

Fighting Fire with Fire: Developing AI-enhanced Methodologies to Combat AI-enhanced Cognitive Threats

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Digital Transformation
RESEARCH SOCIETY

Nitin Agarwal, Ph.D. | Director, COSMOS Research Center

- Jerry L. Maulden-Entergy Chair & Donaghey Distinguished Professor, UA-Little Rock, USA.
- Faculty Fellow, ICSI, University of California, Berkeley, USA.
- IARIA Fellow, ARA Fellow, AAOC Fellow, IEEE Distinguished Visitor and Senior Member, ACM member, AIS member.



- Vanguard in the field of Social Computing & Socio-Cognitive Threat Mitigation
- Develop tools to understand digital behaviors and forecast trends to achieve social good
- Develop and establish partnerships (university-industry-government), alliances, standards, and policies
- Promote and disseminate research, training, and education
- Work with US government agencies and allies to protect our nation from adversaries
- Accelerate industry adoption and incubate commercialization opportunities

\$25+ million in grants

350+ journal and conference publications

10+ books

40+ best paper awards

5500+ research citations

NATO
&
WHO

recognized
COSMOS tools



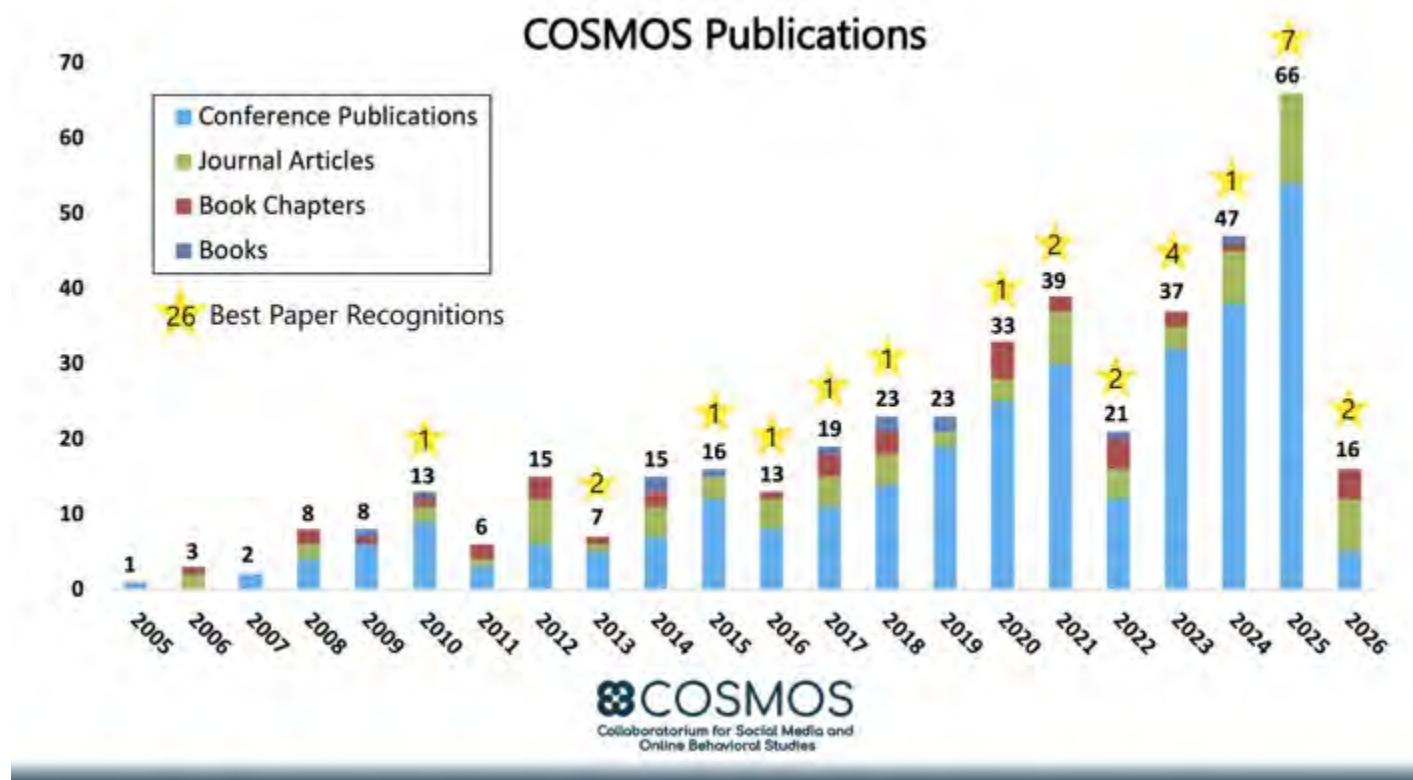
- Mitigating cognitive threats & enhancing community resiliency
- Combating AI-generated and amplified influence campaigns
- Toxicity, polarization, terrorism
- Social movements and collective action
- Smart and connected health

37 grants as PI (total \$69 million and \$30 million to UALR/COSMOS)



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- Combating AI-generated and amplified influence campaigns
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Collaboratorium for Social Media and
Online Behavioral Studies

Statewide research center
headquartered in the University of
Arkansas - Little Rock, USA

100+ members (Canada, USA, St.
Vincent & The Grenadines, Germany,
France, Turkey, Nigeria, Iraq, Pakistan,
India, Nepal, Bangladesh)

Funding \$30 million from US Army,
Navy, Air Force, DARPA, NSF.



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<https://cosmos.ualr.edu/>

- Characterizing *multimedia information environment* tactics (TTPs) and impact assessment [**\$5 million from US DOD - 2023**]
- Characterizing *coordinated cognitive attacks* through collective action-based framework [**\$5 million from US DOD - 2024**]
- Characterizing information actors (producers and consumers) engaged in cognitive attacks [**\$5 million from US DOD - 2025**]



ARO



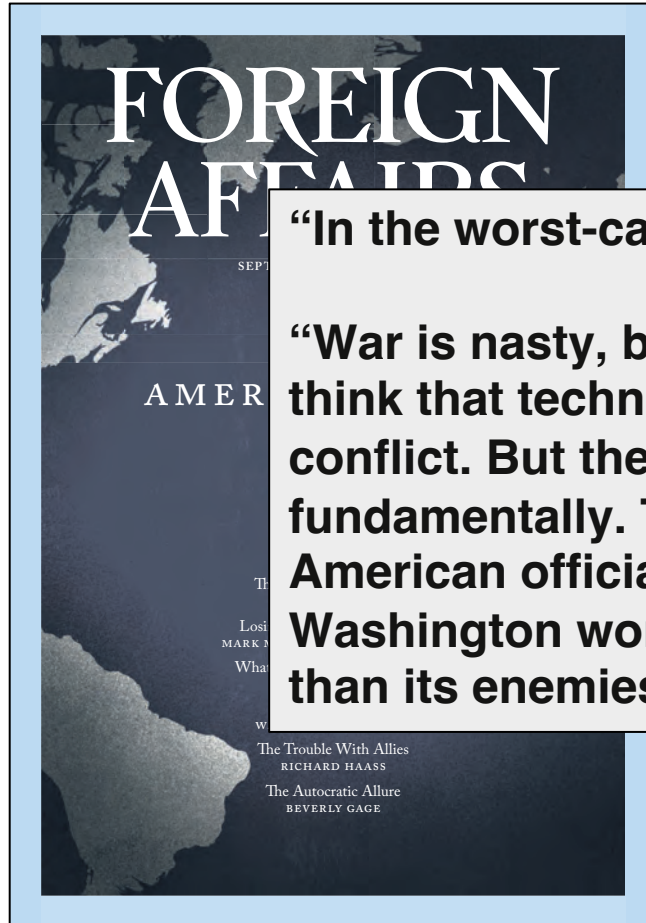
NATO



NATO

ework.

NATO STO-MP-HFM-361 Symposium on Mitigating and Responding to Cognitive Warfare



[Return to Table of Contents](#)

America Isn't

“In the worst-case scenario, AI warfare could endanger humanity.”

“War is nasty, brutish, and often much too long. It is an illusion to think that technology will change the underlying human nature of conflict. But the character of war is changing both rapidly and fundamentally. The United States must change and adapt, as well, and American officials must do so faster than their country’s adversaries. Washington won’t get it exactly right—but it must get it less wrong than its enemies.”

MARK A. MILLEY served as the Chairman of the Joint Chiefs of Staff from 2019 to 2023. He is a Visiting Professor at Princeton University and Distinguished Fellow in Residence at the Georgetown University School of Foreign Service.

ERIC SCHMIDT is Chair of the Special Competitive Studies Project and former CEO and Chair of Google. He is a co-author, with Henry Kissinger and Daniel Huttenlocher, of *The Age of AI: And Our Human Future*.

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FOREIGN AFFAIRS

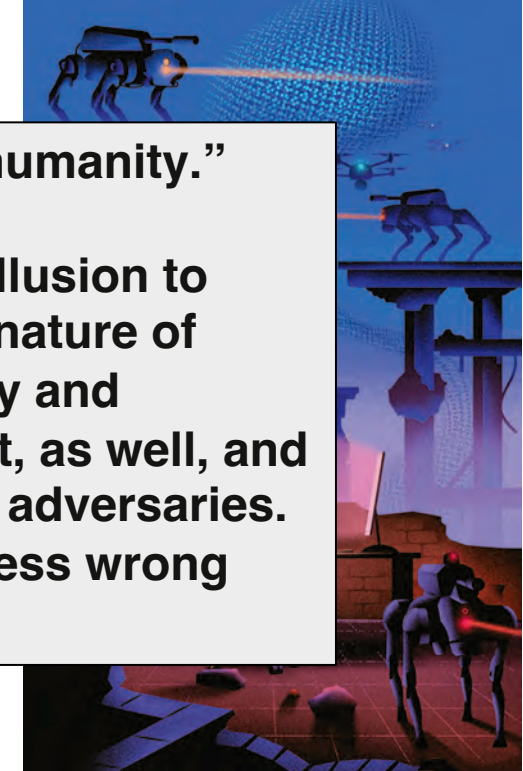


Illustration by Sam Green

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Mitigating Cognitive Threats

- Cognitive is categorized as the 6th and newest warfighting domain after land, sea, air, space, and cyber
- **Influence operations:** Anti-US and allies (e.g., NATO, EU)



Dragoon Ride
2015



Trident Juncture
2015



Brilliant Jump
2016



Anakonda
2016



Trident Juncture
2018



Baltic Operations
2019

- **Social media channels** for US Air Force Public Affairs Office
- **Terrorist** groups campaigns for recruitment, radicalization, and raising funds.
- **Indo-Pacific region** (Australia, Indonesia, Malaysia, Philippines, Singapore, Taiwan)
- **Pandemic:** COVID-19 scam busting & awareness (Arkansas AG, FVEYS, NATO)



