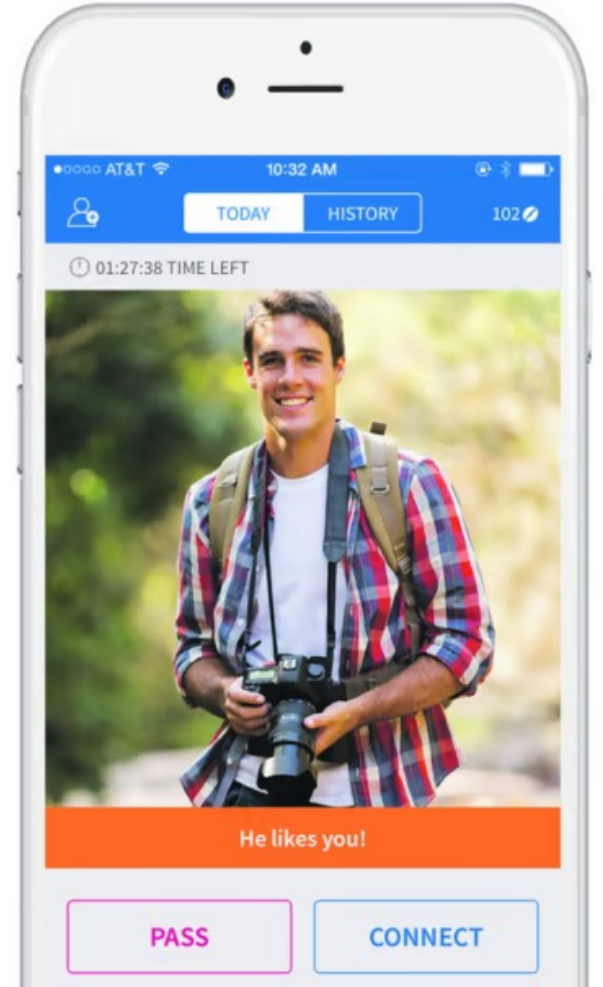
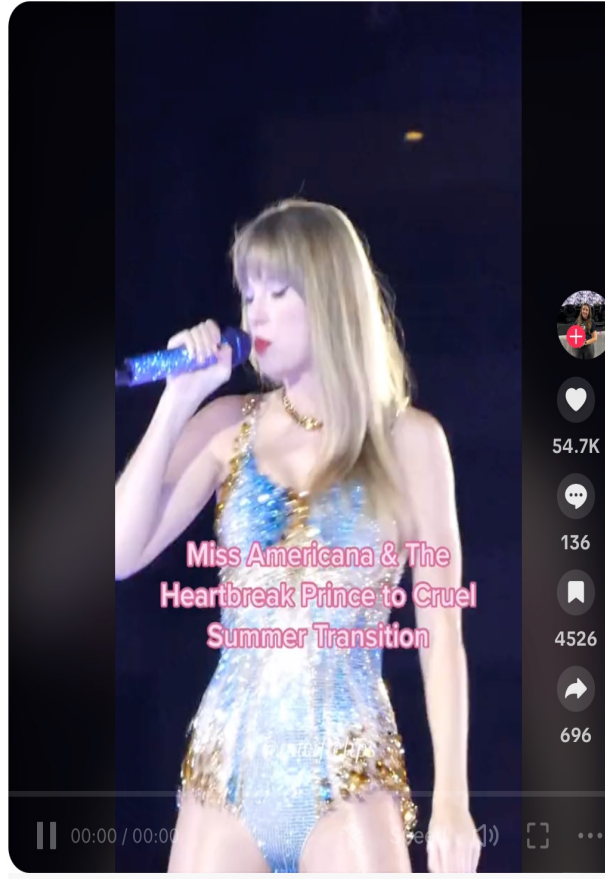
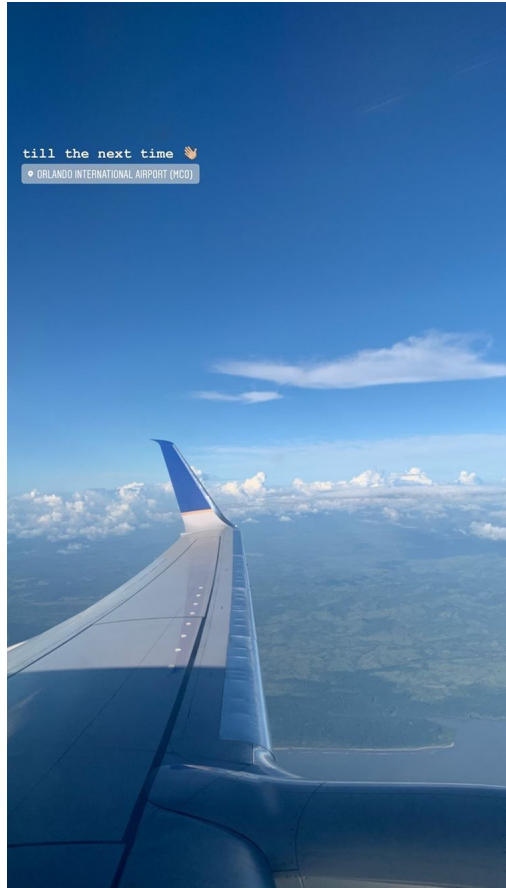


Information Manipulation by Social Media Bots through a Network Analysis View

Lynnette Hui Xian Ng
Carnegie Mellon University
Societal Computing, School of Computer Science




Influencing People



Influencing People



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EINE KLEINE CLIQUE?

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- Generalfeldmarschall V. Weizsäcker,
- Generalfeldmarschall V. Leeb,
- Generalfeldmarschall V. Sittler,
- Generalfeldmarschall F. Halder,
- Generalfeldmarschall G. J. von Soden,
- Generalfeldmarschall E. v. Witzleben,
- Generaloberst Ludwig Beck,
- Generaloberst Freiherr v. Falkenhausen,
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2035

Warnu

Großbritannien an da

Deutlich wird die...
Mit dem...
regierungs...
Großbritannien...
Wacht...
1944...

Goebbels
die Wahrhe


ENGLISCHE „HILFE“
„Januere nicht! Du stützt mich, und ich stütz dich heraus!“

BARBEICH 11. OKTOBER 1941

Nous avons
l'ordre
d'attaquer tout
en haute mer
dans les zones
interdites

RENTREZ CHEZ VOUS
CHEZ NOUS
DELAI

REMEMBER THAT -
AND THINK TWICE



Social media for information manipulation
Reach global audiences
Micro-target
Construct multimodal messages

Social Media Bots

Automated Entities

Create posts at specified periods of time

Target posts to specific audience

Act on posts by heuristics



Social Media Bots

“BotBuster: Multi-platform Bot Detection using Mixture of Experts”
AAAI ICWSM

BotBuster Detection Algorithm

Mixture of Experts algorithm aggregating prediction probabilities per data pillar

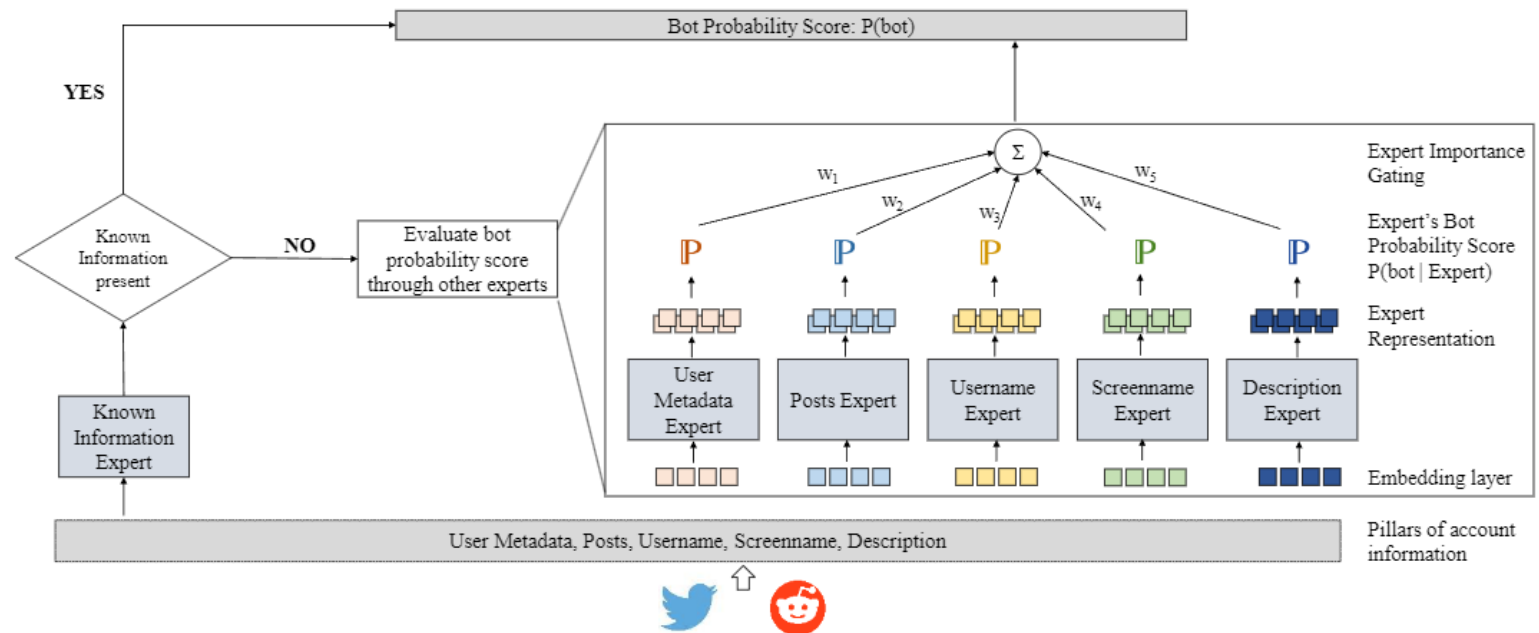
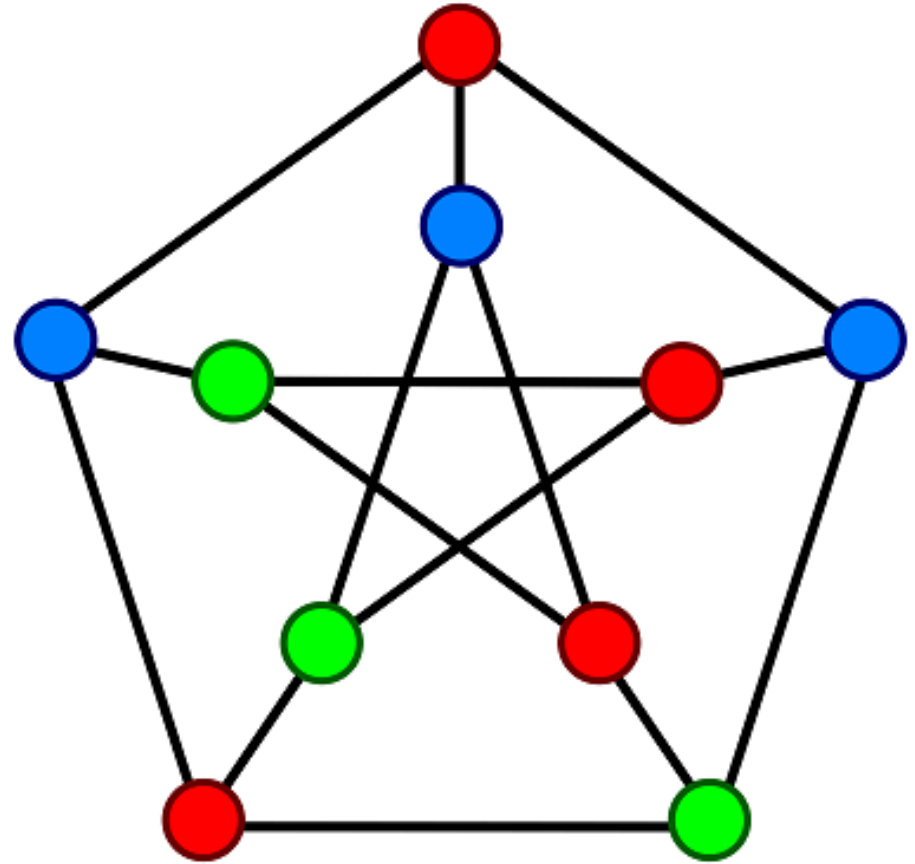
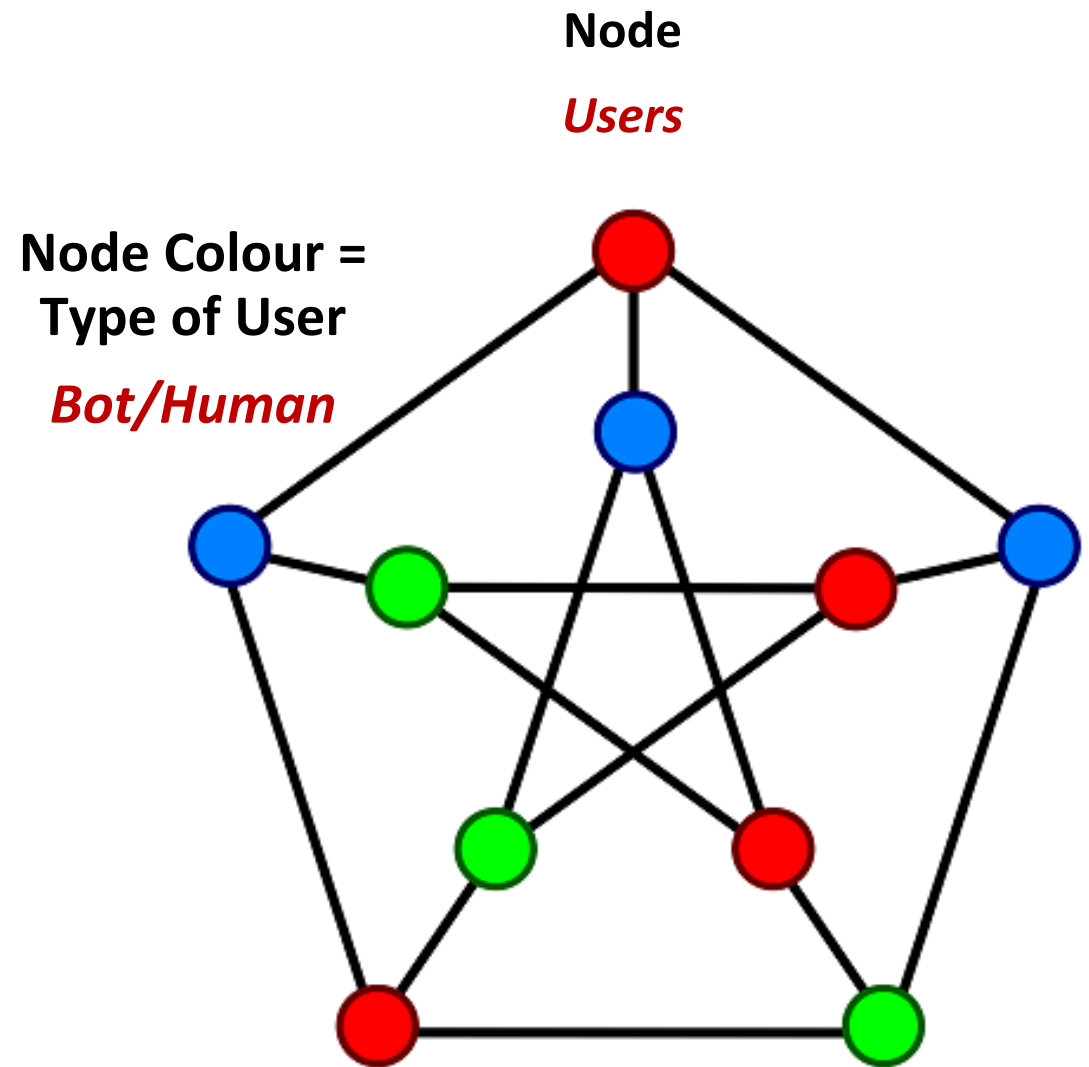


