vis-à-vis information weaponization



Computational methods
to understand and mitigate
information weaponization
at a large scale

Data-driven analysis of
complex and intertwined
communities

Computational methods
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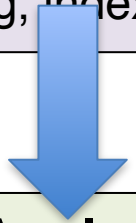
Data-driven analysis of
complex and intertwined
communities

Building proactive and
preventive systems to
counter it

Data Collection

Crawling 4chan, Reddit, Gab, Twitter, YouTube

Processing, cleaning, storing, indexing, etc.



Data Analysis

Statistics tools	Clustering
Probability theory	Contextual analysis
Longitudinal analysis	Image analysis
Change point analysis	Language modeling
Influence estimation	Topic extraction

[…] [Exploratory + hypotheses-driven]

Data Collection

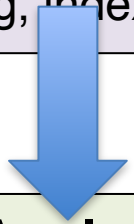
Crawling 4chan, Reddit, Gab, Twitter, YouTube

Processing, cleaning, storing, indexing, etc.

Data Sharing

Everything open source

Easy to use, facilitate qualitative/ social science research



Data Analysis

Statistics tools	Clustering
Probability theory	Contextual analysis
Longitudinal analysis	Image analysis
Change point analysis	Language modeling
Influence estimation	Topic extraction

[…] [Exploratory + hypotheses-driven]

Heard of 4chan?

He

I CAN HAS
CHEEZBURGER?

ANONYMOUS
Because none of us are as cruel as all of us.

He

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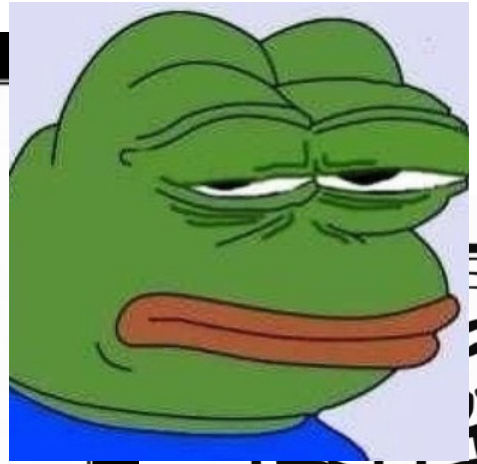

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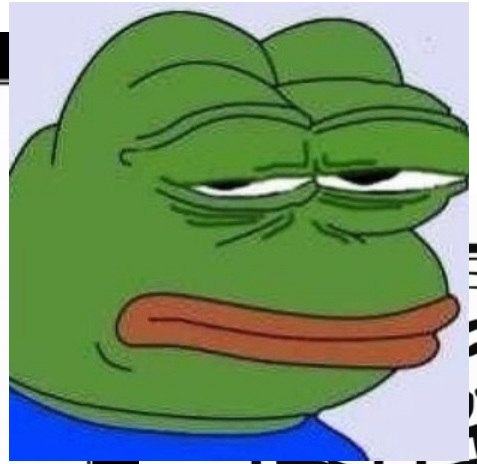
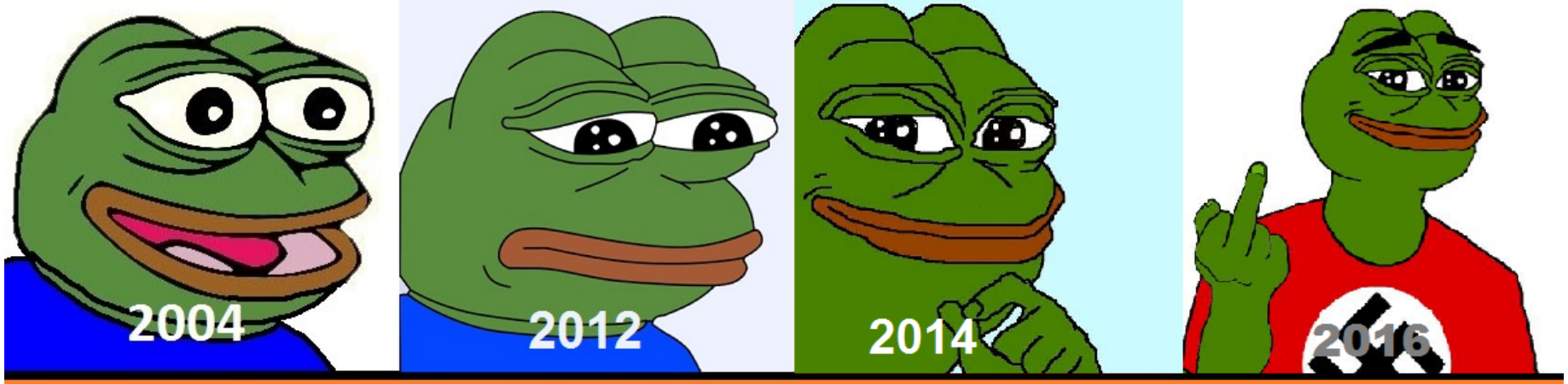


Donald J. Trump
@realDonaldTrump
Follow
"@codyave: @drudgereport @BreitbartNews @Writeintrump "You Can't Stump the Trump" youtube.com/watch?v=MKH6PA… "

He



WHERE DID EVERYTHING

GO SO REICH

Why Do We Care About 4Chan?

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TAYWARD YOUTH 3/24/16 3:10 PM

Who turned Microsoft's chatbot racist? Surprise, it was 4chan and 8chan

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VB

BUSINESS

French fear Putin and Trump followers are using 4chan to disrupt presidential election

CHRIS O'BRIEN @OBRIEN MAY 5, 2017 3:40 AM

TAYWARD YOUTH 3/24/16 3:10 PM

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What is 4chan?

An image-board forum

Organized in boards (70 at the moment)

An “original poster” (OP) creates a new thread by making a post

Single image attached

Other users can reply:

With or without images, possibly add references to previous posts, quote text, etc.

What is 4chan?

An image-boa

Organized in bo

An "original p

Single image a

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With or without

Boards filter ▼

Japanese Culture	Interests	Creative	Other	Adult (NSFW)
Anime & Manga	Comics & Cartoons	Oekaki	Business & Finance	Sexy Beautiful Women
Anime/Cute	Technology	Papercraft & Origami	Travel	Hardcore
Anime/Wallpapers	Television & Film	Photography	Fitness	Handsome Men
Mecha	Weapons	Food & Cooking	Paranormal	Hentai
Cosplay & EGL	Auto	Artwork/Critique	Advice	Ecchi
Cute/Male	Animals & Nature	Wallpapers/General	LGBT	Yuri
Flash	Traditional Games	Literature	Pony	Hentai/Alternative
Transportation	Sports	Music	Current News	Yaoi
Otaku Culture	Alternative Sports	Fashion	Worksafe Requests	Torrents
Video Games	Science & Math	3DCG	Very Important Posts	High Resolution
Video Games	History & Humanities	Graphic Design	Misc. (NSFW)	Adult GIF
Video Game Generals	International	Do-It-Yourself	Random	Adult Cartoons
Pokémon	Outdoors	Worksafe GIF	ROBOT9001	Adult Requests
Retro Games	Toys	Quests	Politically Incorrect	
			International/Random	
			Cams & Meetups	
			Shit 4chan Says	

/pol/ – Politically Incorrect Board

File: sticky.jpg (571 KB, 1600x1131)

Welcome to /pol/ - Politically Incorrect

Anonymous (ID: Iv9eTFJC) 01/08/15(Thu)23:40:44 No.40489590 [Reply] ▶

This board is for the discussion of news, world events, political issues, and other related topics.

Off-topic and /b/-tier threads will be deleted (and possibly earn you a ban, if you persist). Unless they are quality, well thought out, well written posts, the following are examples of off-topic and/or /b/-tier threads:

>Red pill me on X. (with no extra content or input of your own)
>Are X white?
>Is X degeneracy?
>How come X girls love Y guys so much?
>If X is true, then how come Y? Checkmate Z.

The variety of threads allowed here are very flexible and we believe in freedom of speech, but we expect a high level of discourse befitting of the board. Attempts to disrupt the board will not be tolerated, nor will calls to disrupt other boards and sites.

/pol/ – Politically Incorrect Board

File: sticky.jpg (571 KB, 1600x1131)

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A us (ID: lv9 01/ u)23:40:44 No.40489590

This s, political issue

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Extremely lax moderation

Almost anything goes

Anonymity & Ephemerality

Users do not need to register an account to participate

Anonymity is the default (and preferred) behavior

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“Some” degree of permanence and identifiability is supported

Can enter a name along with their posts (no authentication though)

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“Some” degree of permanence and identifiability is supported

Can enter a name along with their posts (no authentication though)

Threads get “archived” after a while

Actually all posts deleted after a week

Challenges of Measuring 4chan (and other fringe communities)

1. Not your typical social network (anonymous/ephemeral)

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2. Their actions not limited to 4chan, need to look at other platforms to understand their impact
3. Knowing what they're talking about is not easy
4. You might get attacked, doxxed, etc.

Datasets

	/pol/	/sp/	/int/	Total
Threads	217K	14.4K	24.9K	256K
Posts	8.3M	1.2M	1.4M	10.9M
June 30 to September 12, 2016				

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June 30 to September 12, 2016				

Methodology:

- Visit the “catalog”
- Snapshot every 5 mins
- Once a thread is archived, retrieve full/final contents from 4plebs.org

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We’re still crawling…

Hate Speech?

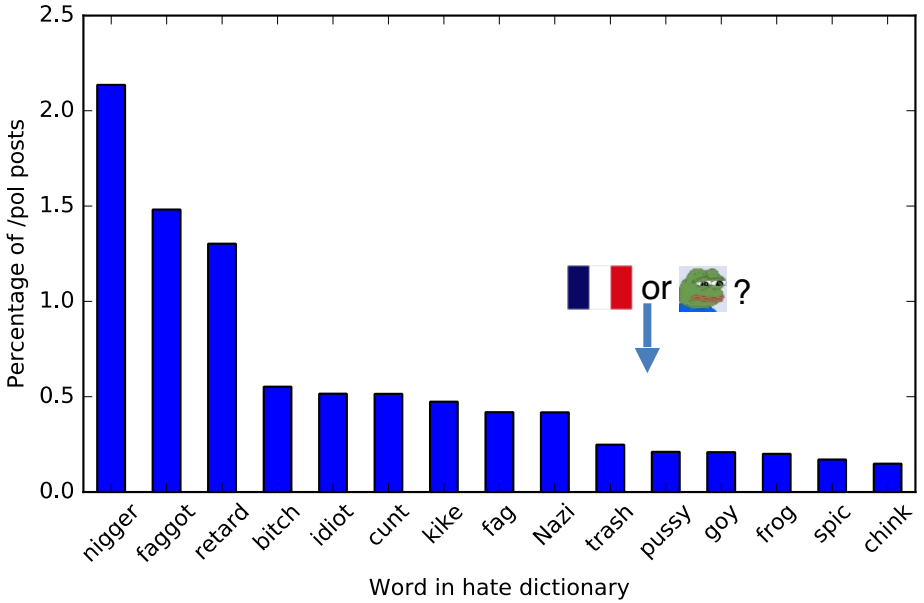
HATEBASE

Crowdsourced dictionary

Manually filtered a bit

/pol/ by far most hate speech use

/pol/	12%
/sp/	7.3%
/int/	6.3%
Twitter	2.2%



Raids on other platforms (e.g., YouTube)

Someone posts a YouTube link

- Maybe with a prompt like “you know what to do”

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If raid is taking place:

- Peak in YouTube comments while thread alive?
- /pol/ thread and YT comments *synchronized?*

Raids on other platforms (e.g. YouTube)

Hans2k4ever 1 month ago
When will the normies learn?
Reply • 181
View all 3 replies

Jack Harper 1 month ago
mfw he accidentally redpills his whole class, they all found the memes funny even the so called "hate speech" he talks about
Reply • 13

Jack Harper 1 month ago
I guess I haven't tightened my fedora enough to be as enlightened by my own enlightenment as you sir. Carry on brave knight!
Reply •

Adem Adiyaman 1 month ago
23:21 "the victory of donald trump and the rise of ultra nazi people"
you dense fuck, nice brain washing
Reply • 227
View all 16 replies

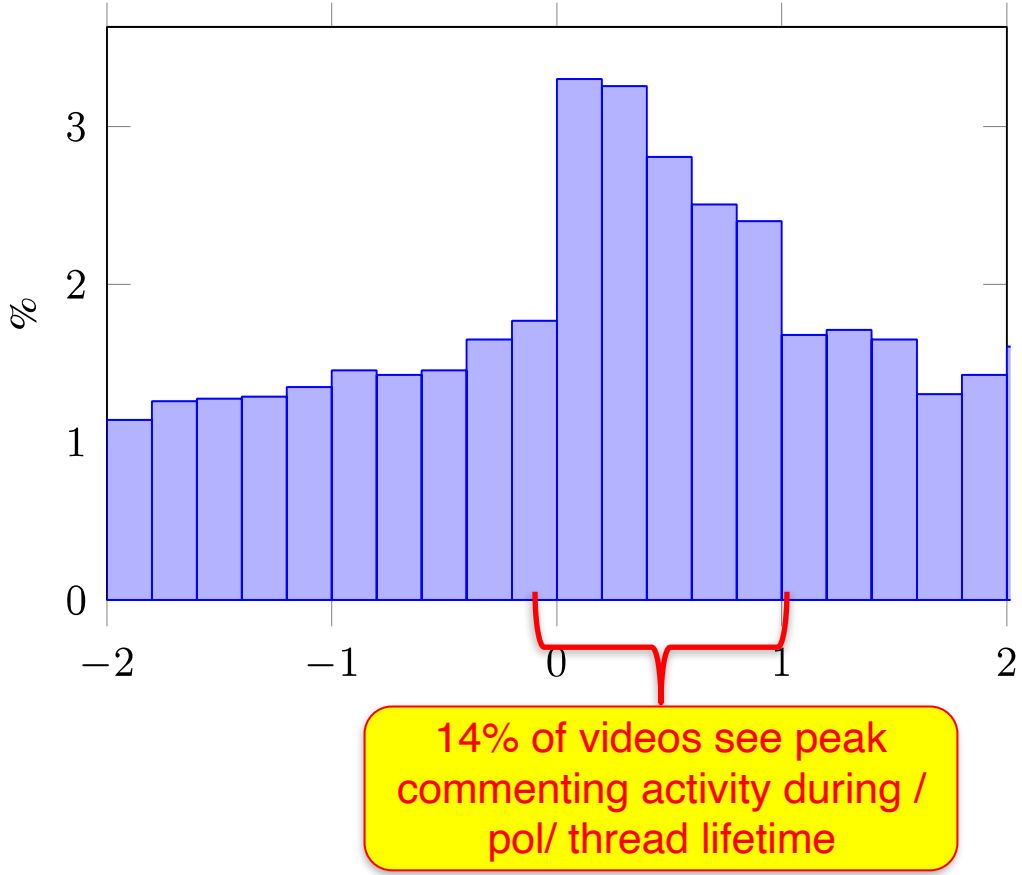
Sz

Szgerle 1 month ago
Not even just your regular nazi but ULTRA NAZI!
Reply • 1

Drakewood 1 month ago
+Potato Jenova A FUCKING LEAF!
Reply •

Thought Criminal 1 month ago
Holy fuck, ((((they)))) are actually intimidated by the powers of Kek.
Reply • 169

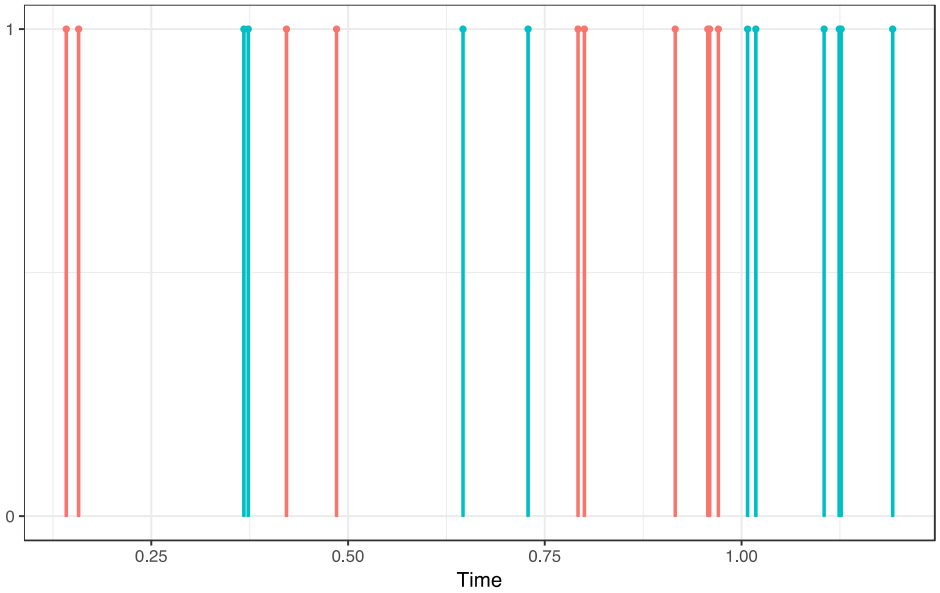
Activity Peaks



YT videos with peaks during 4chan thread

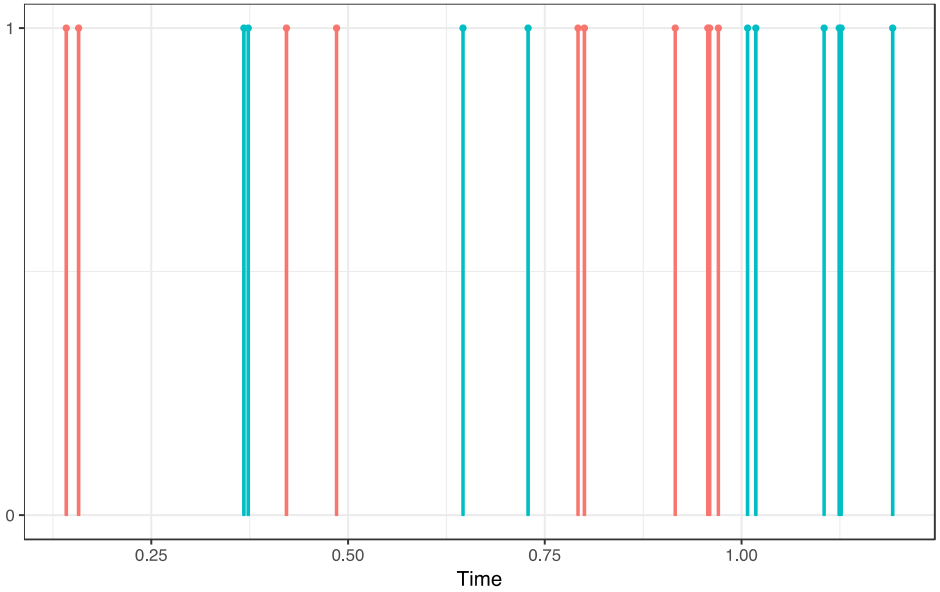
Determined via PDF of commenting timeseries