ISIS flag misusing the *kalma*



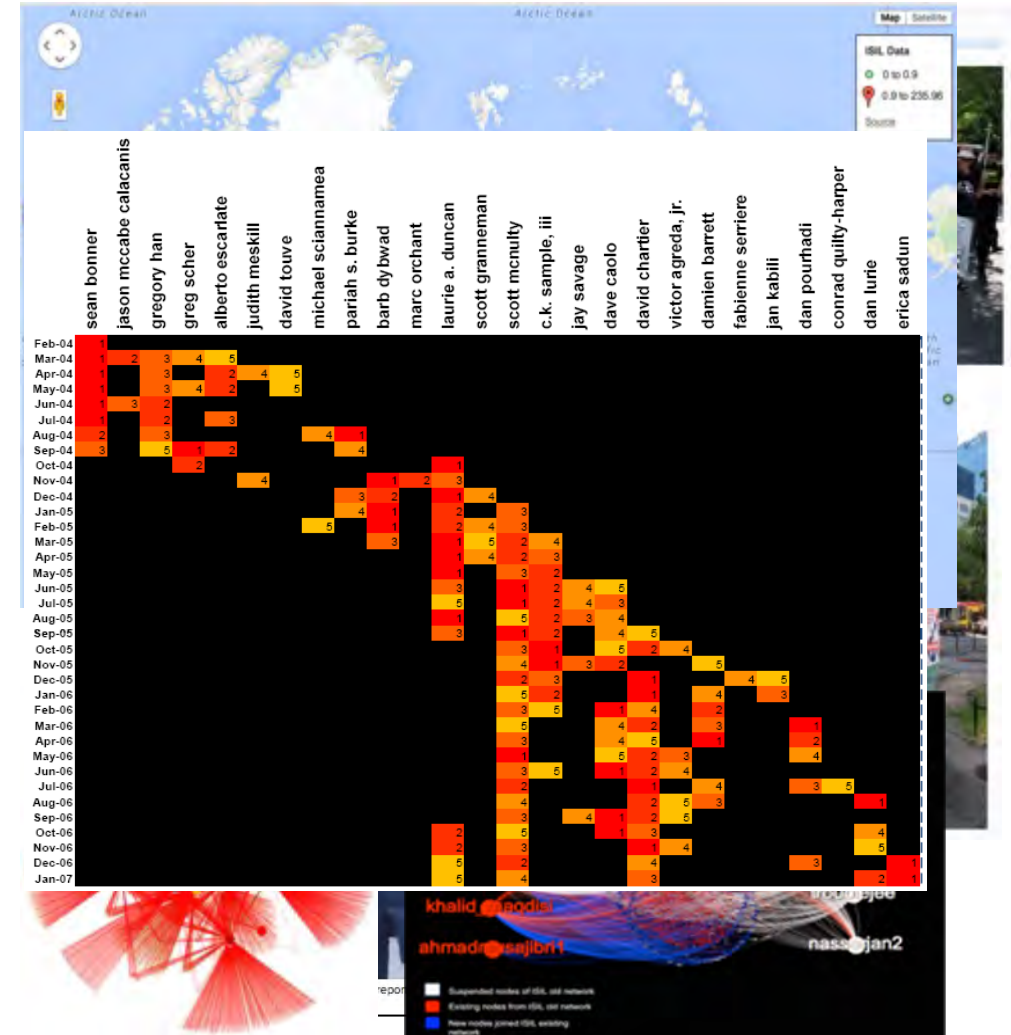
Real-time influence assessment

$$\text{InfluenceFlow}(p) = w_{in} \sum_{m=1}^{|I|} I(p_m) - w_{out} \sum_{n=1}^{|O|} I(p_n)$$

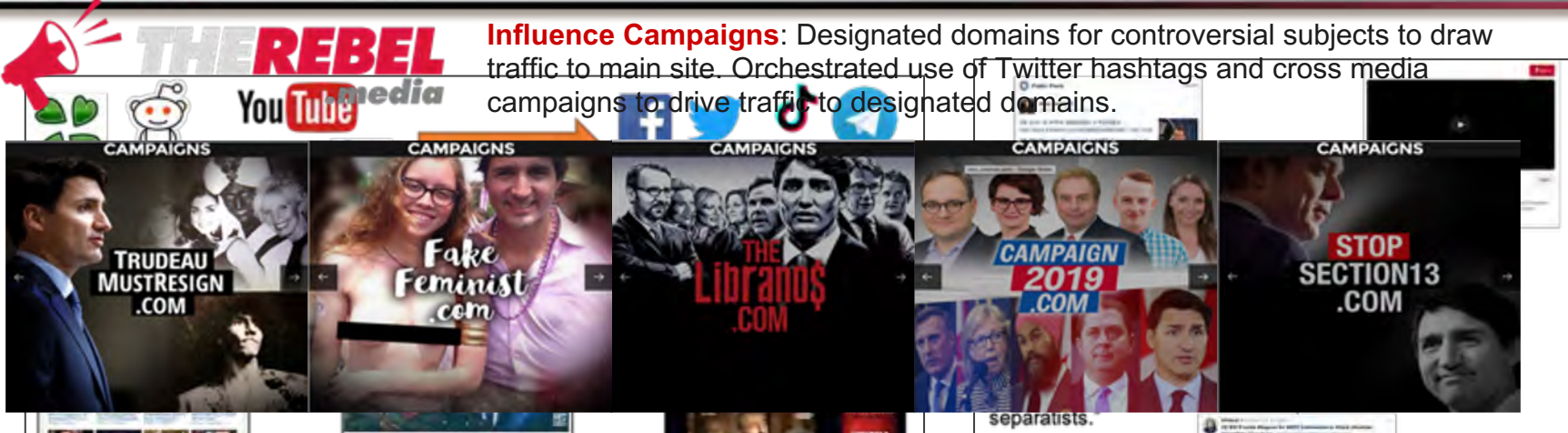
$$I(p) \propto w_{comm} \gamma_p + \text{InfluenceFlow}(p)$$

$$I(p) = w(\lambda) \times (w_{comm} \gamma_p + \text{InfluenceFlow}(p))$$

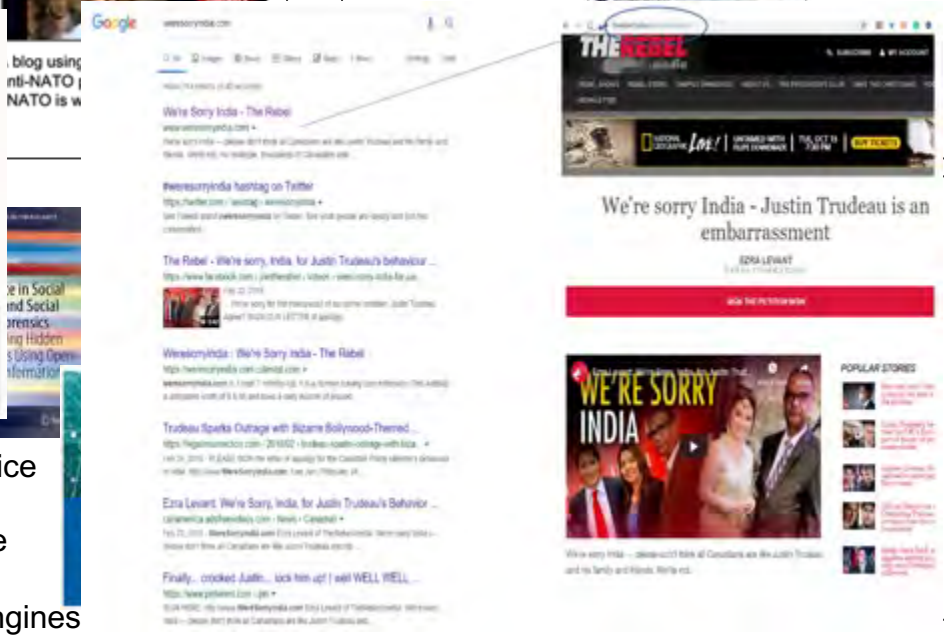
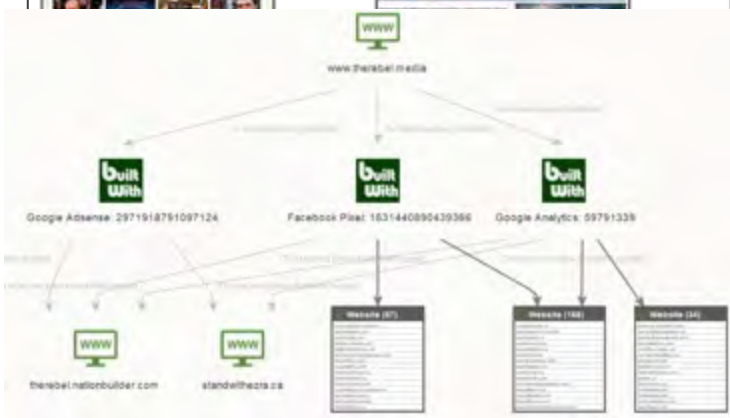
$$iIndex(B) = \max(I(p_i))$$



Multiplatform Influence Campaigns



Influence Campaigns: Designated domains for controversial subjects to draw traffic to main site. Orchestrated use of Twitter hashtags and cross media campaigns to drive traffic to designated domains.



291 fake websites created using "Built with API" service with anti-Trudeau narrative. One such fake website "weresorryindia.com" amplifies anti-Trudeau narrative suggesting he is not a friend of the Canadian-Indian community. The website tops the results in search engines

Multimedia Influence Campaigns

Computat
Res

Video ID: OM5v
Title: China vs U
South China Sea
Channel: Breaki



Similar vide
using barcc
identifie

South China
Morning Post
(SCMP)

1



THE UNIVERSITY OF
SYDNEY

Strengthening Australia's Information Warfare Capabilities in Fighting Foreign Interference and Propaganda

**Strategic Policy Grants Program 2020
Department of Defence**

Aim Sinpeng
The University of Sydney

Nitin Agarwal
University of Arkansas, Little Rock

Justin Hastings
The University of Sydney

30 July 2021



groundbrea
Conference o

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g anti-US vide
- shows up at t

South China Sea

Philippine navy ships
14:11 - 14:11

US AND PHILIPPINES
'MILITARISATION' IN S
address international - 2018

South China Sea - Duterte
against China

Philippine Navy
(photo)

(SHTF) China Has Con
China Sea

South China Sea - Phil
Thun Island

Strengthening Australia's Information Warfare Capabilities Page | 25

South Korea (Arirang News). Two channels of note – Defence Flash News and CIS News Network – are YouTube-based organisations based in the US and India respectively.

Defence's military exercises with US and its allies and deteriorating relations with China dominated YouTube comments



theory.

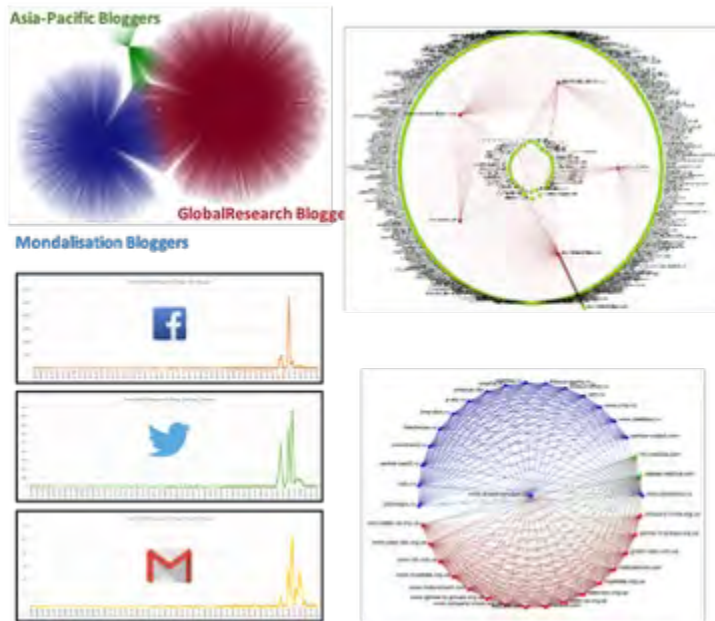
has been
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Capitol Riot