Figure 1: Diagram of the BotBuster Architecture.

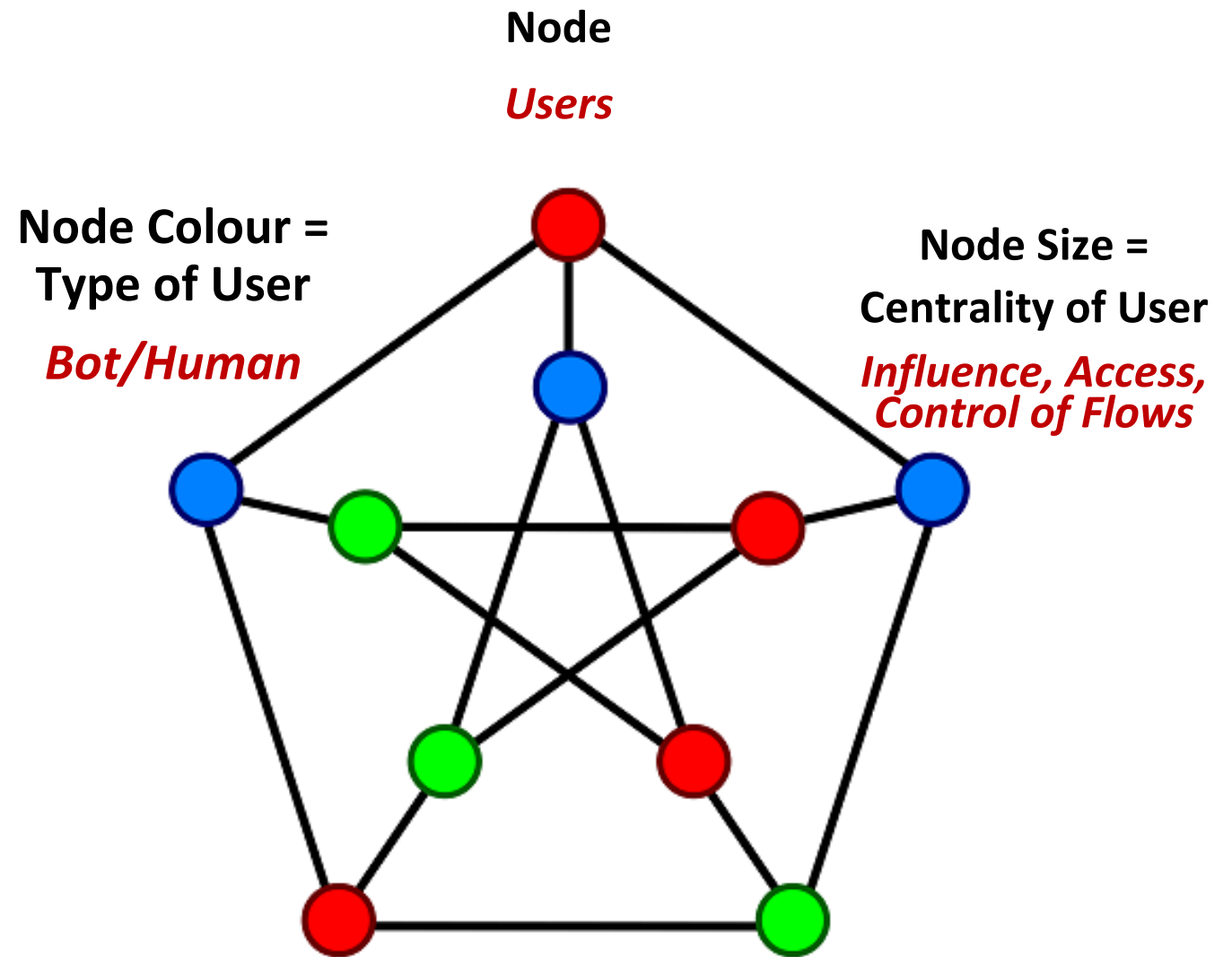
Quick Primer on Networks



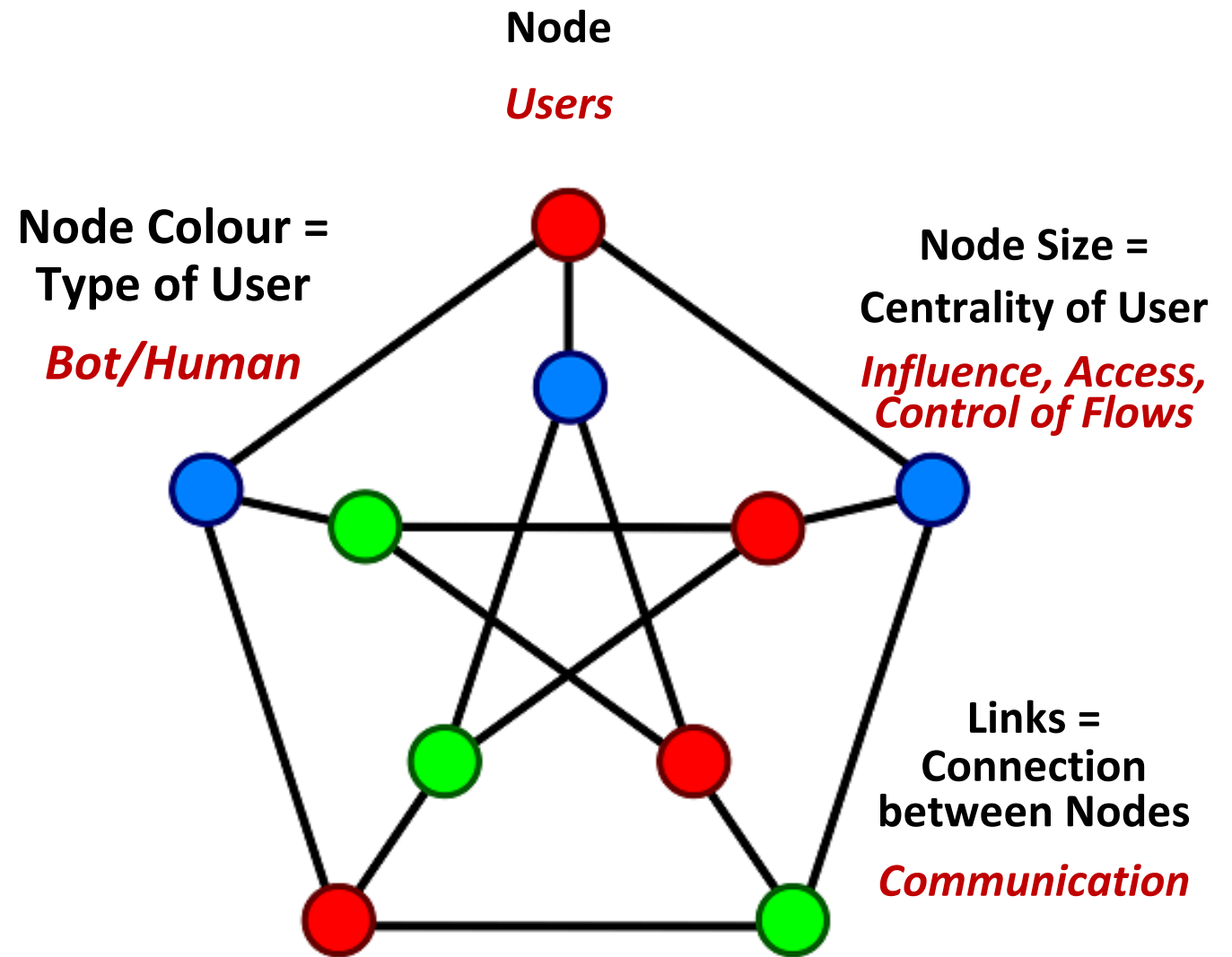
Quick Primer on Networks



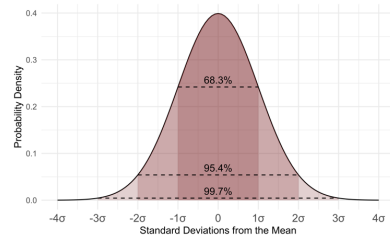
Quick Primer on Networks



Quick Primer on Networks



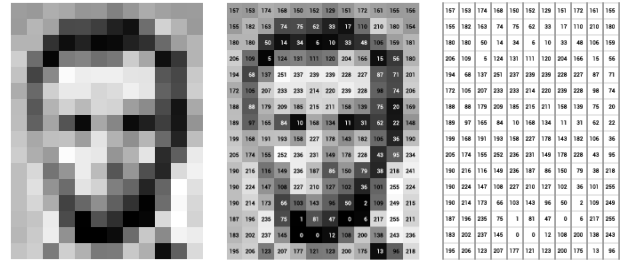
Intersecting Disciplines



Statistics



Social Psychology



Computer Vision



Cognitive Science



Natural Language Processing



Behavioural Economics

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- Generalfeldmarschall Viktor Ritter v. Leeb,
- Generalfeldmarschall Günther Ritter v. Kluge,
- Generalfeldmarschall Ferdinand Scherzer,
- Generalfeldmarschall Günther von Kluge,
- Generalfeldmarschall Erich v. Witzleben,
- Generaloberst Ludwig Beck,
- Generaloberst Freiherr v. Falkenhausen,
- Generaloberst Fritz Fromm,
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l'ordre
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Mit dem erregten
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Wacht
1914

Goebbels
ENGLISCHE „HILFE“
Januere nicht! Du stützt mich, und ich stütz dich herout!
DABESICH 11. OKTOBER 1941

Information Manipulation Persuasion

WHO, WHAT, WHEN, WHERE, WHY, HOW

EINE KLEINE CLIQUE?