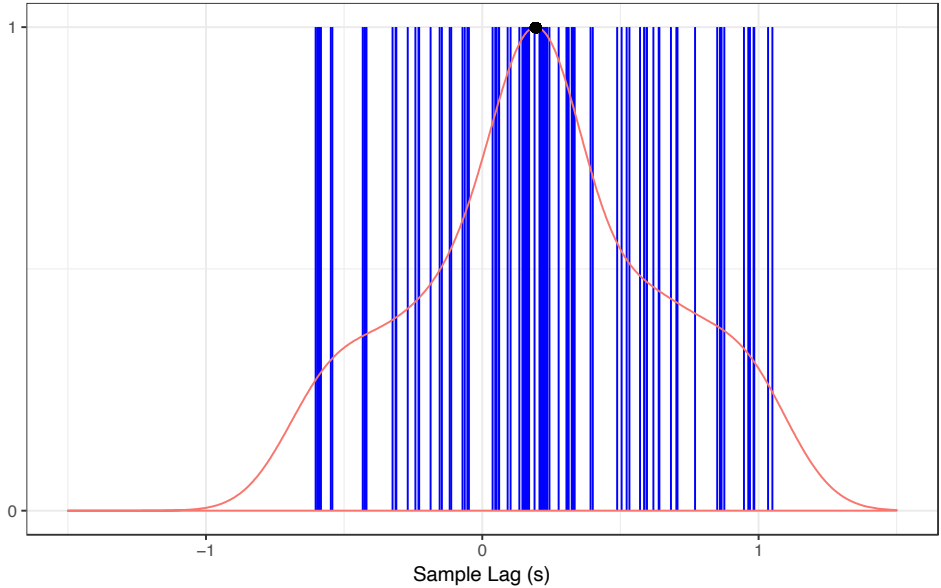
Synchronization



Two series, second randomly shifted from first by 0.2s on avg

Synchronization

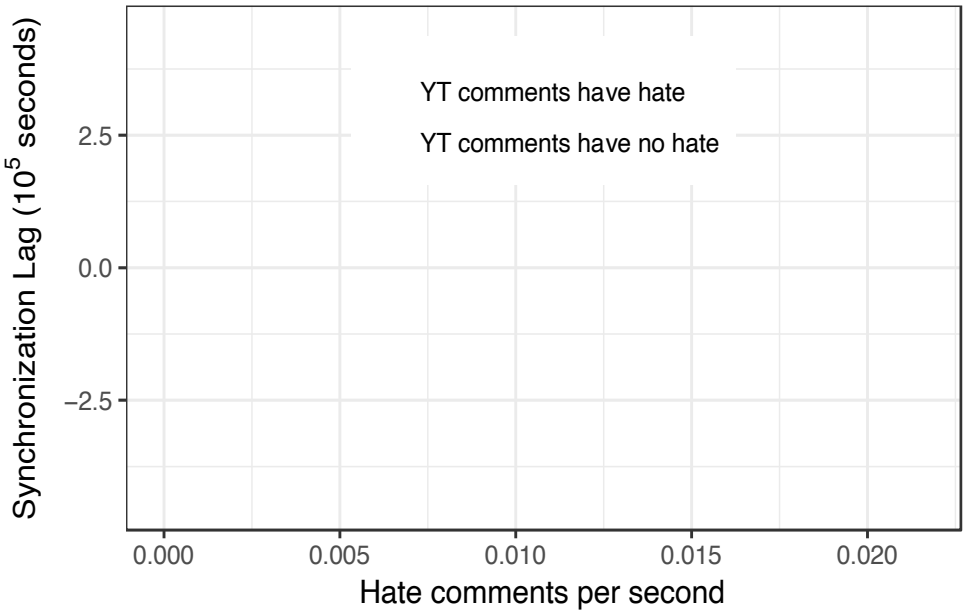


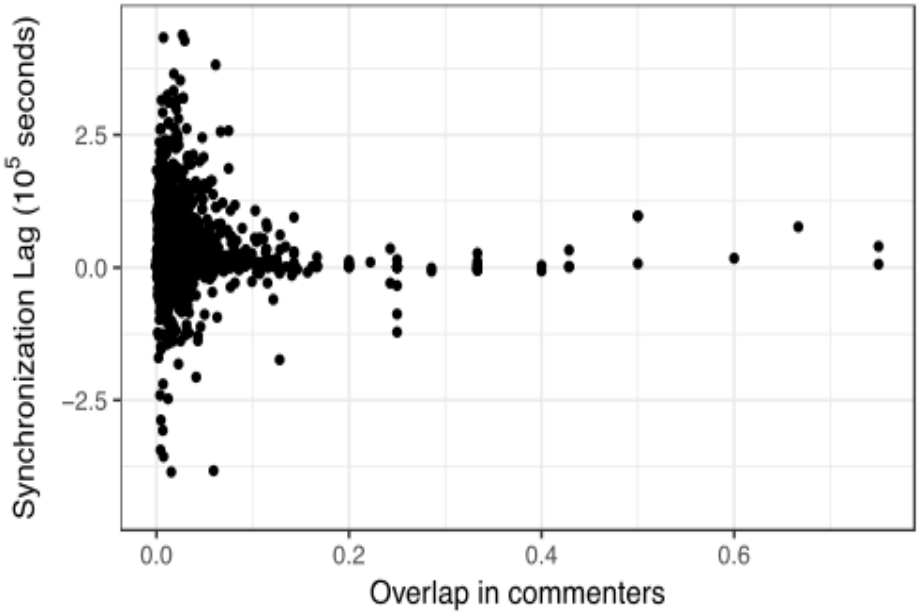


Two series, second randomly shifted from first by 0.2s on avg

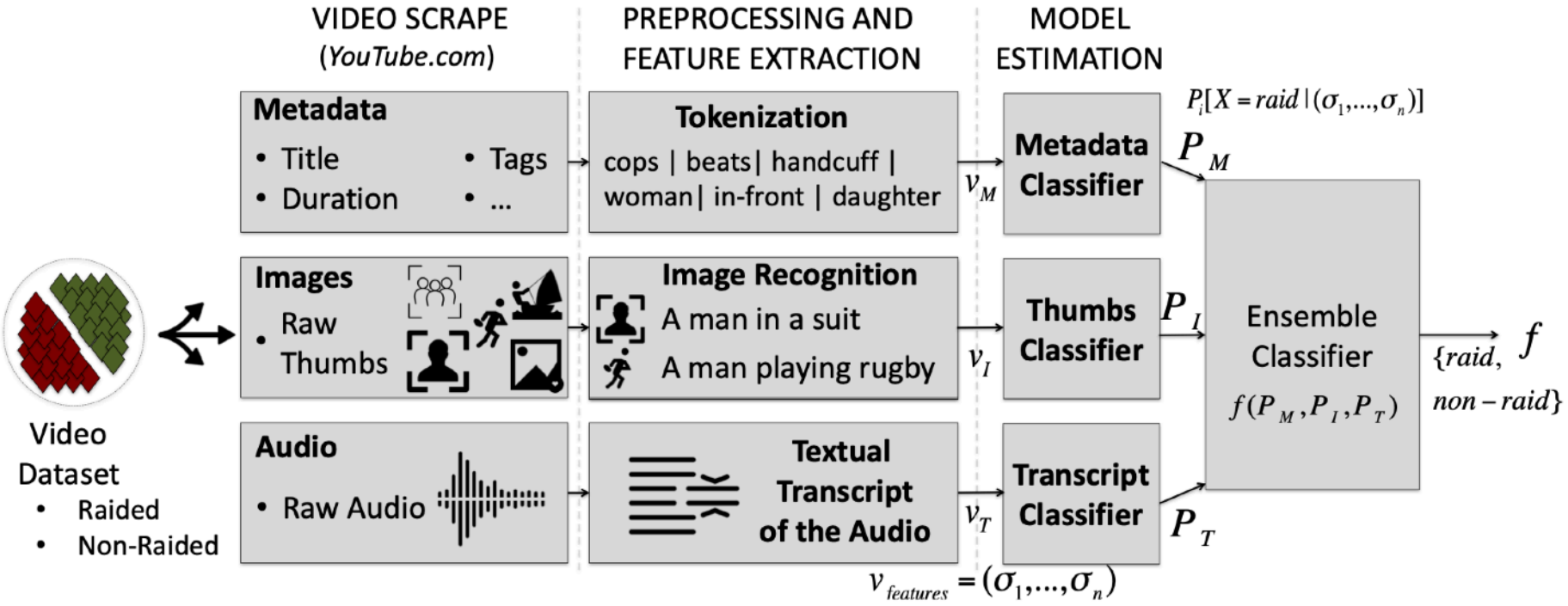
Blue lines → per-sample lag
Red area → density of the lags
Peak of density curve = 0.2s

Validation


YT comments have hate
YT comments have no hate
Synchronization Lag (10^5 seconds)
2.5
0.0
−2.5
0.000
0.005
0.010
0.015
0.020
Hate comments per second


Synchronization Lag (10^5 seconds)
2.5
0.0
−2.5
0.0
0.2
0.4
0.6
Overlap in commenters

In fact… can we predict?



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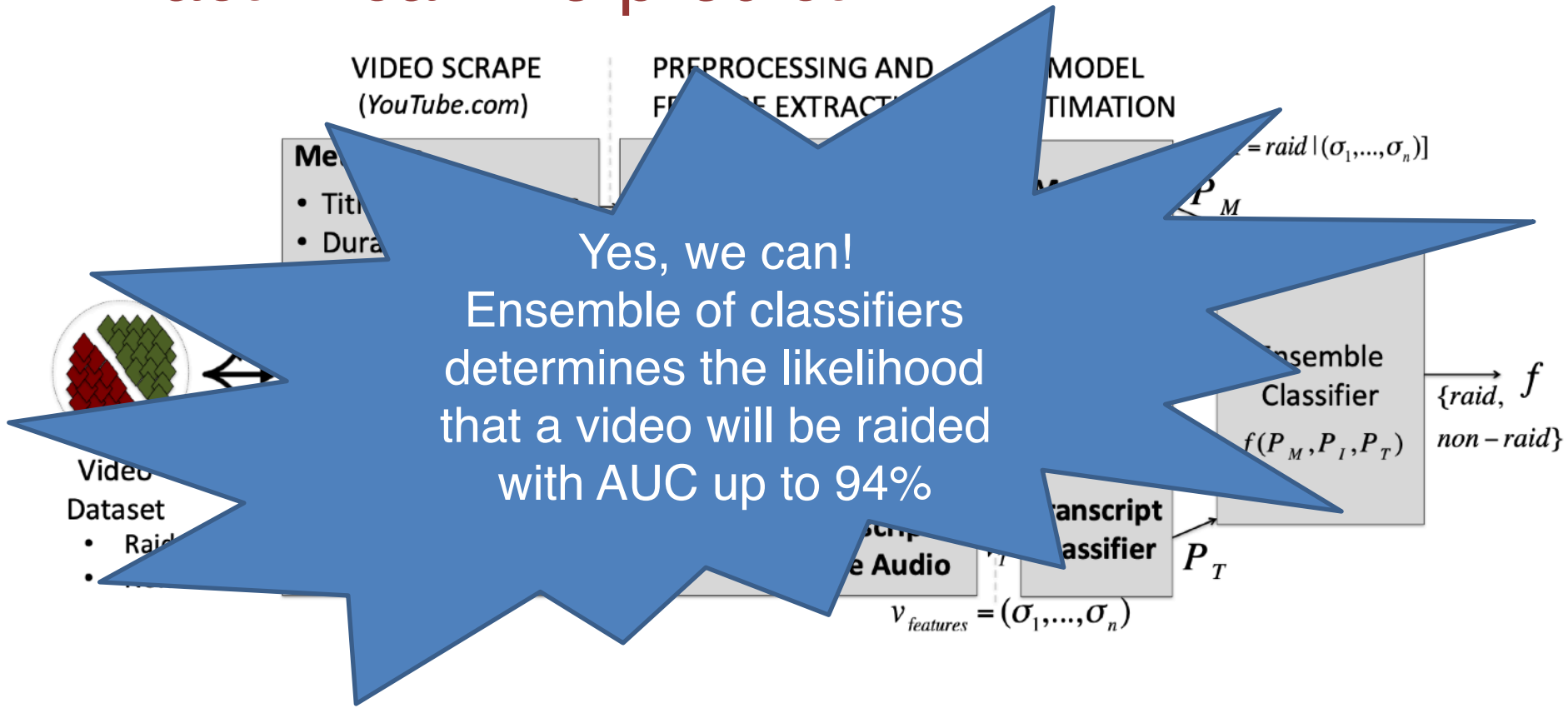
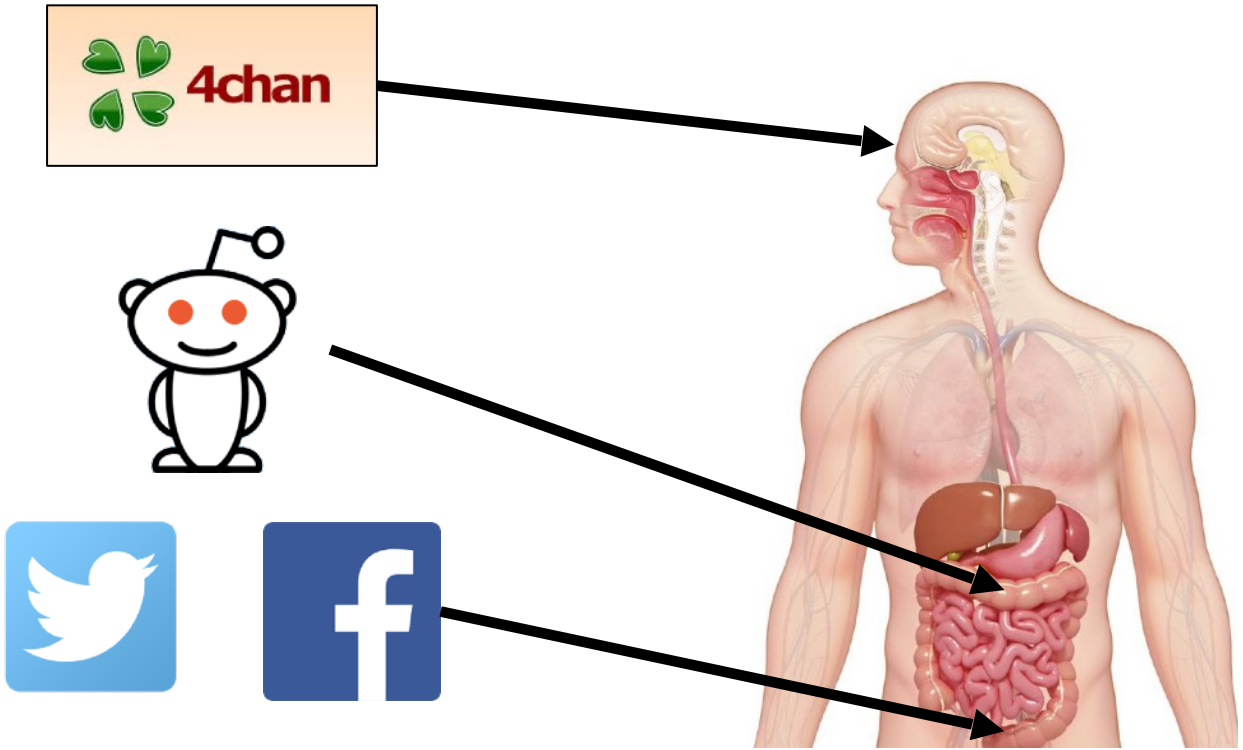


How do communities influence each other?



4chan → Twitter

View Same | Google | iqdb | SauceNAO | C58mabBXEAEm6iY.jpg, 46KiB, 497x503

Anonymous ID:Cgs1YKTD Fri 03 Mar 2017 00:38:09 No.114985529 View Report

Here is picture of Senator Chuck Schumer having coffee and donuts with Vladimir Putin.

We need to investigate this meeting and any Russian ties with Chuck.

4chan → Twitter

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We need to investigate this meeting and any Russian ties with Chuck.