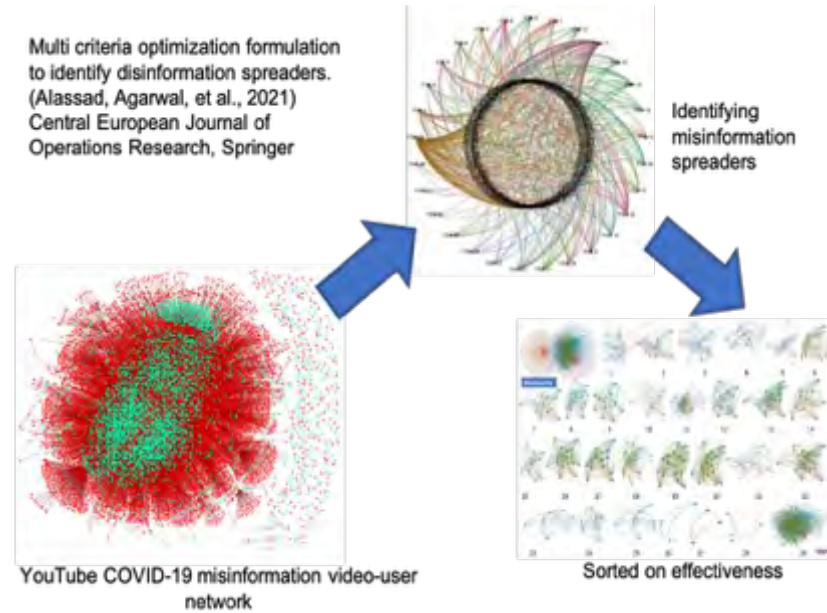


Coordinated bloggers



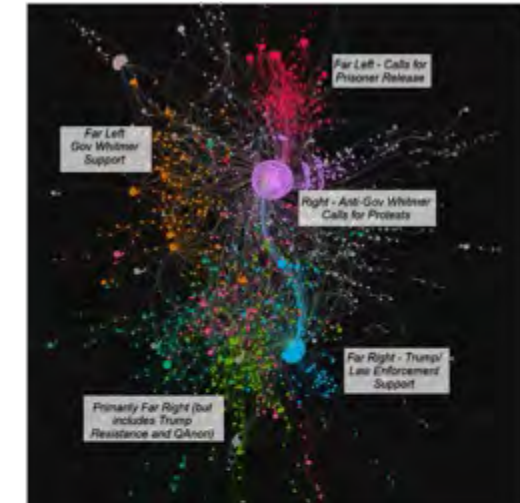
Anti-West/anti-US Indo-pacific bloggers

Coordinated YouTubers

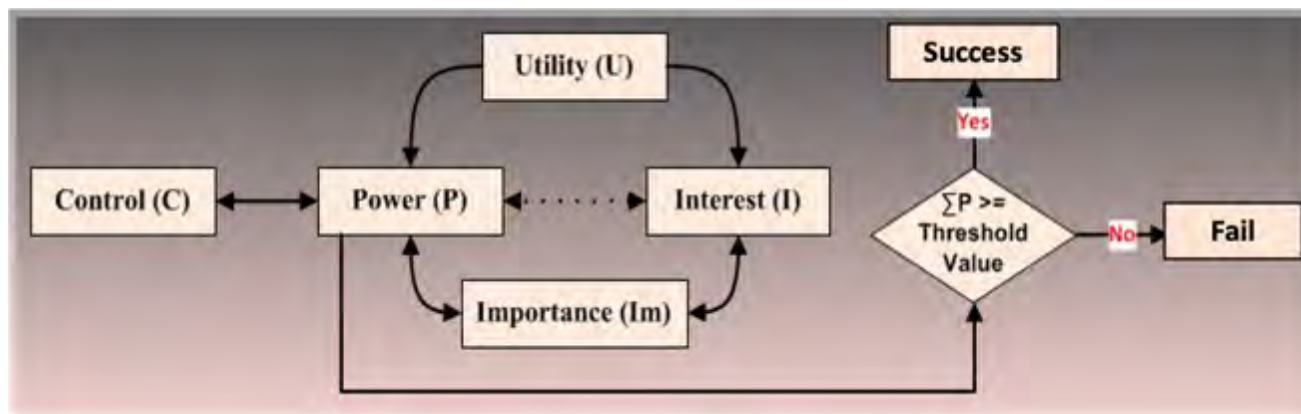
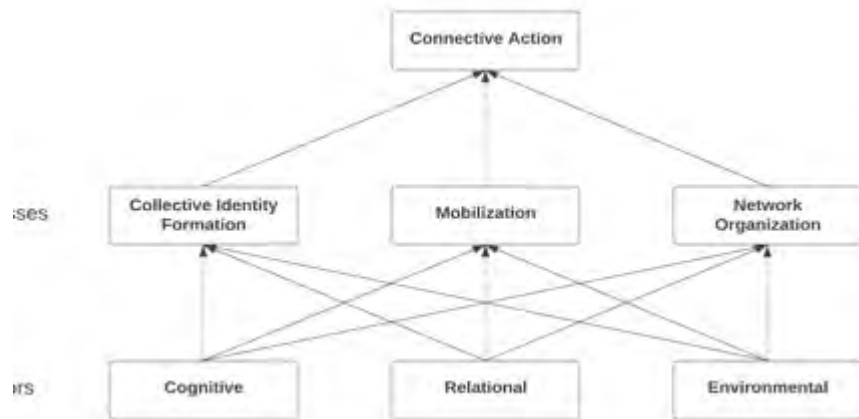


COVID-19 misinformation and conspiracy theory YouTubers

Coordinated Twitter users



Michigan lockdown protest network
 #LetMiPeopleGo, #MiLeg, #Endthelockdown, #MichiganProtest; April 1 to May 20; 16,383 tweets; 3,632 nodes; 382 groups (focused on 5 most powerful groups)
Research showed powerful coordination among conspiracy groups calling for protest and actions against Gov. Whitmer. FBI later unraveled a plot to kidnap Gov. Whitmer.



$$\max \sum_{i=1}^n \delta_i \quad (1)$$

Subject to

$$\delta_i = \{d\delta_1 \leq d\delta_2 \leq d\delta_3 \leq \dots \leq d\delta_i\} - \overline{dc_j^0} \quad \forall i, j \quad (2)$$

$$d_i^j = \sum_j m_{ij} \quad \forall i \quad (3)$$

$$d_i^j \geq 2 \quad \forall i \quad (4)$$

$$D_i^j = \frac{1}{n} \sum_{i=1}^n d_i^j \quad \forall i \quad (5)$$

$$D_i^j < d_i^j \leq D_i^j \quad \forall i \quad (6)$$

$$a_i^j = \frac{(\# \text{ of Triangles}) \times 3}{\# \text{ of Connected Triples of Nodes}} \quad \forall i \quad (7)$$

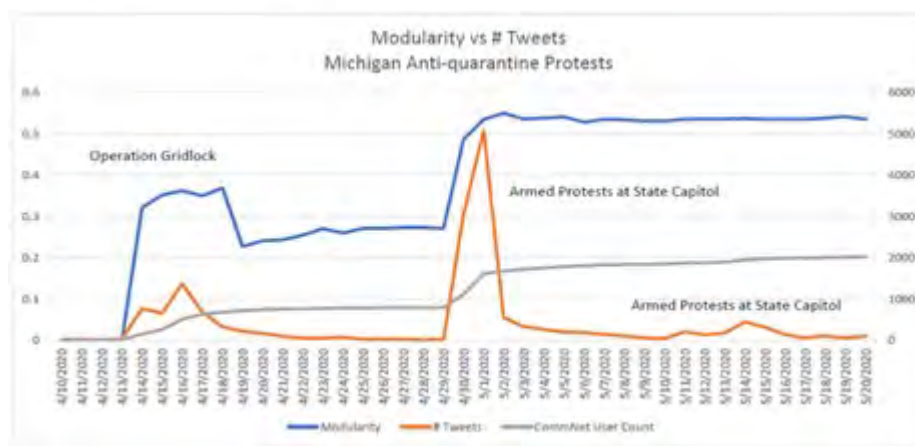
$$AC_i^j = \frac{1}{n} \sum_{i=1}^n a_i^j \quad \forall i \quad (8)$$

$$AC_i^j < a_i^j \leq AC_i^j \quad \forall i \quad (9)$$

$$\overline{c_j^0} = \{c_1^0, c_2^0, c_3^0, \dots, c_j^0\} - \overline{c_j^0} \quad \forall i, j \quad (10)$$

$$\overline{c_{j,k}^0} = \overline{c_{j,k}^0} \quad \forall i \quad (11)$$

$$F = \{c_0, c_j, c_{j+1}, \dots, c_k^0\} \quad \forall j, k \quad (12)$$



Communities	Political Category	No. of Users in Each Community	No. of Nodes	No. of Edges	Modularity	Average Weighted Degree	Average Betweenness Centrality	DCFM Power
Largest Community	Right	459	510	526	0.294	1.457	0	90.88
Second Community	Right	152	284	419	0.578	2.773	0	77.12
Third Community	Right	212	269	322	0.468	1.792	0	280.98
Fourth Community	Left	78	204	491	0.422	9.779	24.26	10.36
Fifth Community	Left	115	243	339	0.608	7.683	0.16	28.94

Table Y1 - Top 5 Largest Modularity-Based Communities

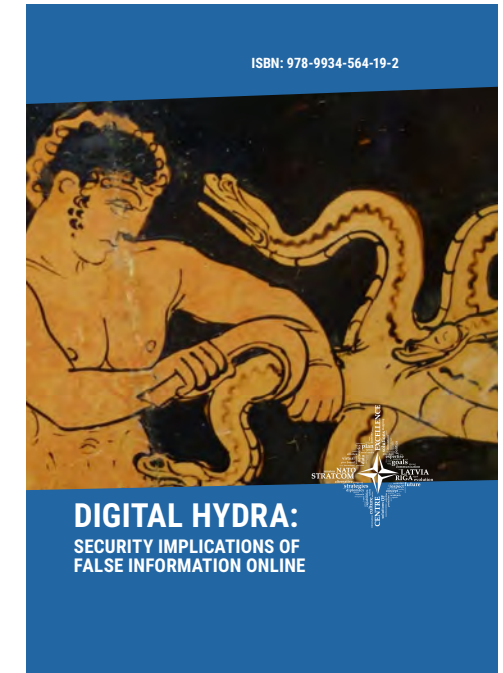
Elsevier Journal of Information Processing and Management. Springer's Central European Journal of Operations Research. Journal of Computational and Mathematical Organization Theory, Journal of Social Network Analysis and Mining. (2020, 2021, 2022, 2023, 2024)



Published by Army University Press, in 7 volume book set on ***Large-Scale Combat Operations***, in the book titled "Perceptions are Reality: Information Operations" (AUSA)



Examining Strategic Integration of Social Media Platforms in Disinformation Campaign Coordination. **Journal of NATO Defence Strategic Communications**

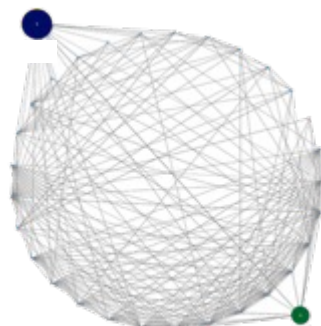


Blogs, Fake News, and Influence Operations. Digital Hydra: False Information Online as a Weapon, **NATO StratCom COE**.

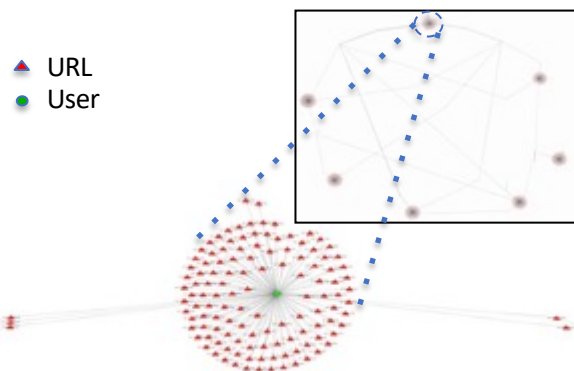
Human-AI Agent Coordination Evolution

From bots → botnets → social bots

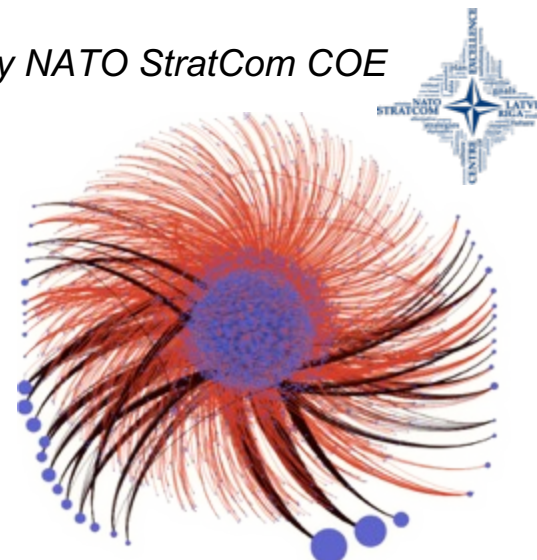
Published by NATO StratCom COE



Mutual reciprocity.
IFYFM & FMIFY



No mutual reciprocity.
Coordination in information network



Organizational hierarchy.
Core and peripheral bots

COORDINATION/BEHAVIOR COMPLEXITY



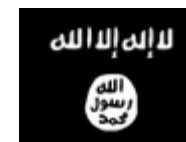
Crimean Invasion 2014



Dragoon Ride 2015



Trident Juncture 2015

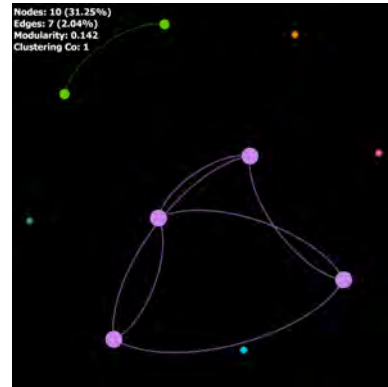
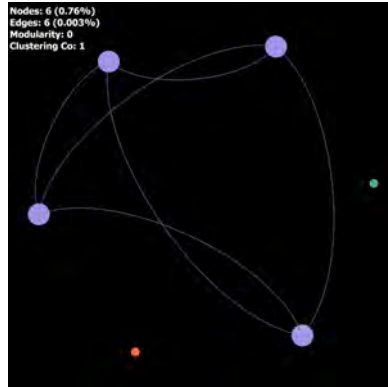