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- Generaloberst Ludwig Beck,
- Generaloberst Freiherr v. Falkenhausen,
- Generaloberst Fritz Fromm,
- Generaloberst Franz Halder,
- Generaloberst Erich von Manstein,
- Generaloberst v. Seydlitz-Kurzbach,
- Generaloberst v. Thoma,
- Generaloberst v. Weizsäcker,
- Generaloberst v. Ziemer.

„Das eine, das andere, die „Kleinen“? Jemand hat es sich bei den obersten Generalen um Wehrmacht-militärischen Belangen anders als die politische Führung. Die „Kleinen“ sind darauf, dass Deutschland den Krieg so schnell beenden muss.“

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Nous avons l'ordre d'attaquer tout bateau de pêche en haute mer dans les zones interdites

RENTREZ CHEZ VOUS CHEZ NOUS DELAI

REMEMBER THAT - AND THINK TWICE

Information Manipulation

Why do we care?





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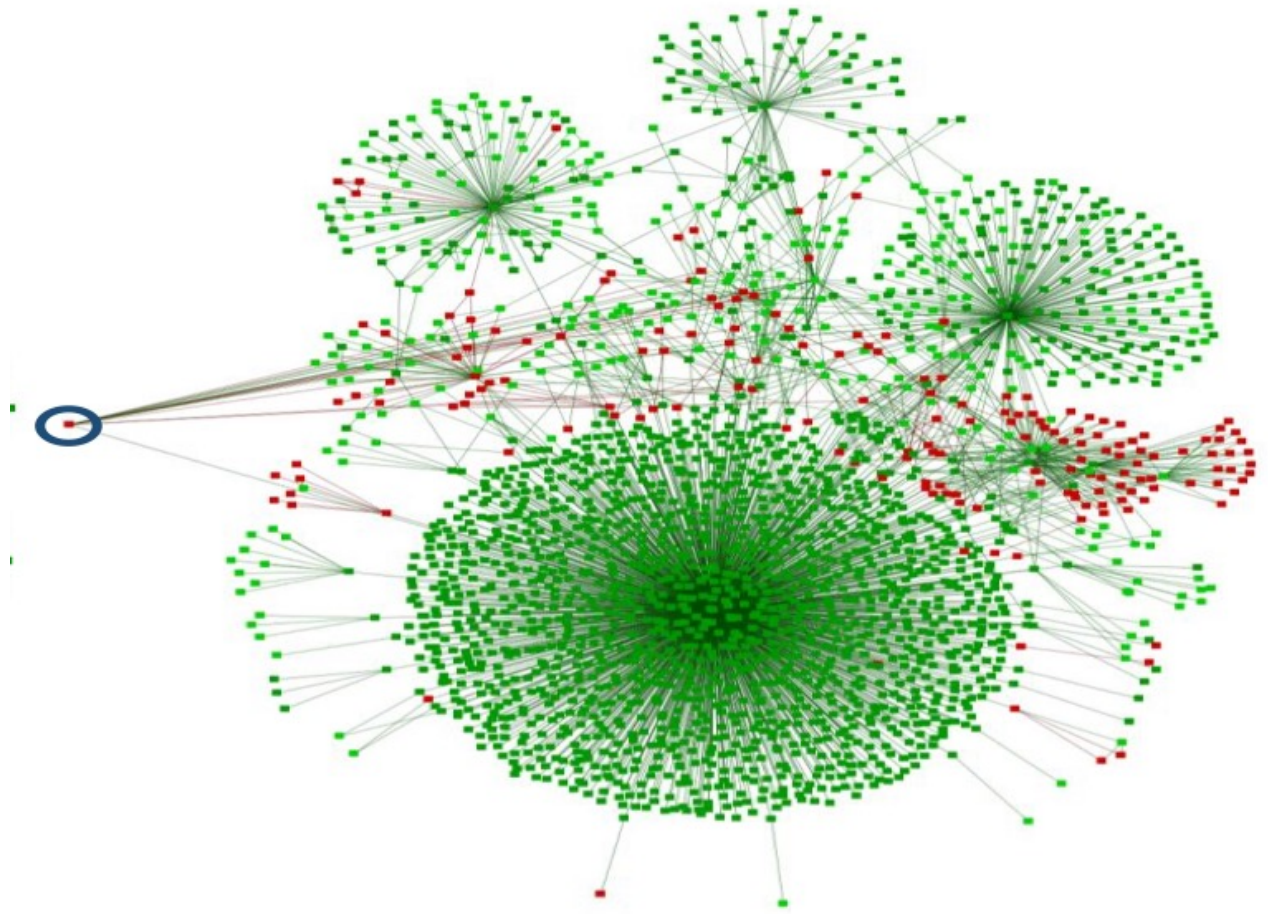
ENTREZ CHEZ VOUS CHEZ NOUS

Information Manipulation

Why do we care?

“Pro or Anti, A Social Influence Model of Online Stance Flipping”
IEEE Transactions of Network Science and Engineering

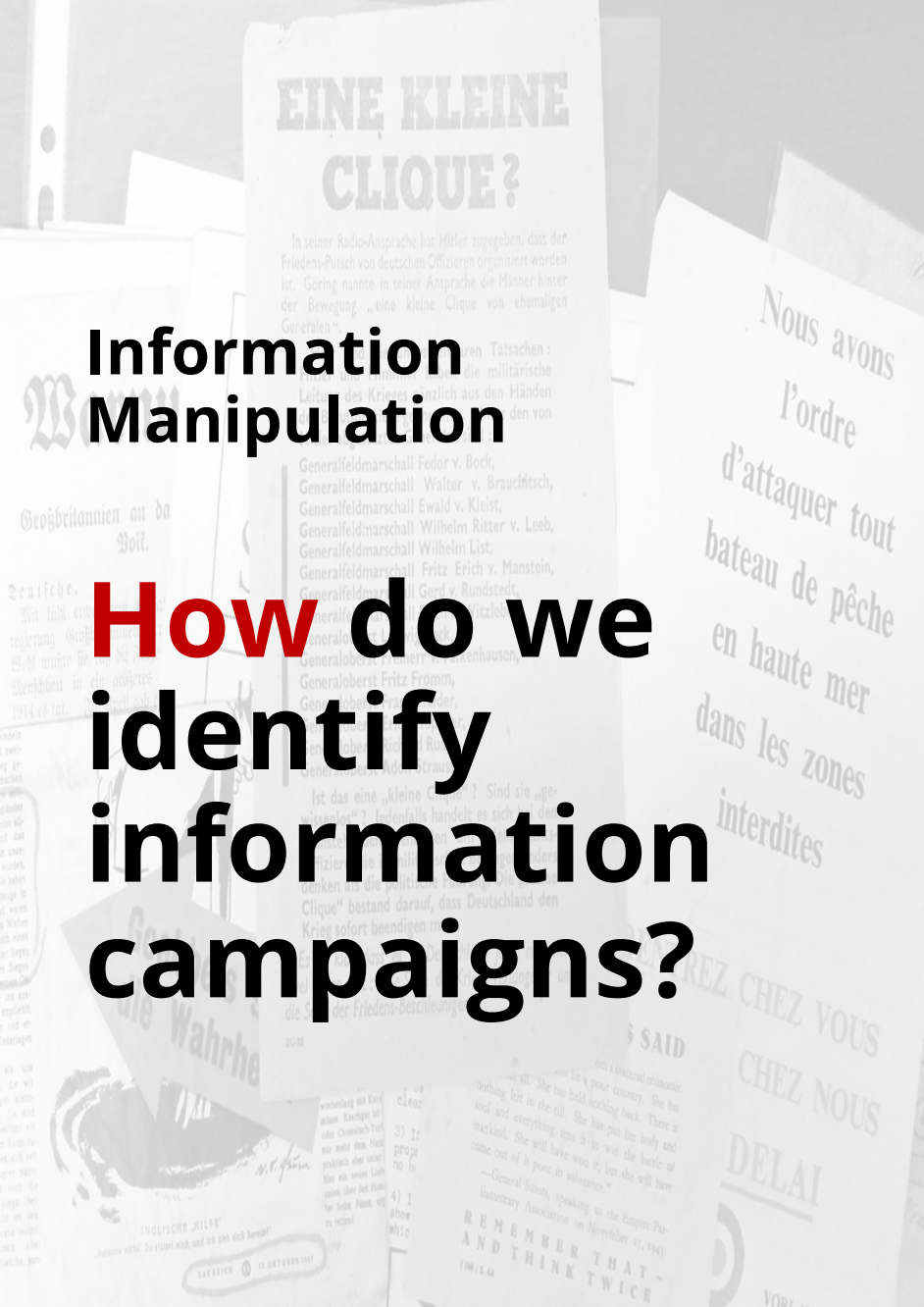
Changing people stances



Green = Pro-Vaccine Users / Red = Anti-Vaccine Users

Information Manipulation

How do we identify information campaigns?



Information Manipulation

How do we identify information campaigns?

“Analyzing Digital Propaganda and the Conflict Rhetoric: A Study on Russian Bot Driven Campaigns and Counter Narratives During the Ukraine Crisis”

BEND Framework

Information maneuvers comprised of narrative & community maneuvers

BEND Maneuvers				
	Community Maneuvers		Narrative Maneuvers	
Affirmative	Back	Discussion that increase the actual, or the appearance of, an actor’s importance or effectiveness relative to a community or topic	Excite	Discussion related to a community or topic that cause the reader to experience a positive emotion such as joy, happiness, liking, or excitement
	Build	Discussion that create a group, or the appearance of a group, where there was none before	Explain	Discussion that clarify a topic to the targeted community or actor often by providing elaborations on the topic
	Bridge	Discussion that build a connection between two or more groups or create the appearance of such a connection	Engage	Discussion that increase the relevance of the topic to the reader often by providing anecdotes or enabling direct participation and so suggesting that the reader can impact the topic or will be impacted by it
	Boost	Discussion that increase the size of a group and/or the connections among group members, or the appearance of such	Enhance	Discussion that provide material that expands the scope of the topic for the targeted community or actor often by making the topic the master topic to which other topics are linked
Adverse	Negate	Discussion that decrease the actual, or the appearance of, an actor’s importance or effectiveness relative to a community or topic	Dismay	Discussion related to a community or topic that cause the reader to experience a negative emotion such as worry, sadness, disliking, anger, despair, or fear
	Neutralize	Discussion that cause a group to be, or appear to be, no longer of relevance, e.g., because it was dismantled	Distort	Discussion that obscure a topic to the targeted community or actor often by supporting a particular point of view or calling details into question
	Narrow	Discussion that lead a group to be, or appear to be, more specialized, and possibly to fission, into two or more distinct groups	Dismiss	Discussion that decrease the relevance of the topic to the reader often by providing stories or information that suggest that the reader cannot impact a topic or be impacted by it
	Neglect	Discussion that decrease the size of a group and/or the connections among group members, or the appearance of such	Distract	Discussion that redirect the targeted community or actor to a different topic often by bring up unrelated topics, and making the original topic just one of many

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2022 Russian Ukraine Campaign

