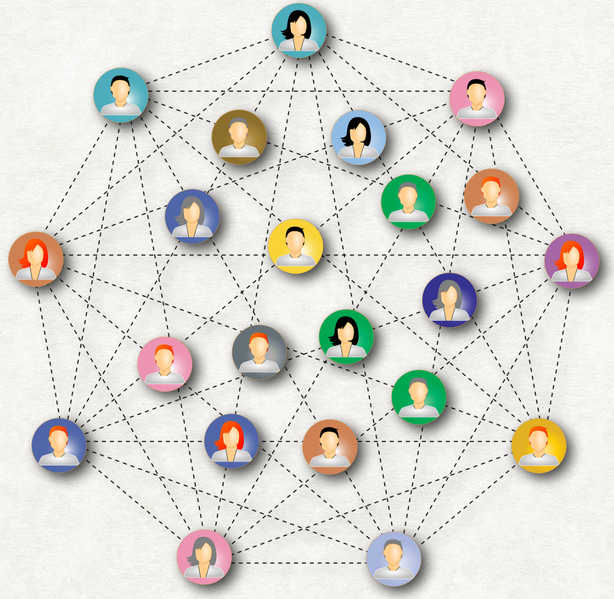
ESTIMATING THE IMPACT OF COORDINATED INAUTHENTIC BEHAVIOR ON CONTENT RECOMMENDATIONS IN SOCIAL NETWORKS



AI4ABM WORKSHOP,
ICML '22

S. MEHTA, A.G. BAYDIN, B. STATE,
R. BONNEAU, J. NAGLER, P.H. TORR

COORDINATED INAUTHENTIC BEHAVIOR

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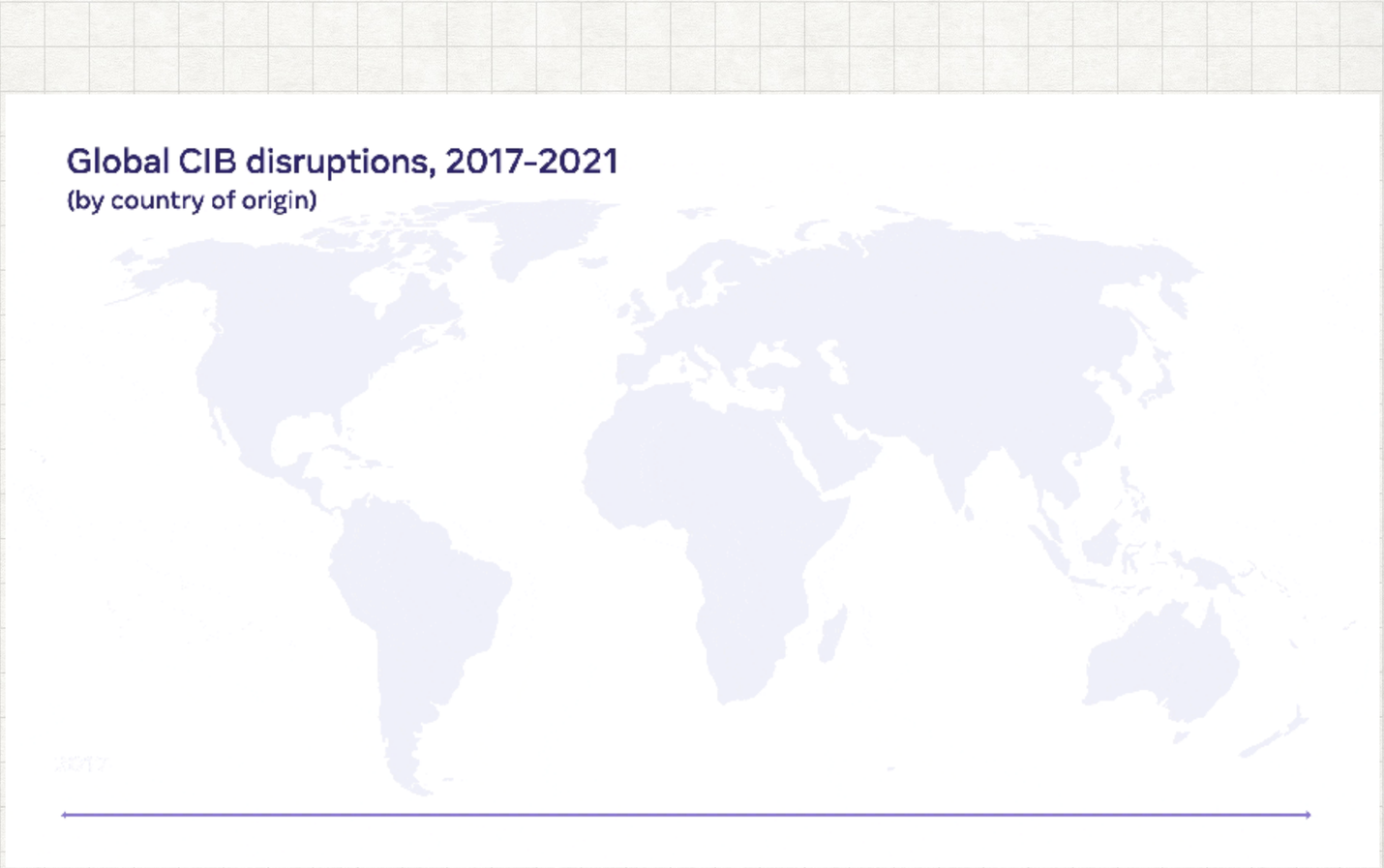

COORDINATED INAUTHENTIC BEHAVIOR

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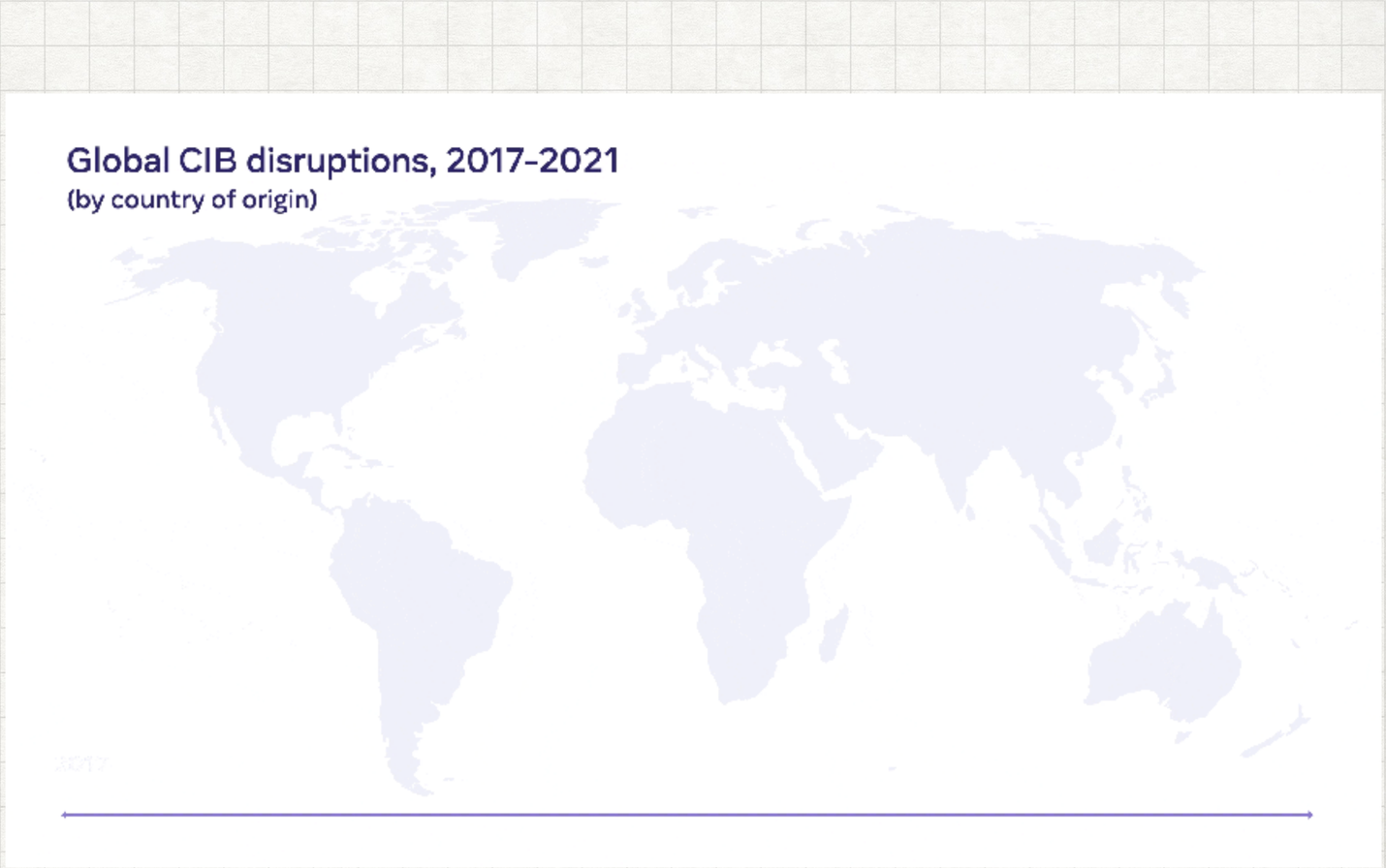
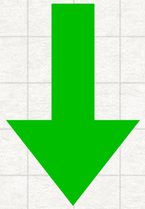
- There are global coordinated networks of accounts promoting disinformation on social networks.
- Meta and Twitter release transparency reports about them a while after taking them down.
- No real-time solution nor verified damage assessment because effects are hard to quantify externally!



(COST TO)
MITIGATE THESE INFLUENCE OPS!

MEASURING THE HARMS DUE TO COORDINATED INAUTHENTIC BEHAVIOR



(COST TO) MITIGATE THESE INFLUENCE OPS!

RESEARCH GOALS

- RQ: Quantify the relative impact of different algorithmic choices that a platform makes, for instance:

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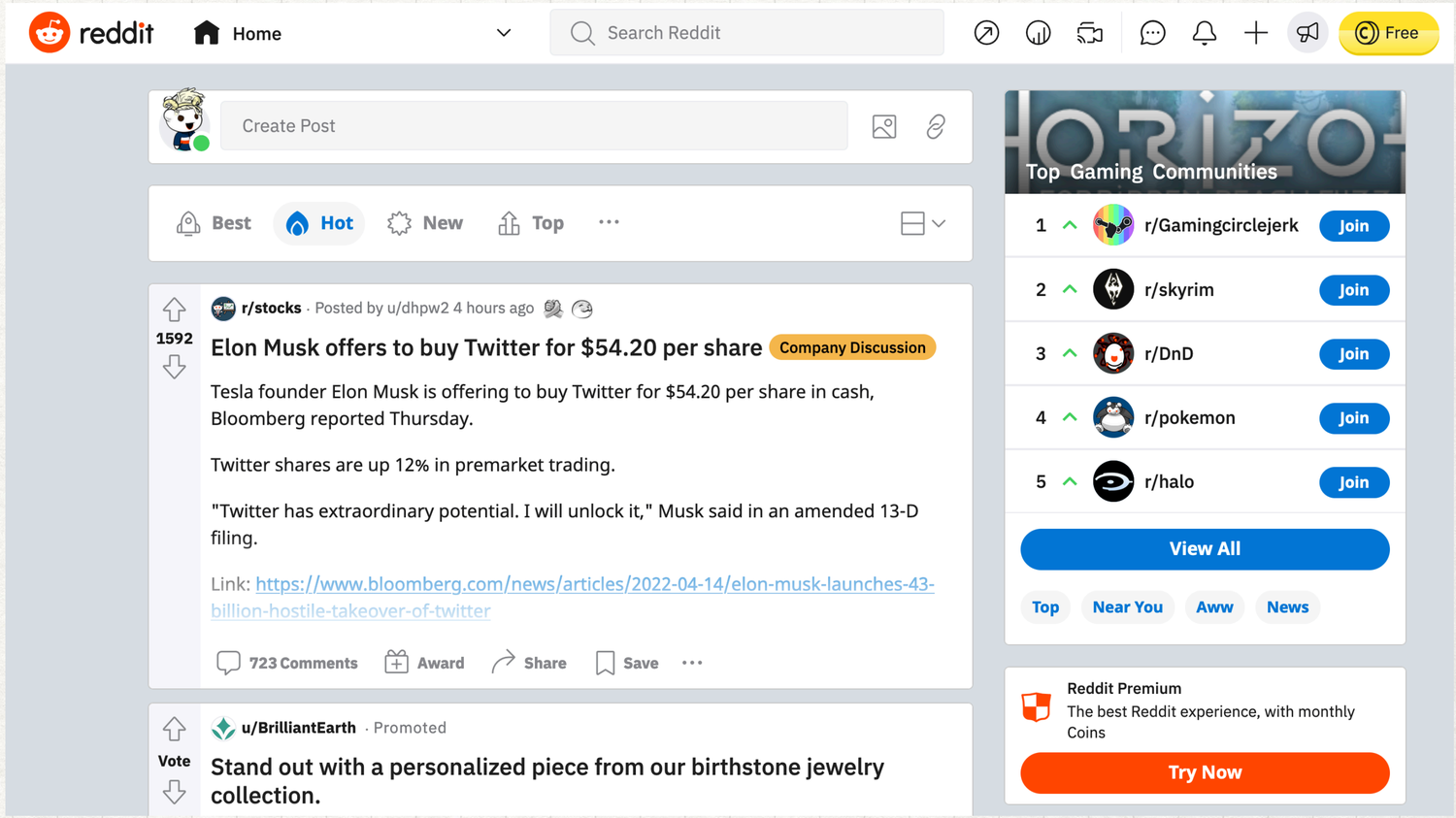
  - What about "controversial" opinions?
  - Susceptibility varies by community. Will penalties on engagement with disinformation be fair to apply?