ISIS Propaganda 2016



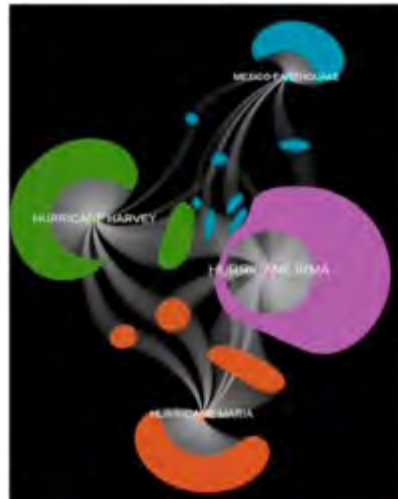
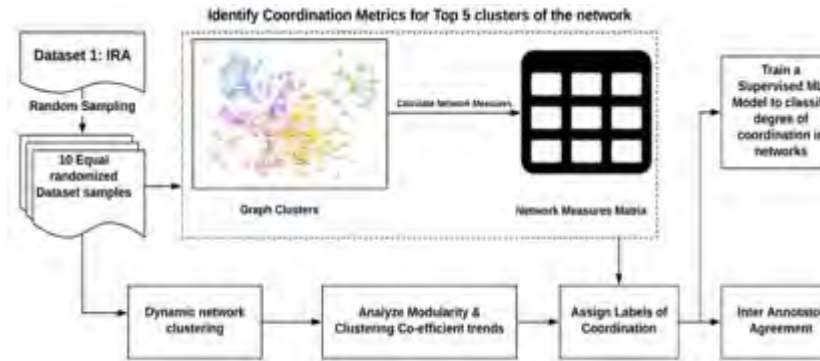
Examining the Use of Botnets and their Evolution in Propaganda Dissemination. **Journal of NATO Defence Strategic Communications**

Modeling Botnet Coordination



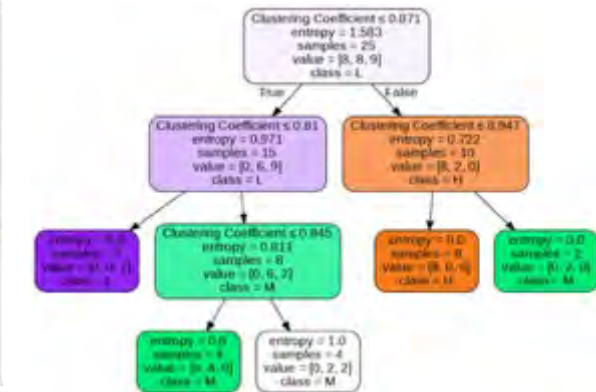
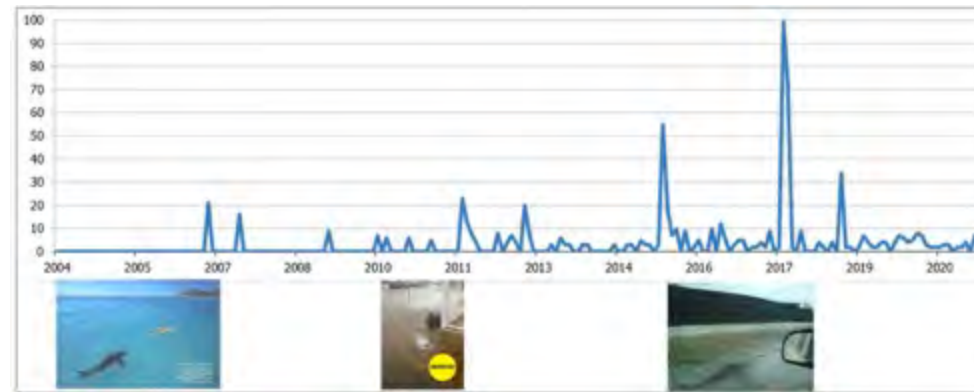
IRA Twitter bot data released by US Intelligence Agencies

Detecting coordination among Twitter social bots
IEEE Transactions on Computational Social Systems (TCSS), 2021.

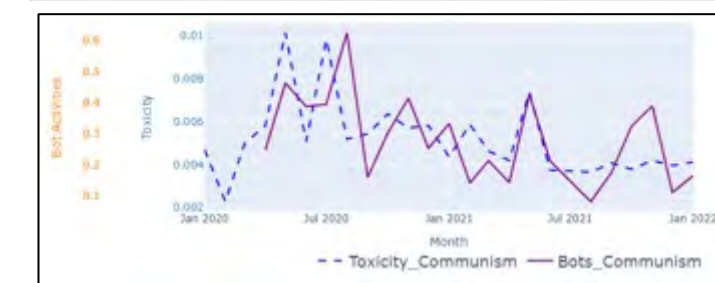
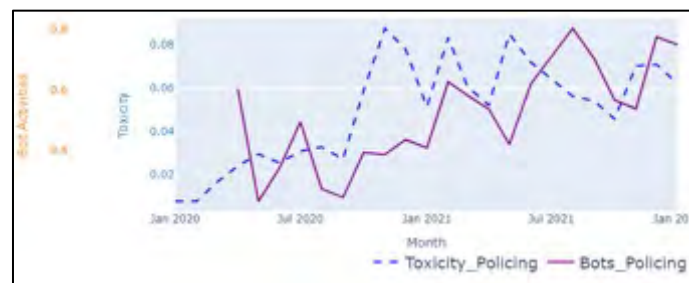
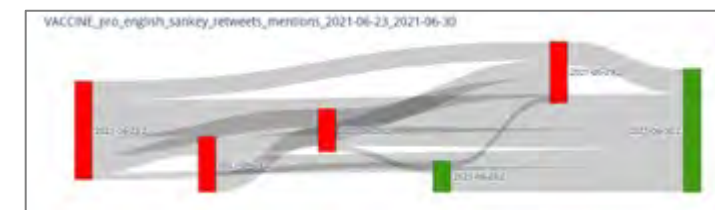
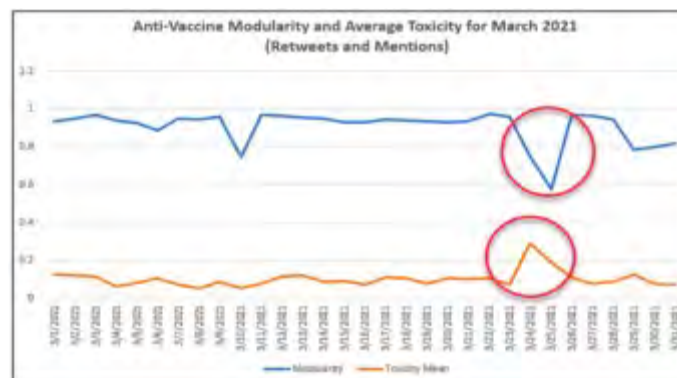
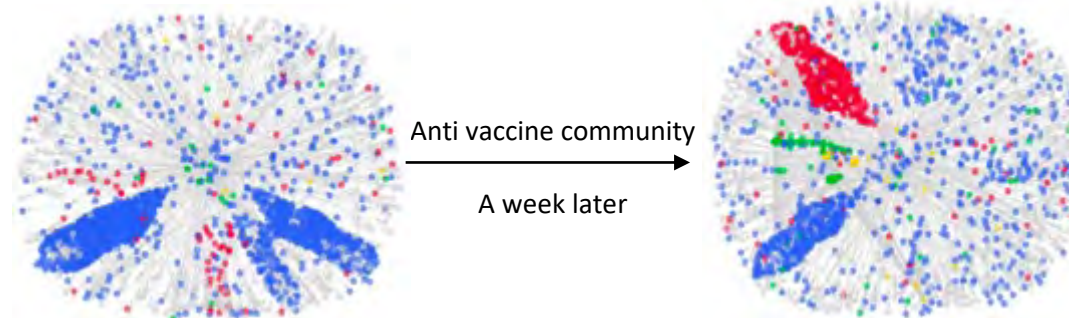


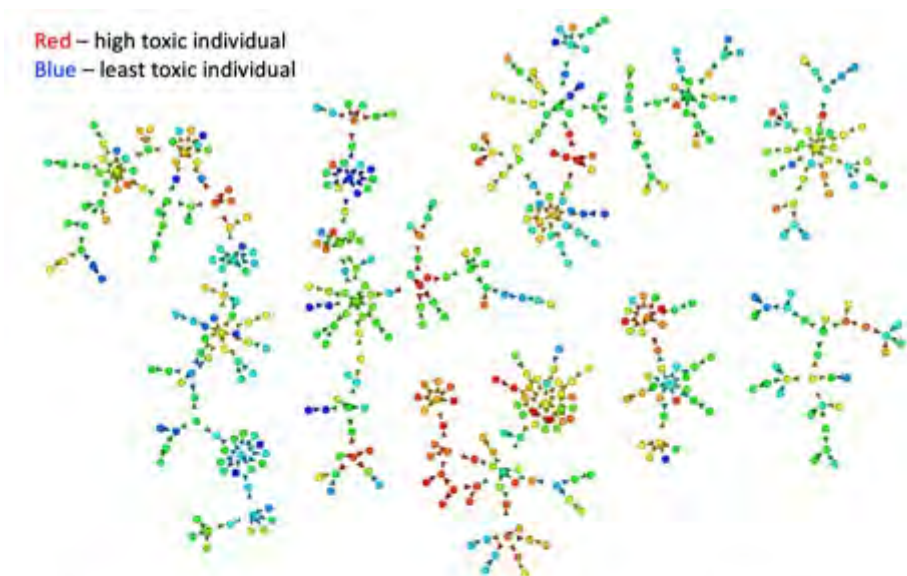
Language	Hashtag (Translation)
English	#DACA, #BlackLivesMatter
Spanish	#VenezuelaDemocraciaYDialogo (Venezuela Democracy and Dialogue), #Cáncer (Cancer)
Arabic	(The demise Of Israel) #الارث (The Jews)
French	#Nudéaire (Nuclear), #GendarmerieEnOpération (Gendarmerie Special Operations)
Mandarin	金正恩 (Kim Jong-un), 核试验 (Nuclear Test)

Bot coordinated misinformation during Hurricanes



- Toxic discourse causes disruption and polarization/ segregation among communities.
- Community splinters when toxicity rises.
- Granger causality test suggests the effect is strongest after two days.
- Bot activity found to be positively correlated with toxicity.
- Higher toxicity leads to community fracturing.
- This work shows a way to measure impact of bots.





Toxicity analysis on YouTube commenters. Toxic discourse causes disruption and polarization/segregation among communities, as seen above. We demonstrate that by removing highly toxic users from a network, hate speech reduces, online discourse improves, and fractured communities heal. Our findings offer guidance to policymakers within each online social network to make informed decisions about the information environment and derive appropriate and timely countermeasures to continue providing a healthy platform for their users.

STRS epidemiological model for toxicity propagation – Susceptible (S); Toxic (T); Recovered (R); Susceptible (S)

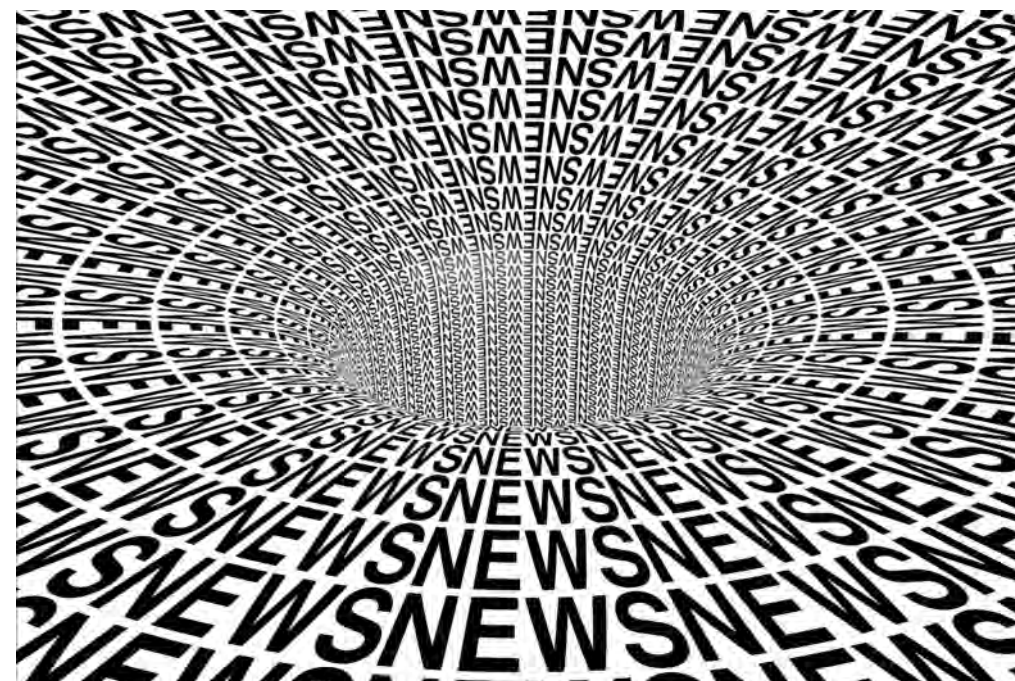
We demonstrate that by removing highly toxic users from a network, hate speech reduces, online discourse improves, and fractured communities heal. Our findings offer guidance to policymakers within each online social network to make informed decisions about the information environment and derive appropriate and timely countermeasures to continue providing a healthy platform for their users.