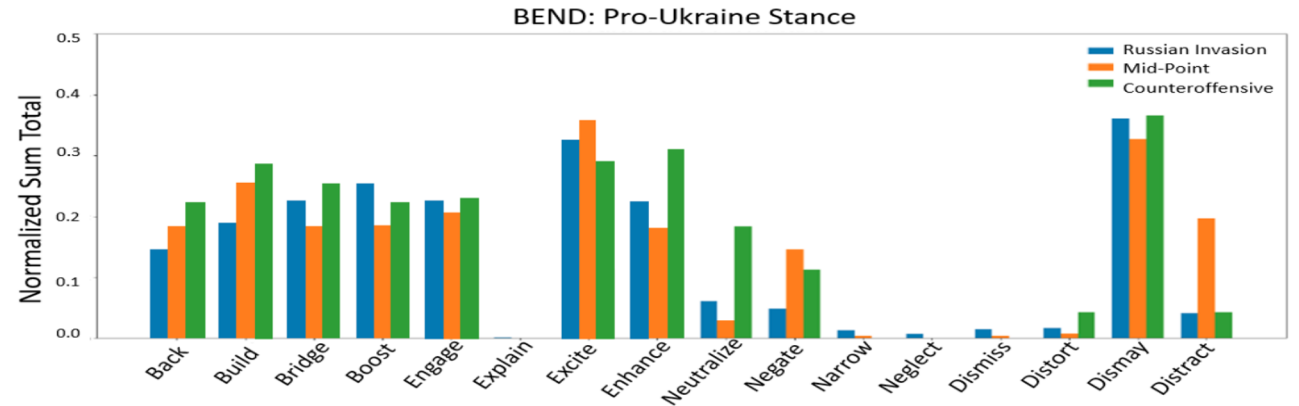
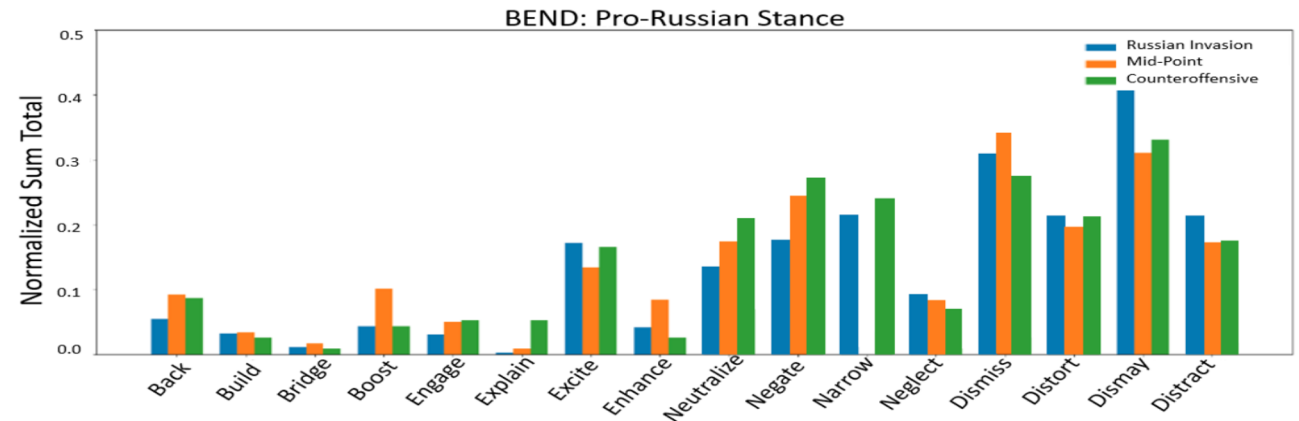


Figure 13. BEND results normalized across all three timeframes for Pro-Ukraine Stance



2022 Russian Ukraine Campaign

Information Manipulation

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“Analyzing Digital Propaganda and the Conflict Rhetoric: A Study on Russian Bot Driven Campaigns and Counter Narratives During the Ukraine Crisis”

Pro-Ukraine users consistently perform more positive techniques

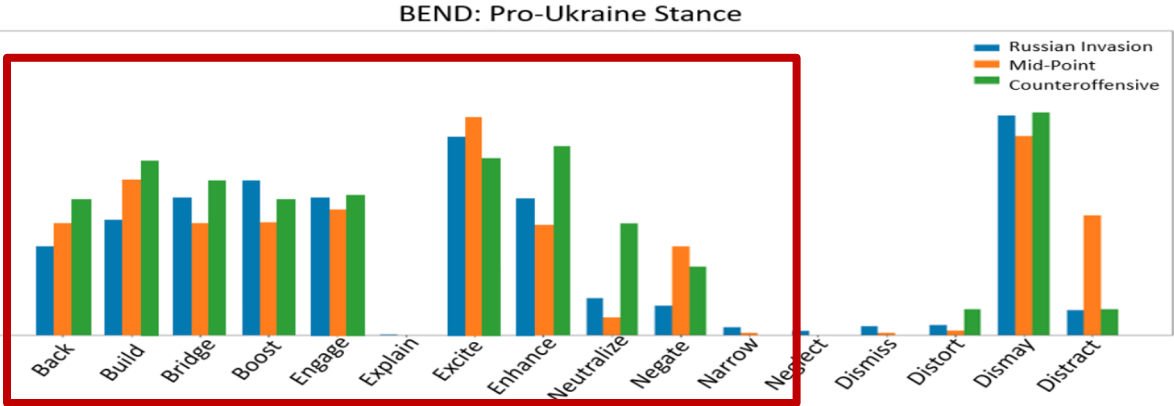
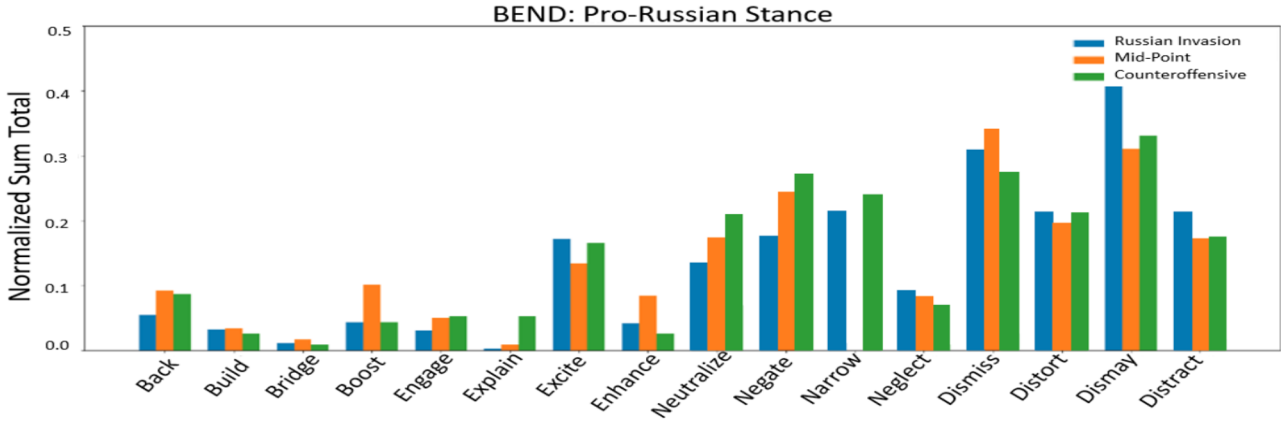


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2022 Russian Ukraine Campaign

Information Manipulation

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Pro-Ukraine users consistently perform more positive techniques

Pro-Russian users consistently perform more negative techniques

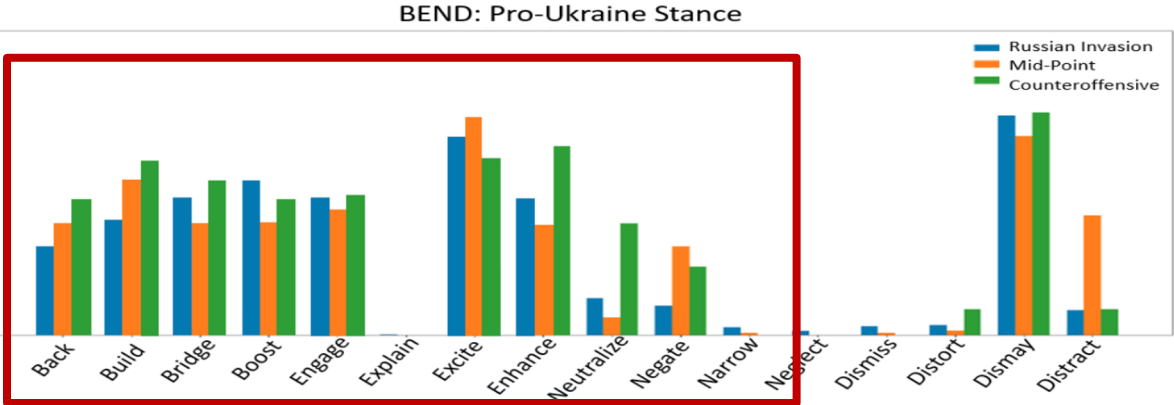
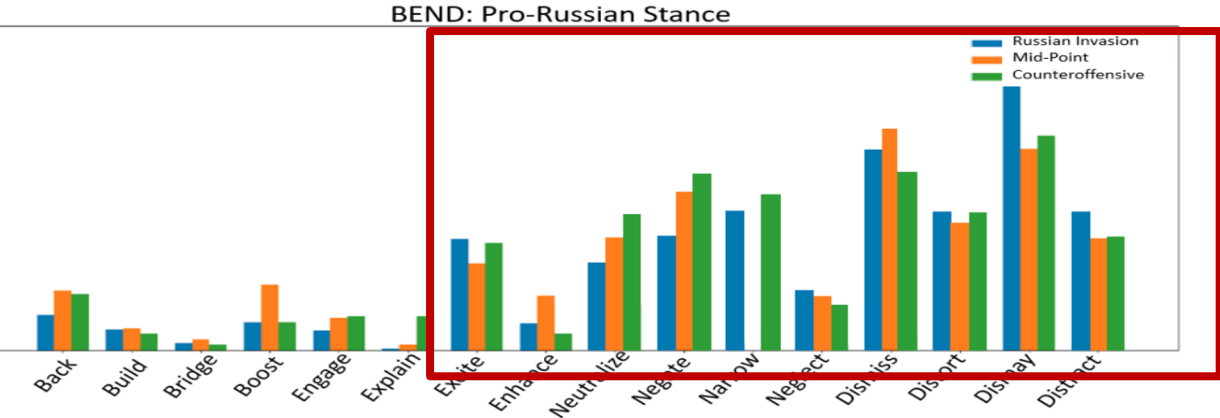


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Automated Coordination

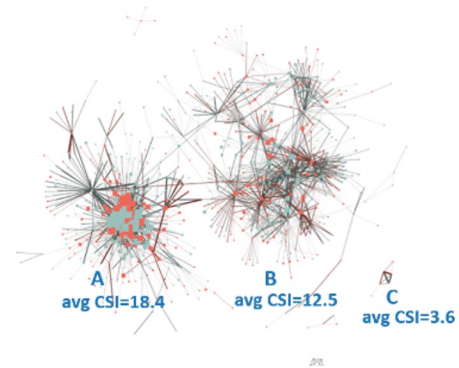
Identifying groups of bots that coordinate

Information Manipulation

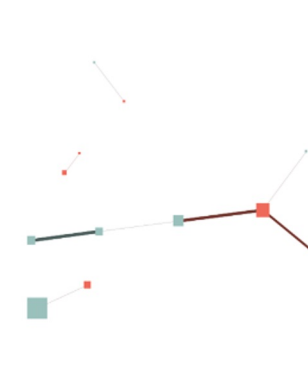
How do we identify information campaigns?

“Tiny-BotBuster: Identifying Automated Political Coordination in Digital Campaigns”

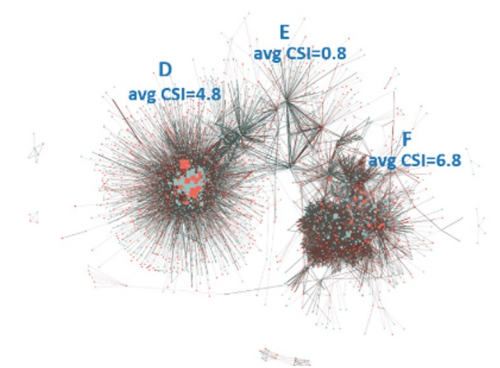
(a) Social Coordination Network



(b) Referral Coordination Network



(c) Semantic Coordination Network



Green = Humans/ Red = Bots

2024 Indonesian Election Campaigns

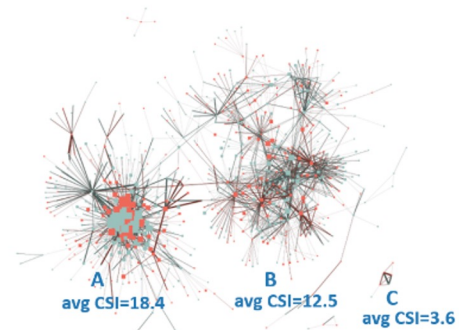
Three Largest Political Parties have clusters of online information campaigns using bots

Information Manipulation

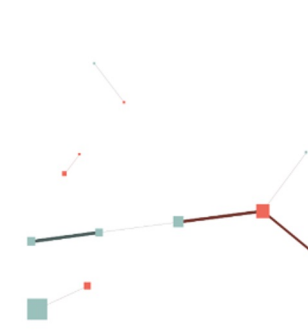
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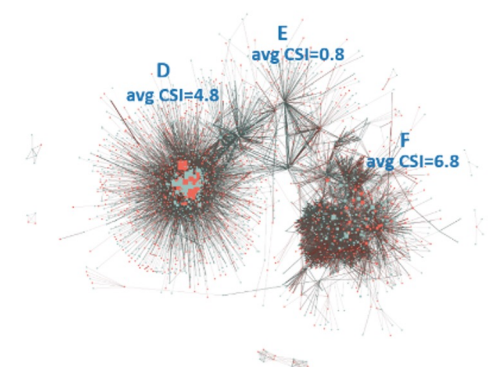
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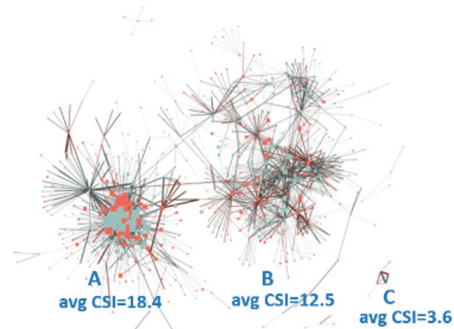
Largest party (PDI-P) used the most % of bots