SIMULATE A SOCIAL NETWORK

- Reddit is a pseudonymous social network comprising users who are part of like-minded groups or subreddits
- It has a community-based structure
- The state-action space for a user includes:
  - Create a post/comment
  - Upvote a post/comment
  - Downvote a post/comment
  - Cross-post an existing post



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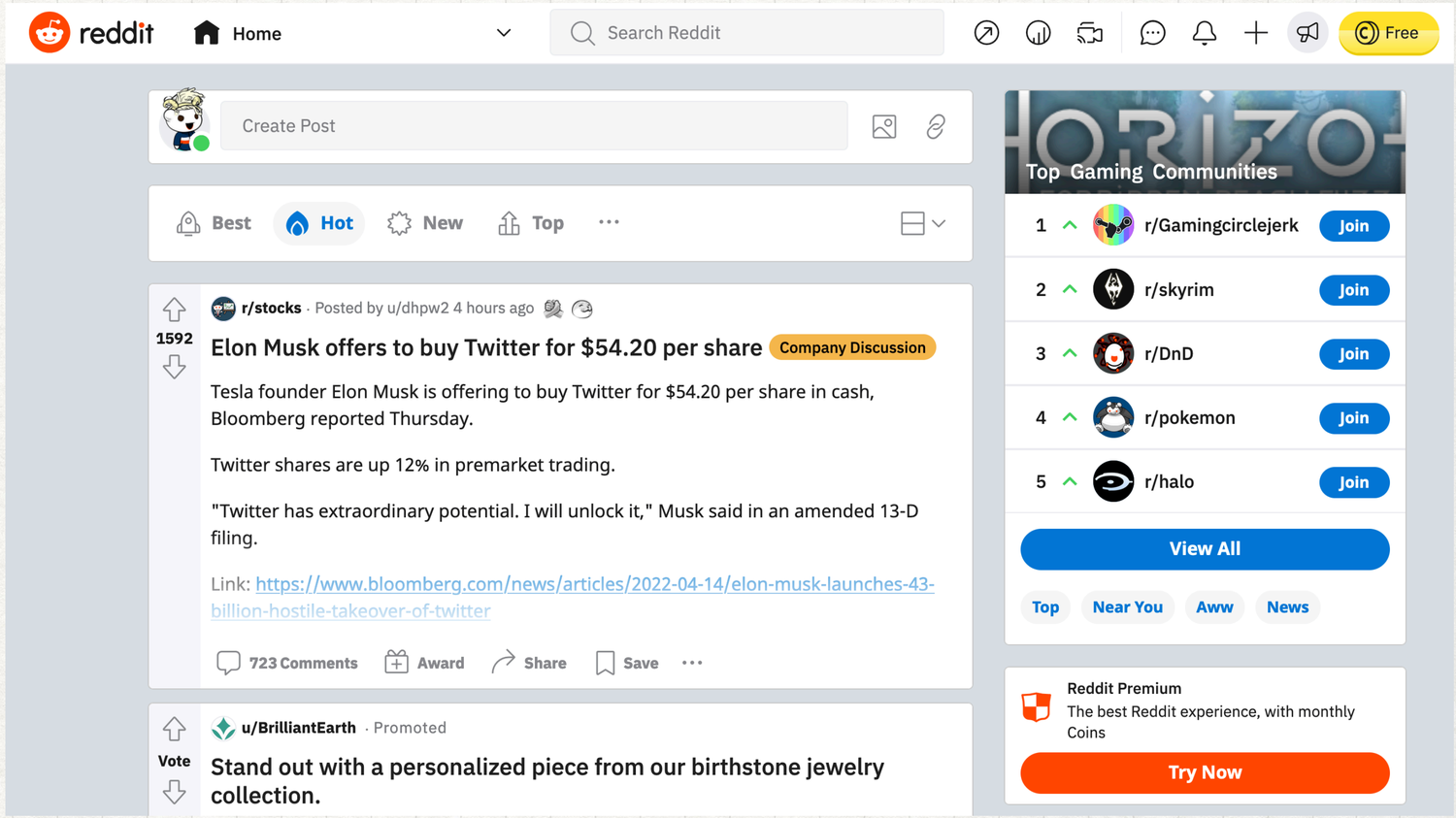

SIMULATING SOCIAL NETWORKS

REDDIT

- Developing a model for a user's posting behavior
- Creating a story of how a user interacts with Reddit

Algorithm 6: Simulating User Activity on Reddit

$N \in \mathbb{N}$: Number of users
$T \in \mathbb{N}$: Time steps
$S \in \mathbb{N}$: Number of sub-reddit categories
$\{\pi_i \in \text{Uniform}(0,1)\}_{i=1,j=1}^{N,S}$ ▷ Interaction frequency

procedure REDDIT
Sample latents:
$\boldsymbol{\upsilon} \leftarrow \{\upsilon_i \sim \text{Uniform}(0,1)\}_{i=1,j=1}^{N,S}$ ▷ Interaction propensity over subreddit categories
Simulate:
    $\Phi_{1:N} \leftarrow \langle\rangle$ ▷ User Activity
    for $t = 1 : T$ **do**
        for $i = 1 : N$ **do**
            $\gamma \sim \text{Categorical}(\pi_i)$ ▷ Choose Subreddit (category)
            $\tau \sim \text{Bernoulli}(\upsilon_{i,\gamma})$ ▷ Interact with Subreddit (category)
            $\Phi_i \leftarrow \Phi_i + \langle\tau\rangle$ ▷ Append to user's activity
    return $\Phi_{1:N}$ ▷ All user activity

SIMULATING SOCIAL NETWORKS

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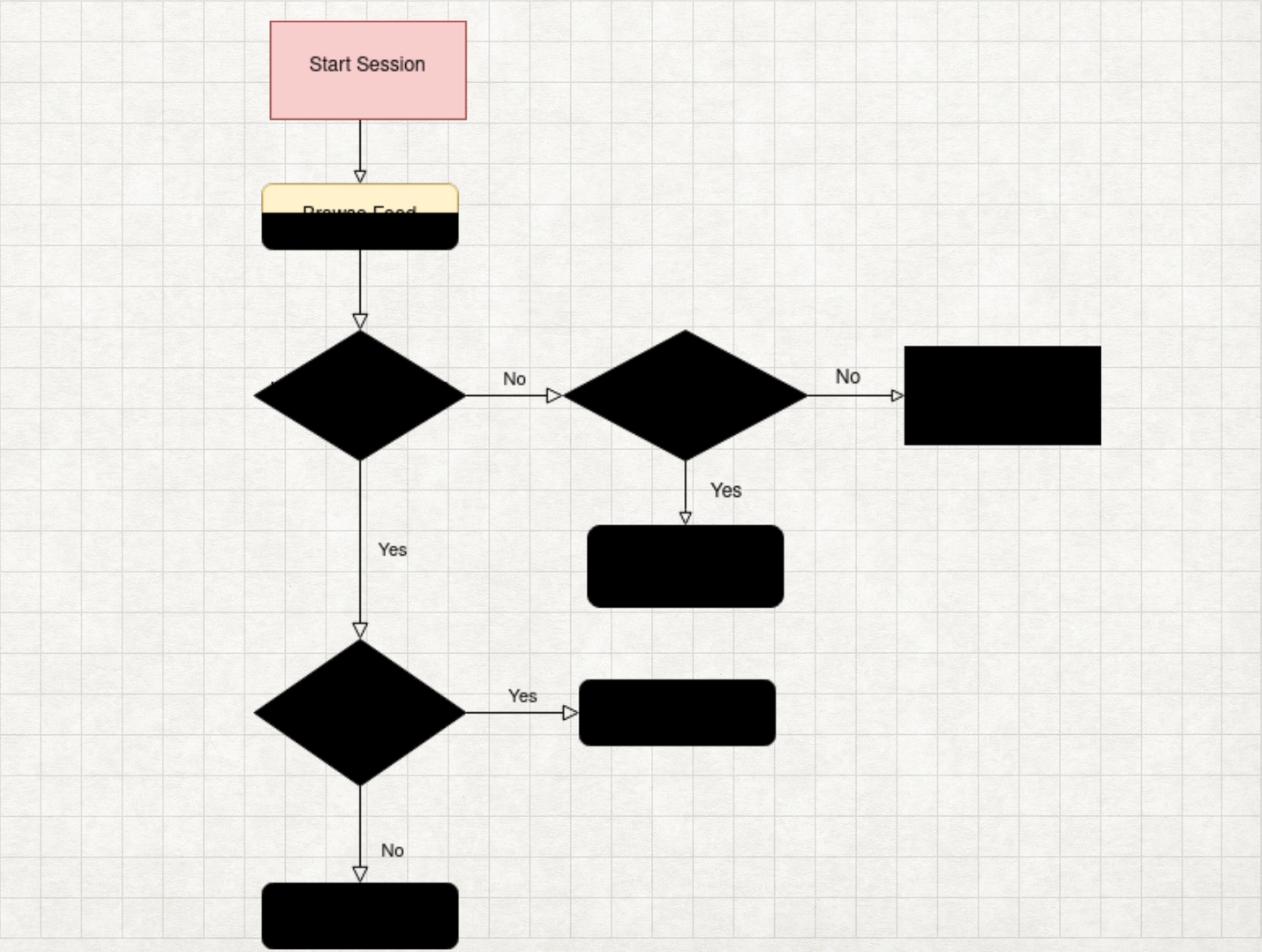
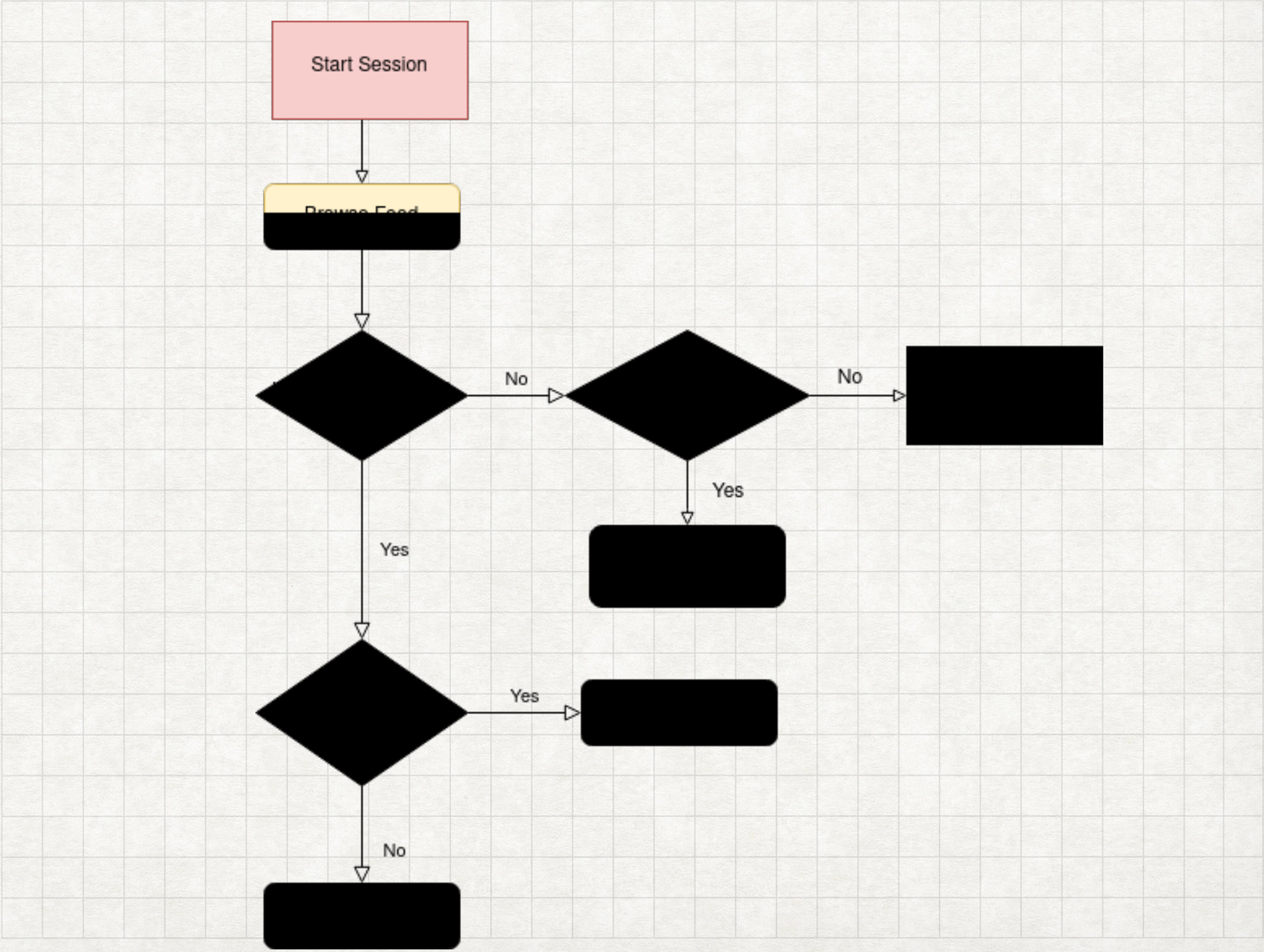