Experimental simulation	Toxicity score	Percentage reduction
Removal of top 10 users with high Betweenness centrality	0.720981759	0.21
Removal of top 10 users with high PageRank centrality	0.722317191	0.02
Removal of users with toxicity scores greater than 0.8	0.641927323	11.15

Elsevier Journal on *Information Processing and Management Special issue on Dis/Misinformation Mining from Social Media 2022*, HICSS 2022, AMCIS 2024, ICWSM 2024.

Working with Social Media platforms and Arkansas Office of the Attorney General

- AI-based recommendation algorithms that predict our shopping behaviors, books and articles to read, videos to watch lack transparency.
- Recommendation algorithm learns from behavioral data and perpetuates the underlying bias in its recommendations.
 - YouTube's recommendation algorithm is known to push its viewers down the conspiratorial rabbit hole by suggesting related videos.
 - On Facebook, ads to recruit delivery drivers for Domino's Pizza Inc. were disproportionately shown to men, while women were more likely to receive notices in recruiting shoppers for grocery-delivery service Instacart Inc.
- Explainable model could help in identifying causes of biased recommendations thereby enhancing the model's transparency.



- Channel characterization based on implicit algorithmic bias requires identification and measurement of bias.
 - Power law distribution fitting (exponent)
 - Gini coefficient - a single number that demonstrates a degree of inequality in a distribution of income/wealth.
- Characterization based on context -> COVID-19 context showed largest implicit algorithmic bias, marked in red.
- Characterization based on impact -> Implicit bias resulted in extremist content communities (far left and far right information bubbles).

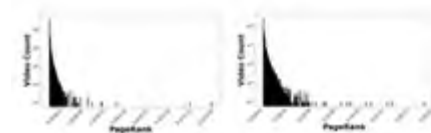


Fig. 1. Distribution of PageRank values in the recommendation graphs 1 (left) and 2 (right). We observe similar results in all recommendation graphs. The count of values is represented in log scale on the y-axis.

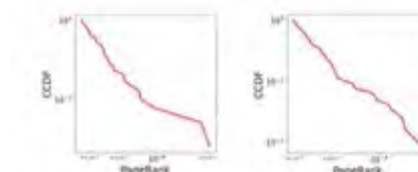
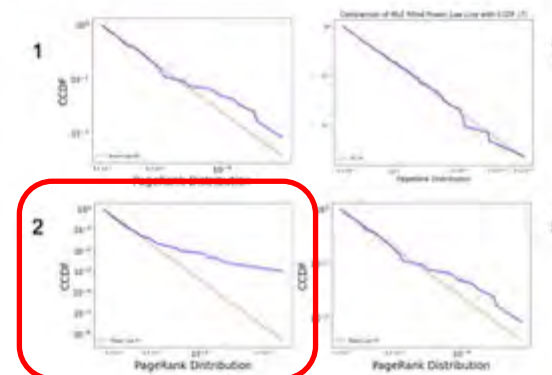
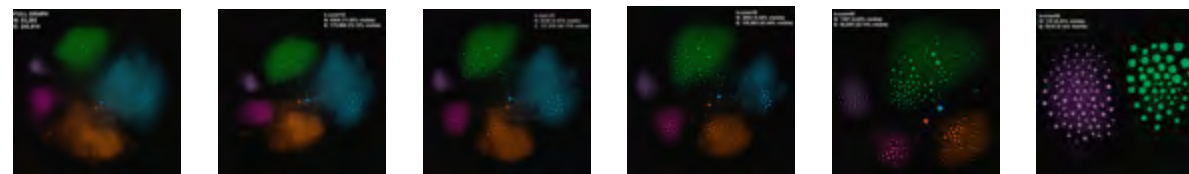


Fig. 2. Complementary Cumulative Distribution Function (CCDF) Plots of PageRank Scores in each Recommendation Graphs 1 (left) and 2 (right).

Topic drift and decrease in relevance was observed.



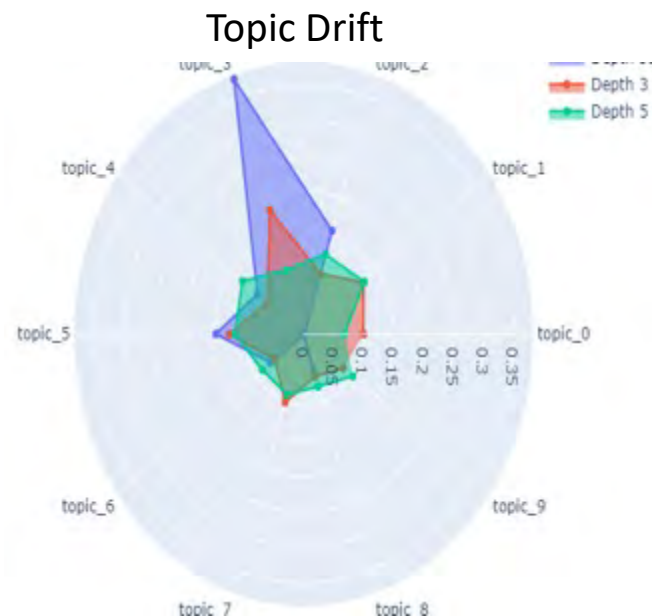
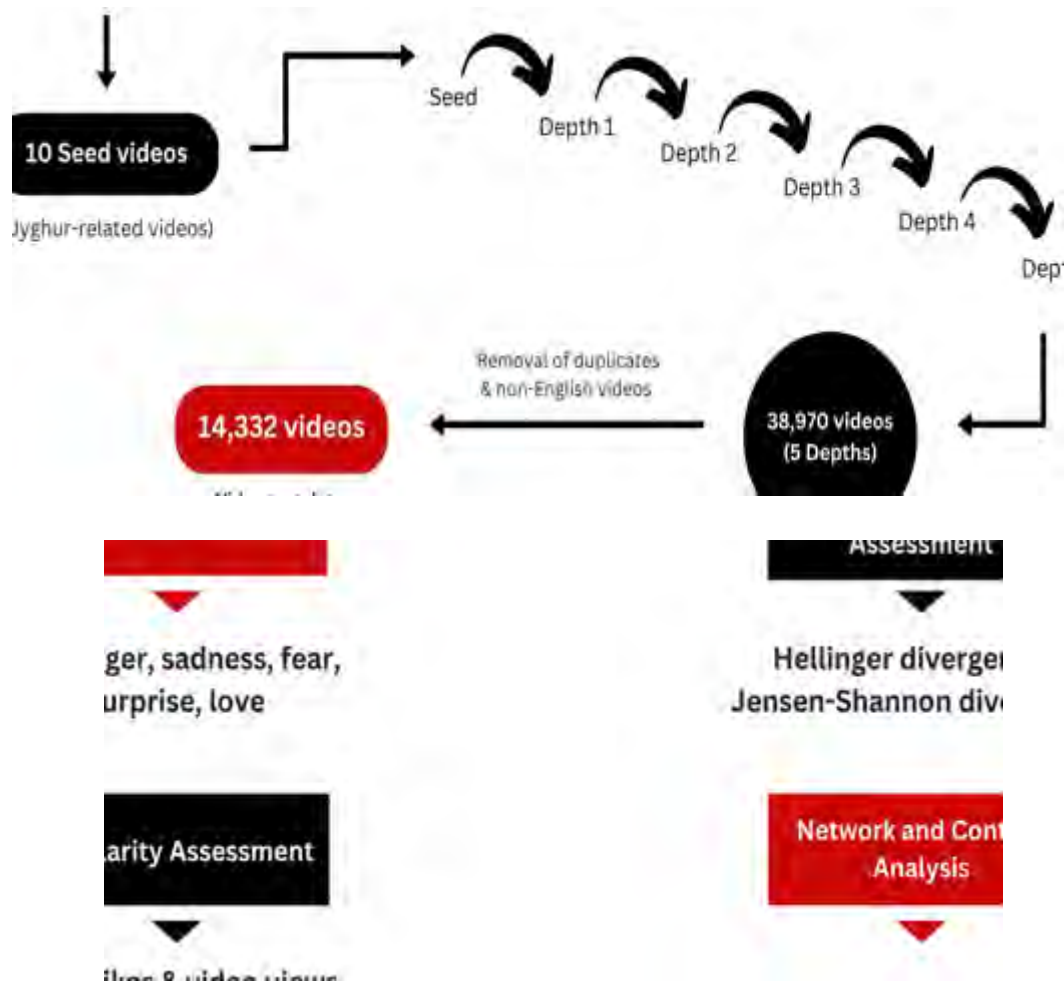
Top PageRank videos were removed weeks or months after their appearance in the recommendation network. Reason for content removal is violation of platform terms and services.



Far-left and far-right content communities/information bubbles resulting due to biased recommendations

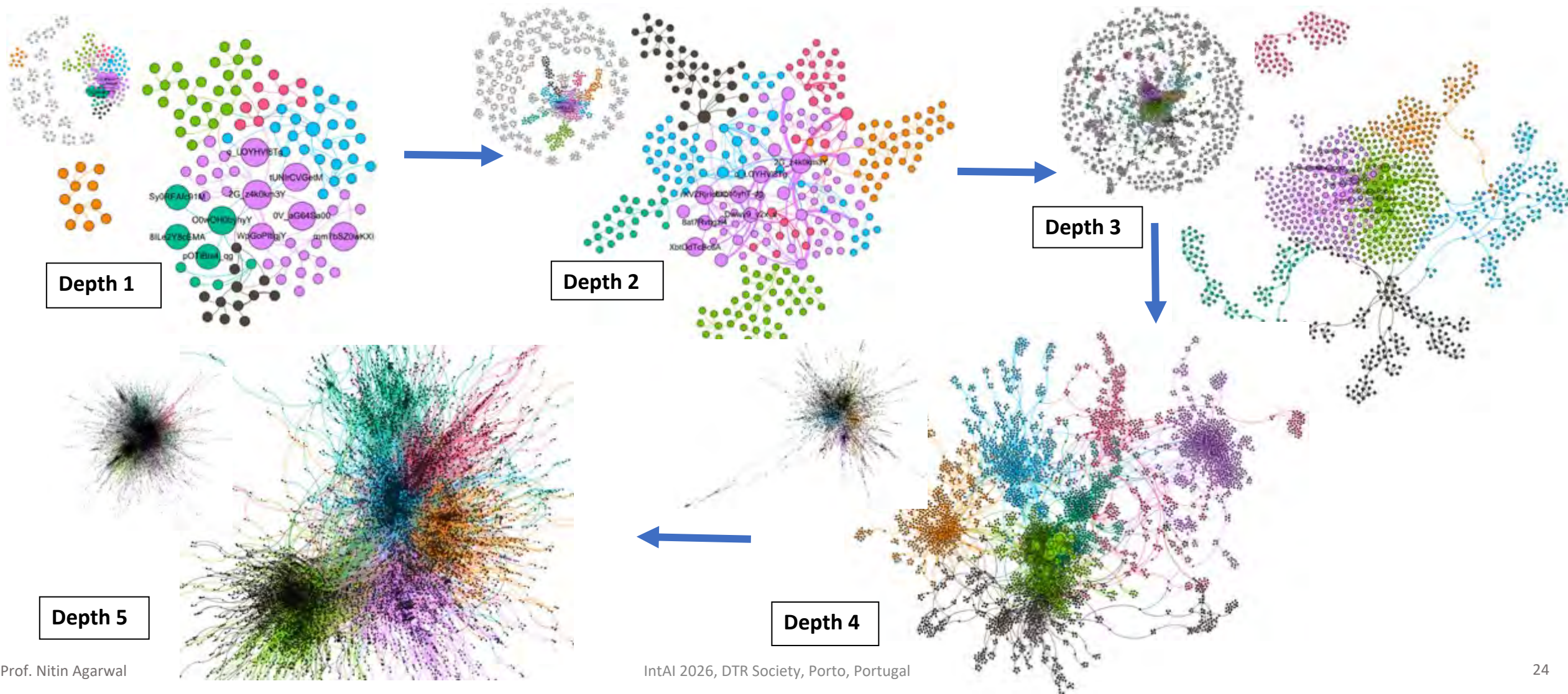
Complex Networks 2021; ECIR 2023; Complex Networks 2023, 2024; ASONAM 2023, 2024, HICSS 2025