Information Manipulation

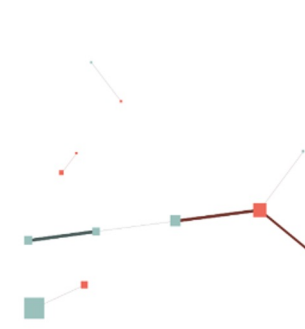
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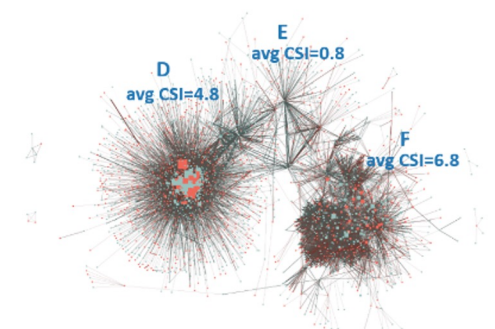
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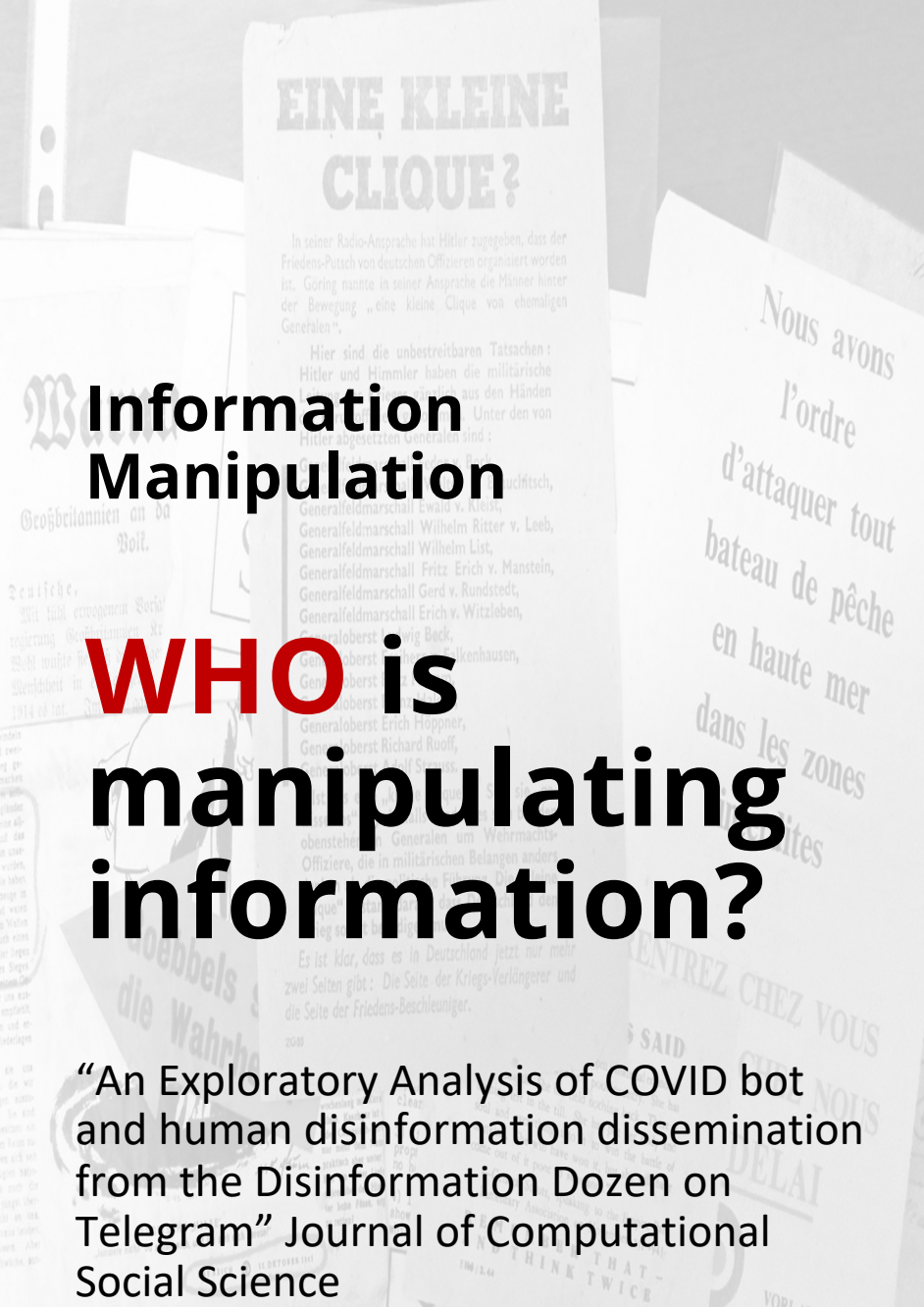


Green = Humans/ Red = Bots



Information Manipulation

WHO is manipulating information?



Information Manipulation

WHO is manipulating information?

“An Exploratory Analysis of COVID bot and human disinformation dissemination from the Disinformation Dozen on Telegram” Journal of Computational Social Science

COVID disinformation on Telegram



(a) User x User network by Message Forwarding



(b) User x User network by Message Reply

Green = Humans/ Red = Bots



Information Manipulation

WHAT
narratives are being spread?

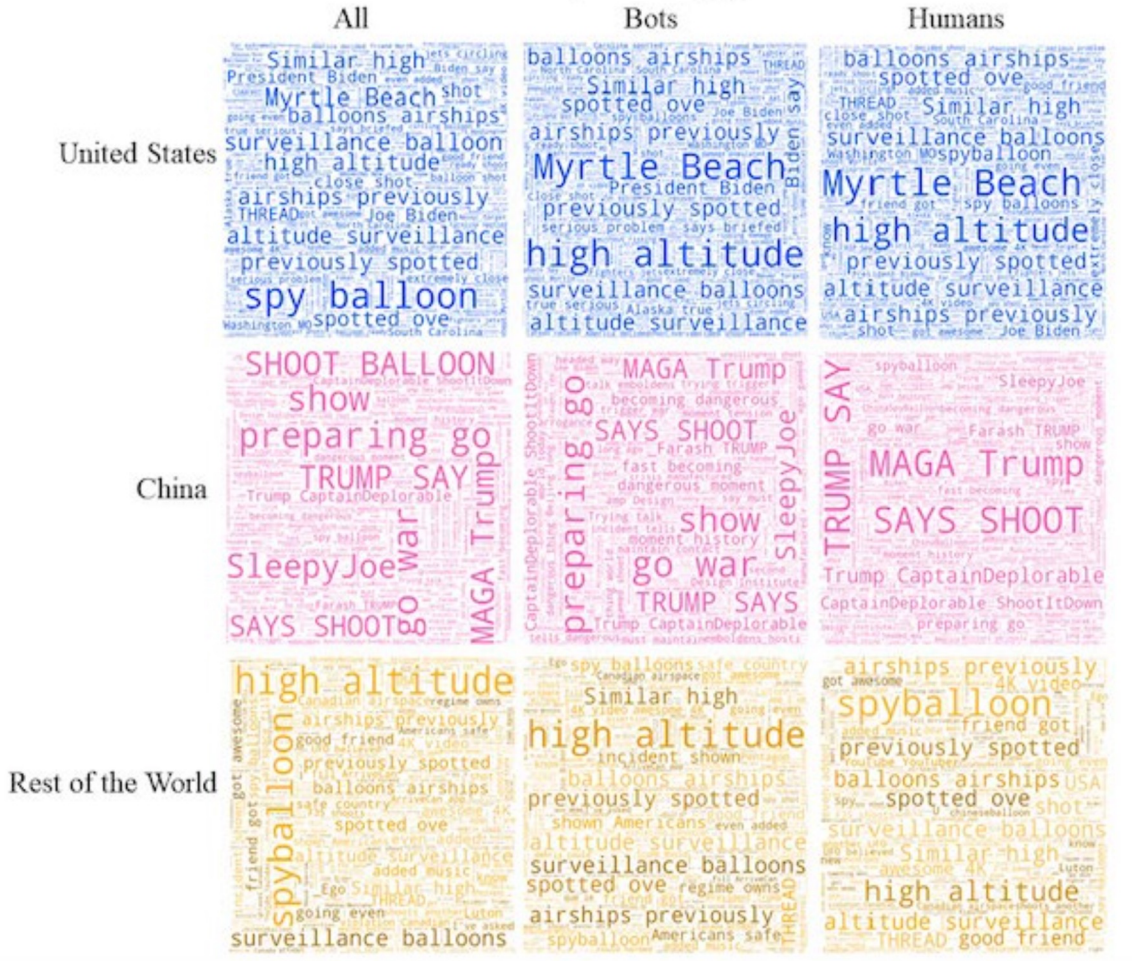
2023 US-China Balloon Incident

Bots exaggerate narratives spread by humans

Information Manipulation

WHAT narratives are being spread?

“Deflating the Chinese Balloon: Types of Twitter Bots in the US-China balloon incident” EPJ Data Science



2020 Singapore Elections

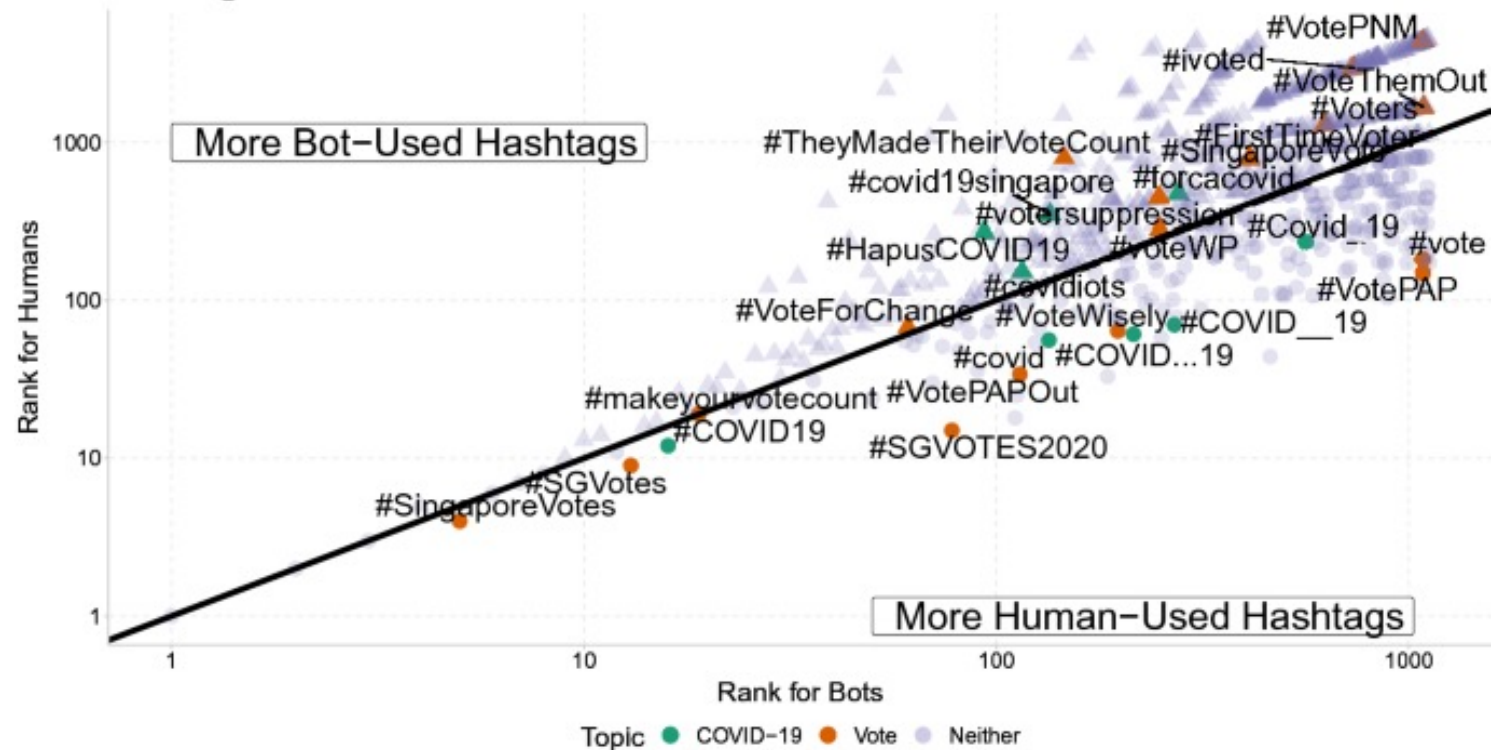
Information Manipulation

WHAT narratives are being spread?