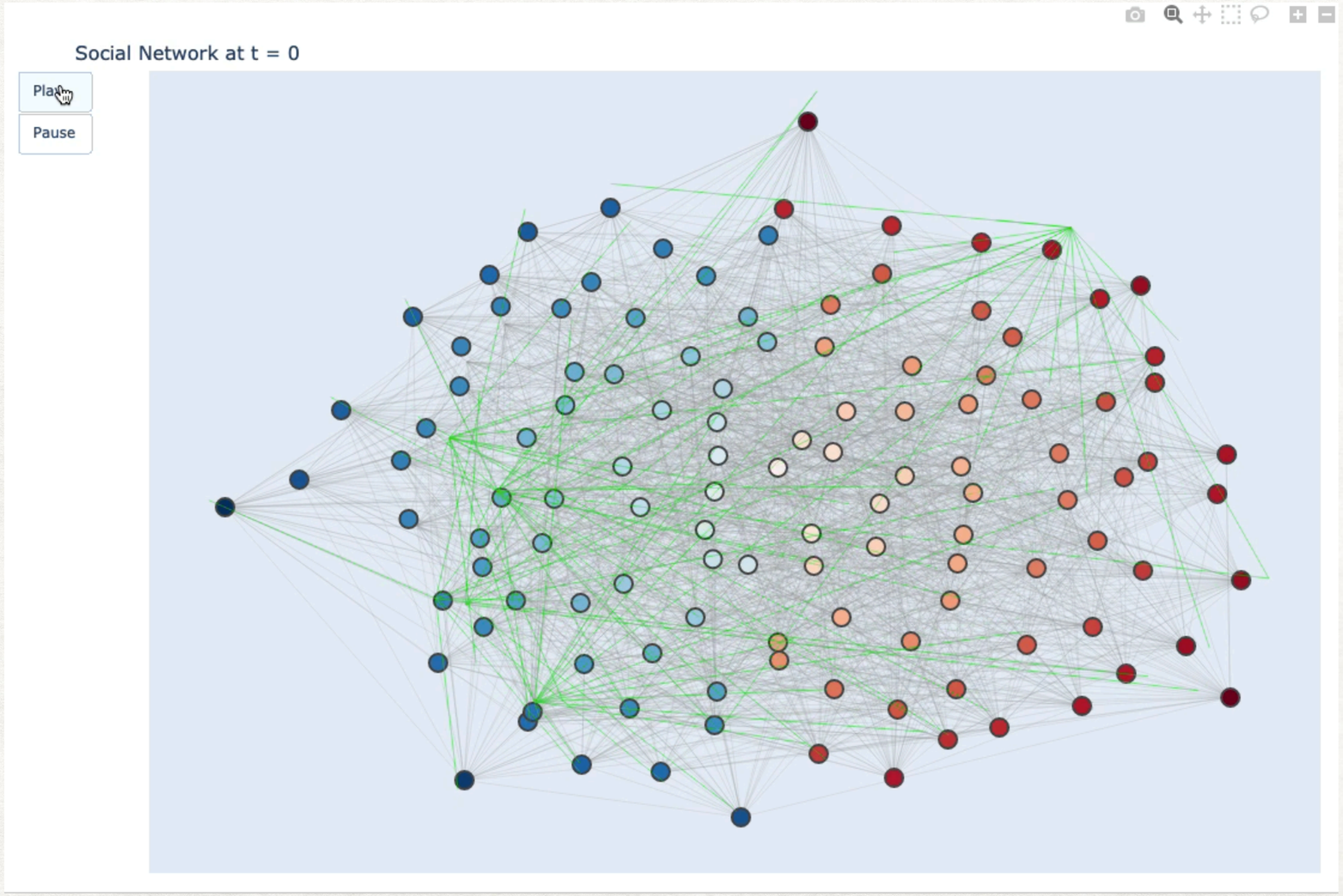
SIMULATING SOCIAL NETWORKS

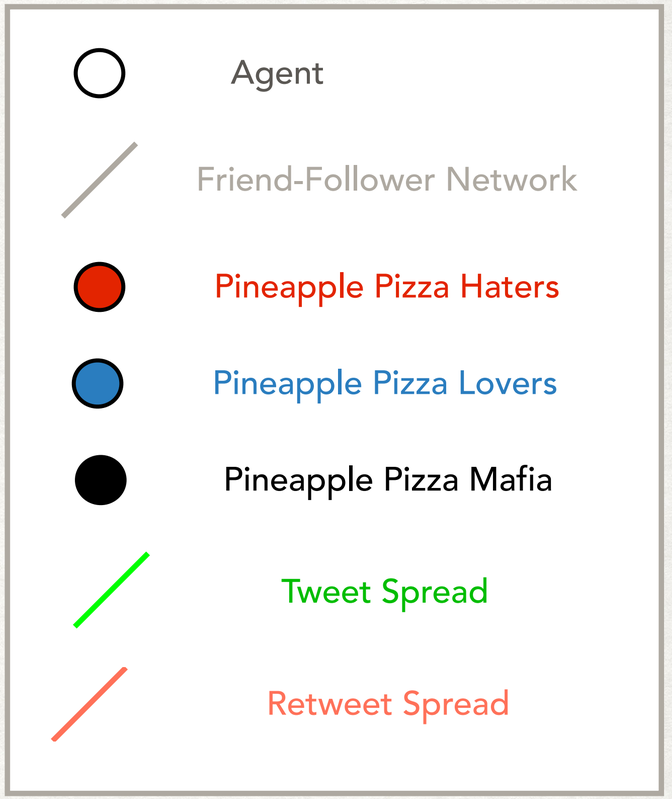
REDDIT

- Developing a model for a user's posting behavior
- Creating a story of how a user interacts with Reddit
- Use the data to set priors on interaction frequency
- Simulate counterfactual outcomes!



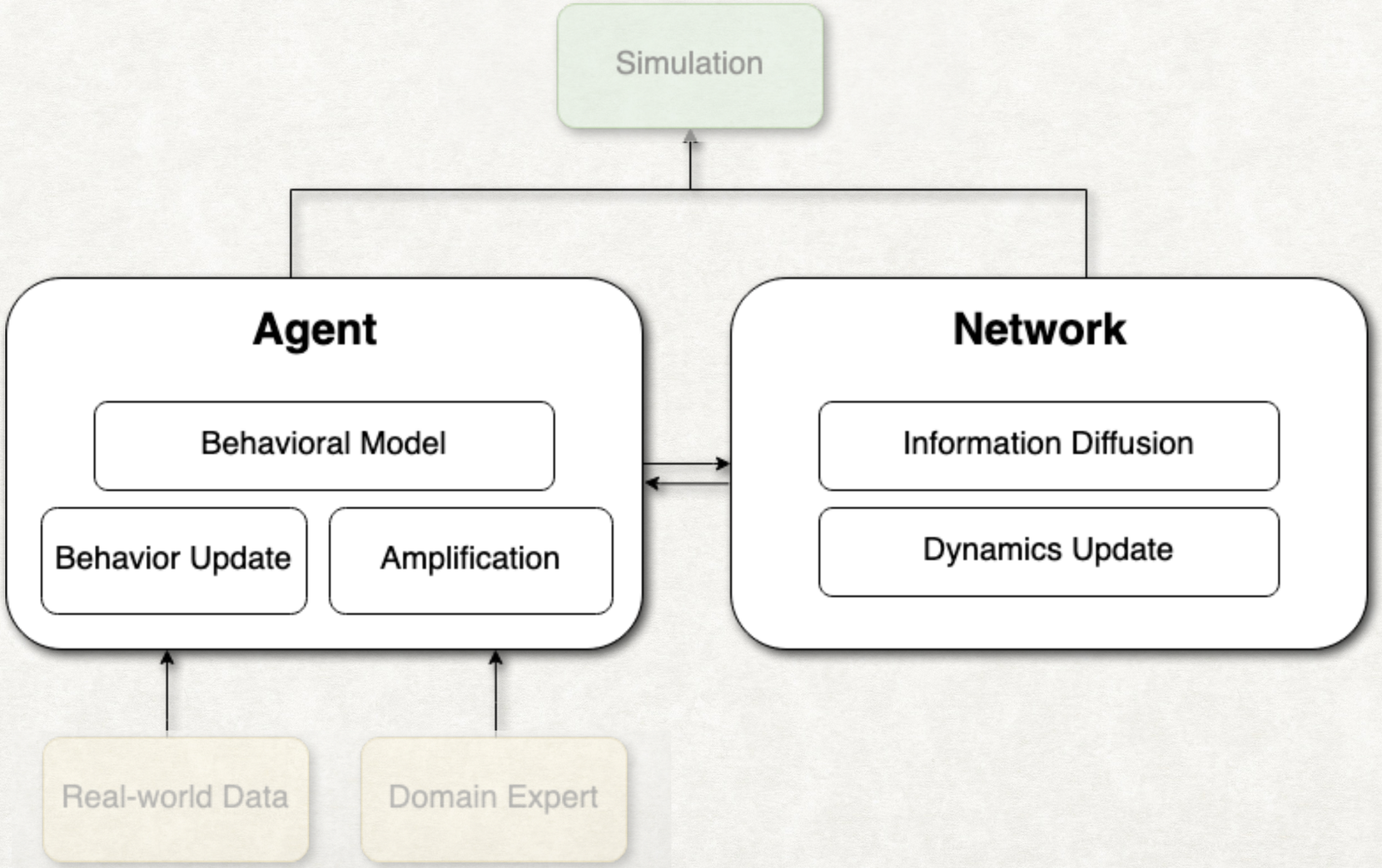
SIMULATING SOCIAL NETWORKS



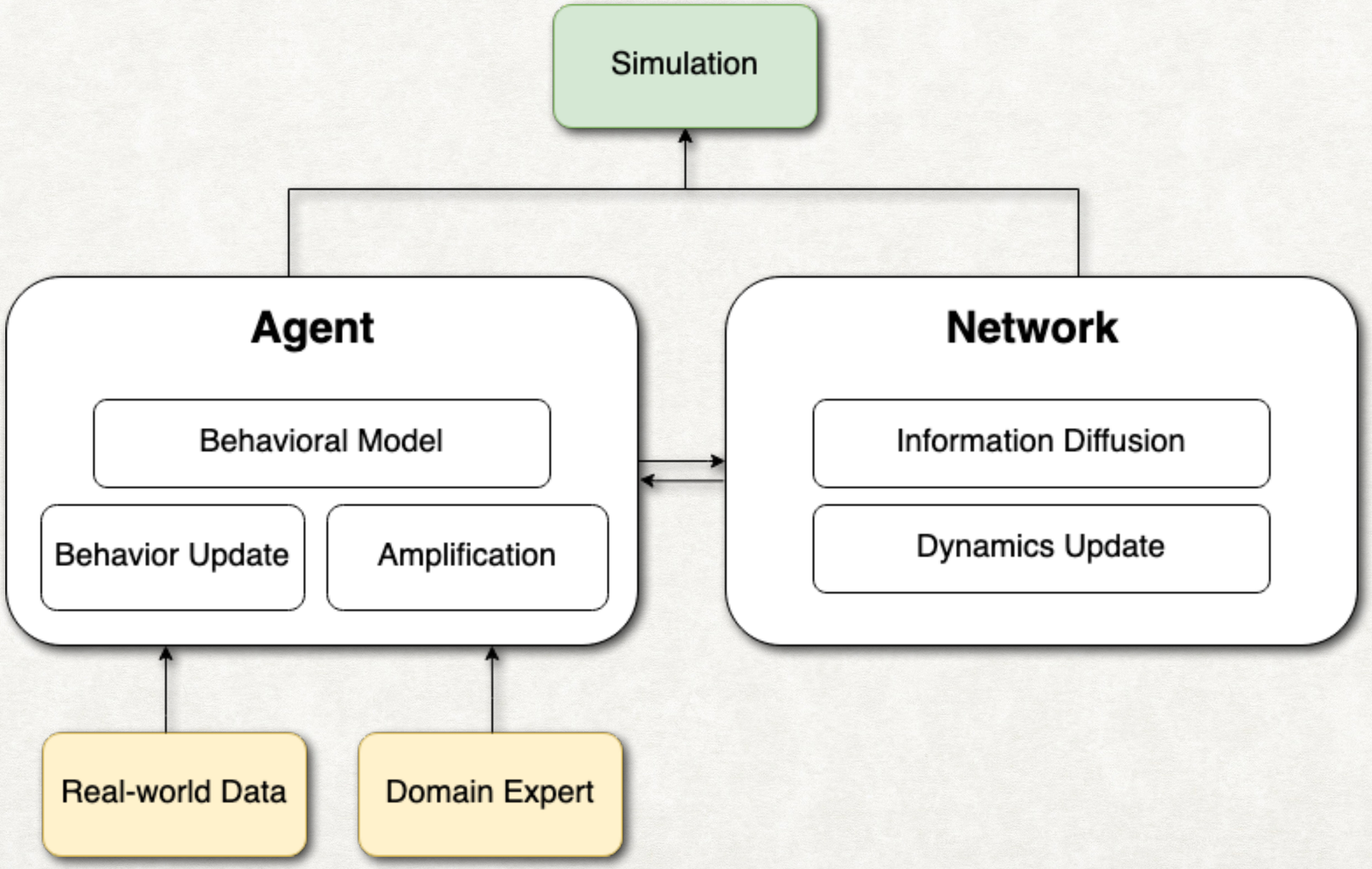


https://youtu.be/GV5XuftiD7s

SIMPPL


Simulation
Agent
Behavioral Model
Behavior Update
Amplification
Network
Information Diffusion
Dynamics Update
Real-world Data
Domain Expert

SIMPPL


Simulation
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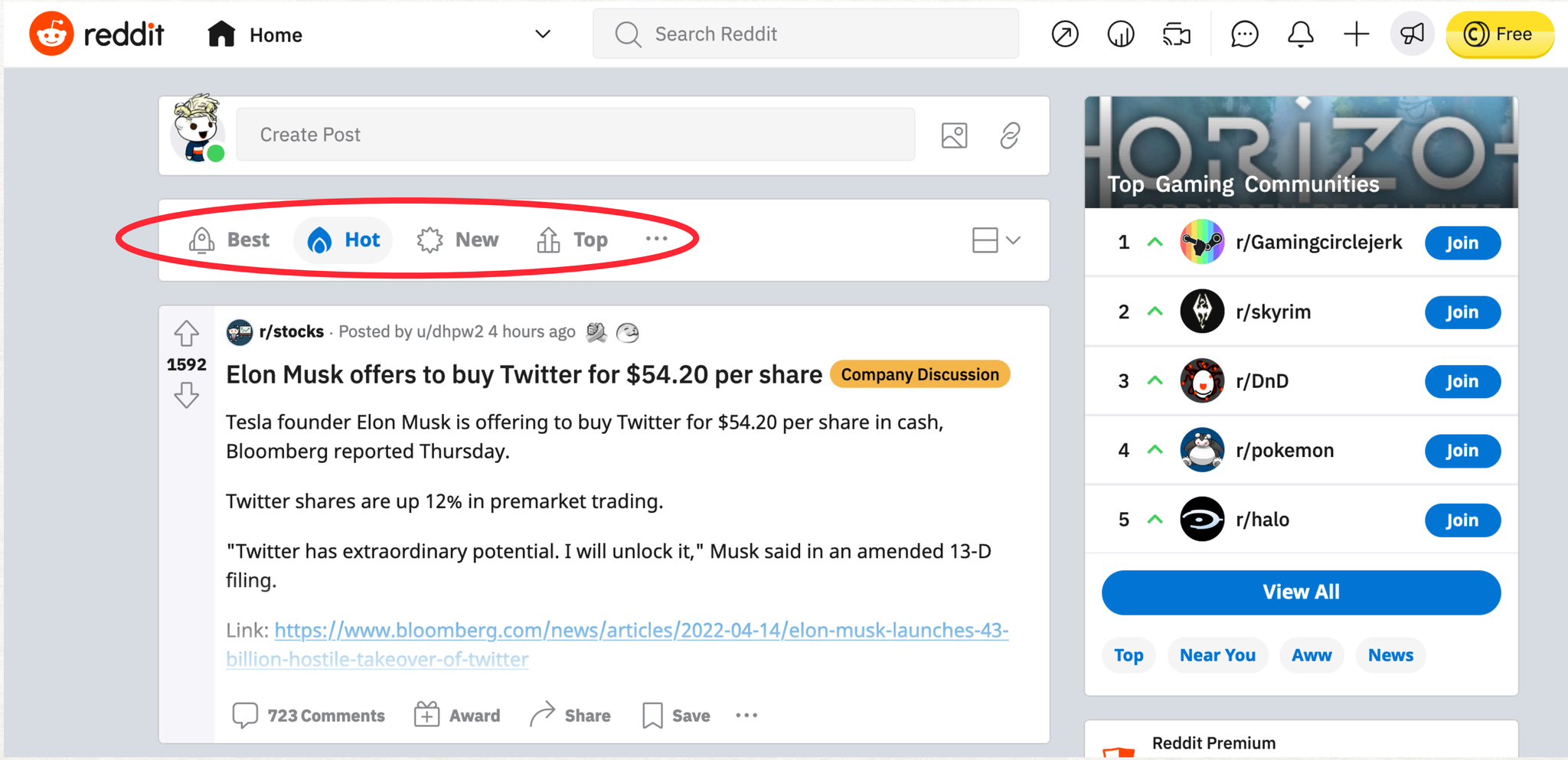
DISINFORMATION MANOEUVRES