Exploiting AI Bias – Uyghur Narrative

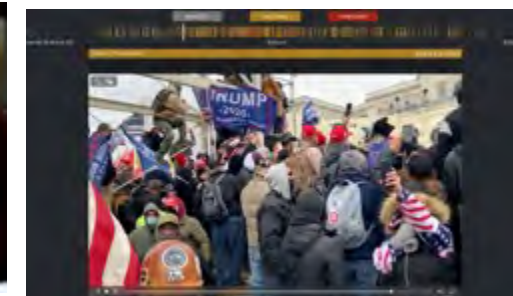
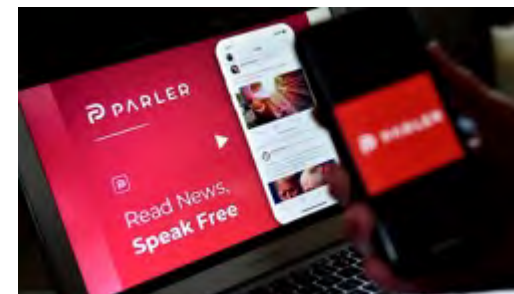


ECIR 2023, HUSO 2023, The Web Conference 2024, Jnl of SNAM 2024

AI Bias 'Hot Spots'



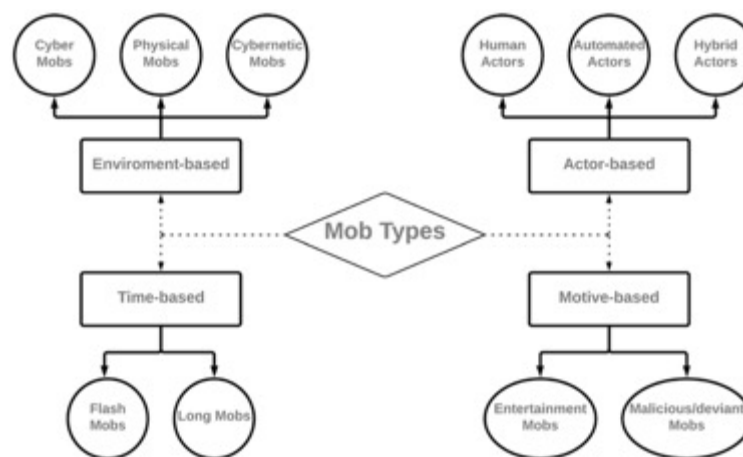
SCF and SNA informed methodologies to examine strategic combination of mainstream and fringe social media platforms; influence and reach of digital activity of extremist groups; multi-theoretic mob simulation – AI and Agent based modeling.



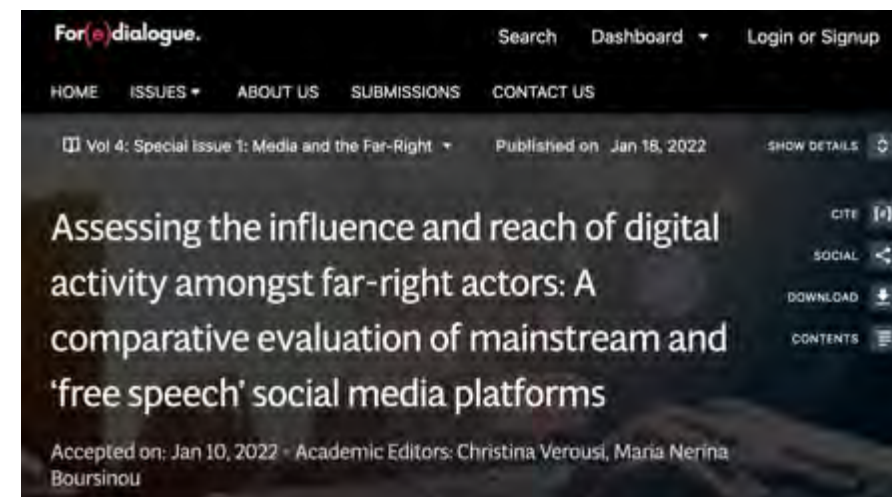
US



Brazil

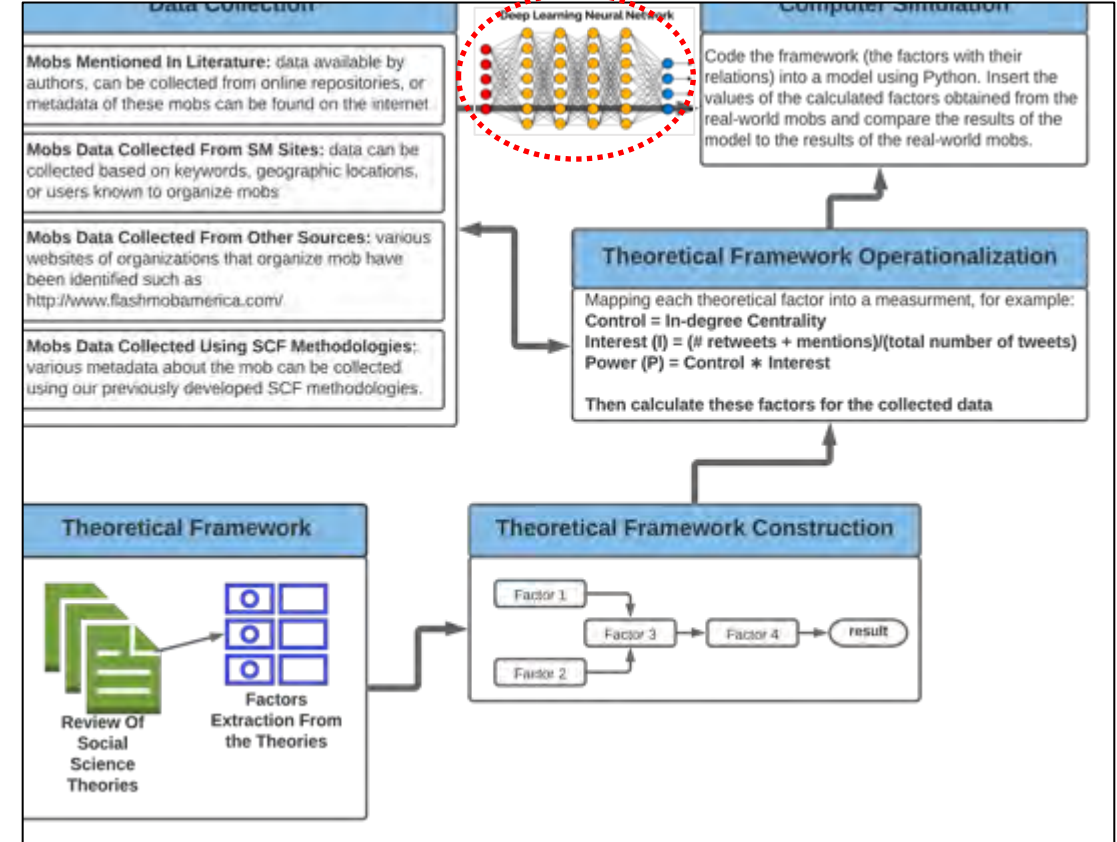
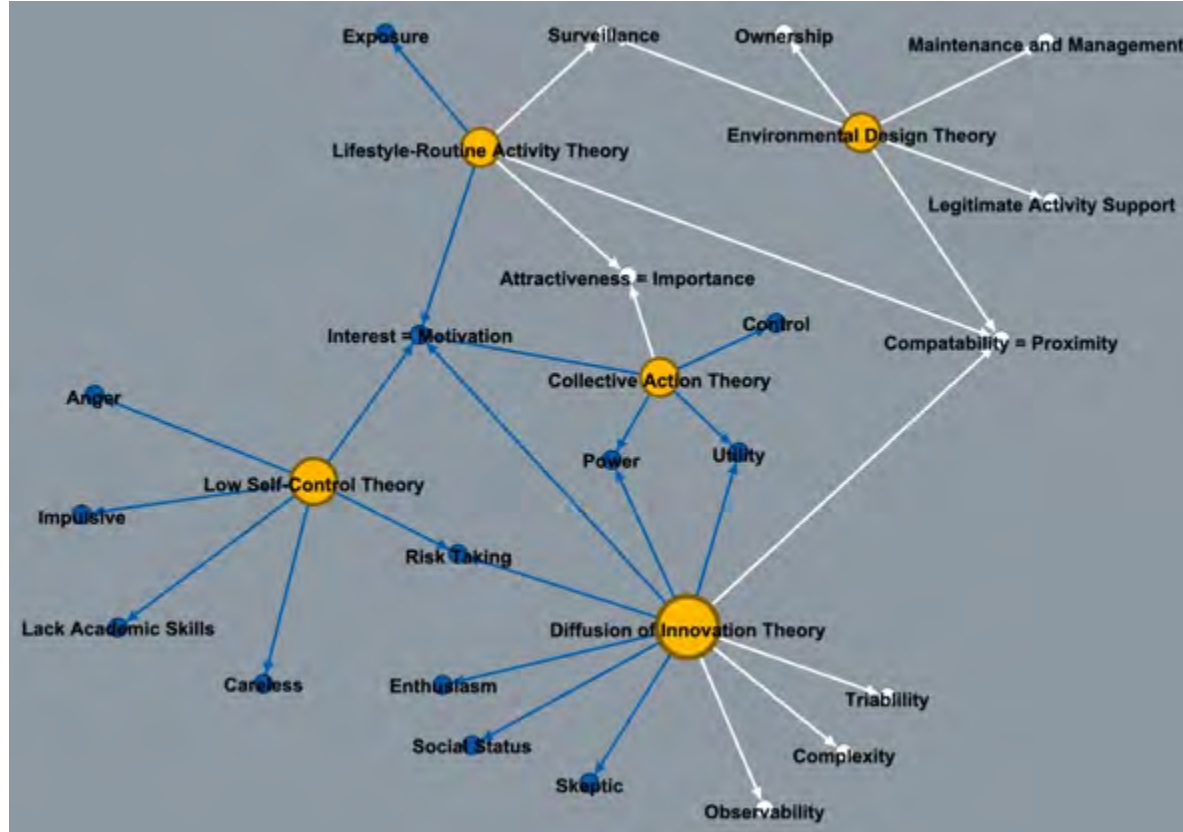


Mob Characterization
(Social Networks Analysis & Mining, AMCIS, HICSS, 2021, 2022, 2023, 2024)