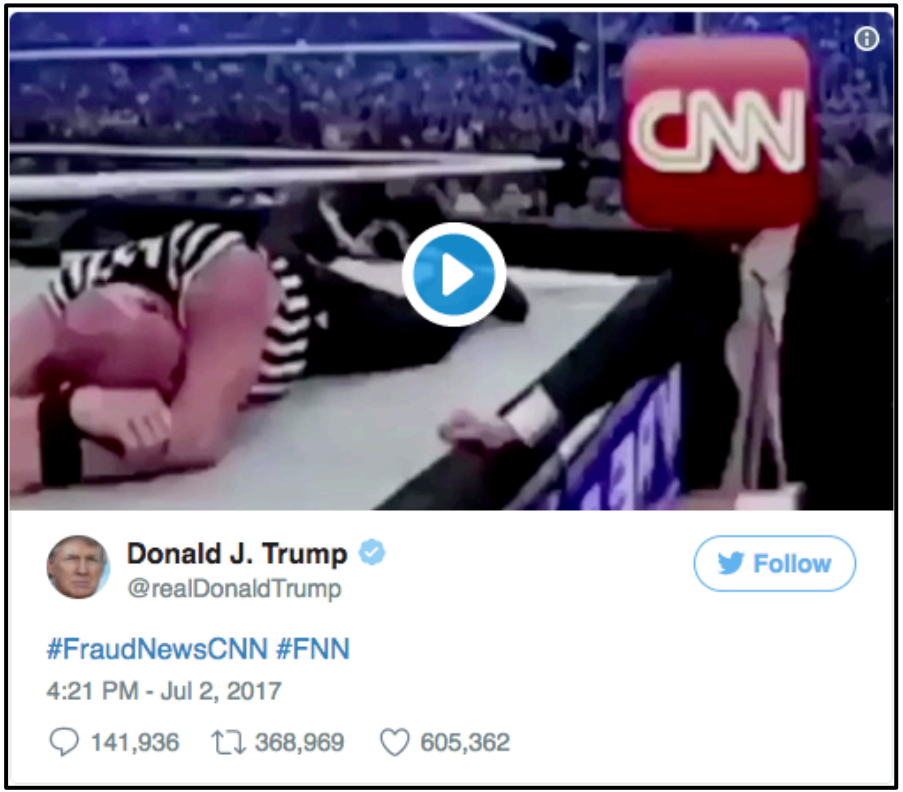
Donald J. Trump
@realDonaldTrump

Following

We should start an immediate investigation into @SenSchumer and his ties to Russia and Putin. A total hypocrite!

9:54 AM - 3 Mar 2017

54,218 Retweets **148,062** Likes


CNN
Donald J. Trump
@realDonaldTrump
Follow
#FraudNewsCNN #FNN
4:21 PM - Jul 2, 2017
141,936
368,969
605,362

Reddit → Twitter

Donald J. Trump
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4:21 PM - Jul 2, 2017

141,936 368,969 605,362

Vox

EXPLAINERS POLITICS & POLICY WORLD CULTURE SCIENCE & HEALTH IDENTITIES MORE

Trump's anti-CNN tweet originated from Reddit's largest right-wing extremist forum

Regardless of his intentions, Trump's tweet aligned him with violent hate speech.

Updated by Aja Romano | @ajaromano | Jul 3, 2017, 5:00pm EDT

The Pizzagate Conspiracy Theory

The saga of 'Pizzagate': The fake story that shows how conspiracy theories spread

BBC TRENDING

By BBC Trending
What's popular and why

2 December 2016

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The saga of 'Pizzagate': The fake story that shows how conspiracy theories spread

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2 December 2016

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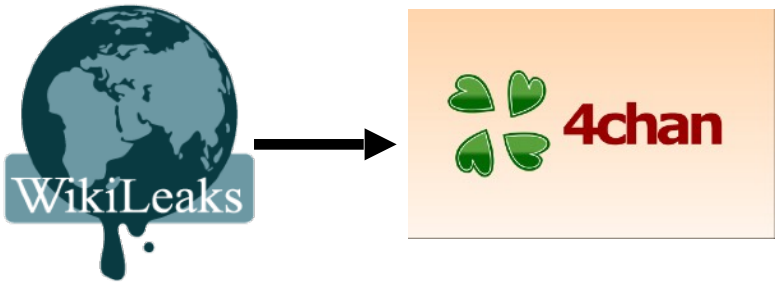

Data Provider

Theory Generator

The Pizzagate Conspiracy Theory

The saga of 'Pizzagate': The fake story that shows how conspiracy theories spread

BBC TRENDING

By BBC Trending
What's popular and why

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Theory Incubators & Gateway to mainstream "world"

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Large-scale Disseminator

Idea…

Study the appearance of alternative and mainstream news URLs within the platforms

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Build a sequence of appearance for each URL according to the timestamps

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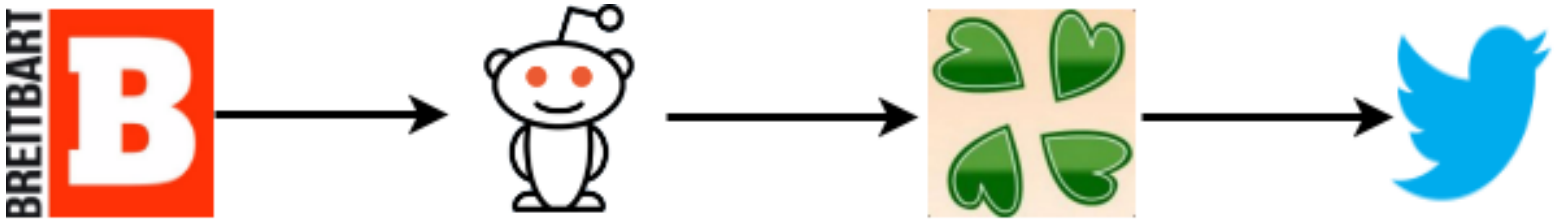

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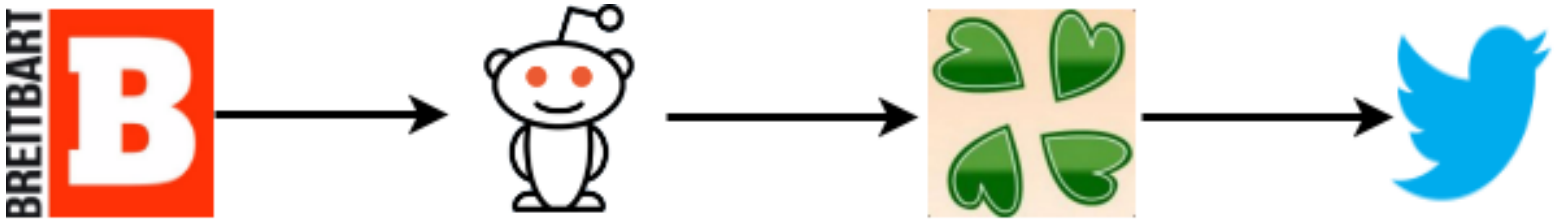


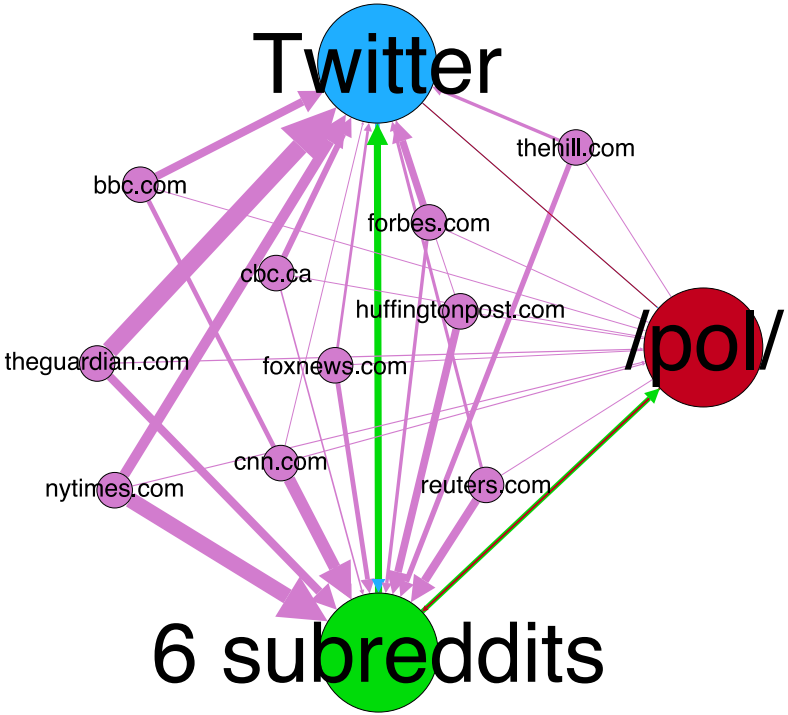
Build a graph with the sequences

The Data

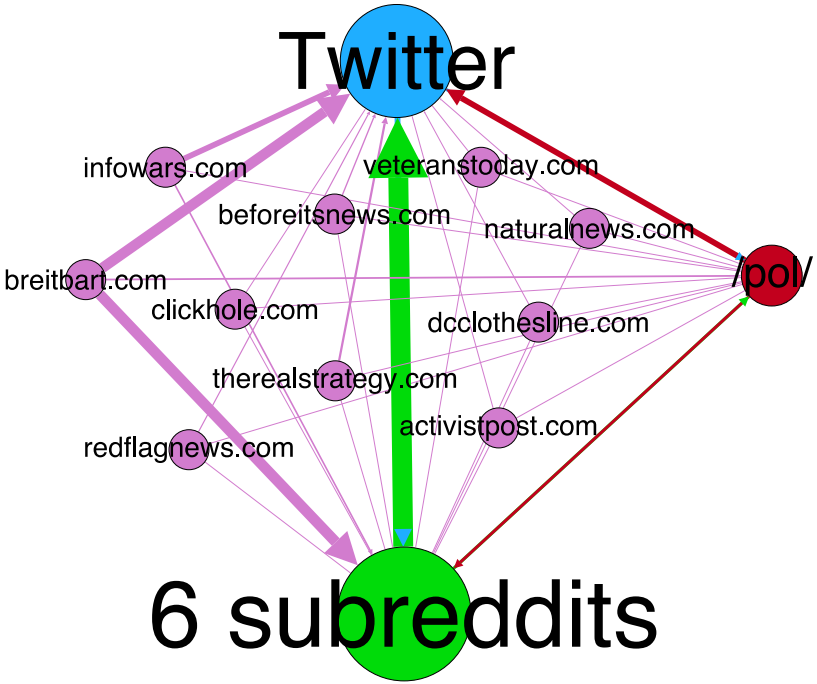
99 mainstream and alternative (“fake”) news sources

Platform	Posts/Comments	Alternative URLs	Mainstream URLs
Twitter	486K	42K	236K
Reddit (six selected subreddits)	620K	40K	301K
4chan (/pol/)	90K	9K	40K

Here's What The Graph Looks Like



Mainstream News Sources



Alternative News Sources

Quantify Influence? Hawkes Processes!

Assume K processes

Each with a rate of events (i.e., posting of a URL), called the *background rate*

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Quantify Influence? Hawkes Processes!

Assume K processes

- Each with a rate of events (i.e., posting of a URL), called the *background rate*

An event can cause **impulse responses** in other processes

- Increases the rates of other processes for a period of time

Enables us to be confident about the number of events caused by another event on the source process (weight)

- **Reveals causal relationships**

Hawkes Processes Example

Reddit

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Reddit

Twitter

Hawkes Processes Example

Reddit

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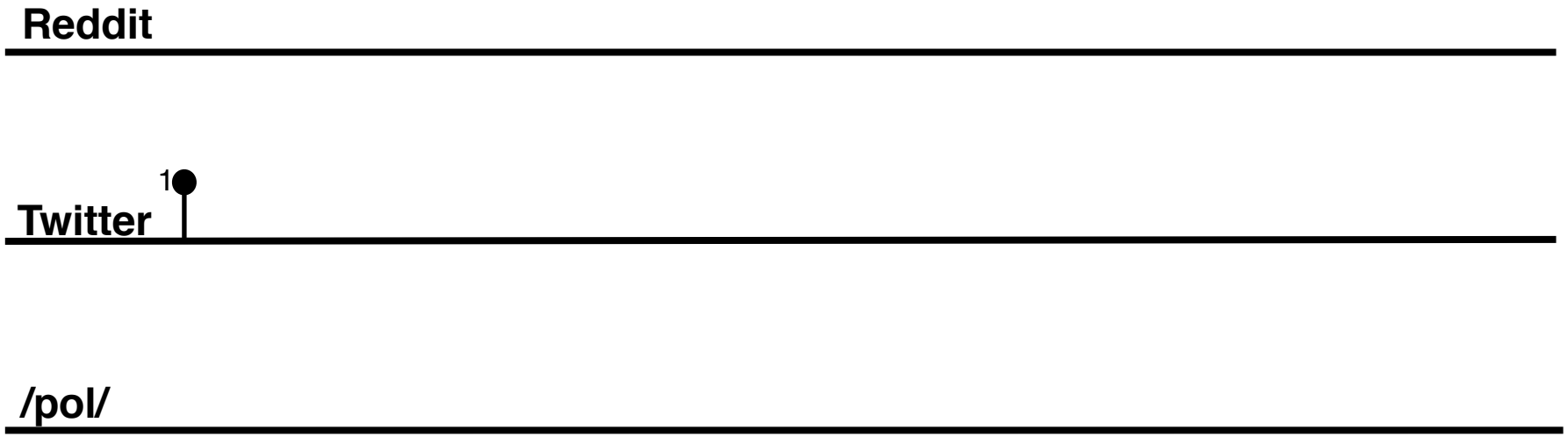
/pol/

Hawkes Processes Example



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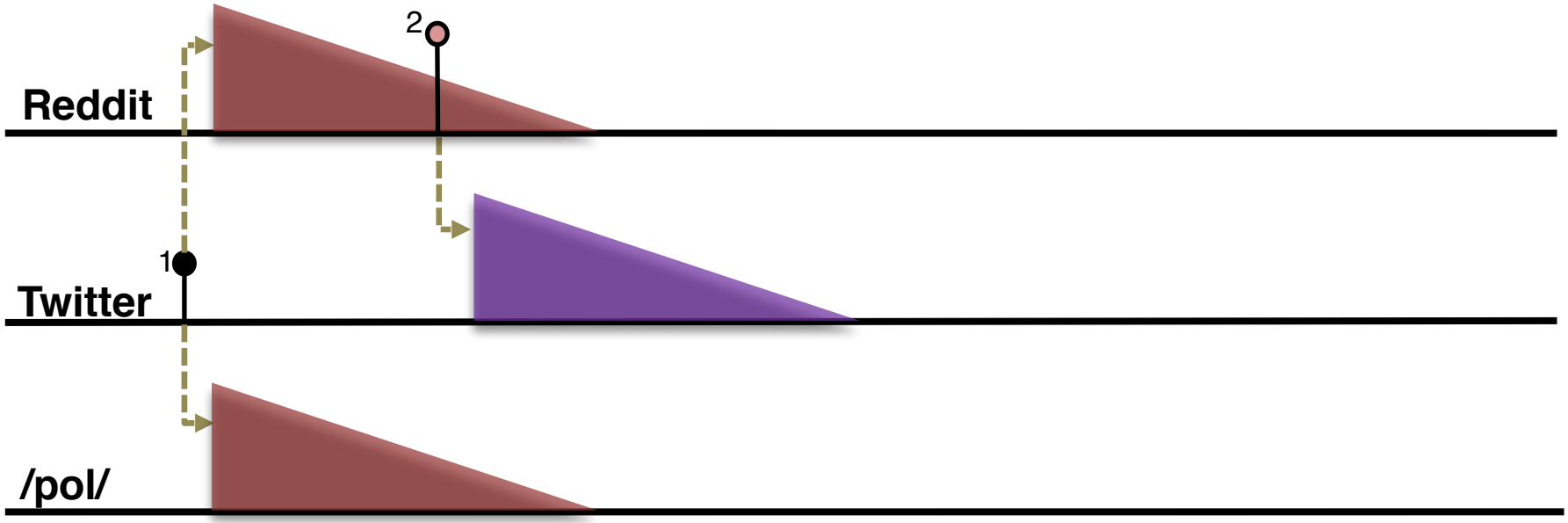

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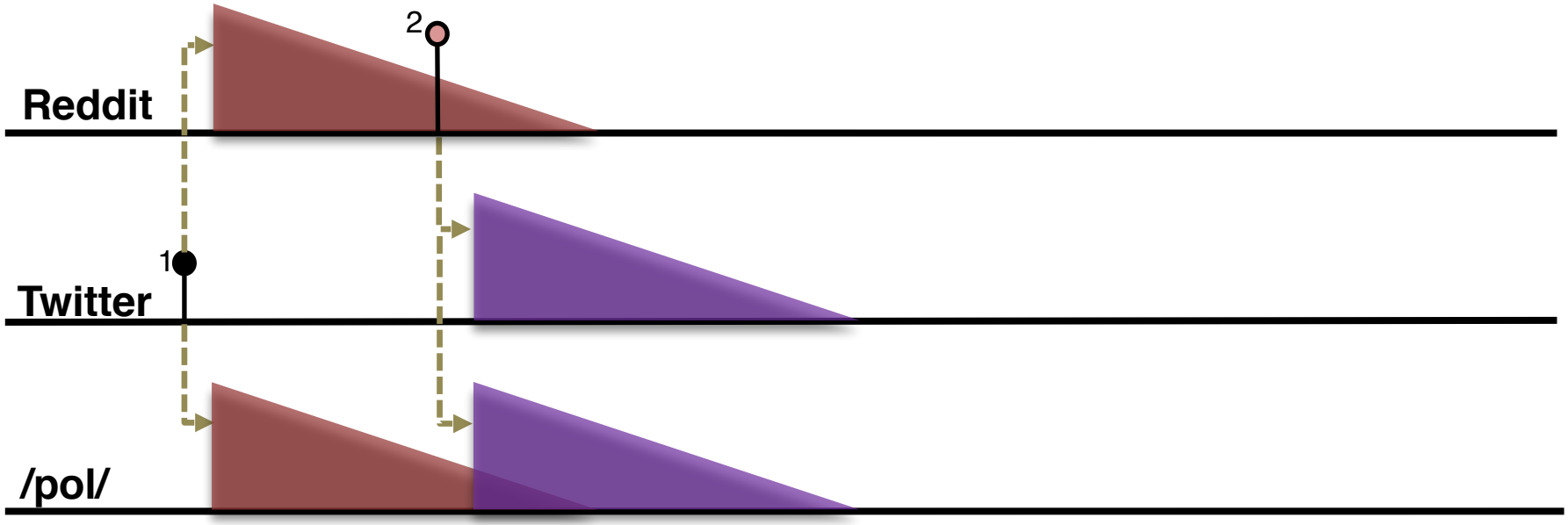