	Manipulating the narrative		Manipulating the social network	
Positive	**Engage**	Messages that bring up a related but relevant topic	**Back**	Actions that increase the importance of the opinion leader or create a new opinion leader
	Explain	Messages that provides details on or elaborate the topic	**Build**	Actions that create a group or the appearance of a group
	Excite	messages that elicit a positive emotion such as joy or excitement	**Bridge**	Actions that build a connection between two or more groups
	Enhance	Messages that encourage the topic-group to continue with the topic	**Boost**	Actions that grow the size of the group or make it appear that it has grown
Negative	**Dismiss**	Messages about why the topic is not important	**Neutralize**	Actions decrease the importance of the opinion leader
	Distort	Messages that alter the main message of the topic	**Nuke**	Actions that lead to a group being dismantled or breaking up, or appearing to be broken up
	Dismay	Messages that elicit a negative emotion such as sadness or anger	**Narrow**	Actions that lead to a group becoming sequestered from other groups or marginalized
	Distract	Discussion about a totally different topic and irrelevant	**Neglect**	Actions that reduce the size of the group or make it appear that the group has grown smaller

K. Carley, 2020

REDDIT RECOMMENDER SYSTEMS



RANKING AND RECOMMENDATION ALGORITHMS

New	Top	Rising	Controversial	Best (Personalized)
Age of Post	Age of Post			Age of Post
	# of Upvotes	# of Upvotes	# of Upvotes	# of Upvotes
			# of Downvotes	
		Age of Votes		
		Age of Comments		
				Relevance to User
				Subreddit Membership