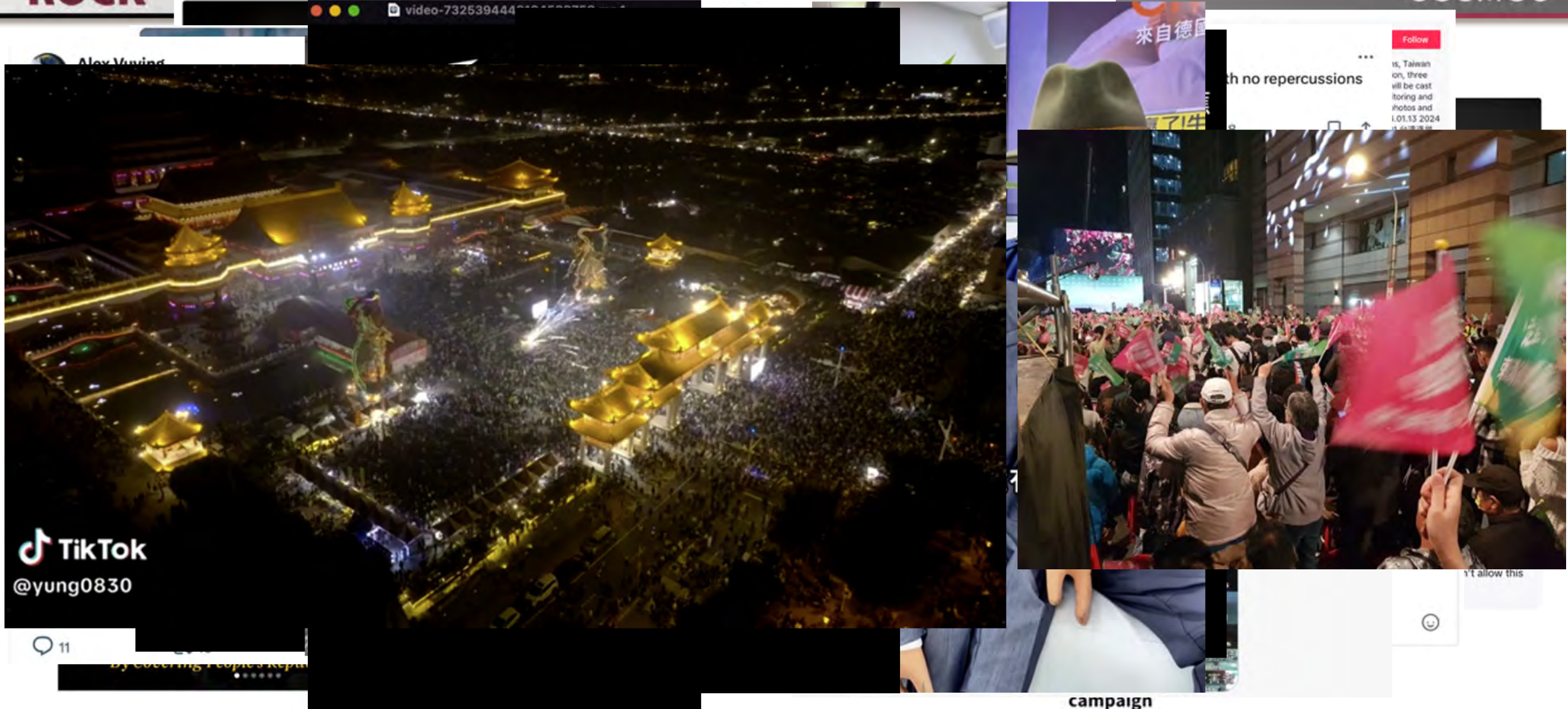


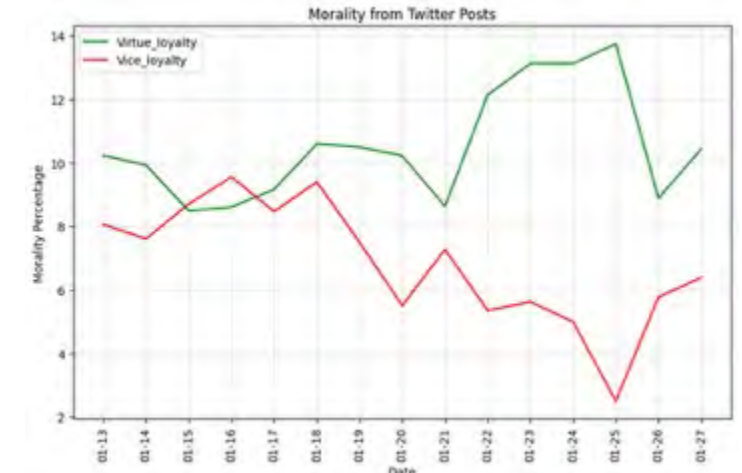
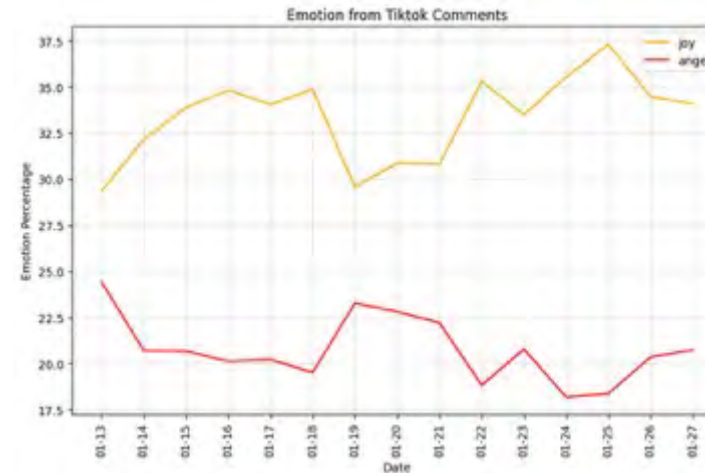
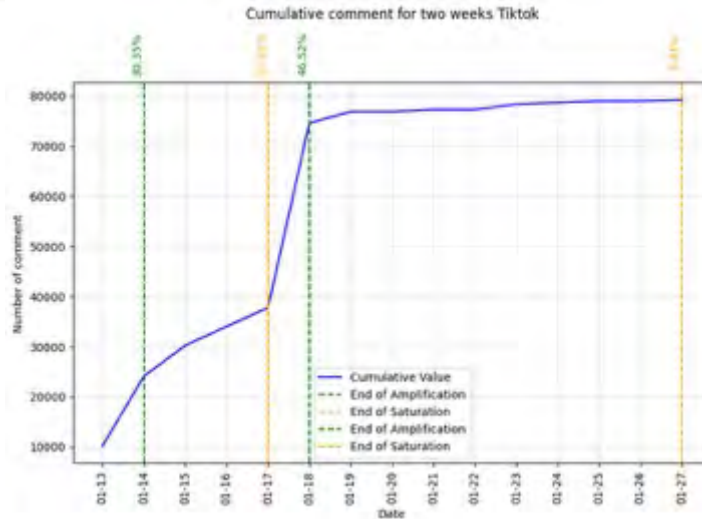
Influence and reach of digital activity of extremist groups (Agarwal et al., 2022, For(e)dialog)

'AI + Social Science' Mob Simulation Model



Social Media a Positive Force





Modeling anti-disinformation campaign adoption.
When is a campaign successfully adopted?

Stronger positive emotions about electoral process.

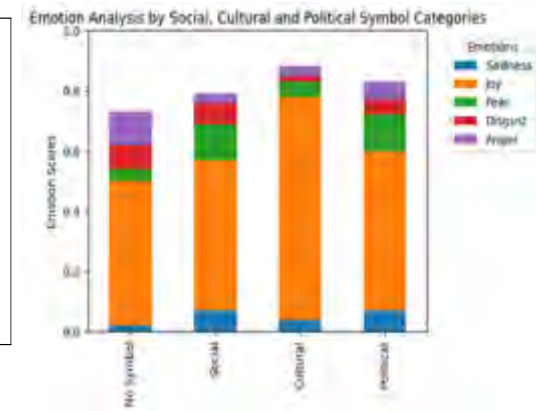
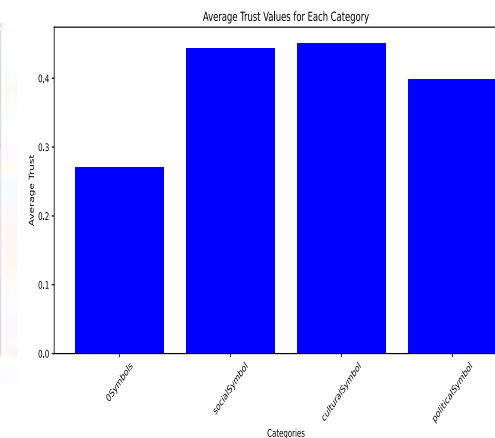
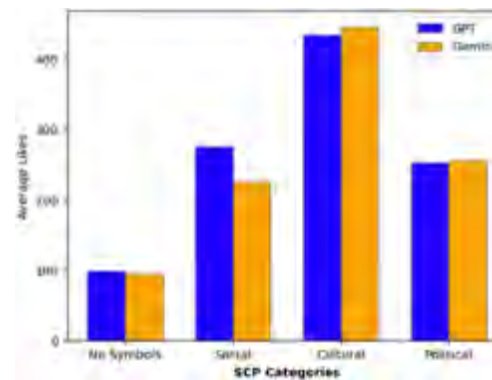
Trust restored in electoral process.

How to design a successful campaign message?

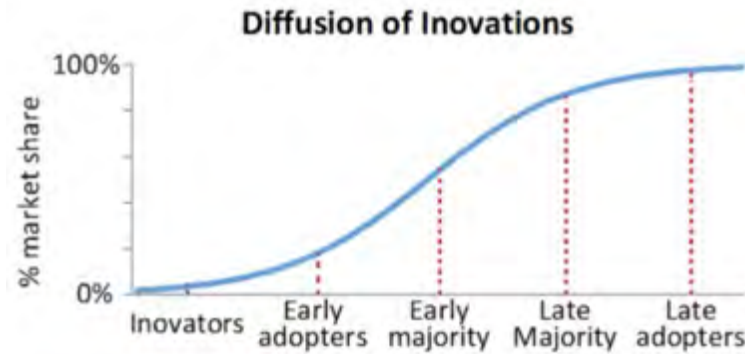
Social, Cultural, and Political Symbols!!!

Message consistency

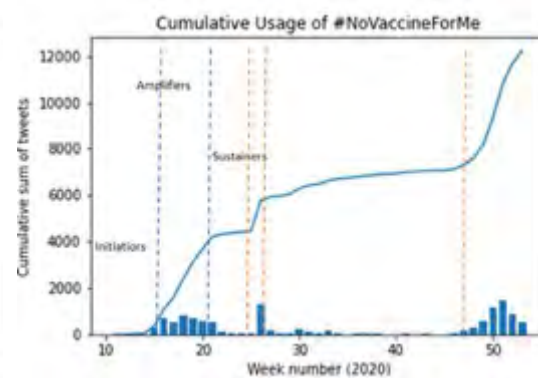
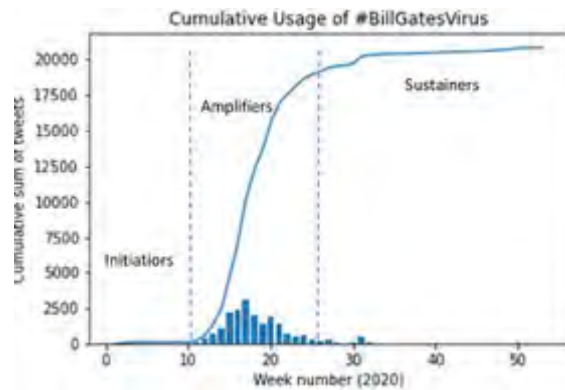
- More engagement
- More positive reactions
- Faster trust restoration



Characterization of information producers



Diffusion of innovations, (1962)

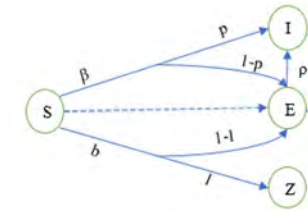


OSNEM, ASONAM, SNAM, HICSS, 2022, 2023, 2024, 2025

Characterization of information consumers

How misinformation spreads? Who should be inoculated?
Leveraging epidemiological modeling. Treat misinformation like an epidemic → **misinfodemic**

- S: Susceptible
- I: Infected
- Z: Skeptic
- E: Exposed

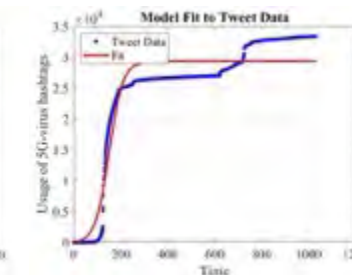
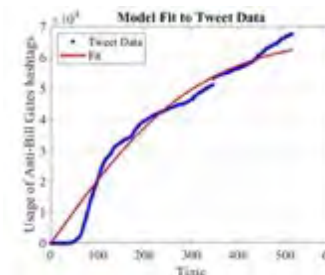
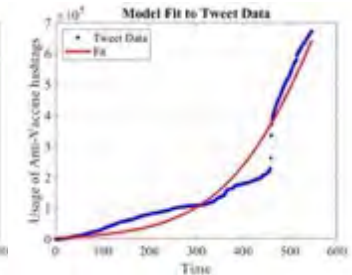
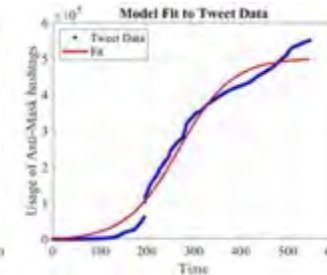
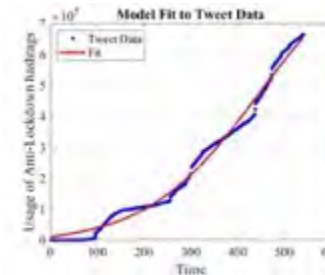


$$\frac{dS}{dt} = -\beta S \frac{I}{N} - bS \frac{Z}{N}$$

$$\frac{dE}{dt} = (1-p)\beta S \frac{I}{N} + (1-l)bS \frac{Z}{N} - \rho E \frac{I}{N} - \epsilon E$$

$$\frac{dI}{dt} = p\beta S \frac{I}{N} + \rho E \frac{I}{N} + \epsilon E$$

$$\frac{dZ}{dt} = lbS \frac{Z}{N}$$



HICSS 2022, ICWSM 2024

The collage features several key elements:

- Blogtrackers:** A screenshot of a website with a green header and various data visualizations.
- INNOVATION HUB:** A screenshot of the challenge's main website. It has a dark blue header with the text "CAN YOU SOLVE IT?" and a Canada flag. Below, it discusses "The Invisible Threat: Countering Cognitive Warfare" and lists the challenge details.
- NATO Innovation Hub Tweet:** A tweet from @NATOinnovation announcing the finalists: ADTAC, Beam Me Up, COSMOS, Deloitte, Influence Influencers, IIDR, Novacene AI, Preveny, Shumac, Veriphix. It mentions a live final on 30 Nov at ow.ly/Ec2W50GSM0w with hashtags #WeAreNATO and #Innovation.
- NATO Innovation Challenge Graphic:** A large graphic with a dark blue background, featuring a network of glowing blue nodes and lines. The text "NATO INNOVATION CHALLENGE" is at the top, and "CAN YOU SOLVE IT?" is at the bottom.