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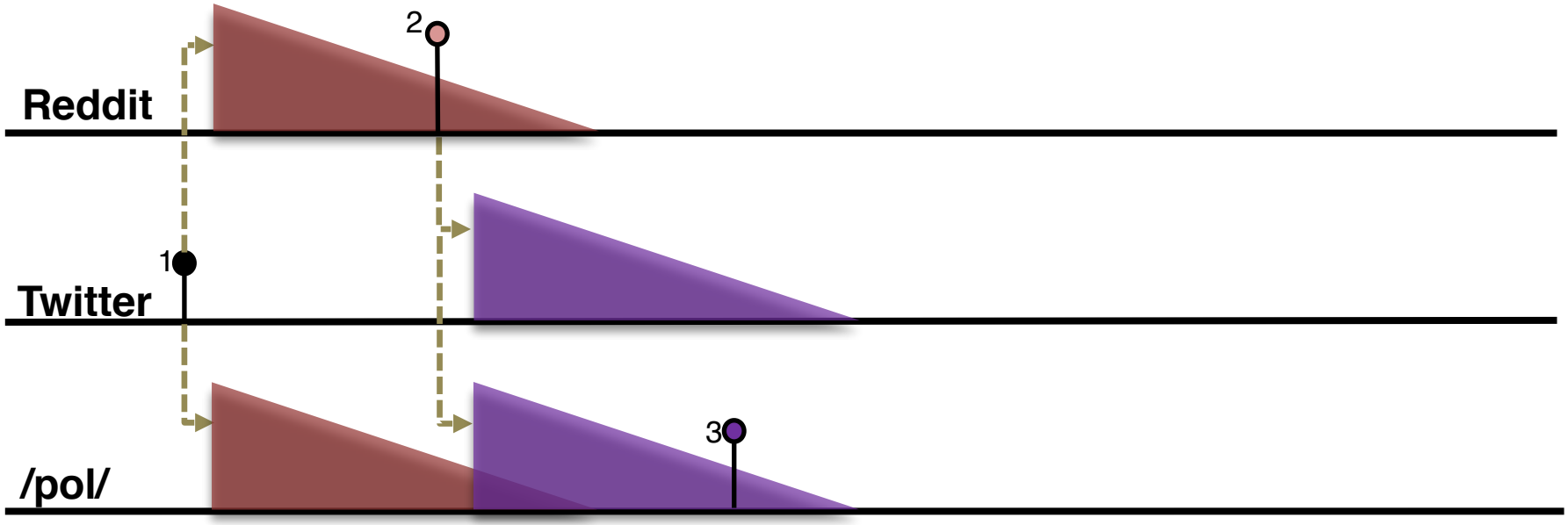

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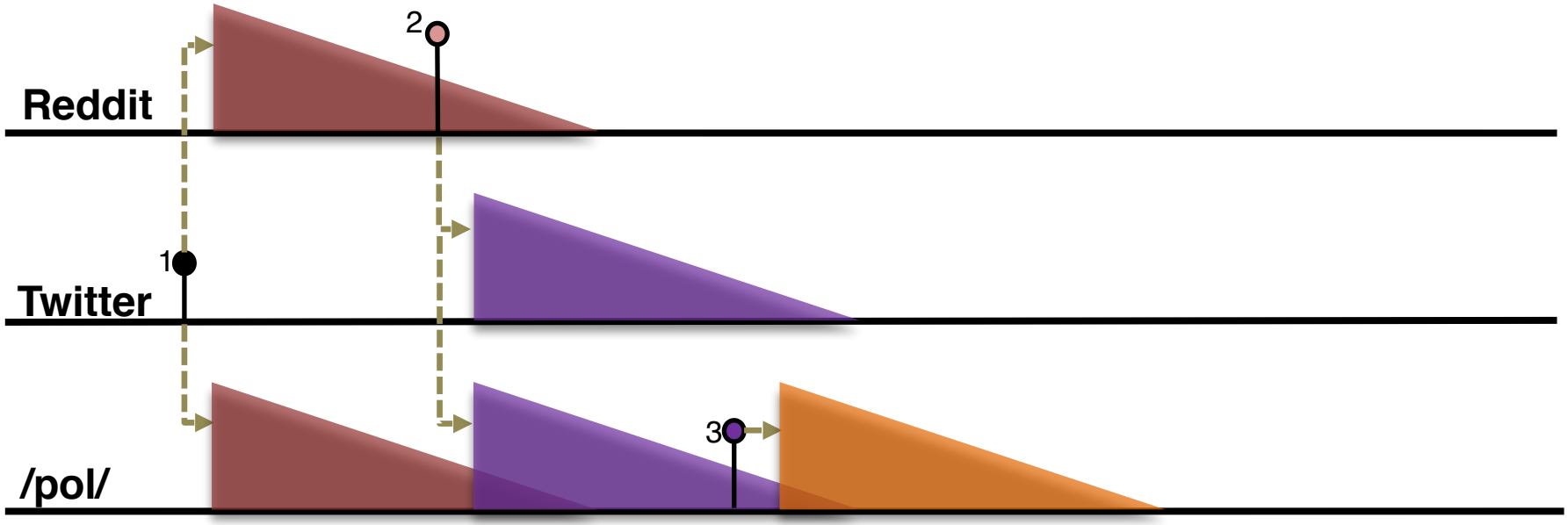

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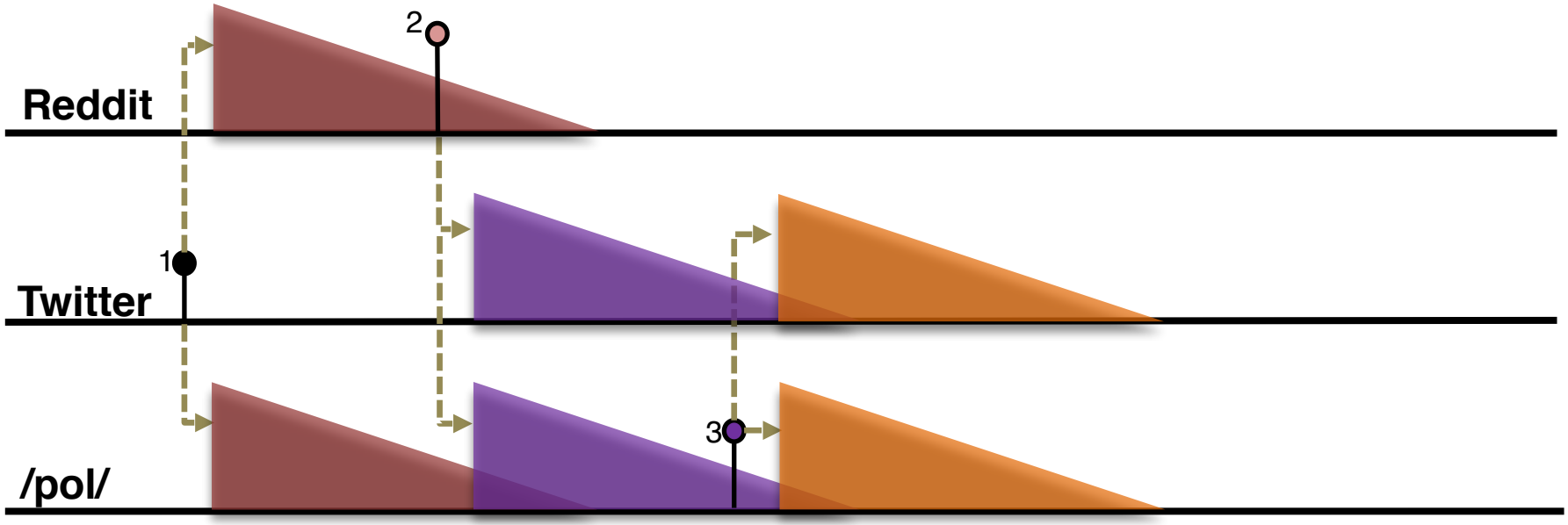

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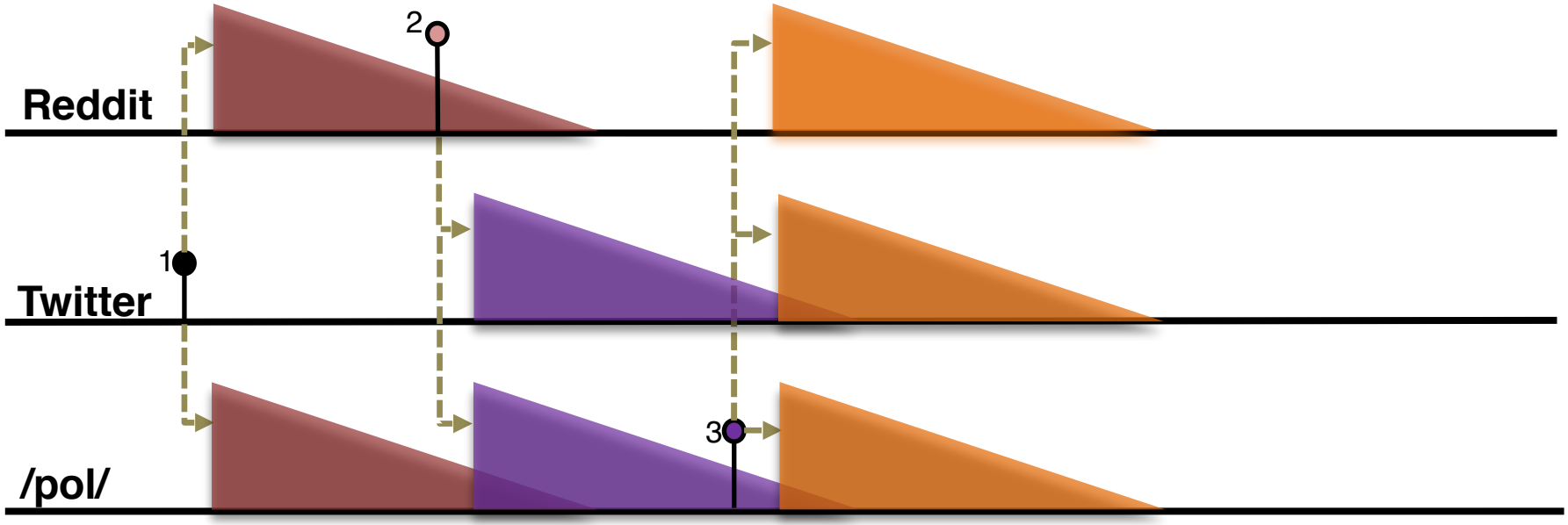

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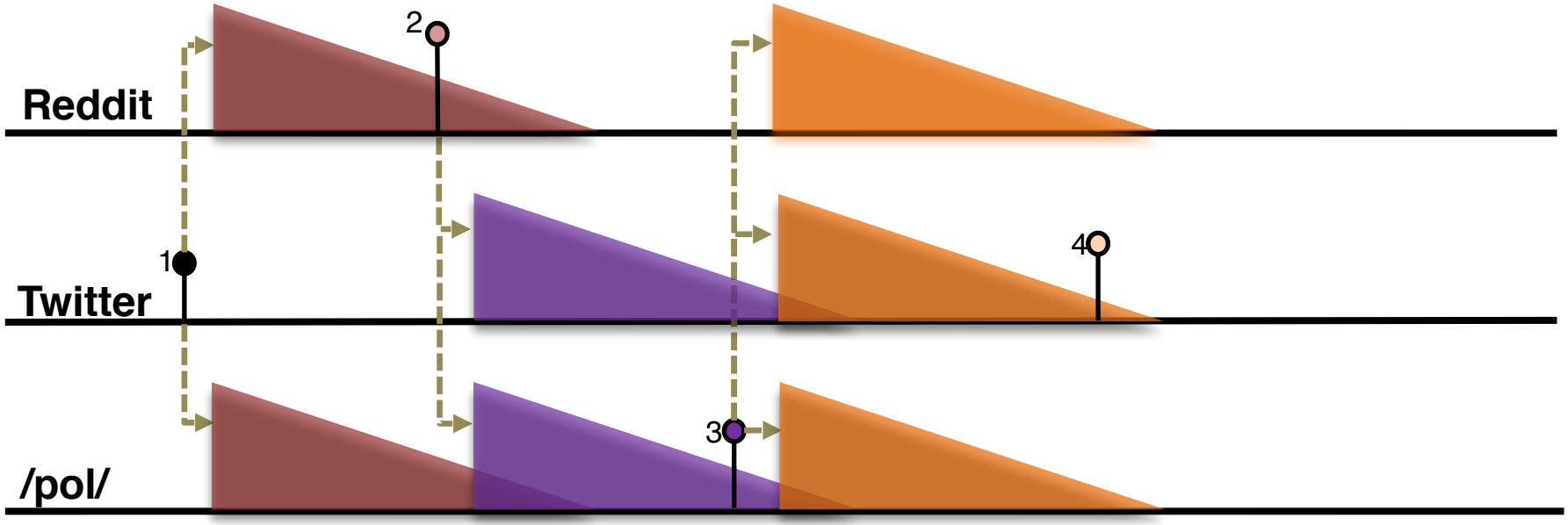

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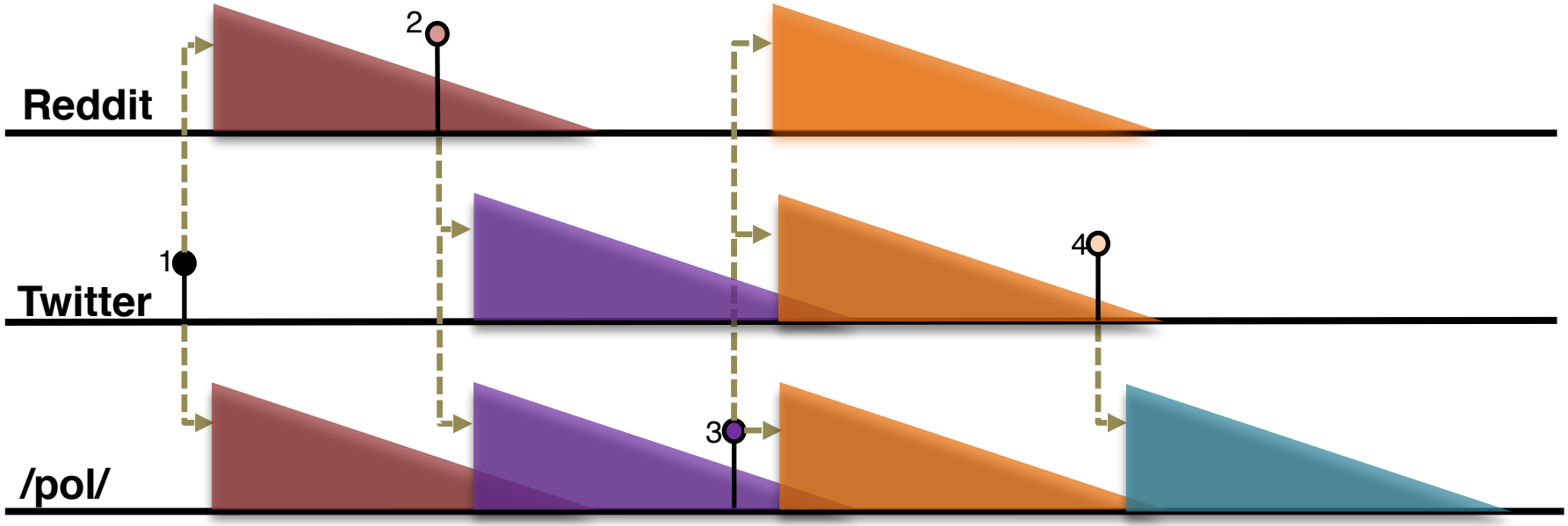