USING REAL-WORLD DATA TO DRIVE THE SIMULATIONS

REDDIT DATA COLLECTION

r/politics

r/politics Posts

2.7M posts

+

r/politics Comments

23M comments

REDDIT DATA COLLECTION

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User Interactions

REDDIT DATA COLLECTION

r/politics

r/politics Posts

2.7M posts

+

r/politics Comments

23M comments

Author

255K users

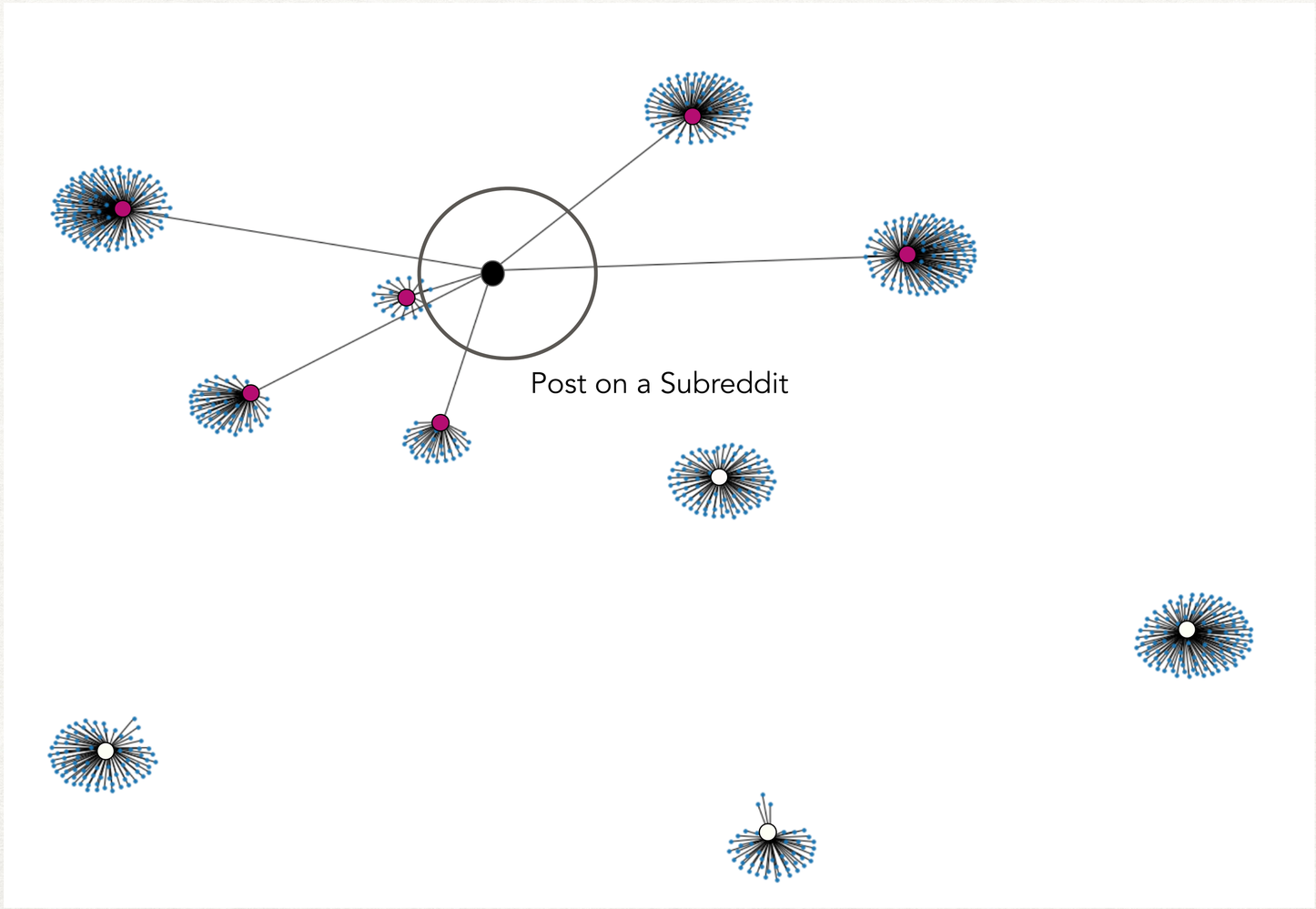
Commenter

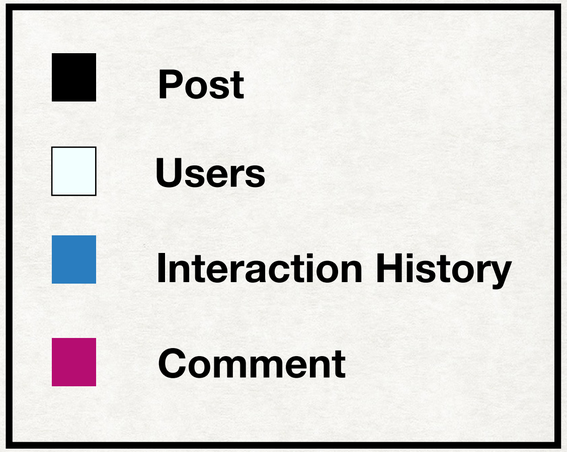
1M users

User Interactions

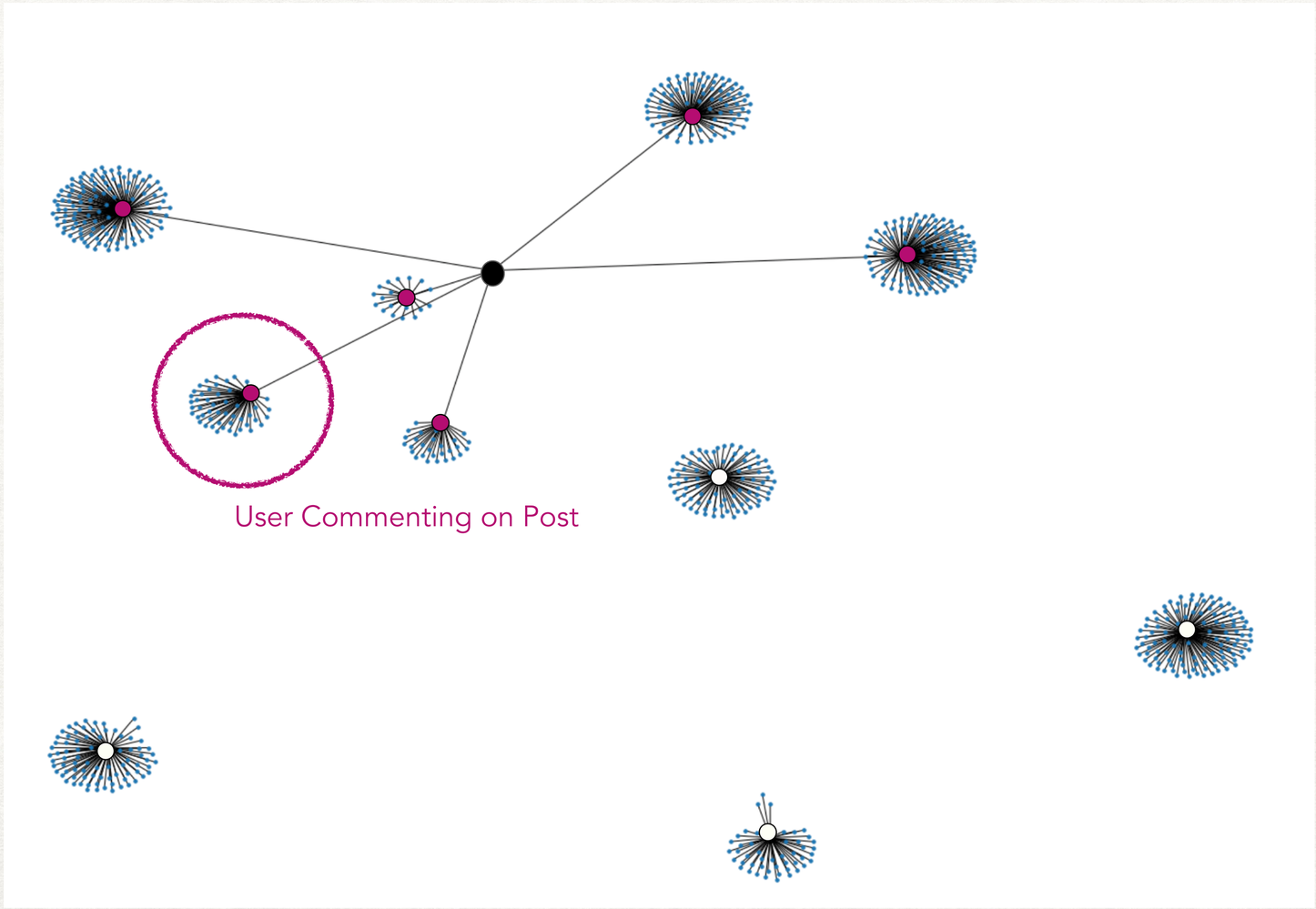
14M comments and posts

REDDIT POST


Post on a Subreddit


Post
Users
Interaction History
Comment

REDDIT POST



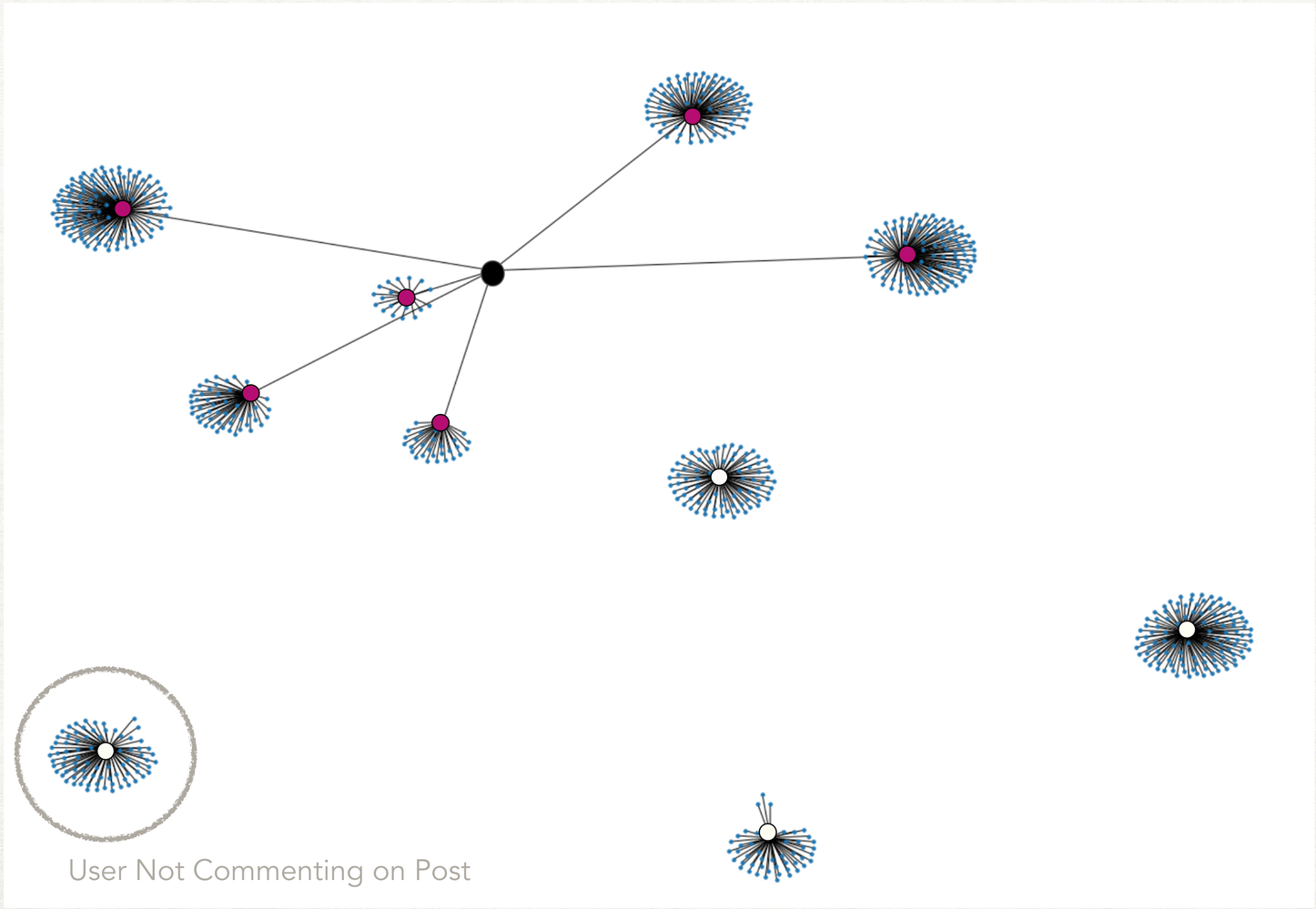
Post

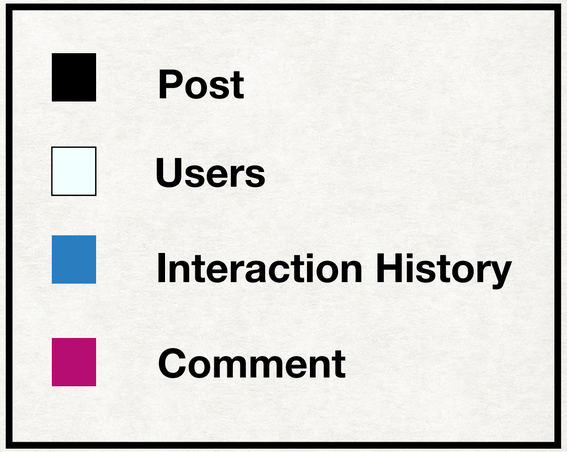
Users

Interaction History

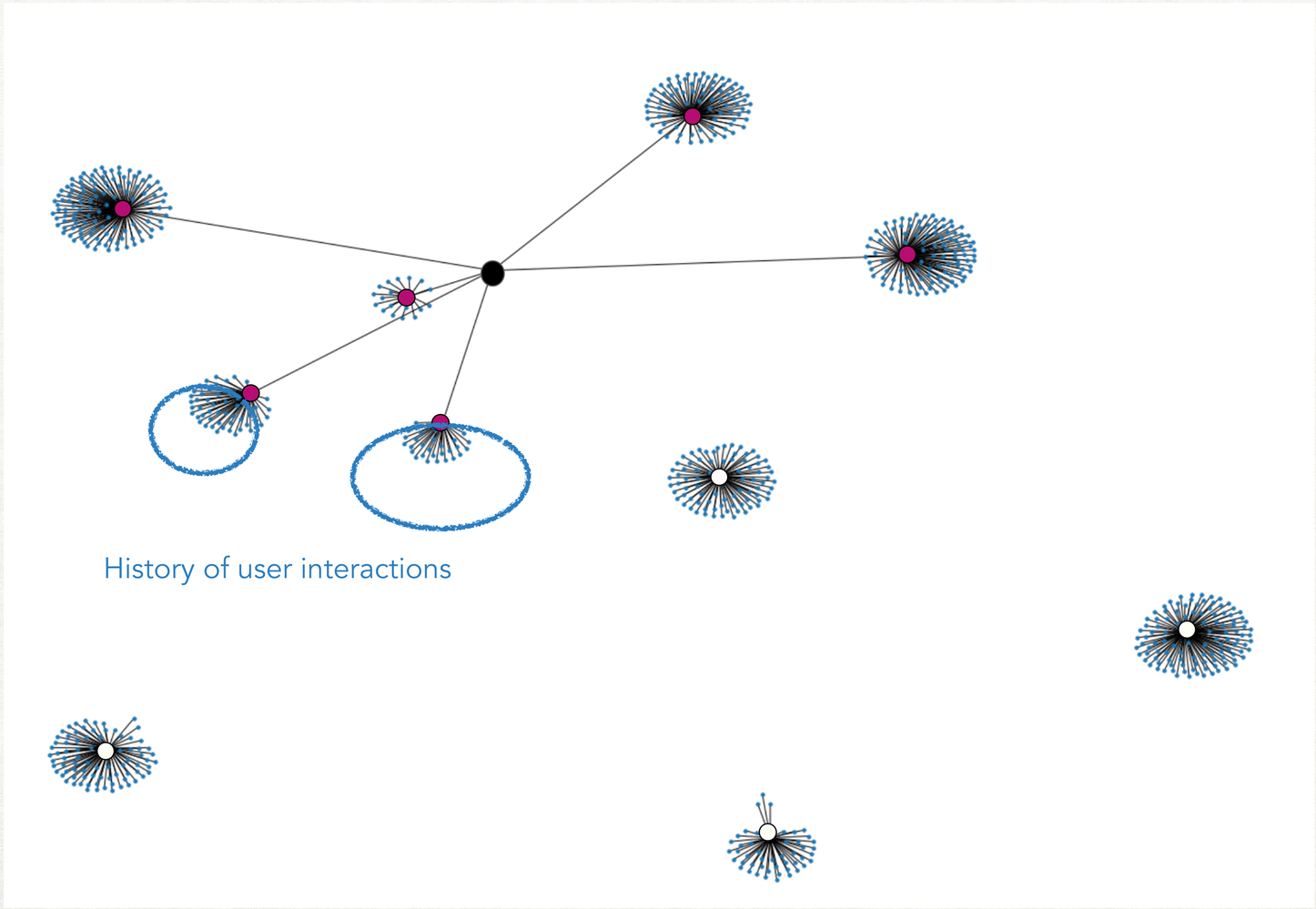
Comment

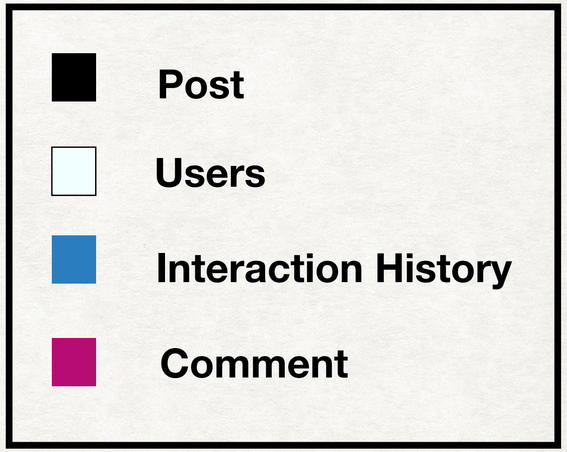
REDDIT POST


User Not Commenting on Post

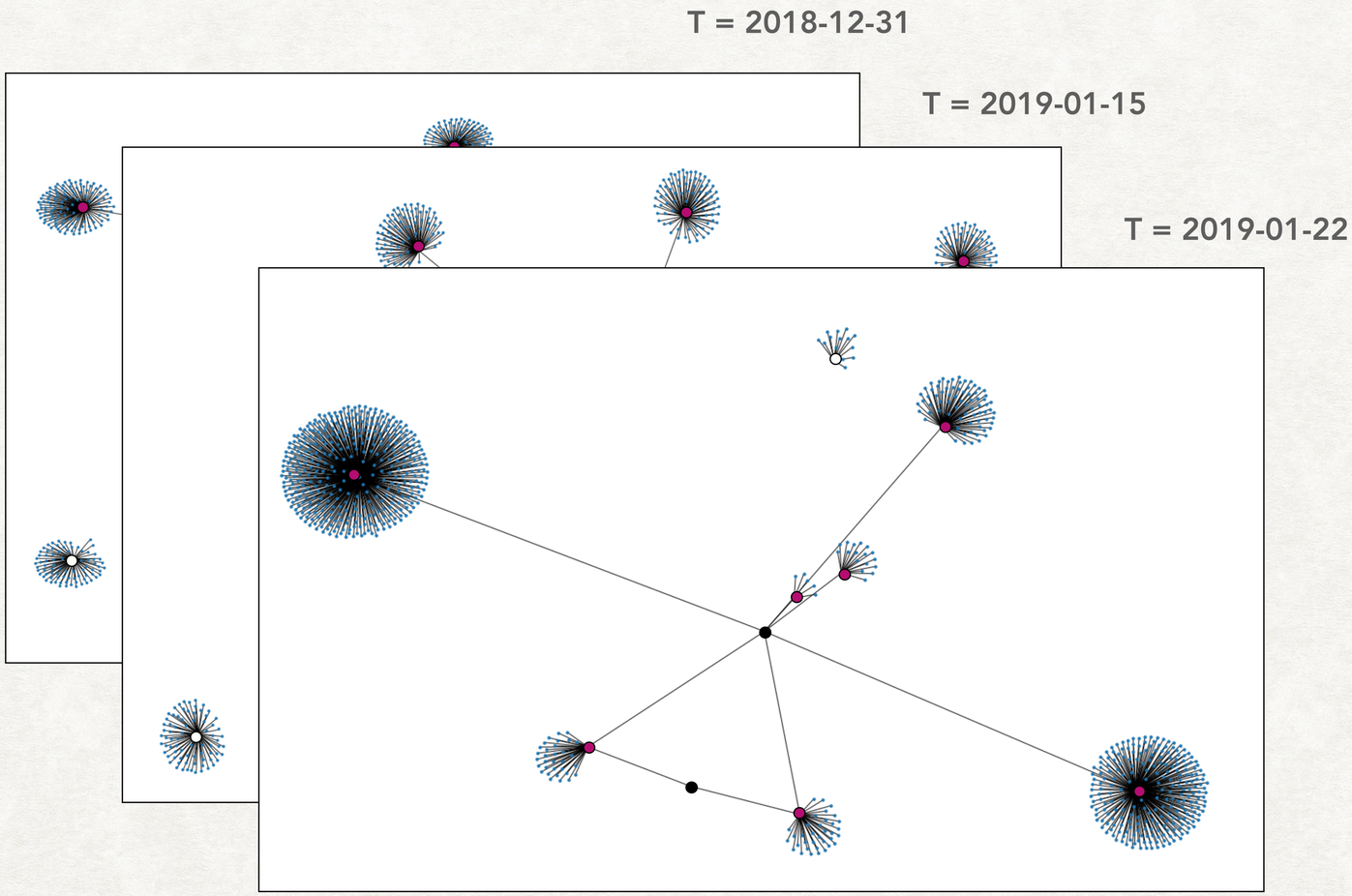

Post
Users
Interaction History
Comment

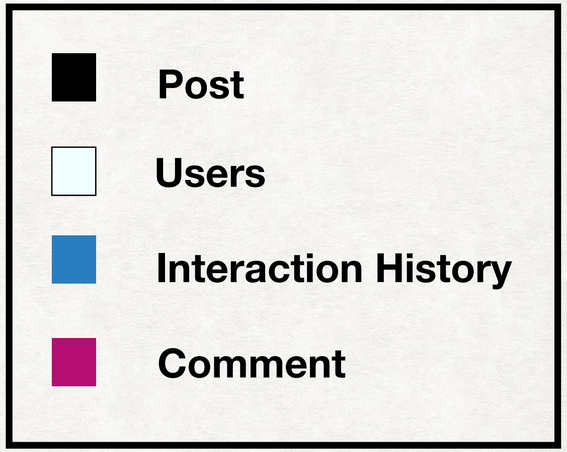
REDDIT POST


History of user interactions


Post
Users
Interaction History
Comment

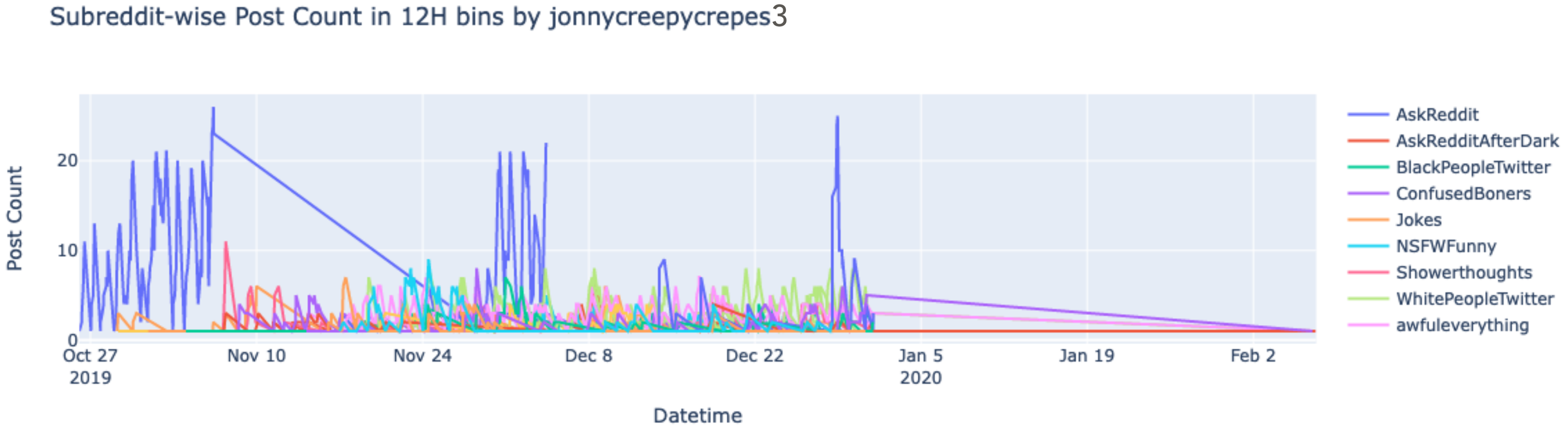
POLITICS POSTS





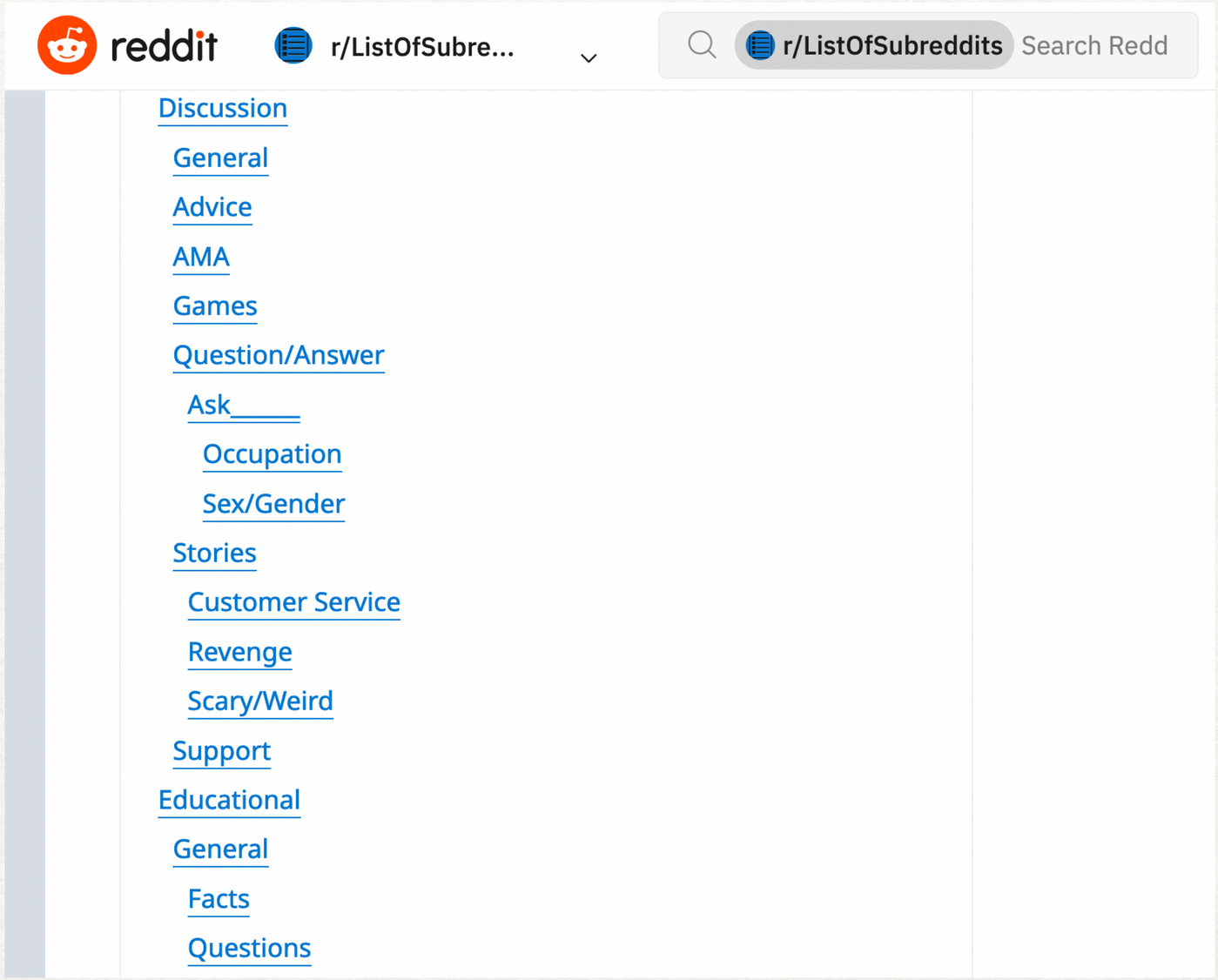
REAL-WORLD MODELING

REDDIT USER 'JONNYCREEPYCREPES3'