“Active, Aggressive but to No Avail: Characterizing Bot Activity during the 2020 Singaporean Elections”
Computational and Mathematical Organization Theory

Bots Call for Action

Hashtag Ranks for Bots and Humans





Information Manipulation

WHEN are narratives spread?



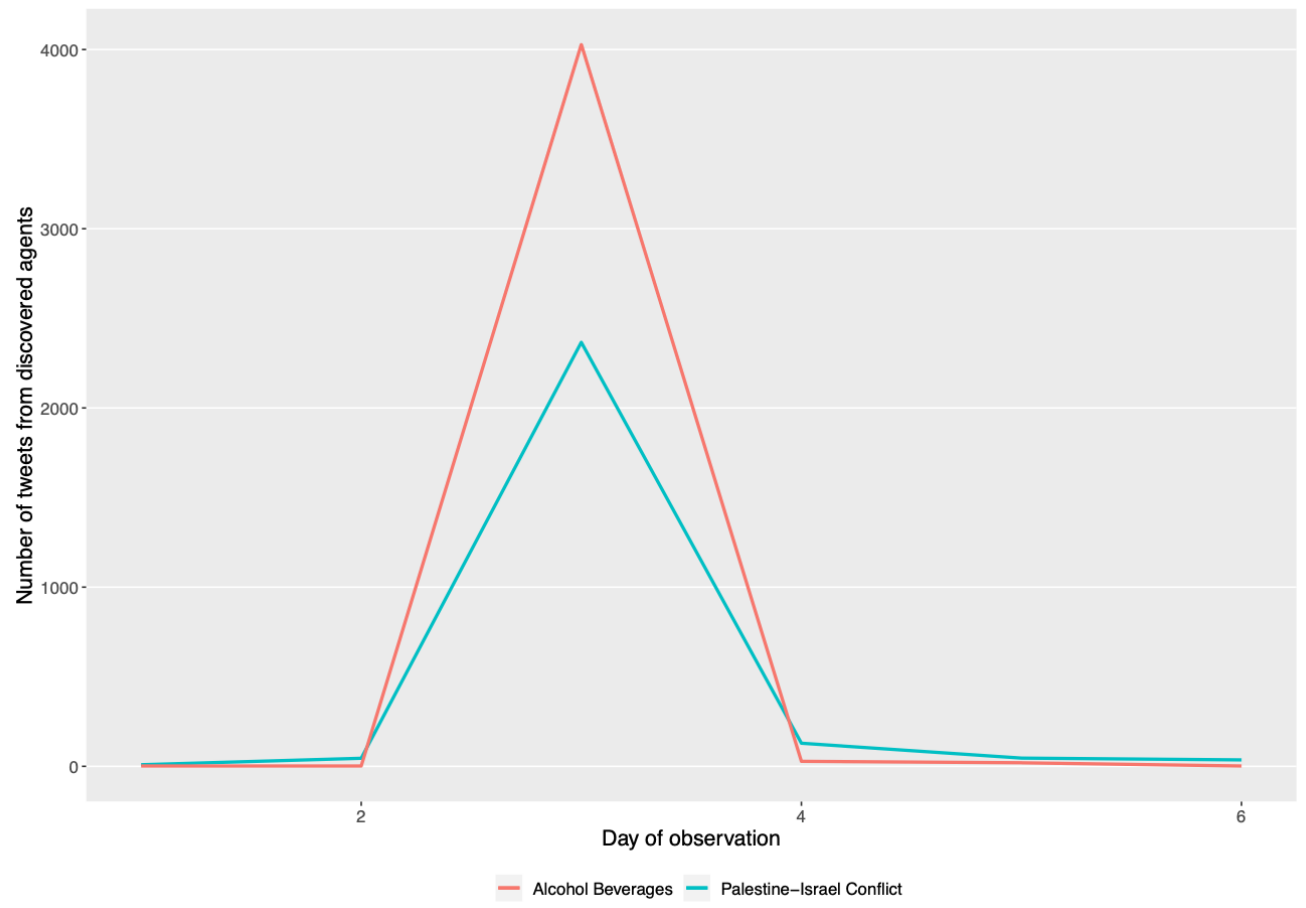
Information Manipulation

WHEN are narratives spread?

“From curious hashtags to polarized effect: profiling coordinated actions in Indonesian twitter discourse”
Social Network Analysis and Mining

2021 Indonesian Discourse

Spikes in tweet volumes by bot accounts on the days of key announcements





Information Manipulation

WHERE are narratives targeting?

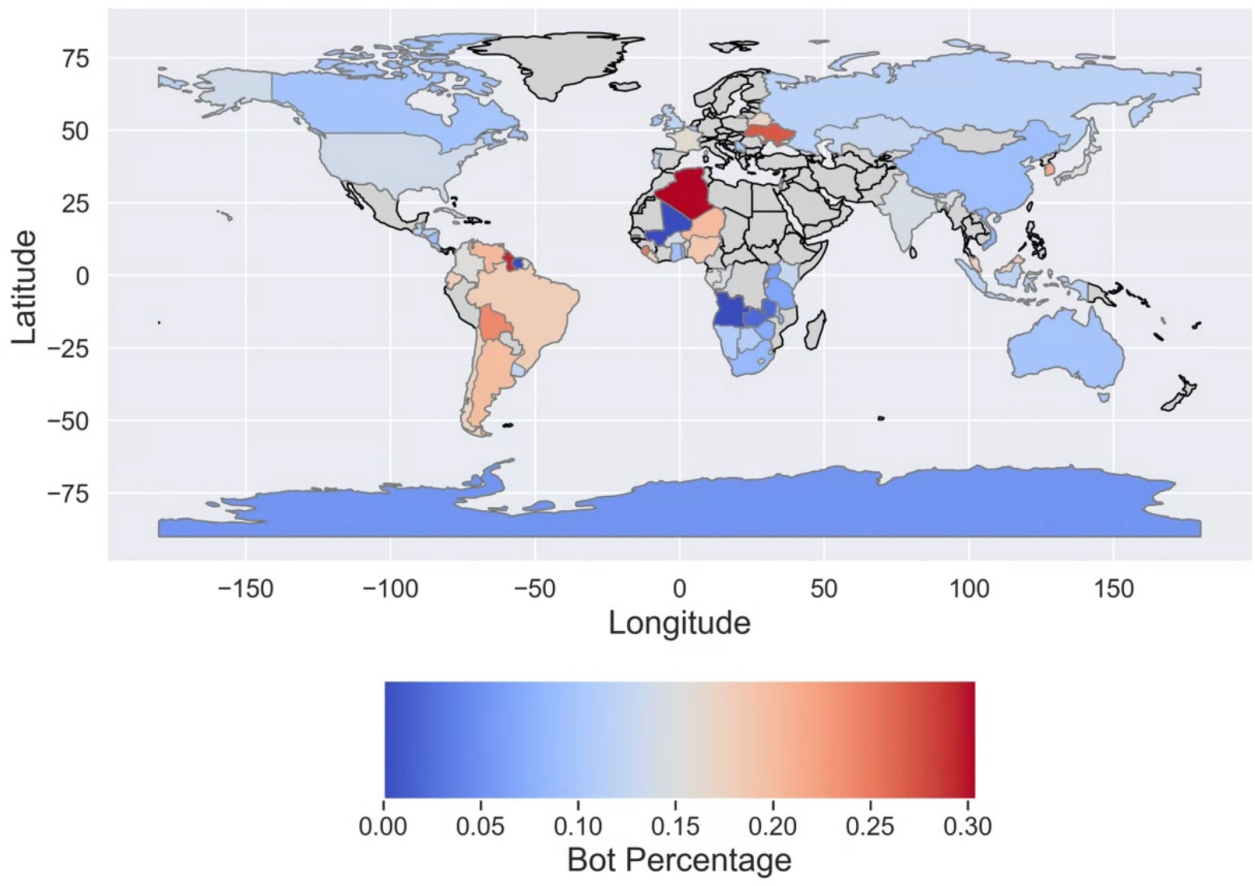


Information Manipulation

WHERE are narratives targeting?

COVID data 2020-2021

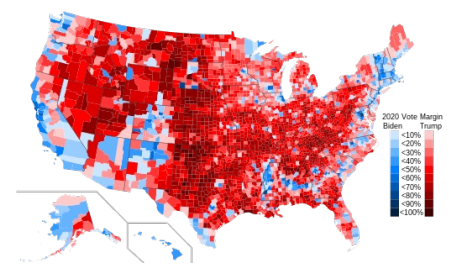
Bots are present all around the globe





Information Manipulation

WHERE are narratives targeting?



2020 US Elections



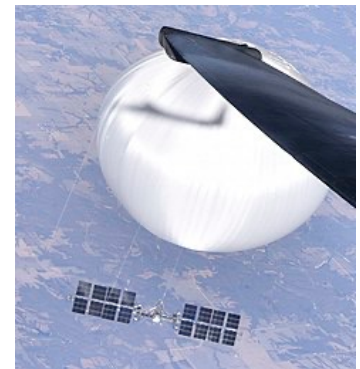
2020 Brexit



2021 Indonesian Alcohol Beverages/Palestine-Israel discourse



2022 Nancy Pelosi Visit to China



2023 US-China Balloon Incident

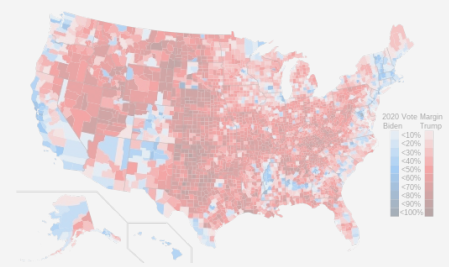


2023 Russia-Ukraine Conflict



Information Manipulation

WHERE are narratives targeting?