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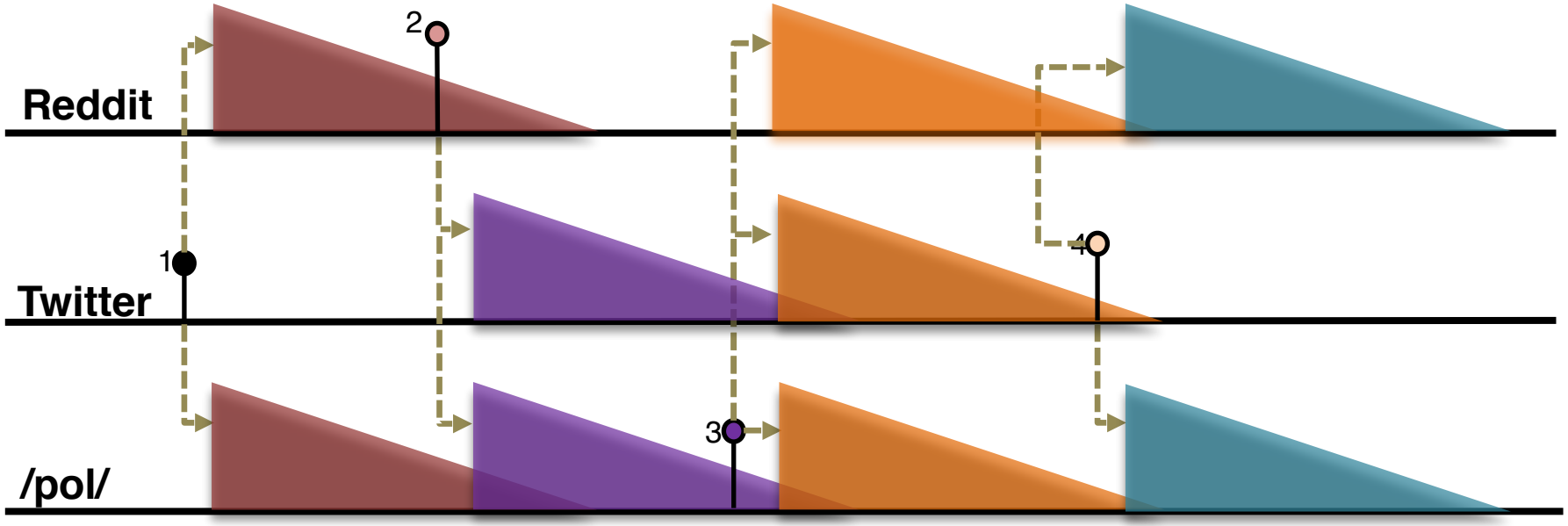

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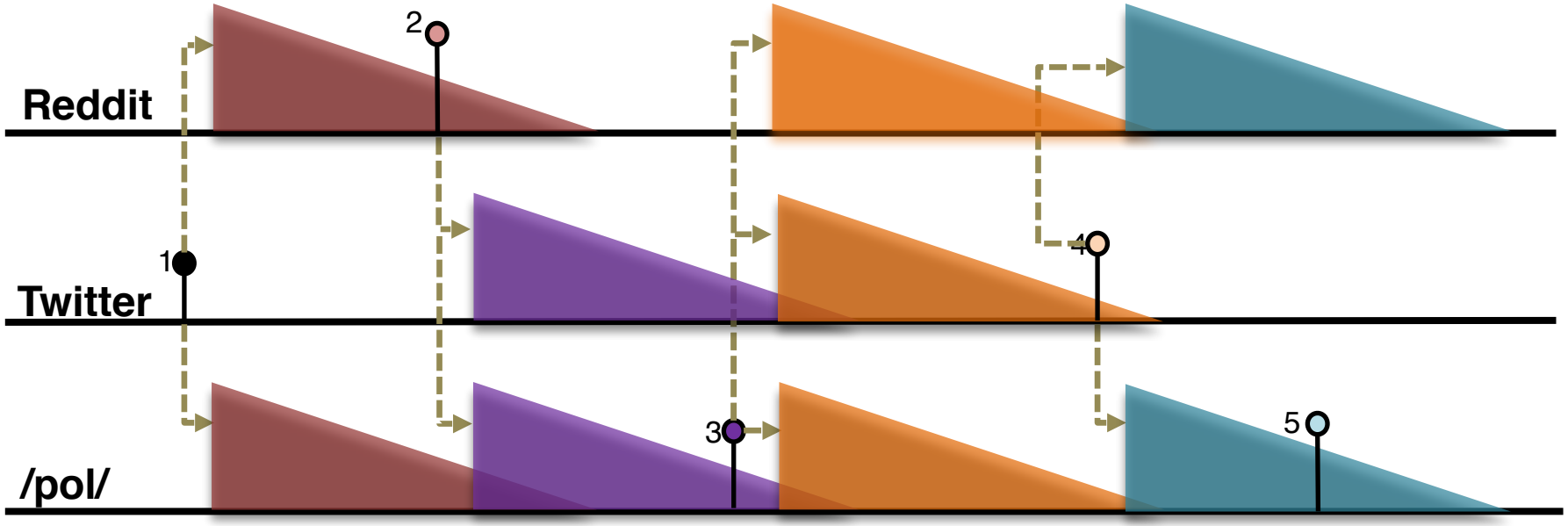

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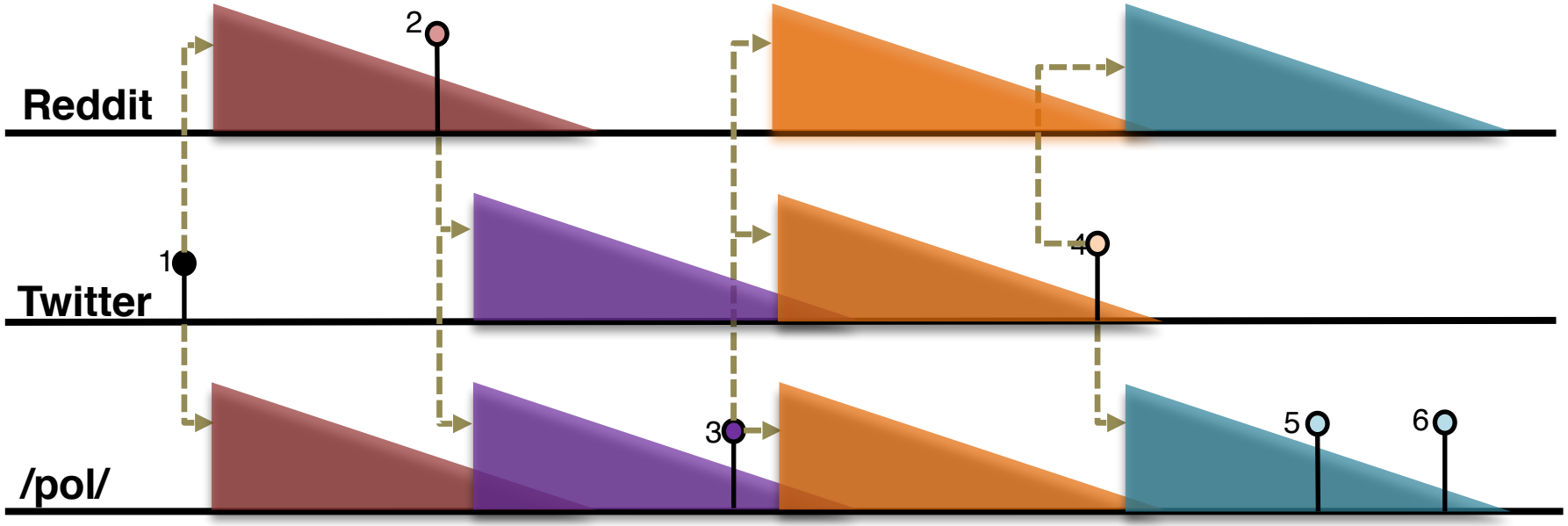

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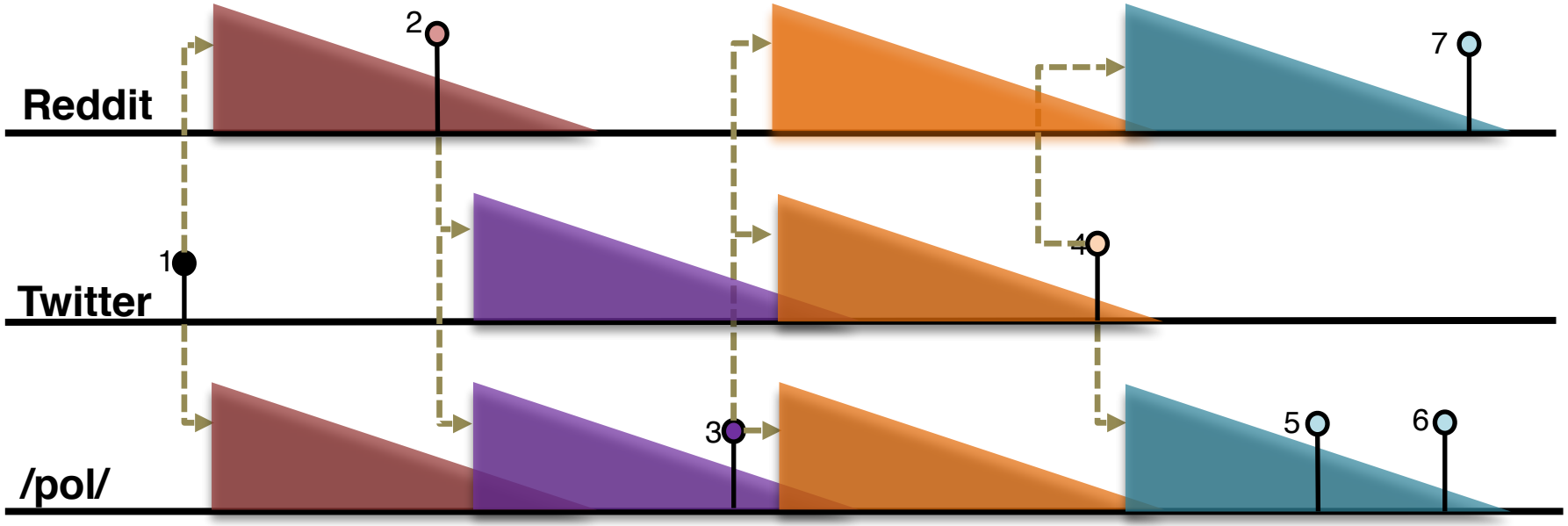

For Our Purposes…

Hawkes model with 8 processes

- One for each platform/community
- Distinct model for each URL

Fit each model with Gibbs sampling

Calculate the percentage of events **created because** of events happened in each of the other processes

How Communities Influence Each Other?

Twitter top influencers for alternative URLs

- /r/The_Donald (2.72%)
- /pol/ (1.96%)
- /r/politics (1.1%)

Twitter top influencers for mainstream URLs

- /r/politics (4.29%)
- /pol/ (3.01%)
- /r/The_Donald (2.97%)

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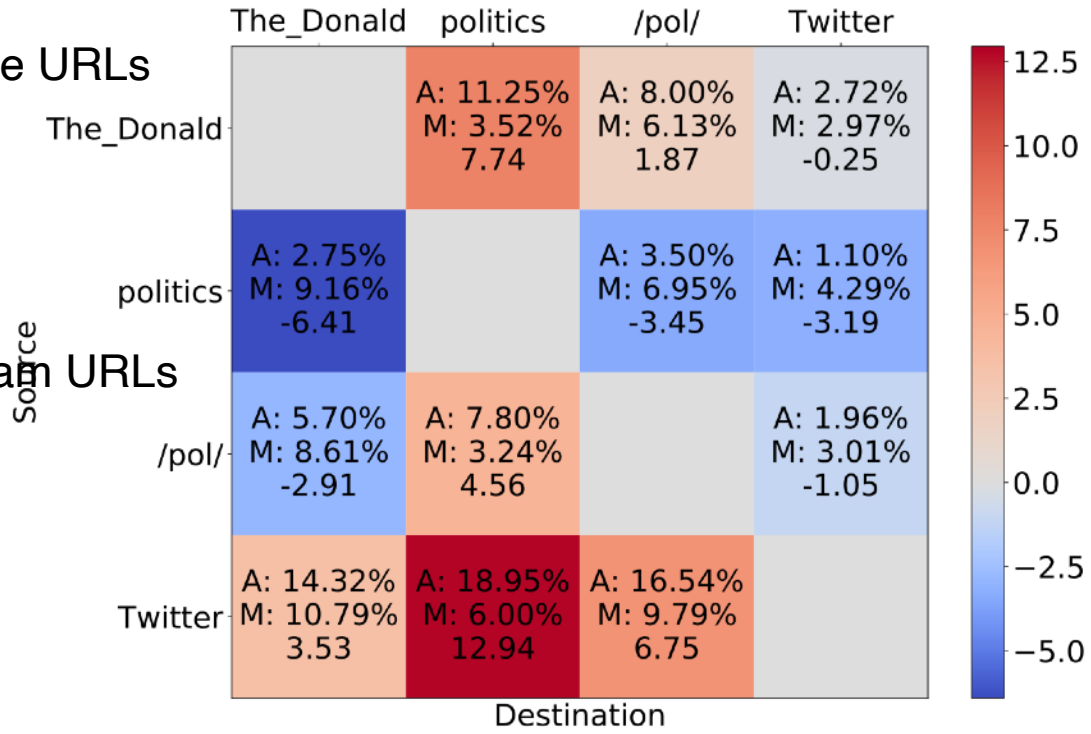

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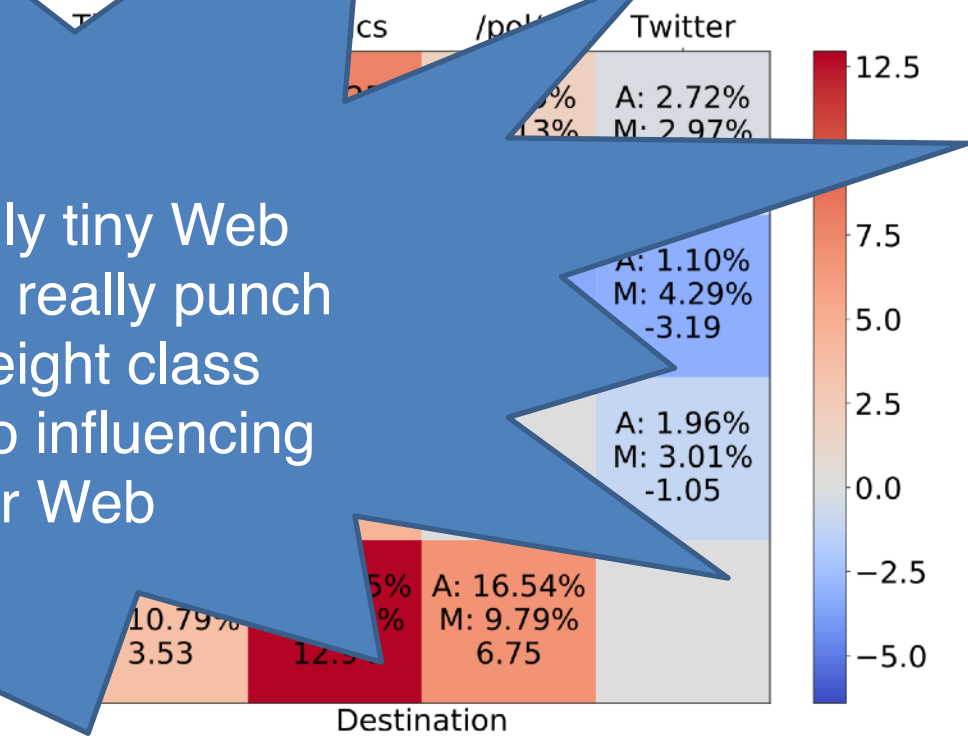
- /pol/ (1.96%)

Twitter top in…

- /…

These seemingly tiny Web communities can really punch above their weight class when it comes to influencing the greater Web



WE NEED TO DECIDE THE TOPIC FOR OUR NEXT PAPER
BLOCKCHAIN
GDPR
MEMES

WHEN YOUR BOSS THANKS YOU FOR STAYING LATE
BUT YOU WERE JUST LOOKING AT MEMES
AND LOST TRACK OF TIME

ONE DOES NOT SIMPLY
WIN AN AWARD WITH A PAPER ON MEMES
imgflip.com

Memes are fun!