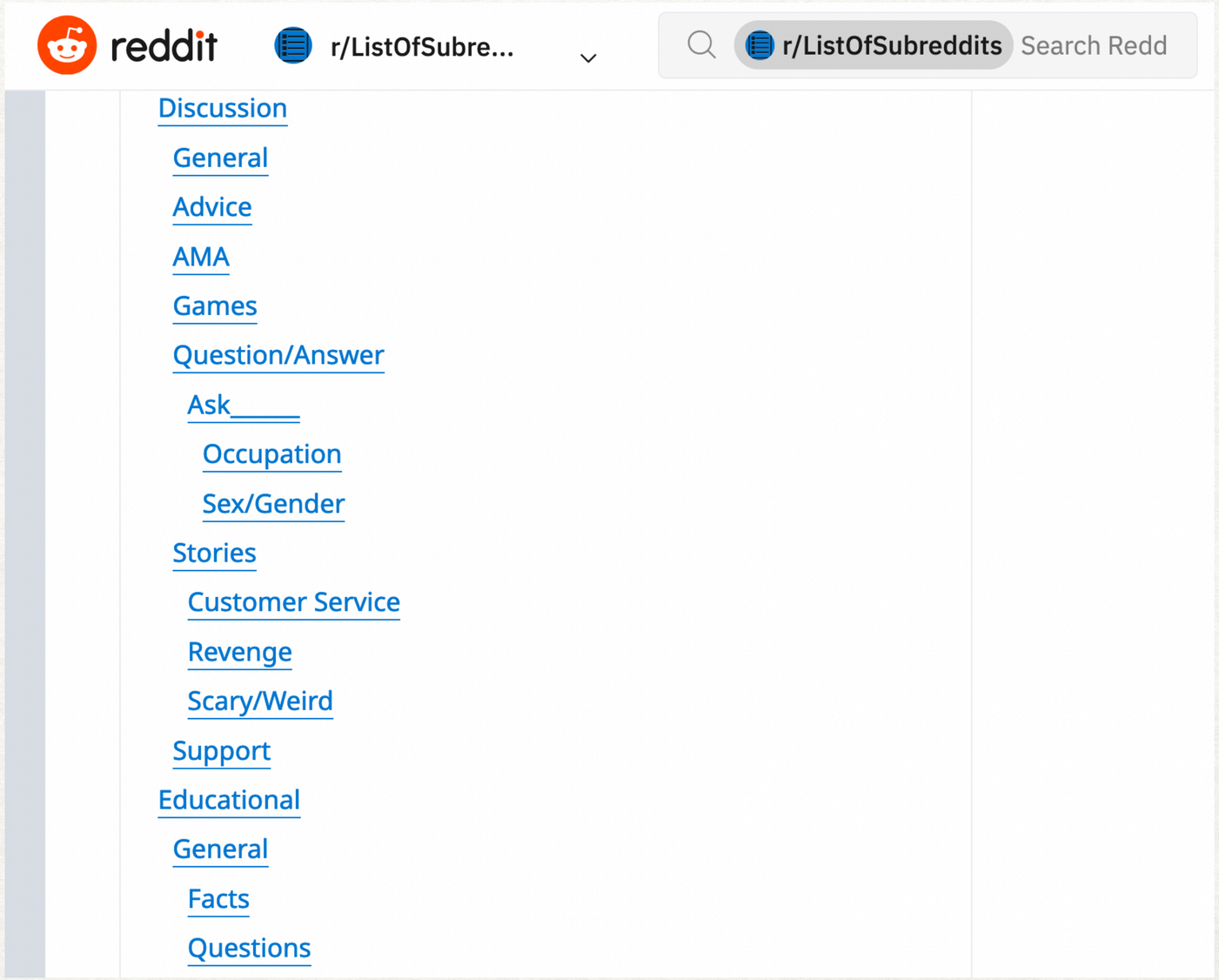
REDDIT WIKI PAGES

- User-driven hierarchical categorization of subreddits
- Discussion > Stories > Customer Service
- 4998 subreddits
- 5-level hierarchy of categories

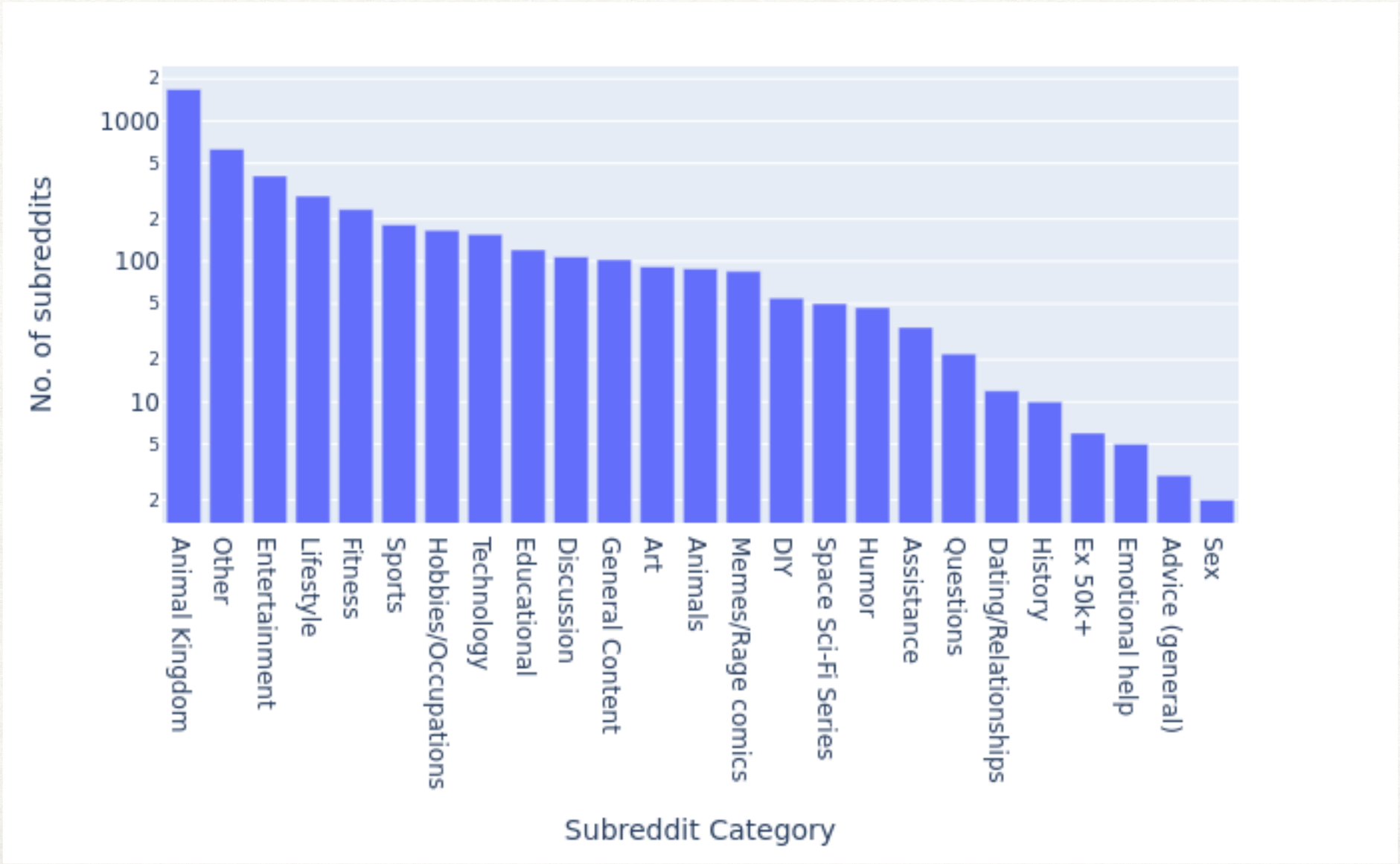


REDDIT WIKI PAGES

- User-driven hierarchical categorization of subreddits
- Discussion > Stories > Customer Service
- 4998 subreddits
- 5-level hierarchy of categories
- For each new subreddit
  - Split words > match embeddings > associate category



CATEGORIZE POSTS ACROSS SUBREDDITS



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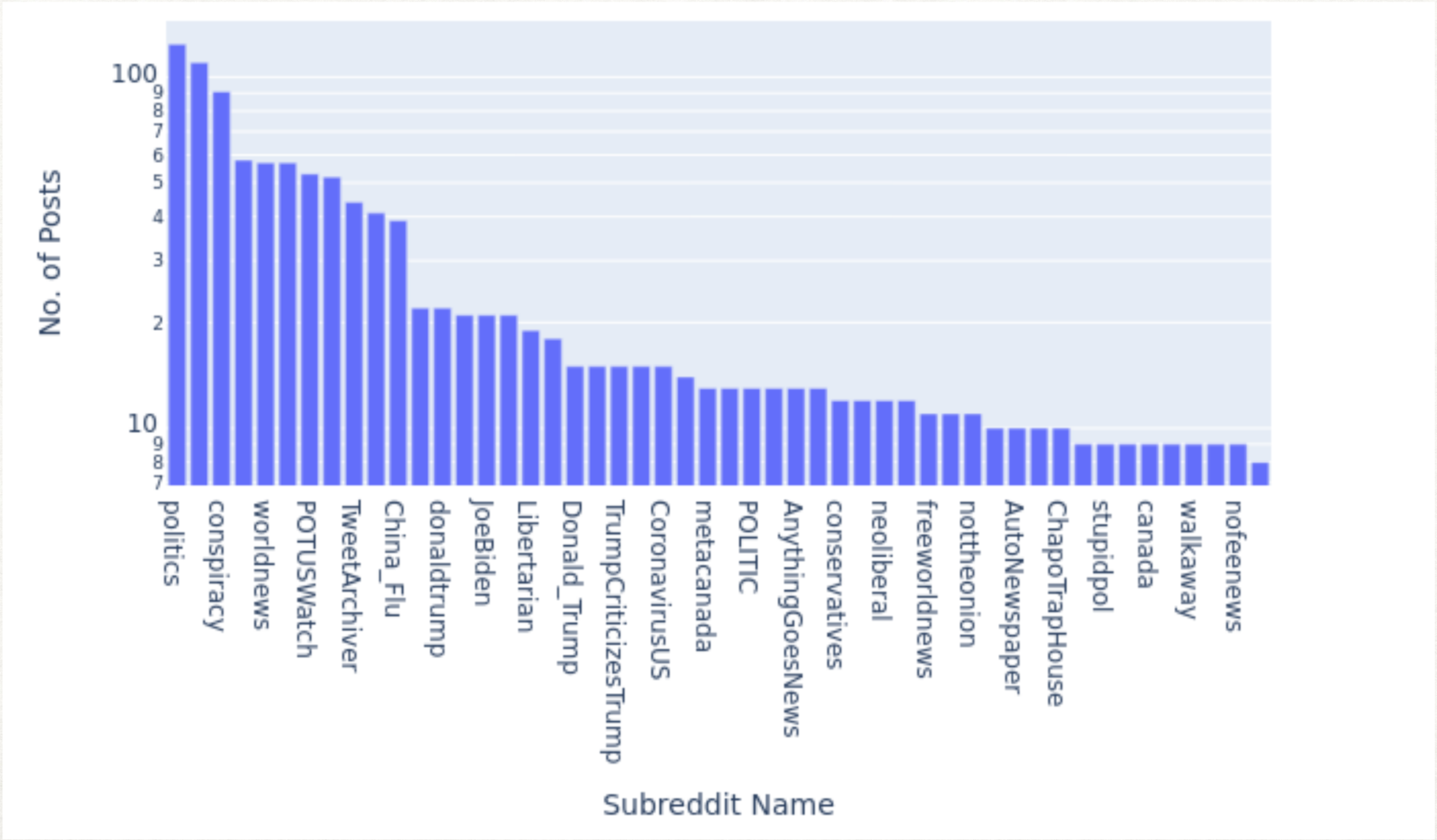