2020 US Elections



2020 Brexit

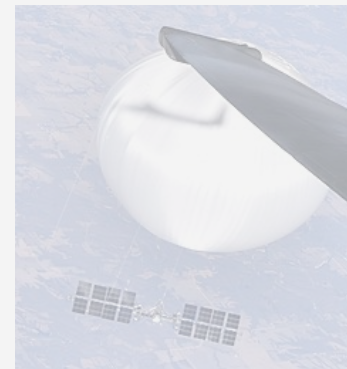


2021 Indonesian Alcohol Beverages/
Palestine-Israel discourse



2022 Nancy Pelosi Visit to China

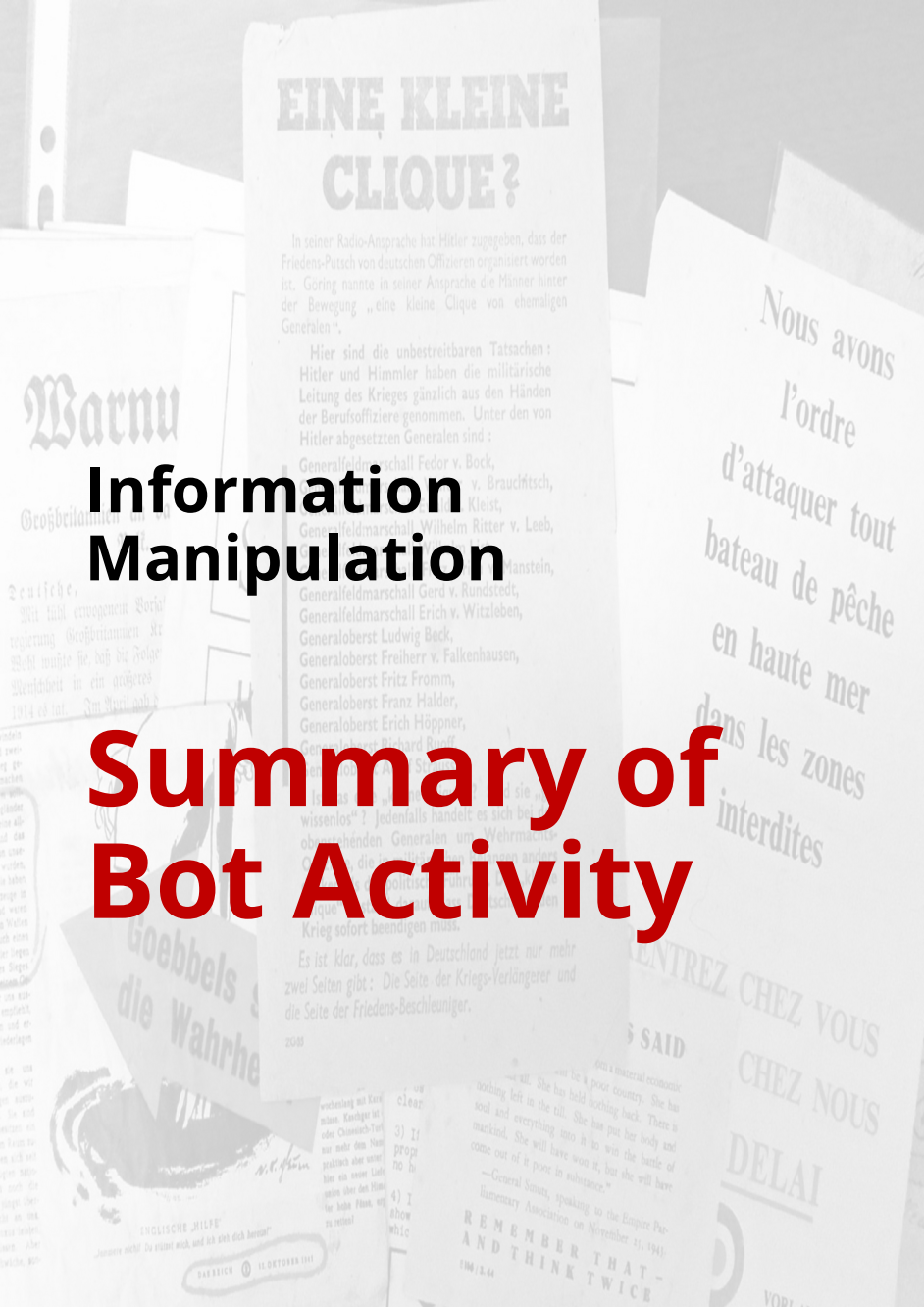
Topics that can divide society



2023 US-China Balloon Incident



2023 Russia-Ukraine Conflict



Information Manipulation

Summary of Bot Activity

WHY

Changing people's stances,
Polarizing Societies, Stance Convergence

HOW

BEND Framework,
Automated Coordination

WHO

Bots keep conversation alive
Humans create and spread narratives

WHAT

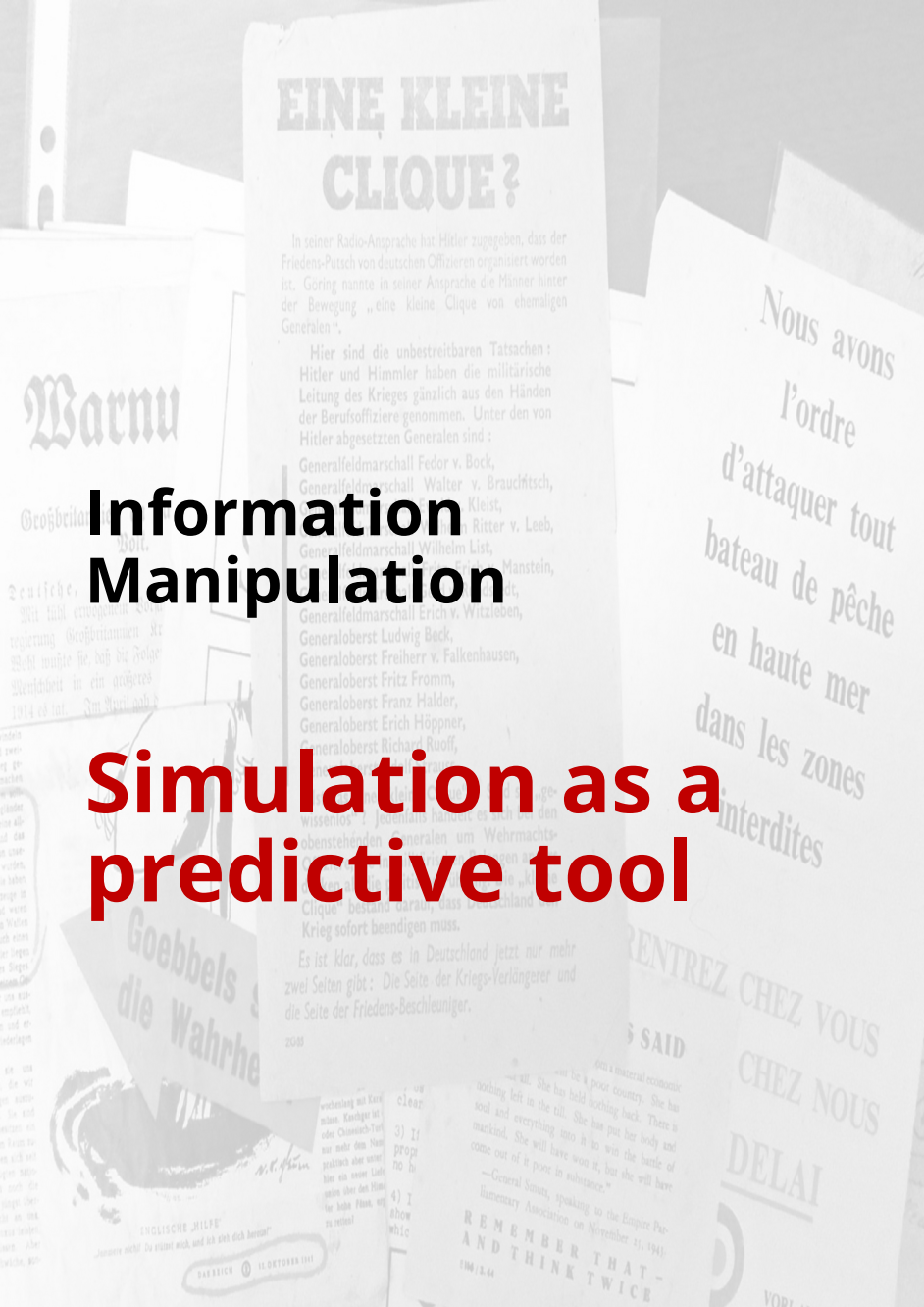
Bots exaggerate human-created narratives
Call for Action

WHEN

Key Events

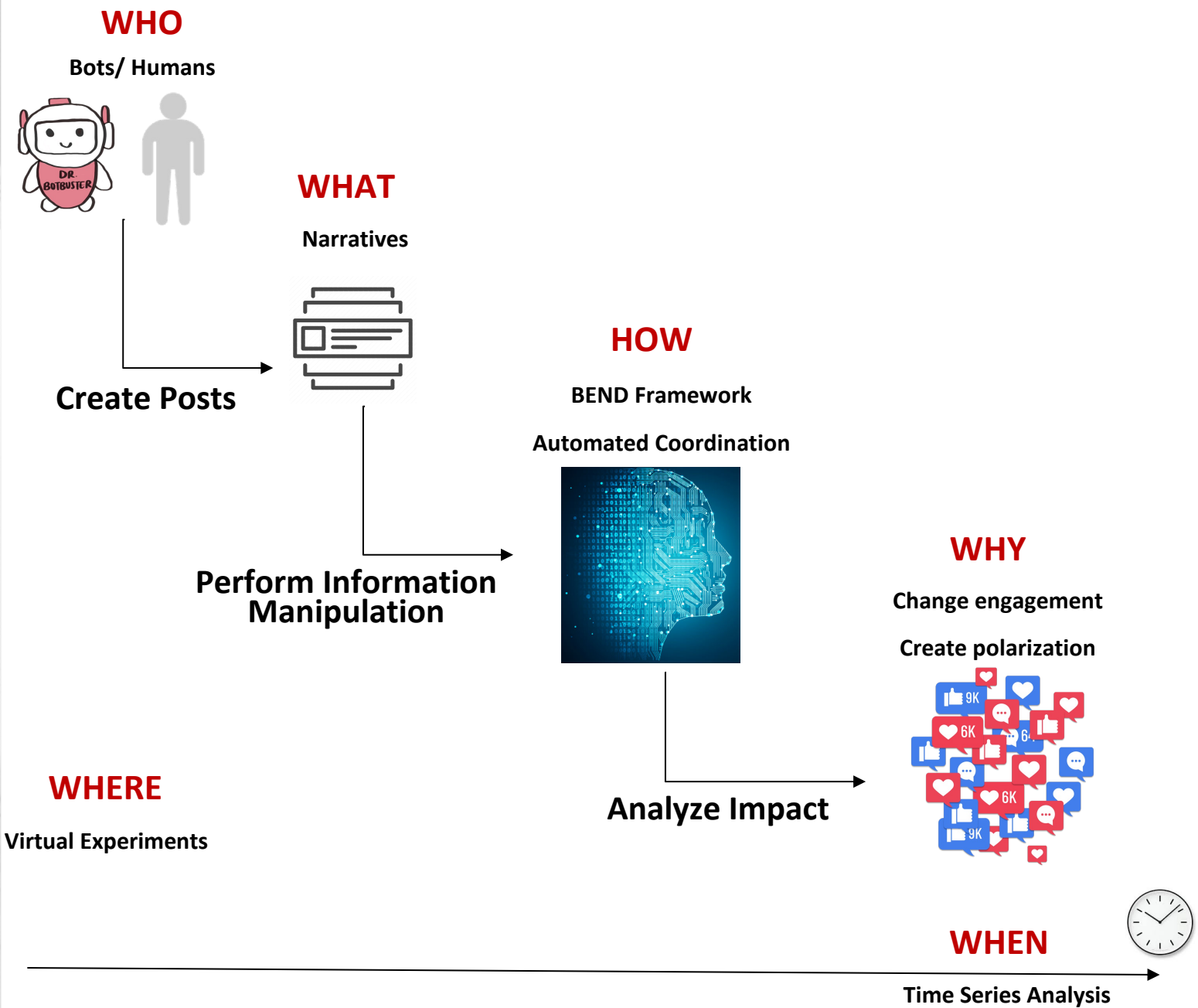
WHERE

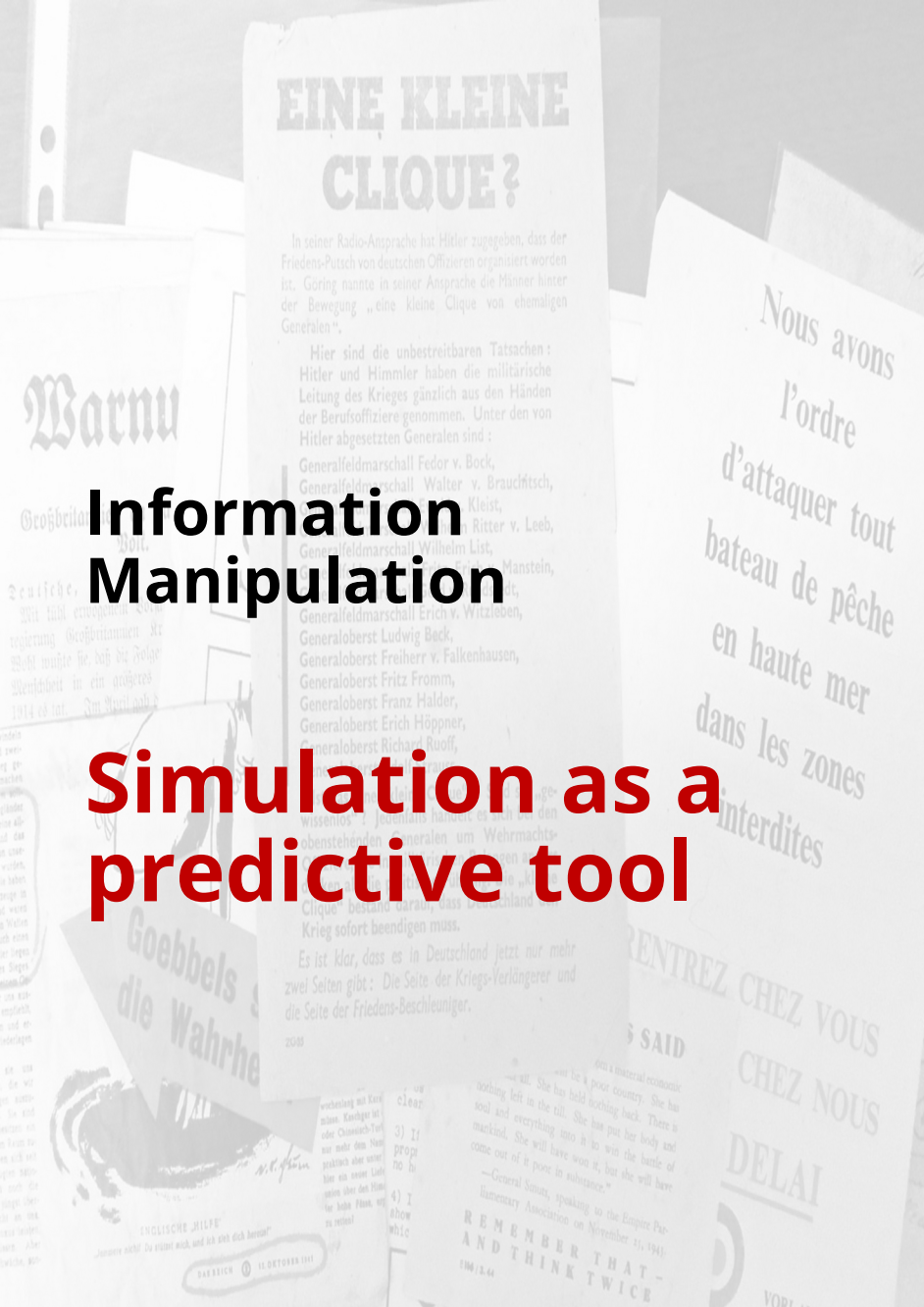
All around the globe
Topics that can divide society