Not always though…

Not always though…

Not always though…

Not always though…

Memes in politics

Annotated: the Trump memes stuck to Cesar Sayoc's van

The vehicle seized by law enforcement in Florida was covered in strange propaganda

▲ Cesar Sayoc's van is seen in Boca Raton, Florida, on 18 October 2018 in this picture obtained from social media. Photograph: Social Media/Ed Kennedy via Reuters

most viewed in US

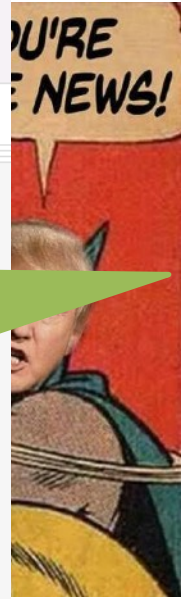
Pittsburgh synagogue shooting: suspect held after at least four killed

'I bet $500 they are lying': Trump fans sceptical about pipe bomb arrest

'Why is that racist?' Trump greets young black leaders with freewheeling rant

Barack Obama takes aim at Donald Trump for 'making stuff up'

Muncy hits walk-off homer as Dodgers win longest ever World Series game



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The Guardian

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Annotated Trump m
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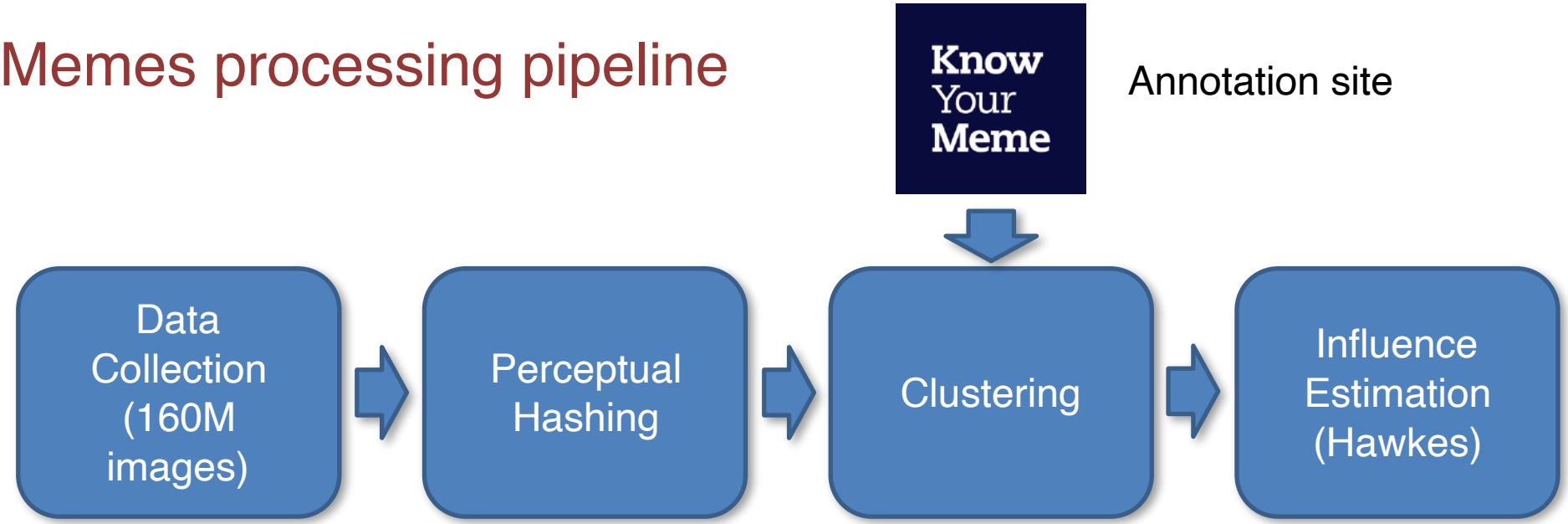
Memes have become a popular, and seemingly effective, method to transmit ideology.

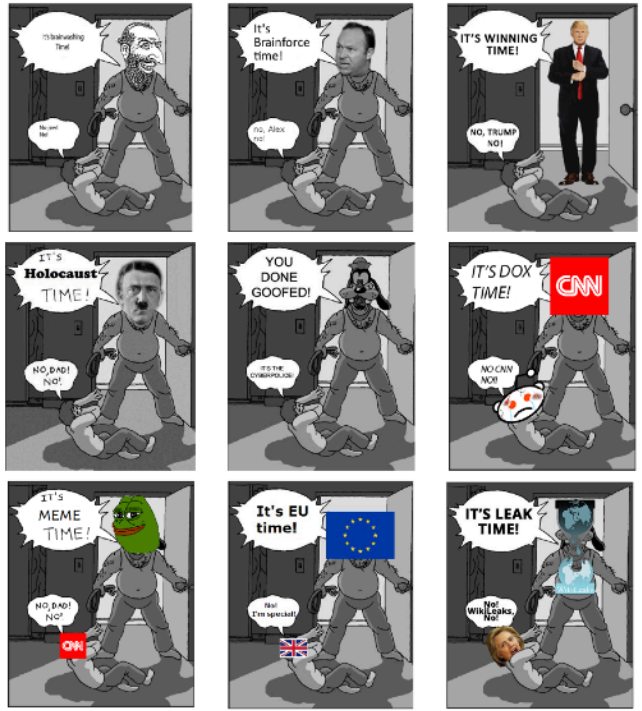
Memes have been weaponized

Memes processing pipeline



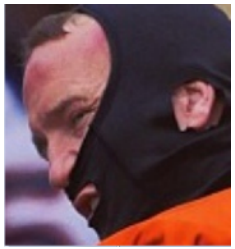
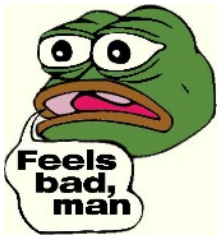
Code for our analysis pipeline (and data) available at
https://github.com/memespaper/memes_pipeline

Examples of clusters



Top memes per social network

Paper (IMC 2018)

4chan (/pol/)	Reddit	Gab	Twitter
			
			

Top memes per Web community

/pol/		Reddit		Gab		Twitter	
Entry	**Posts (%)**	**Entry**	**Posts (%)**	**Entry**	**Posts (%)**	**Entry**	**Posts(%)**
Feels Bad Man/Sad Frog	64,367 (4.9%)	Manning Face	12,540 (2.2%)	Jesusland **(P)**	454 (1.6%)	Roll Safe	55,010 (5.9%)
Smug Frog	63,290 (4.8%)	That's the Joke	7,626 (1.3%)	Demotivational Posters	414 (1.5%)	Evil Kermit	50,642 (5.4%)
Happy Merchant **(R)**	49,608 (3.8%)	Feels Bad Man/ Sad Frog	7,240 (1.3%)	Smug Frog	392 (1.4%)	Arthur's Fist	37,591 (4.0%)
Apu Apustaja	29,756 (2.2%)	Confession Bear	7,147 (1.3%)	Based Stickman **(P)**	391 (1.4%)	Nut Button	13,598 (1,5%)
Pepe the Frog	25,197 (1.9%)	This is Fine	5,032 (0.9%)	Pepe the Frog	378 (1.3%)	Spongebob Mock	11,136 (1,2%)
Make America Great Again **(P)**	21,229 (1.6%)	Smug Frog	4,642 (0.8%)	Happy Merchant **(R)**	297 (1.1%)	Reaction Images	9,387 (1.0%)
Angry Pepe	20,485 (1.5%)	Roll Safe	4,523 (0.8%)	Murica	274 (1.0%)	Conceited Reaction	9,106 (1.0%)
Bait this is Bait	16,686 (1.2%)	Rage Guy	4,491 (0.8%)	And Its Gone	235 (0.9%)	Expanding Brain	8,701 (0.9%)
I Know that Feel Bro	14,490 (1.1%)	Make America Great Again **(P)**	4,440 (0.8%)	Make America Great Again **(P)**	207 (0.8%)	Demotivational Posters	7,781 (0.8%)
Cult of Kek	14,428 (1.1%)	Fake CCG Cards	4,438 (0.8%)	Feels Bad Man/ Sad Frog	206 (0.8%)	Cash Me Ousside/Howbow Dah	5,972 (0.6%)
Laughing Tom Cruise	14,312 (1.1%)	Confused Nick Young	4,024 (0.7%)	Trump's First Order of Business **(P)**	192 (0.7%)	Salt Bae	5,375 (0.6%)
Awoo	13,767 (1.0%)	Daily Struggle	4,015 (0.7%)	Kekistan	186 (0.6%)	Feels Bad Man/ Sad Frog	4,991 (0.5%)
Tony Kornheiser's Why	13,577 (1.0%)	Expanding Brain	3,757 (0.7%)	Picardia **(P)**	183 (0.6%)	Math Lady/Confused Lady	4,722 (0.5%)
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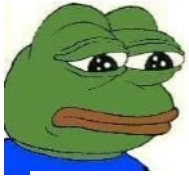
Big Grin / Never Ever	12,893 (1.0%)	Actual Advice Mallard	3,293 (0.6%)	Serbia Strong/Remove Kebab	149 (0.5%)	Clinton Trump Duet **(P)**	3,901 (0.4%)
Reaction Images	12,608 (0.9%)	Reaction Images	2,959 (0.5%)	Riot Hipster	148 (0.5%)	Kendrick Lamar Damn Album Cover	3,656 (0.4%)
Computer Reaction Faces	12,247 (0.9%)	Handsome Face	2,675 (0.5%)	Colorized History	144 (0.5%)	What in tarnation	3,363 (0.3%)
Wojak / Feels Guy	11,682 (0.9%)	Absolutely Disgusting	2,674 (0.5%)	Most Interesting Man in World	140 (0.5%)	Harambe the Gorilla	3,164 (0.3%)
Absolutely Disgusting	11,436 (0.8%)	Pepe the Frog	2,672 (0.5%)	Chuck Norris Facts	131 (0.4%)	I Know that Feel Bro	3,137 (0.3%)
Spurdo Sparde	9,581 (0.7%)	Pretending to be Retarded	2,462 (0.4%)	Roll Safe	131 (0.4%)	This is Fine	3,094 (0.3%)
Total	**445,179 (33.4%)**		**94,069 (16.7%)**		**4,808 (17.0%)**		**249,047 (26.4%)**

Top memes per Web community



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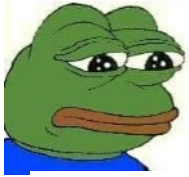

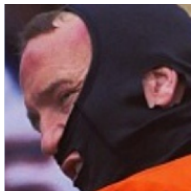

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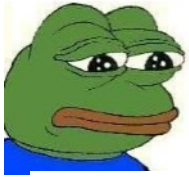

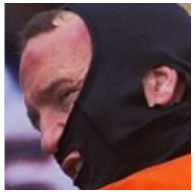

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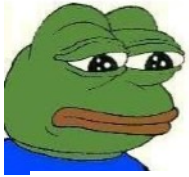

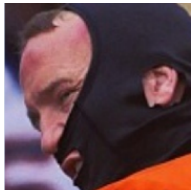

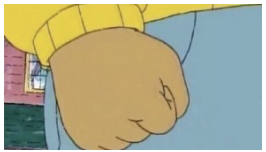

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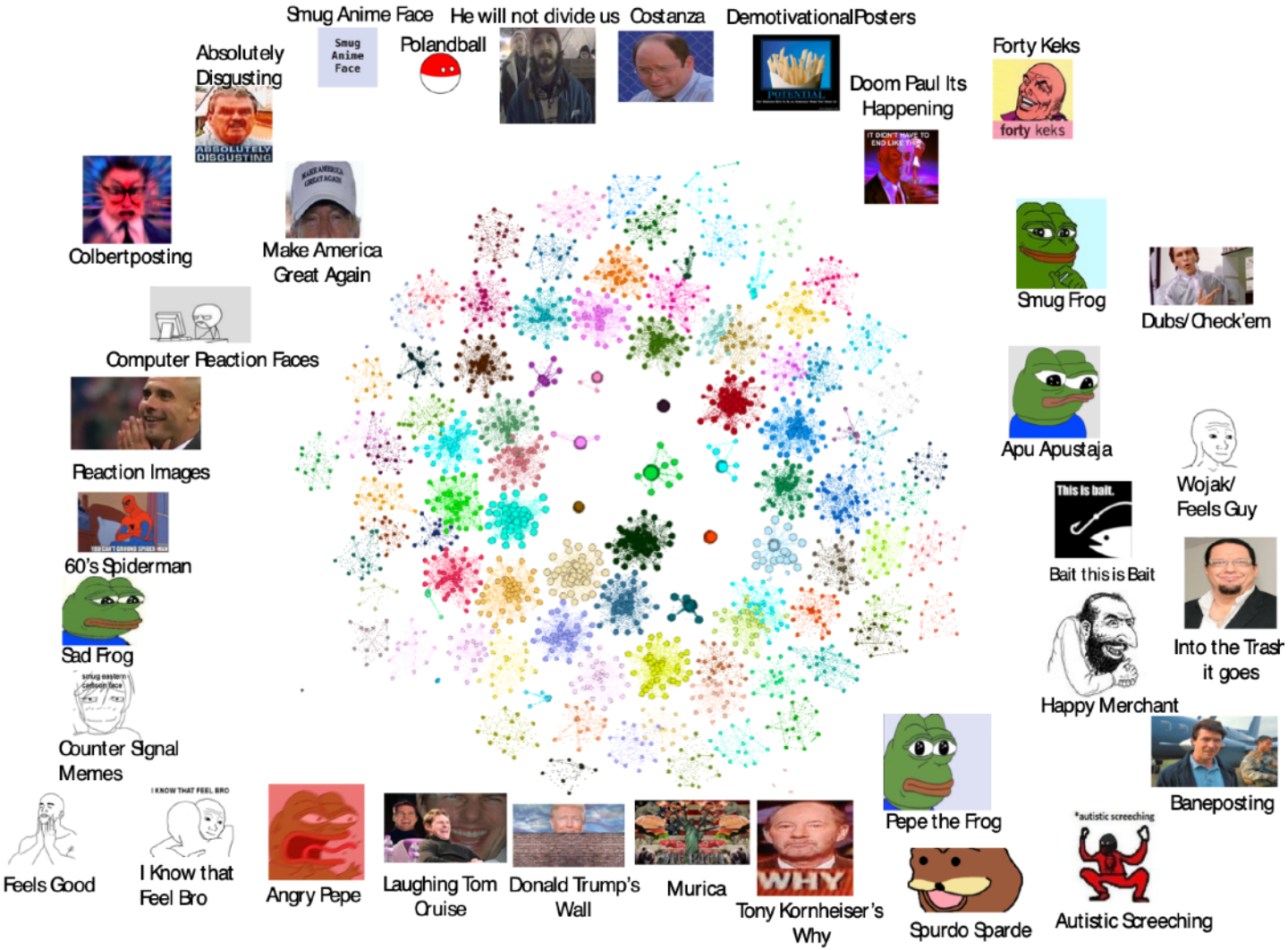
Smug Anime Face
He will not divide us
Costanza
DemotivationalPosters
Absolutely Disgusting
Polandball
Doom Paul Its Happening
Forty Keks
Colbertposting
Make America Great Again
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Dubs/Check'em
Computer Reaction Faces
Reaction Images
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Wojak/ Feels Guy
60's Spiderman
Bait this is Bait
Sad Frog
Into the Trash it goes
Happy Merchant
Counter Signal Memes
Baneposting
Pepe the Frog
Feels Good
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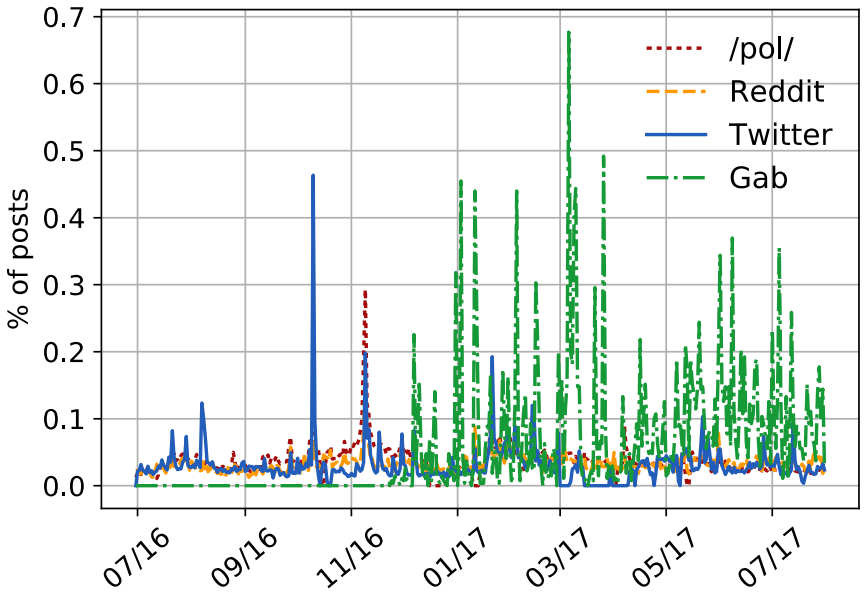
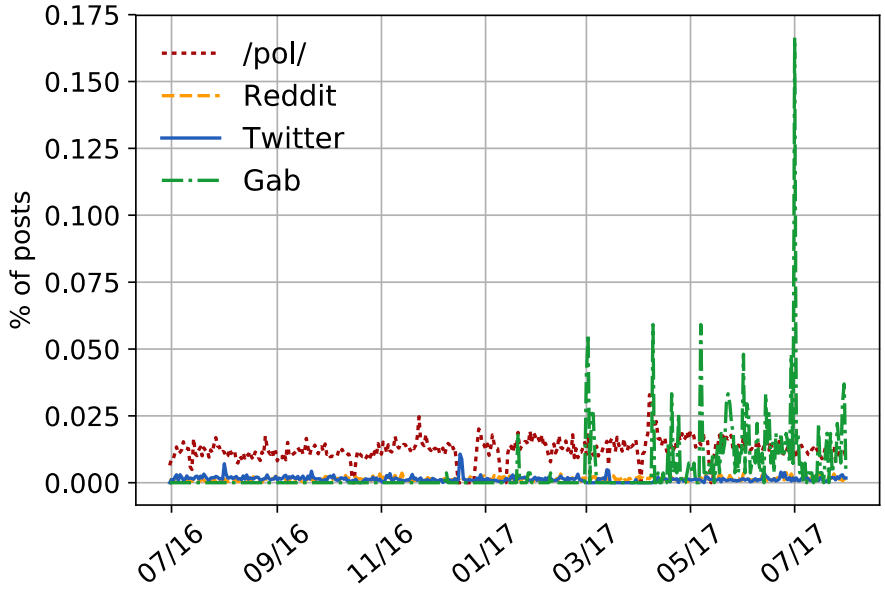
How are memes shared over time?