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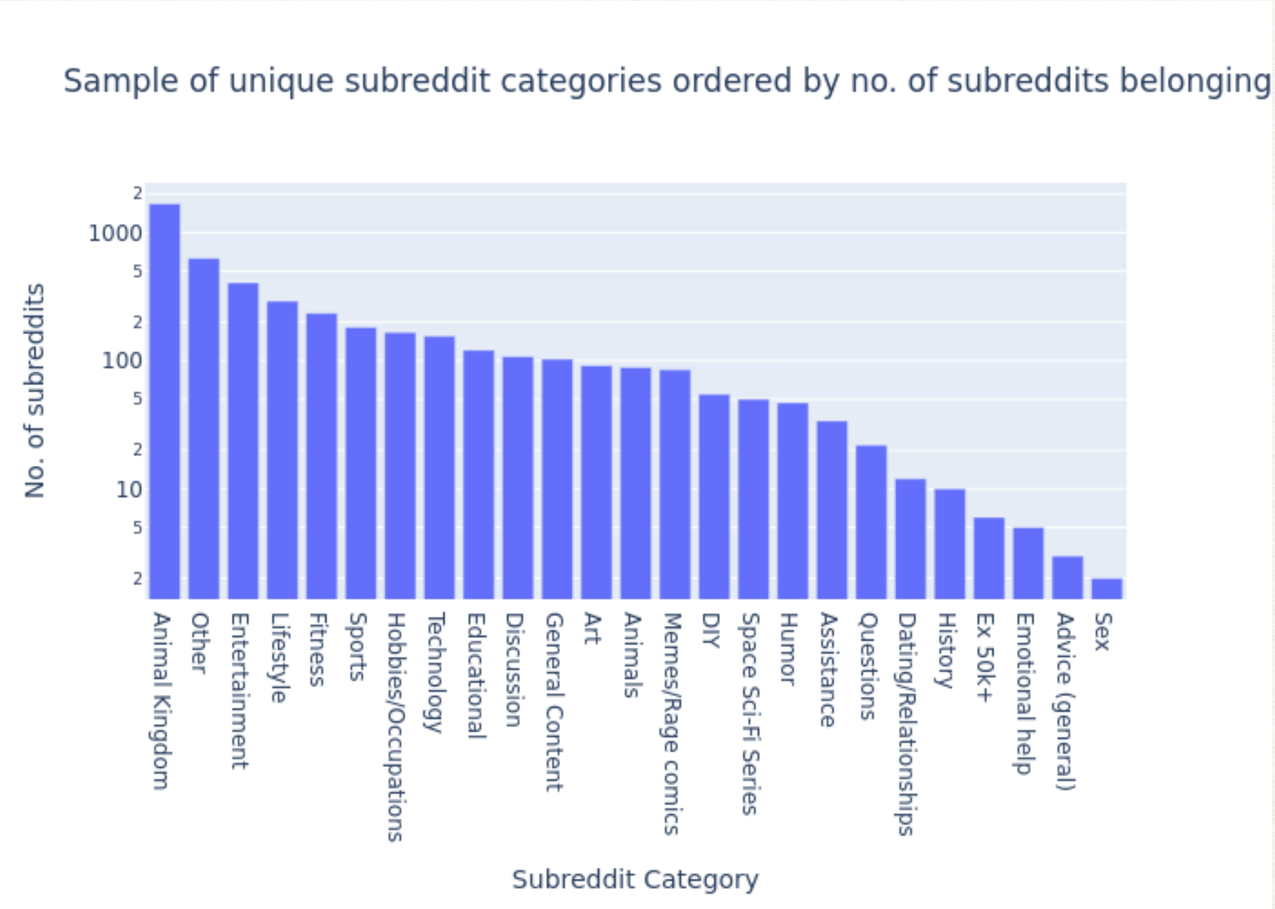


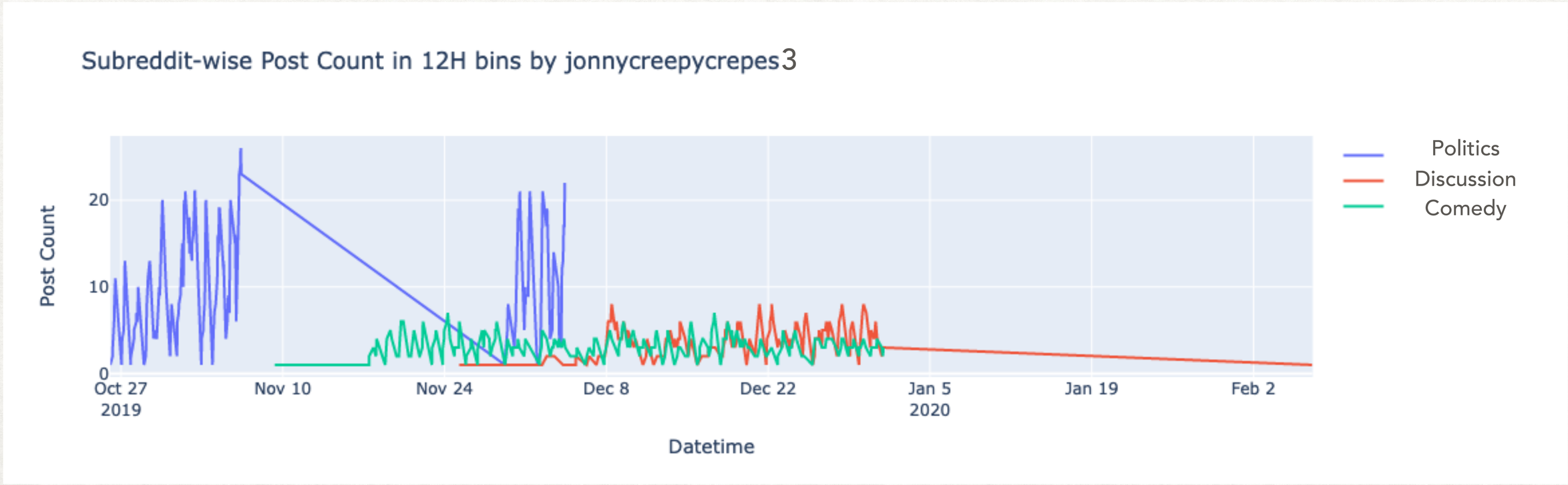
['mormon', 'politics']

Predicted Subreddits:
['mormonhistory', 'ldshistory', 'christianhistory', 'jewishhistory', 'historicalreligion']

Predicted Category:
[[None, 'History of People', None, None, None],

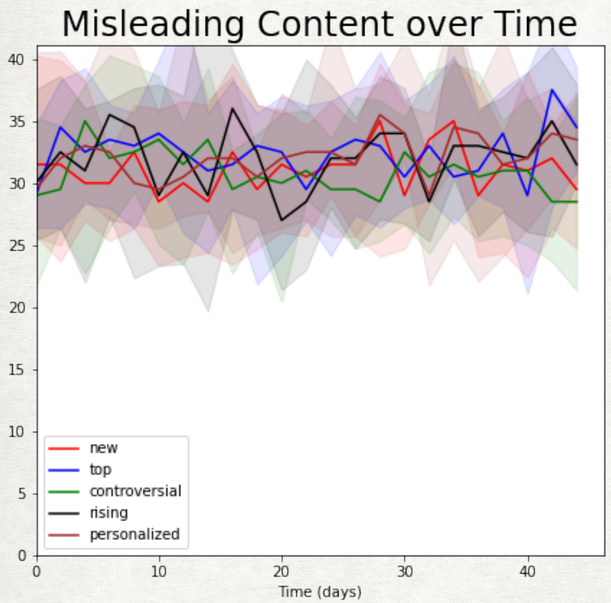
MODELING CATEGORIES

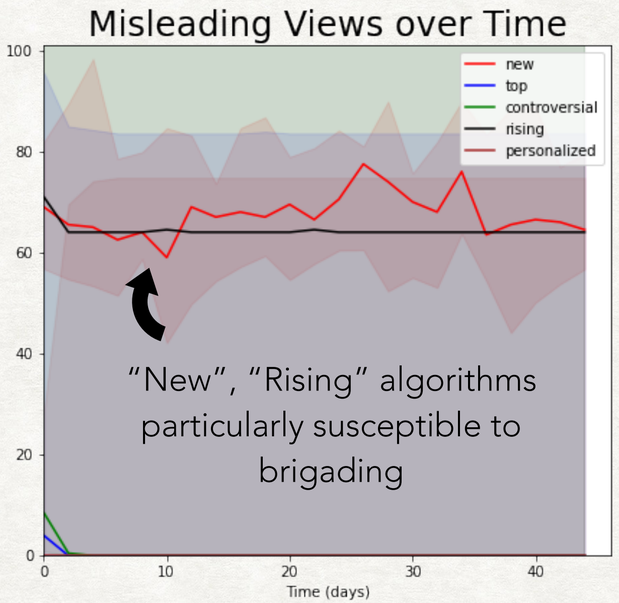
REDUCING SUBREDDIT DIMENSIONALITY

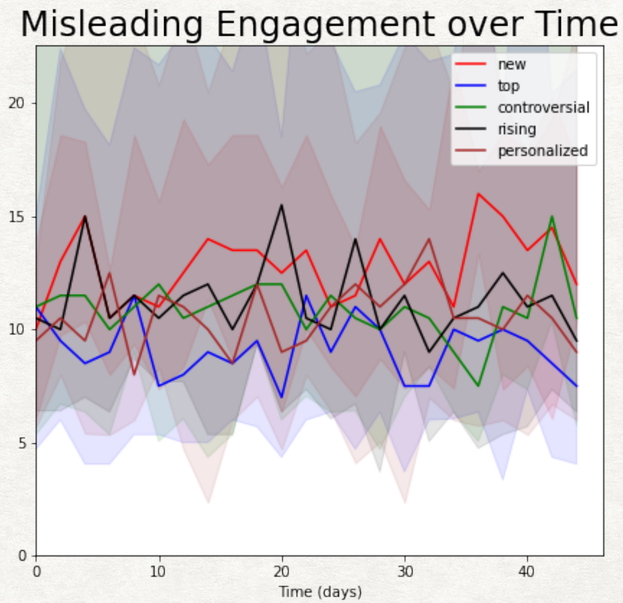


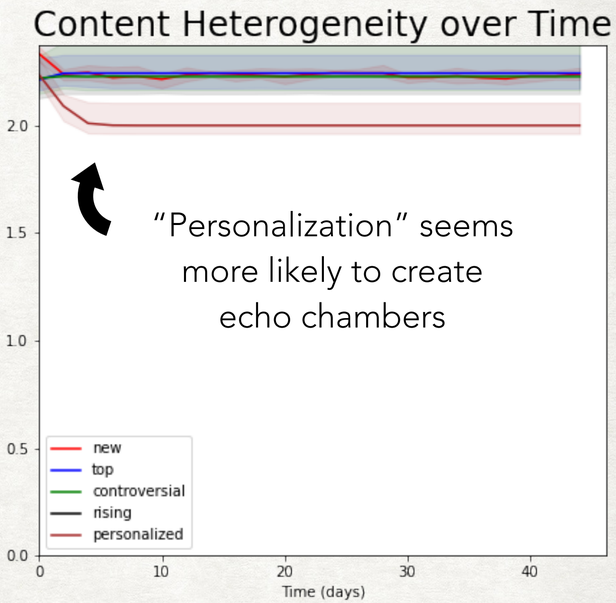
ESTIMATE ALGORITHMIC SUSCEPTIBILITY TO COORDINATED ATTACKS ON REDDIT

WHAT ARE THE EFFECTS OF BRIGADING?



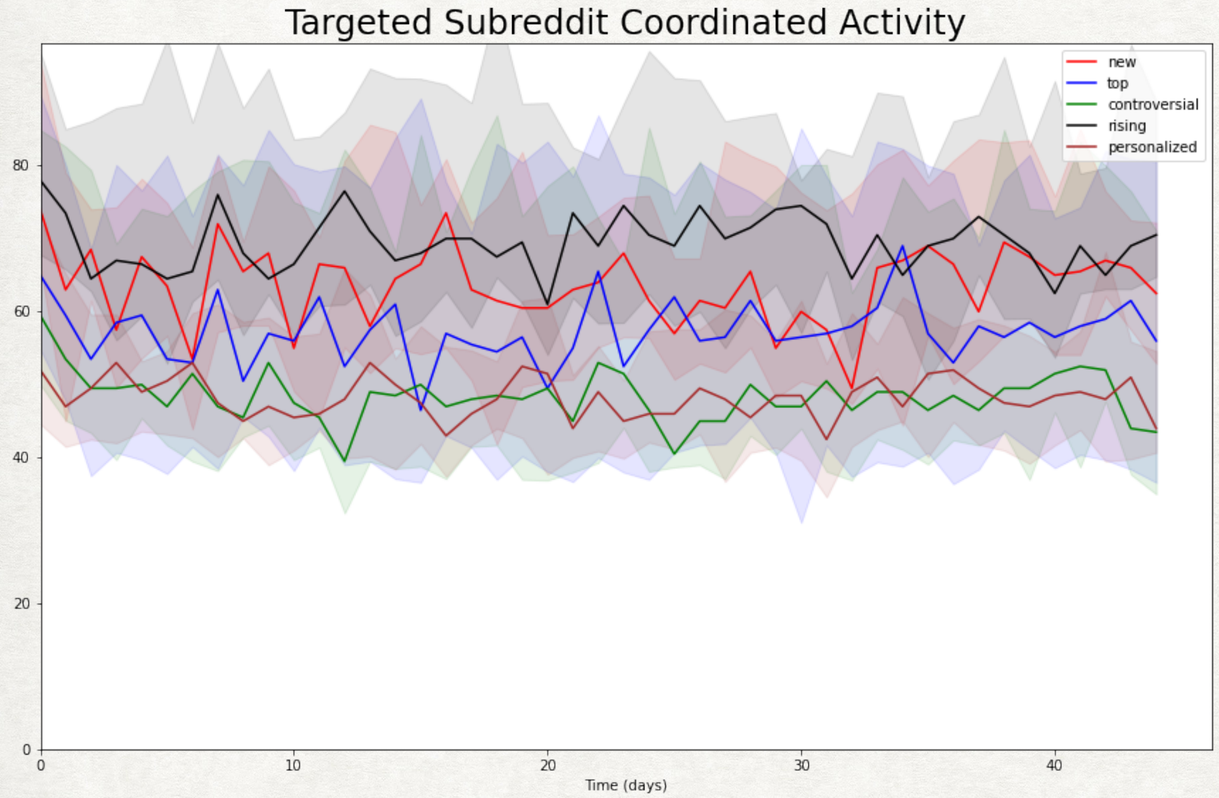


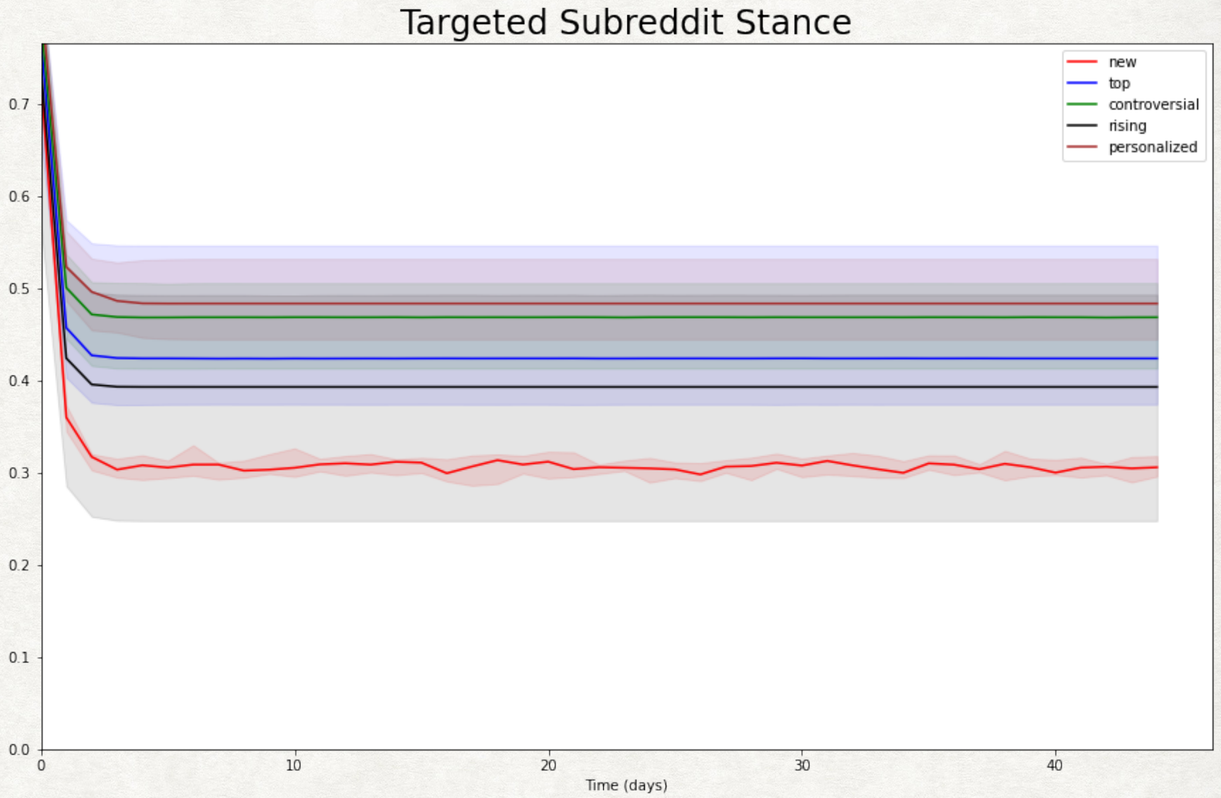




Similar levels of misleading content leads to different emergent dynamics

WHAT ARE THE EFFECTS OF BRIGADING?