Information Manipulation

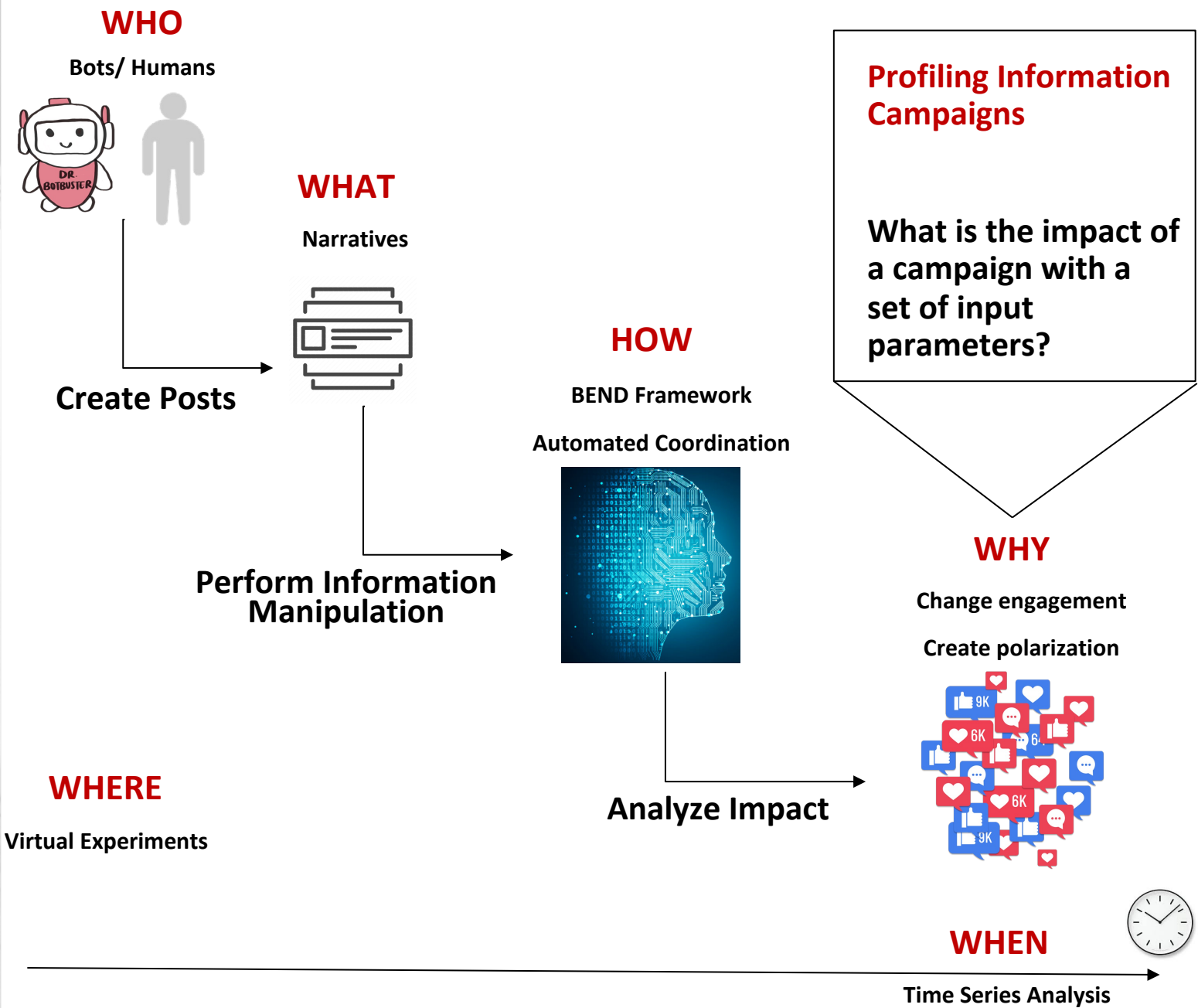
Simulation as a predictive tool

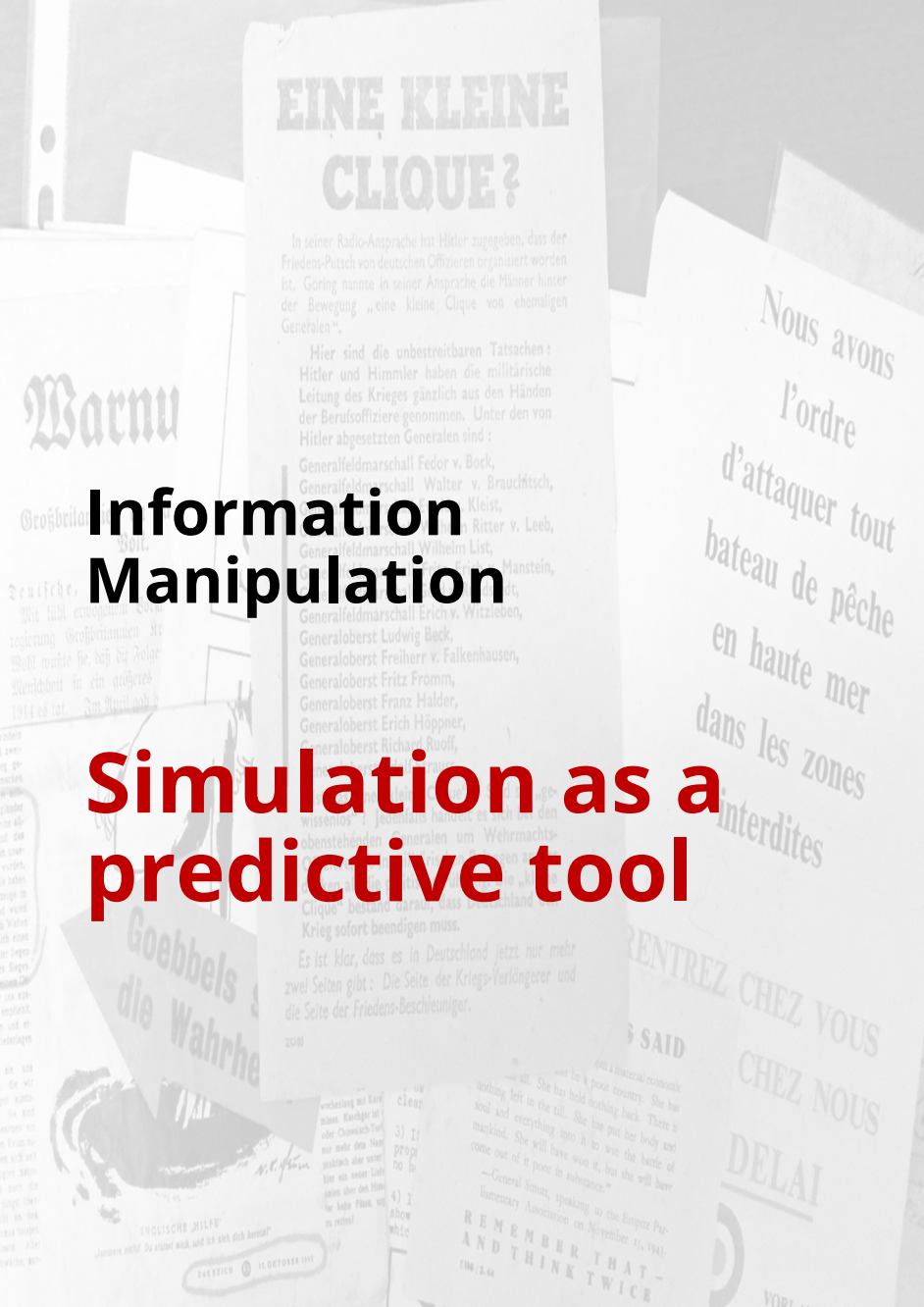




Information Manipulation

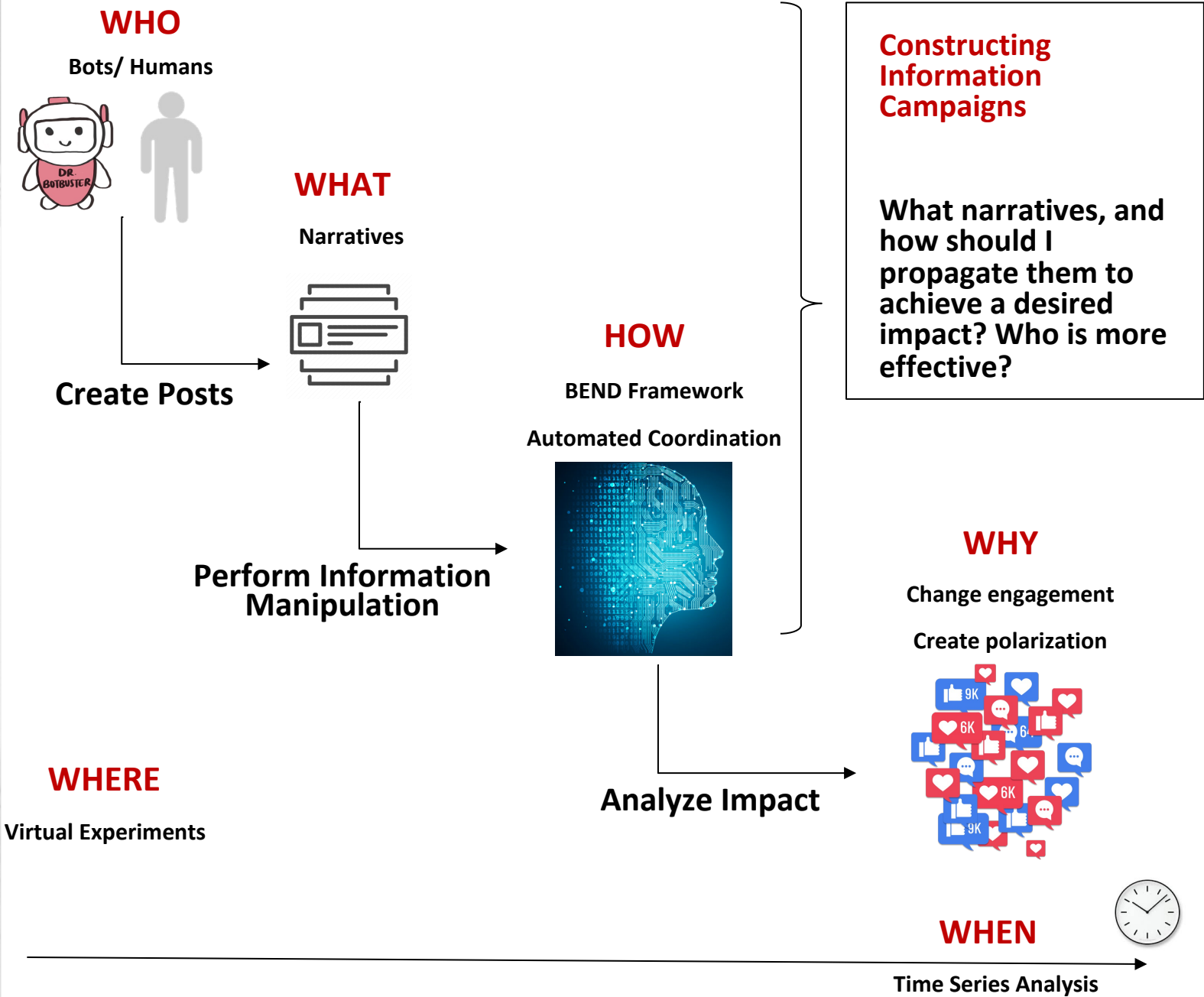
Simulation as a predictive tool





Information Manipulation

Simulation as a predictive tool

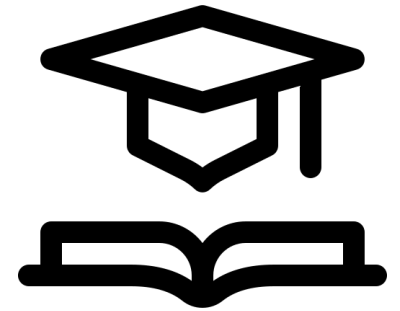
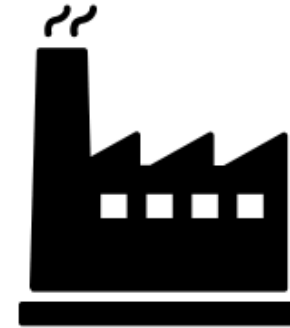




**Combatting
Information
Manipulation**

Multi-Pronged Approach

Government, Industry, Academia



Information Manipulation by Social Media Bots through a Network Analysis View

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