Political Memes



Racist Memes

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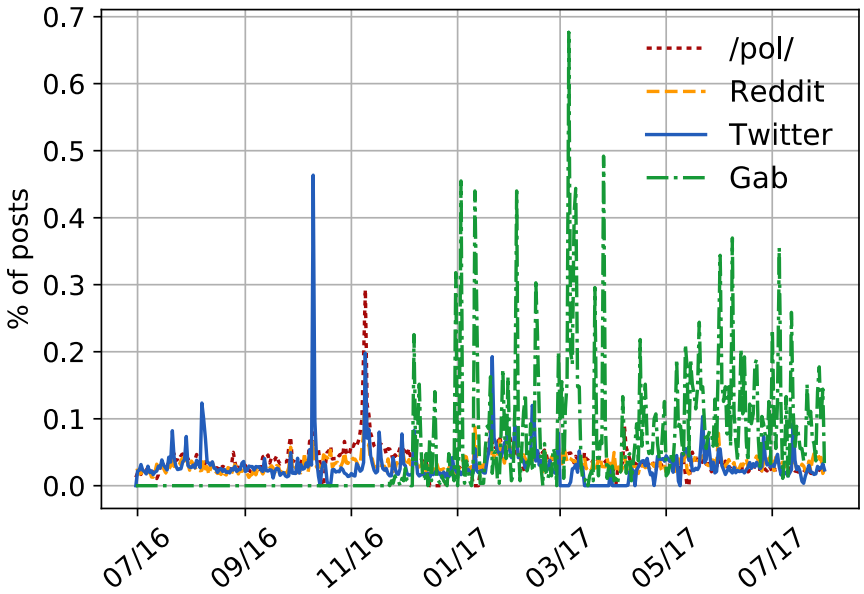

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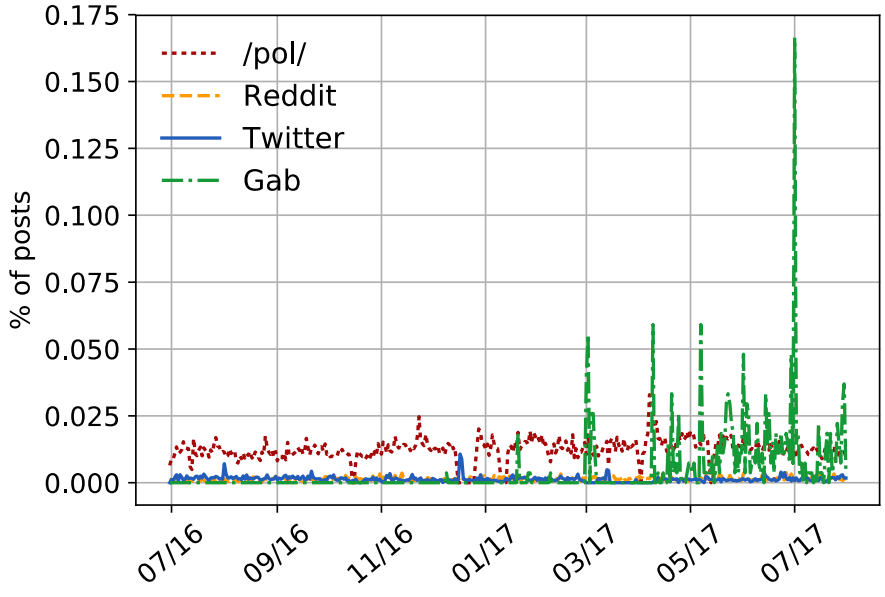

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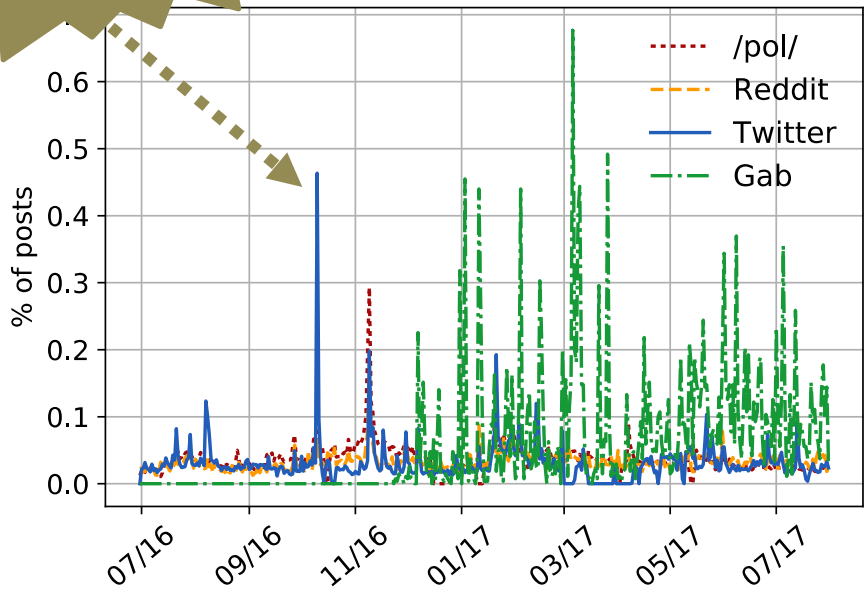
How are memes shared over time?

2nd US presidential debate



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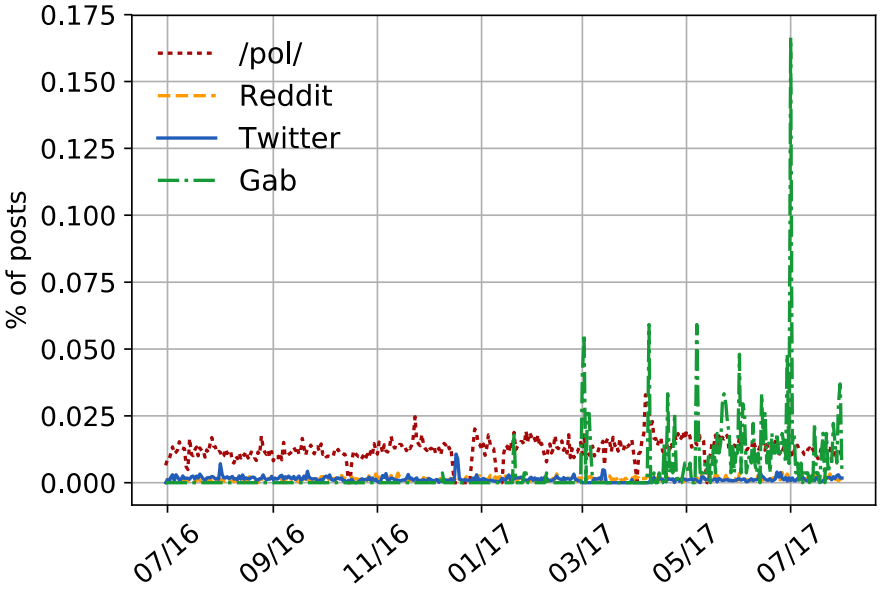

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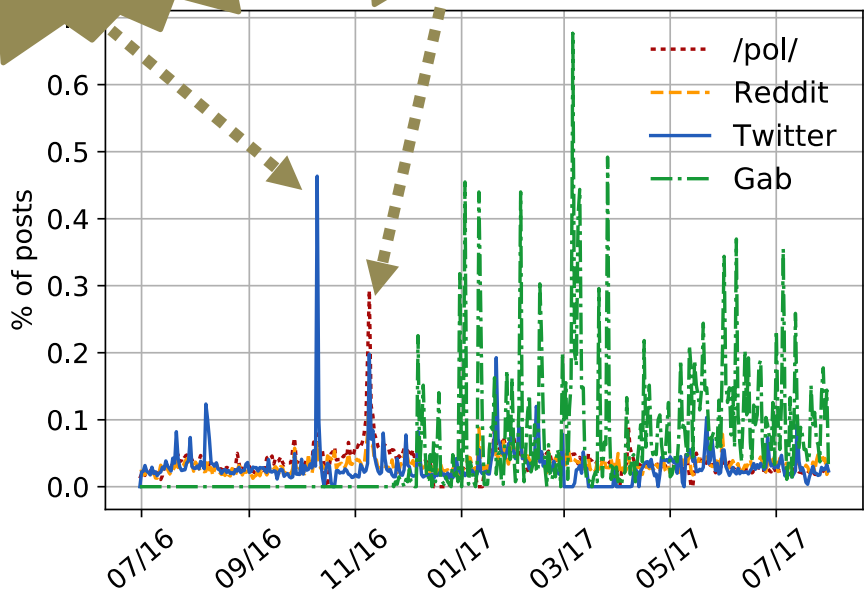

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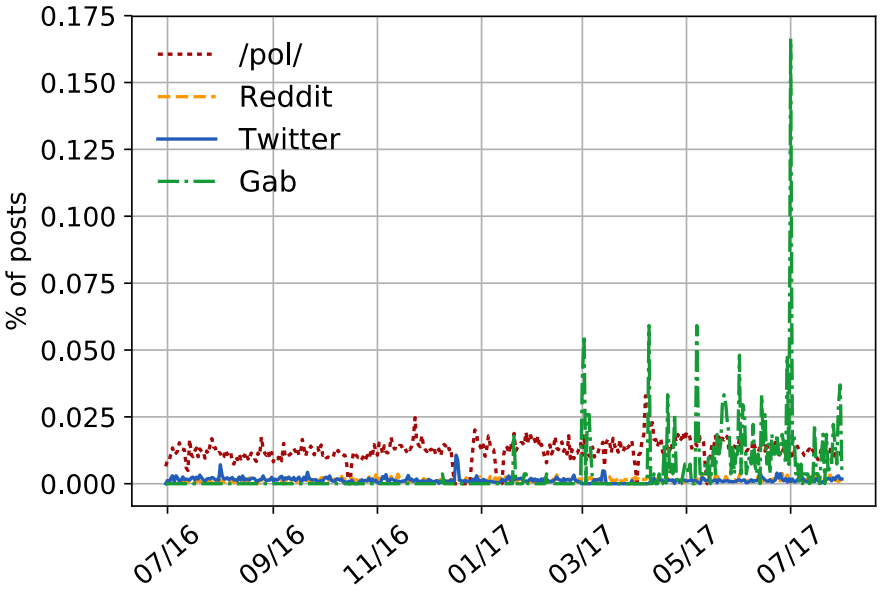

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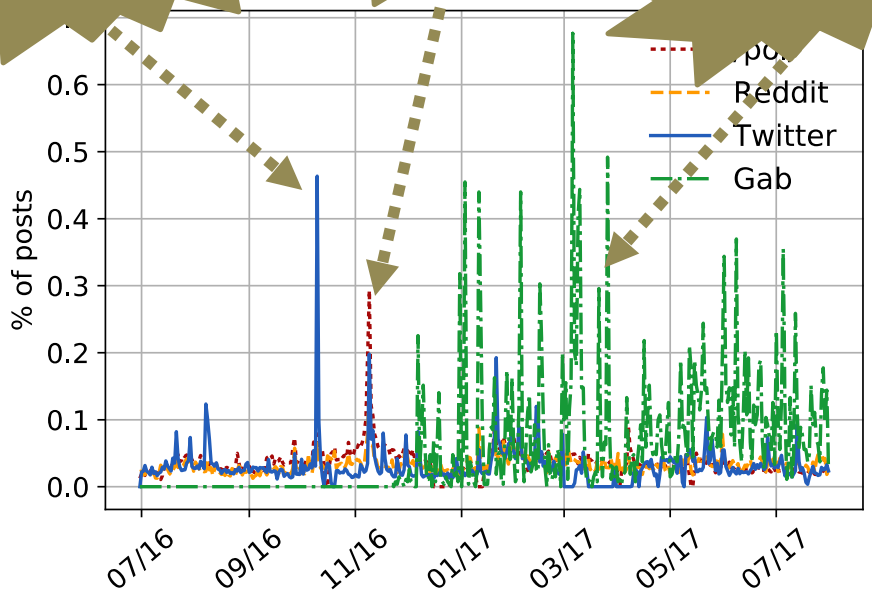

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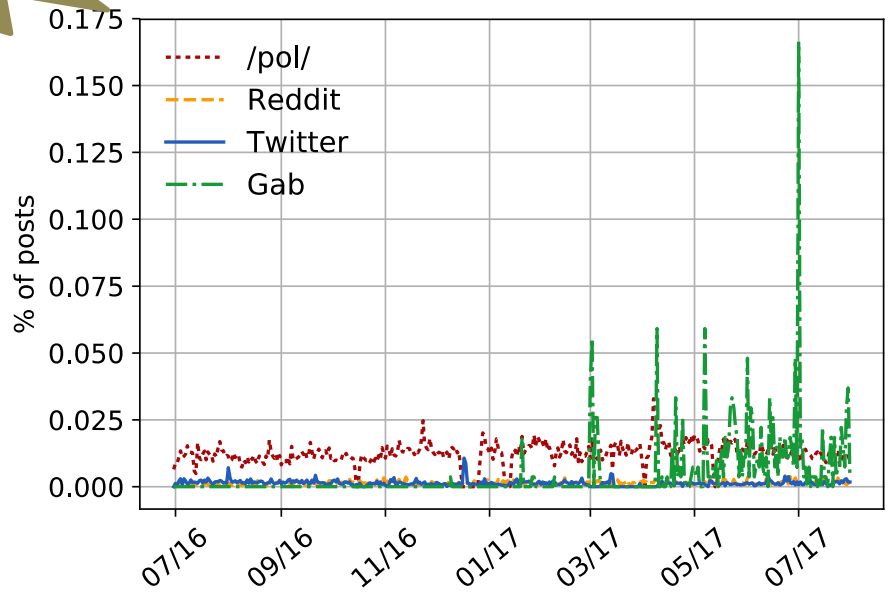

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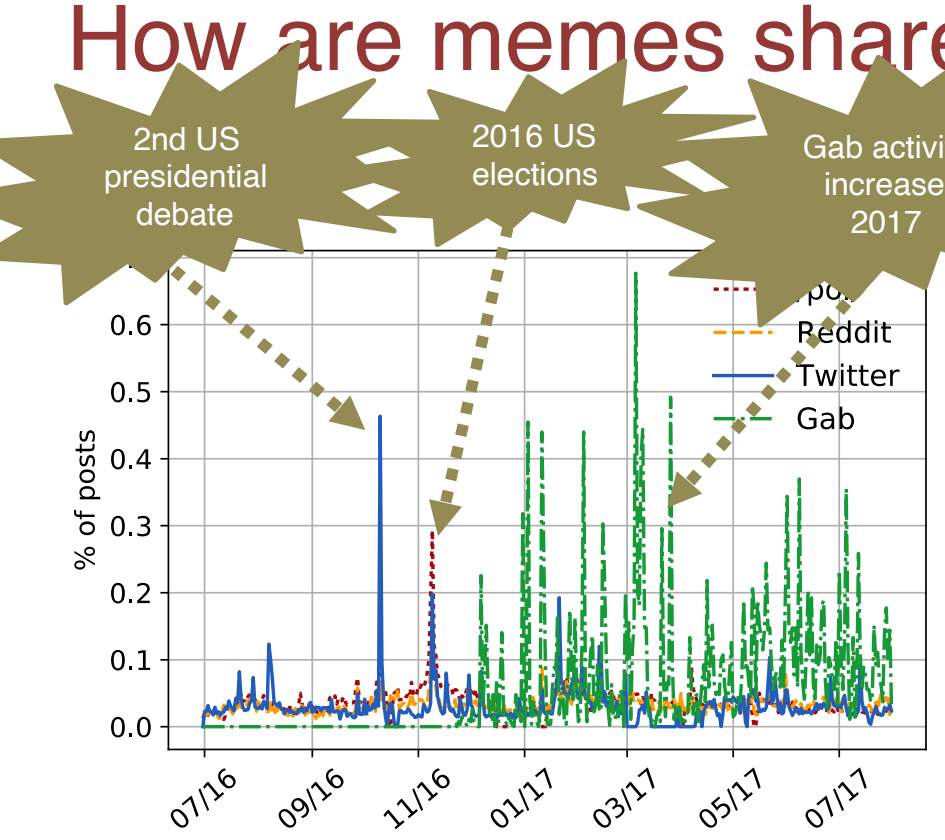