Despite similar levels of activity, there is a significant drop in the positive opinions expressed on the target subreddit for the “New” ranking algorithm

CONTENT DISTRIBUTION CHOICES

APPS | HOW-TO | REVIEWS

How to switch your Twitter feed to a chronological timeline

Look for the sparkle

By Natt Garun | @nattgarun | Mar 6, 2020, 11:47am EST

Facebook's new 'Feeds' tab chronologically displays posts from your friends and groups

Aisha Malik @aiishamalik1 / 10:13 AM EDT • July 21, 2022 Comment

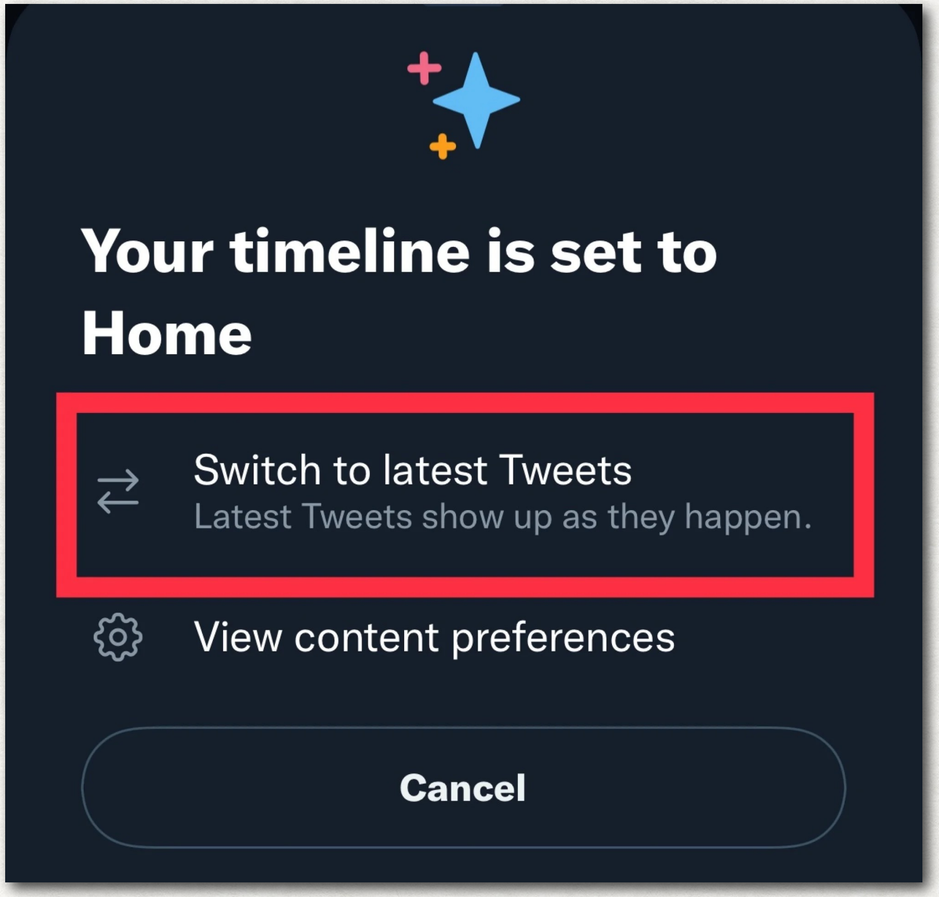
TECH • BIG TECH

Facebook Is Finally Giving People A Non-Algorithmic News Feed

A few taps will allow you to see timely "Feeds" from friends, groups, or pages.

Katie Notopoulos
BuzzFeed News Reporter

Posted on July 21, 2022 at 9:01 am



CONTENT DISTRIBUTION CHOICES

APPS | HOW-TO | REVIEWS

How to switch your Twitter feed to a chronological timeline

Look for the sparkle

By Natt Garun | @nattgarun | Mar 6

Twitter no longer lets users access the chronological timeline by default [U: Rolled Back]

Filipe Espósito - Mar. 14th 2022 12:00 pm PT @filipeesposito

Facebook's New Feeds Tab Chronologically Displays Posts From Your Friends and Groups

Aisha Malik @a

Here's How to Switch Your Instagram Back to Chronological Order

It's a great way to see posts from people you actually follow, instead of posts from ads and "suggested" accounts.

BY TUCKER BOWE UPDATED: JUL 4, 2022

TECH • BIG TECH

Facebo
Algorit

A few taps will allow you to see timely "Feeds" from friends, groups, or pages.

Katie Notopoulos
BuzzFeed News Reporter

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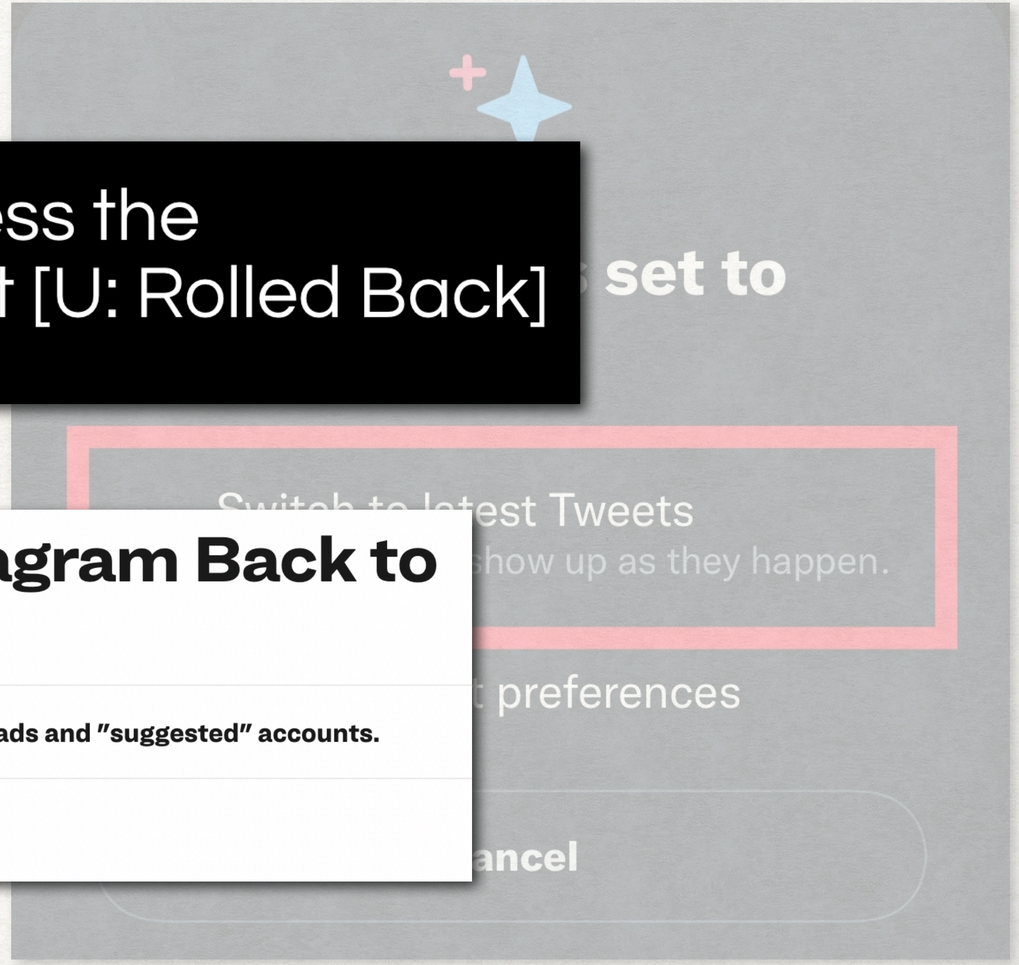
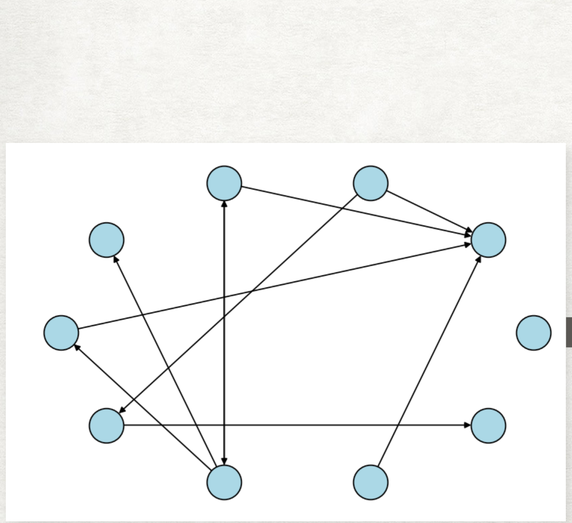
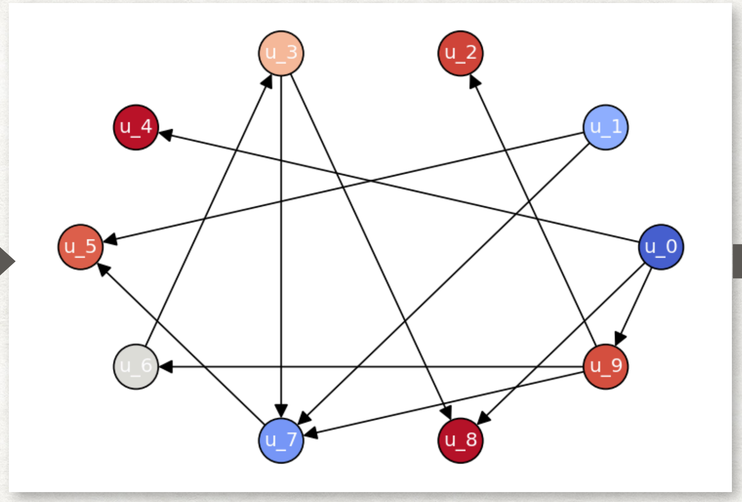


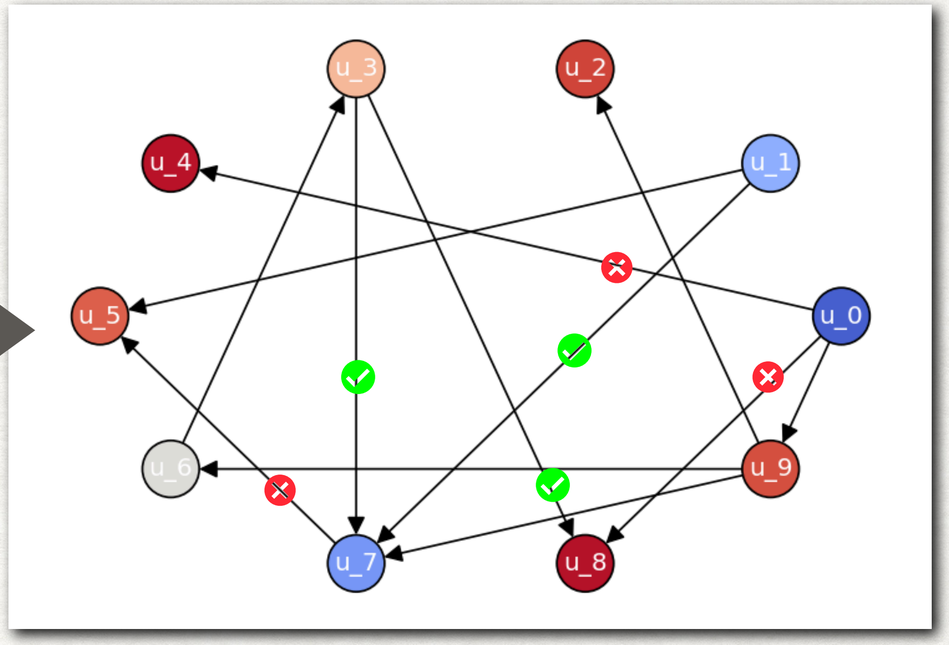
SUMMARY

- We simulate coordinated campaigns seeking to manipulate public debate using multiple authentic/inauthentic (fake) accounts to mislead people.
- Goal: Quantify the harms arising from CIB on Social Networks
  - Measure its effects on ranking and recommendation algorithms
  - Use real-world networks and behavior to simulate counterfactual outcomes
  - *Next Steps: Simulate Interventions*

INTERVENTIONS TO LIMIT DISINFORMATION







Agents + Networks

Agents + Networks + Behaviors

Agents + Networks + Behaviors + Interventions

REAL-WORLD INTERVENTIONS

1. **AGENT - LEVEL**

   Awareness campaigns, training, ideological change

2. **NETWORK - LEVEL**

   Reduced sharing, visibility, confirmation of retweets

3. **HYBRID**

   Blocking/Temporarily suspending users, articles, links

4. **ADAPTIVE**

   Time-limited blocking and reductions in sharing, visibility

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