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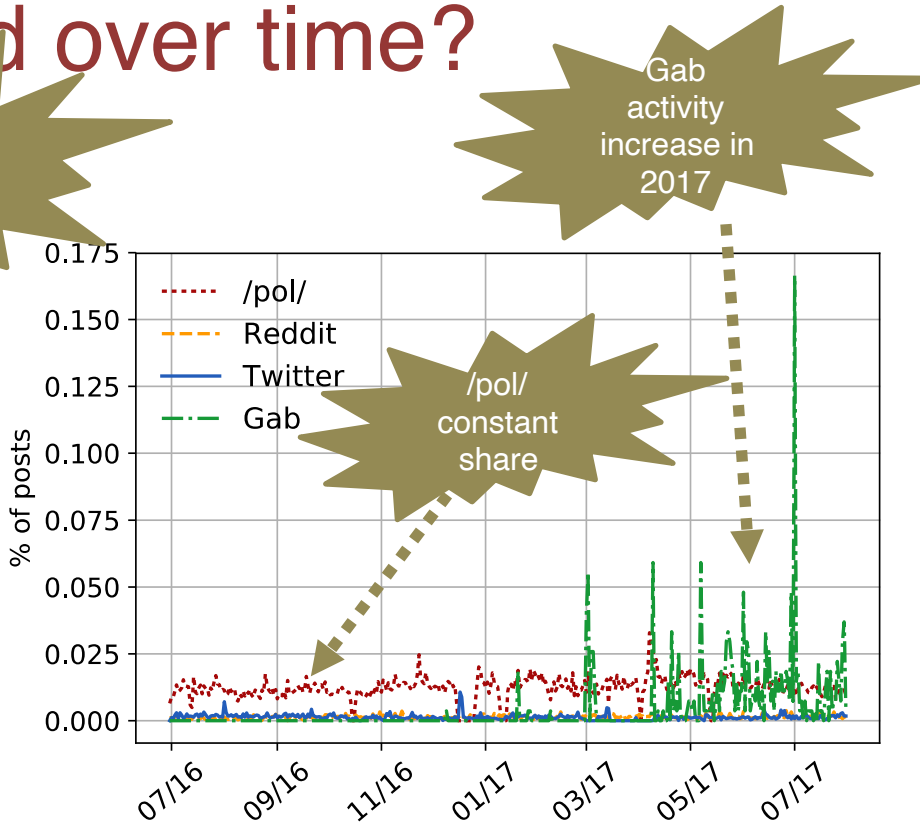
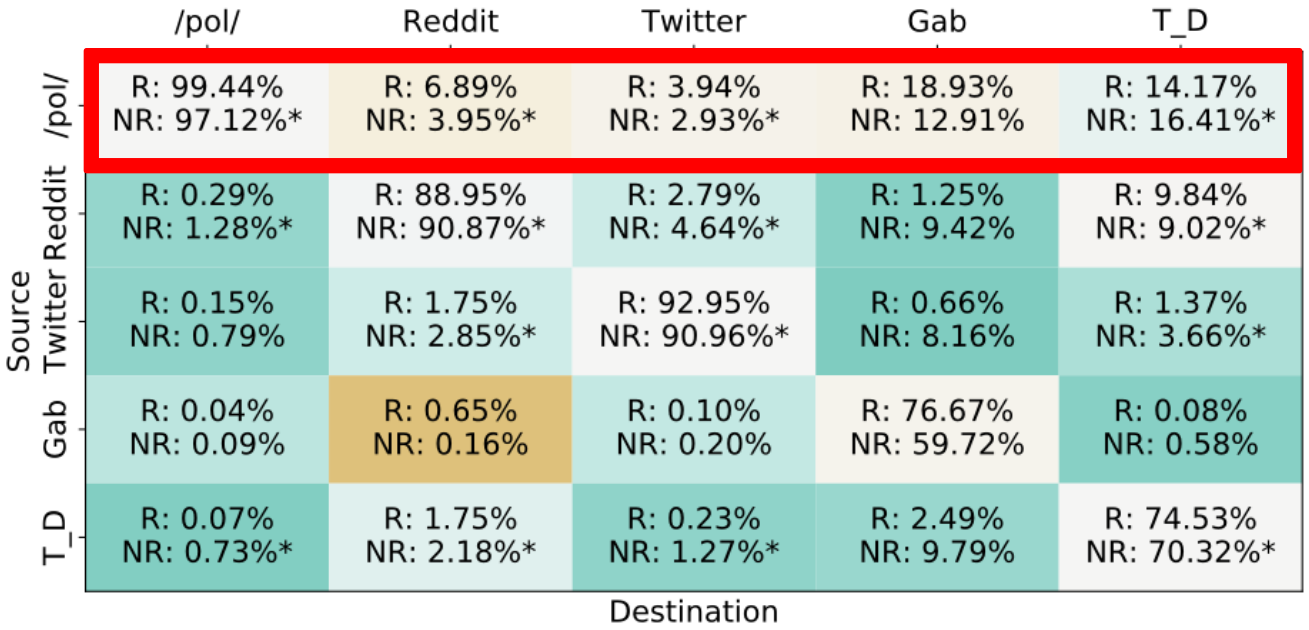


Racist Memes

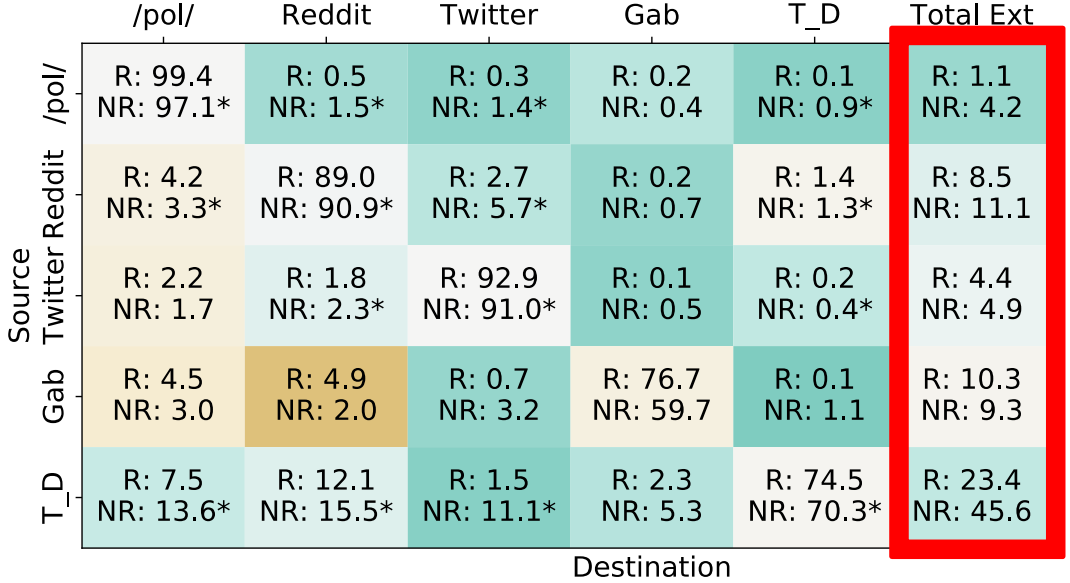
Communities' influence (racist memes)

/pol/ is most influential in terms of spreading racist memes



Communities' efficiency (racist memes)

If we look at the influence normalized to the number of memes posted, the The_Donald is most efficient in terms of disseminating memes



What about state-level adversaries?

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a)

b)

c)

Research Questions

- How do state-sponsored actors operate and evolve?
- How does the behavior of state-sponsored trolls compare to random users?
- More importantly, what was their influence on the Web with respect to the dissemination of news?

What are they posing as?

News accounts?

Nudging users to follow them

Trump supporters

Description			
Word	**(%)**	**Word bigram**	**(%)**
news	10.7%	follow me	7.8%
follow	10.7%	breaking news	2.6%
conservative	8.1%	news aus	2.1%
trump	7.8%	uns in	2.1%
und	6.2%	deiner stdt	2.1%
maga	5.9%	die news	2.1%
love	5.8%	wichtige und	2.1%
us	5.3%	nachrichten aus	2.1%
die	5.0%	aus deiner	2.1%
nachrichten	4.3%	die dn	2.1%

Where are they allegedly posting from?

What hashtags they shared?

Trolls				Baseline			
Hashtag	(%)	Hashtag	(%)	Hashtag	(%)	Hashtag	(%)
news	7.2%	US	0.7%	iHeartAwards	1.8%	UrbanAttires	0.6%
politics	2.6%	tcot	0.6%	BestFanArmy	1.6%	Vacature	0.6%
sports	2.1%	PJNET	0.6%	Harmonizers	1.0%	mPlusPlaces	0.6%
business	1.4%	entertainment	0.5%	iOSApp	0.9%	job	0.5%
money	1.3%	top	0.5%	JouwBaan	0.9%	Directioners	0.5%
world	1.2%	topNews	0.5%	vacature	0.9%	JIMIN	0.5%
MAGA	0.8%	ISIS	0.4%	KCA	0.9%	PRODUCE101	0.5%
health	0.8%	Merkelmussbleiben	0.4%	Psychic	0.8%	VoteMainFPP	0.5%
local	0.7%	IslamKills	0.4%	RT	0.8%	Werk	0.4%
BlackLivesMatter	0.7%	breaking	0.4%	Libertad2016	0.6%	dts	0.4%

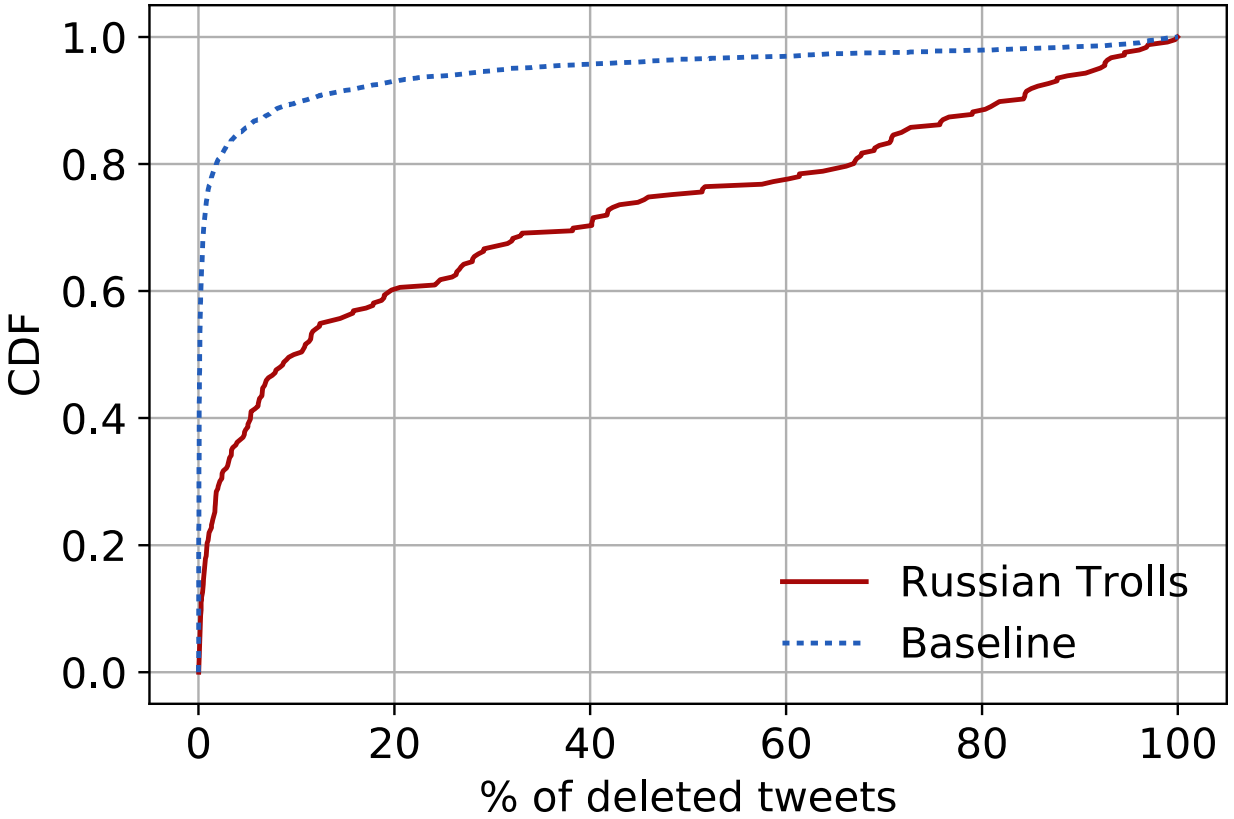
Do Russian trolls change their screen names?

9% of the Russian troll accounts changed their screen name
- Up to 4 times per account

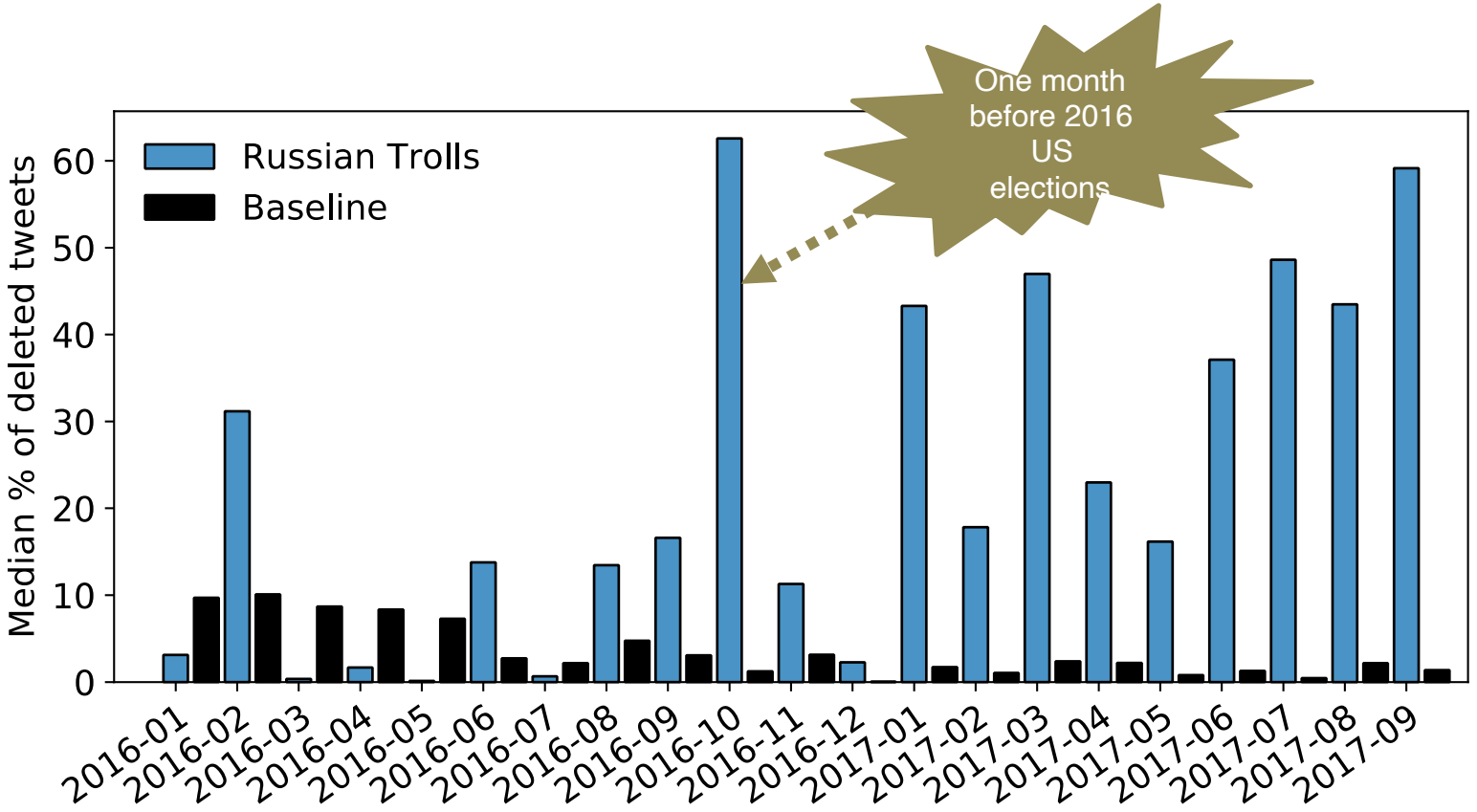
E.g., from “OnlineHouston” to “HoustonTopNews”
- Clear attempt to pose as local news outlet

In our baseline dataset 19% of the accounts changed their screen name
- Up to 11 times per account

Do Russian trolls delete their tweets?



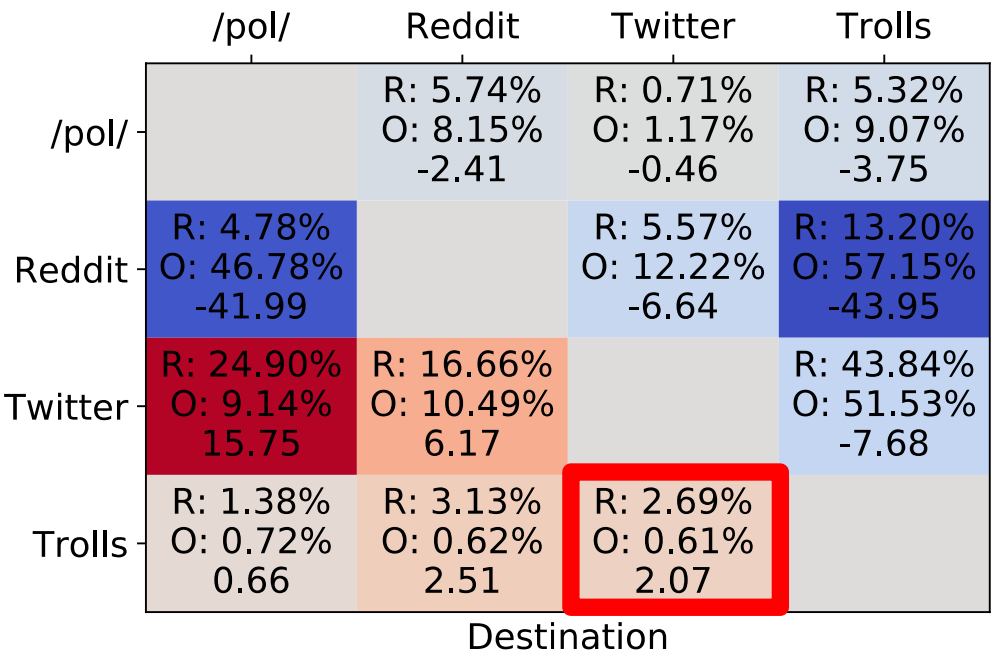
When did Russian trolls deleted their tweets?



Influence

1K trolls caused 2.6% of all Russian state-sponsored news outlets URLs (i.e., RT) on Twitter's 1%.

1K trolls caused 0.6% of all other news outlets URLs on Twitter's 1%.



Main Findings

Differences in the use of the Twitter platform between trolls and random users

Trolls seem to reset their “personas” by changing names and deleting tweets

Particularly influential in spreading Russian state-sponsored URLs on Twitter and other platforms

Moving Forward

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There are still many problems remaining in the broad space

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We have made a lot of progress into gaining a quantitative understanding

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There are still many problems remaining in the broad space

We have made a lot of progress into gaining a quantitative understanding

We now need to deploy **proactive systems in production**

- *Real time* detection of harassment and online attacks
- *Actively* fight weaponized information
- *Policy*
- *Accountability*

Thank you!

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