Recognized as top 10 solution in the 2021 NATO Innovation Hub Challenge on "The Invisible Threat: Countering Cognitive Warfare" from 132 teams across the 30 NATO member nations.



Cross-platform false narratives detected using developed socio-computational methodologies



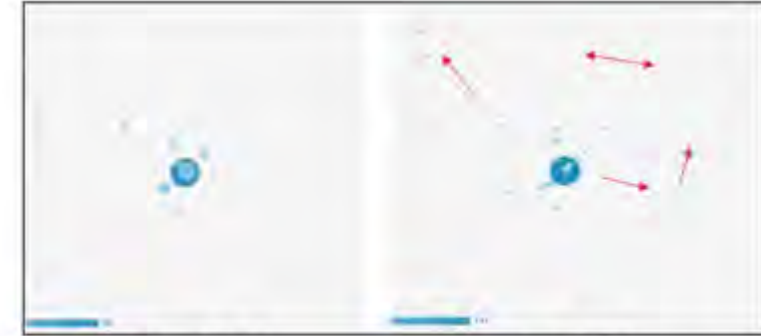
Education component of the effort



People notify us of scams and other misinformation cases not in our database which are then investigated



Daily reports to the AG's Office with our investigation results and recommendations for enhancing outreach/awareness



May 5, 2020
Increased penetration into rural areas of Arkansas as annotated by the arrows in the figure on right demonstrates the effectiveness of the tool and communications strategies.

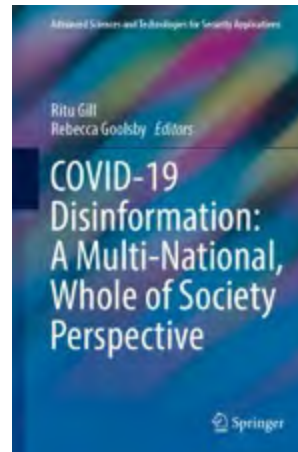


Arkansas Office of the Attorney General Press Release on our COVID-19 Misinfo Tracker



Briefing US Senator John Boozman

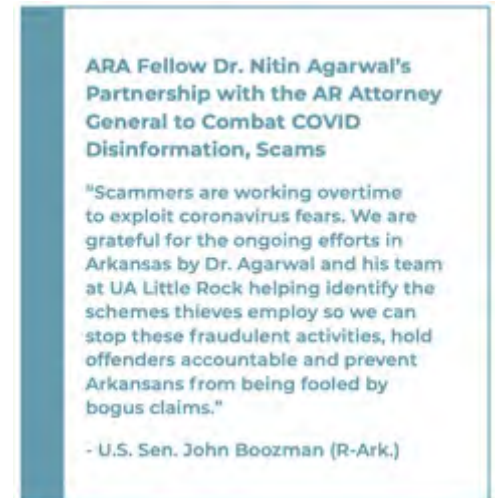
- COVID-19 Scam Tracker
- The capability was developed in partnership with the **Arkansas Office of the Attorney General**.
- Recognized by the **World Health Organization (WHO)** as one of the key technological innovations developed across the world to address COVID-19 pandemic.
- The application leverages our work on socio-cognitive threat modeling, education, and awareness efforts to assist policymakers.

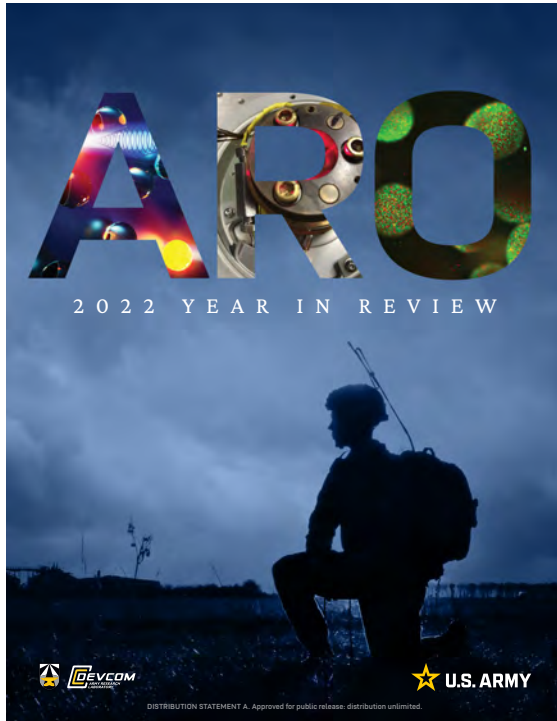


**NATO Research and Technology Group
RTG HFM-293**



**NATO STO-HFM-361
Mitigating Cognitive Warfare**





HUMANS IN COMPLEX SYSTEMS

SOCIAL AND COGNITIVE NETWORKS PROGRAM

Dr. Edward T. Palazzolo
Program Manager

Dr. Palazzolo completed his undergraduate studies in 1997 at the State University of New York at Buffalo as a double major in Psychology and Communication. He received his M.A. from the State University of New York at Buffalo in Interpersonal and Organizational Communication in 1999. He earned his Ph.D. at the University of Illinois Urbana-Champaign in 2003 in Organizational Communication and Knowledge Management.

He came to ARO in 2014 as the Program Manager for the Social and Cognitive Networks Program.

Current Scientific Objectives

1. Develop fundamental science (nonclinical) in support of Community Cognitive Resilience that, if successful, will help the military, veterans, and civilians transition from illness to wellness with respect to post-traumatic stress disorder (PTSD), depression, anxiety, chronic pain, suicidal ideation and prevention, substance abuse, and disinformation.
2. Discover the fundamental principles governing human-agent teaming activities that support designing and maintaining high-performance teams that, if successful, will allow the Army and Joint Staff to engineer high-performance teams with specified characteristics to satisfy mission requirements, and enable teaming with unprecedented coordination across multiple defense organizations while improving Soldiers' cognitive resilience.
3. Create verifiable models of networked human behavior by bridging social science theories with computer science techniques and engineering precision that, if successful, will create the ability to forecast societal opinions and shifts with pinpoint accuracy, especially with potential for real-world effects, to support Army and Joint Operations by providing support for decision-making.

SUCCESS STORY

Leveraging Mind-Body-Community Connections to Reduce Alcohol Abuse

Researchers discovered a causal relationship between a focused mindset and lower alcohol consumption: Mindfulness and perspective taking causally reduce alcohol cravings and real-world drinking. Reducing alcohol consumption and abuse has a direct impact on Army unit readiness and pain management of Soldiers (active duty, Reserve, and National Guard), civilians, and veterans.

CHALLENGE

The scientific community is at the nascent stage of understanding how the mind-body is coupled of the intersection of biology and psychology. Until this research, there have been no clear, coherent models pushing beyond the mind-body connection with the intent to understand how one's social network influences their cognitive network, which in turn influences their neural network, and vice versa. That is, how can we establish a scientific theory describing the impact of people's social connections, with the messages received and the changes to the way they think? And how does the way people think change the way their brains are wired? In turn, how does the way people's brains are wired influence the way they think and influence the people they choose to spend time with and the messages they choose to consume? Collectively,

these questions drive us toward the science of Community Cognitive Resilience.

ACTION

Dr. Palazzolo began building a research program in 2015 around the idea of mind-body-community (MBC) connections to bring together his backgrounds in psychology, communication, social networks, and knowledge management with his personal passion for mindfulness and hypnotherapy as potential force multipliers for managing and improving the cognitive dimension and, thereby, the individual's overall well-being. With this vision in mind, he teamed up with Dr. Fred Gregory, ARO's Program Manager for Neurophysiology of Cognition, and together they successfully completed a Multi-disciplinary University Research Initiative (MURI) topic and secured funding for a research

Anticipated Impact

If this research is successfully replicated with active duty Soldiers, the Army would have a powerful tool to reduce binge drinking and improve Army readiness. If the collective Community Cognitive Resilience program is successful, the Army will not only be able to help people more quickly transition from illness to wellness but could also discover ways to prevent PTSD and reduce suicides among Soldiers and veterans.

WAY AHEAD

Current findings lay the foundation for four possible research directions. First, Dr. Palazzolo is working with the MJR team to develop a follow-on grant that will replicate the research, but instead of studying undergraduate students, the team will collect data from active duty service members. This new proposal is being coordinated with the Humans in Complex Systems Intramural team. Second, expand this research methodology from alcohol consumption

to focus on anxiety, depression, PTSD, and suicidal ideation and identify if similar, positive effects can be affected. Third, combine all of this with other efforts into a systemic model for community cognitive resilience that has the potential to improve overall Army readiness. And fourth, work with colleagues at Walter Reed Army Institute of Research and NIH's National Center for Complementary and Integrative Health to transition the basic science into clinical trial research efforts.

SUCCESS STORY

Developing Research Infrastructure to Strengthen Socio-Cognitive Security for Combating Misinformation and Deviant Connective Action

Researchers developed a methodology to discover and track COVID-19 misinformation. The COVID-19 Misinformation Tracker was recognized by the World Health Organization (WHO) as one of the key technological innovations developed across the world to address the COVID-19 pandemic. This capability was also adopted by the Arkansas Office of the Attorney General to combat misinformation campaigns.

CHALLENGE

Misinformation is not an individual activity but a coordinated collective activity. This type of collective action is known as connective action, which is a form of collective action where users form more individualized and more technologically organized actions around a protest, demonstration, or social movement using online social networks and in the absence of formally organized groups. The intelligence challenge is to identify both deviant actors and misinformation narratives in a timely fashion that will allow for countermeasures.

ACTION

Having funded Prof. Nitin Agarwal (University of Arkansas at Little Rock) since 2016 for work on detecting and predicting deviant cyber flash mobs (DCFM), coordinated criminal cyber activity, Dr. Palazzolo was well-aware of Prof. Agarwal's research capabilities and immediately reached out to solicit a basic research proposal related to COVID-19 misinformation once the global pandemic began. Prof. Agarwal was eager to leverage his skills

Figure 2. MBC results showing significant impact of mindfulness and perspective taking cognitive strategies on the participants' reduction of drinking occasions for Study 1 (in person) and Study 2 (virtual) training methods.

Figure 3. The Connective Action Model - OR - Socio-technical framework for connective action comprised of Collective Identity, Network Organization, and Mobilization.

Figure 4. Successful transitions of Dr. Agarwal's research on COVID-19 misinformation: (A) the World Health Organization (WHO), (B) Arkansas Attorney General Leslie Rutledge partners with Dr. Agarwal to identify misinformation and to educate the public, and (C) NATO Science and Technology Organization leverages Dr. Agarwal's work and incorporated it in a recent book by NATO members.

CHAPTER 3
SUCCESS STORIES

ARO Competencies:

- Humans in Complex Systems
- Military Information Sciences

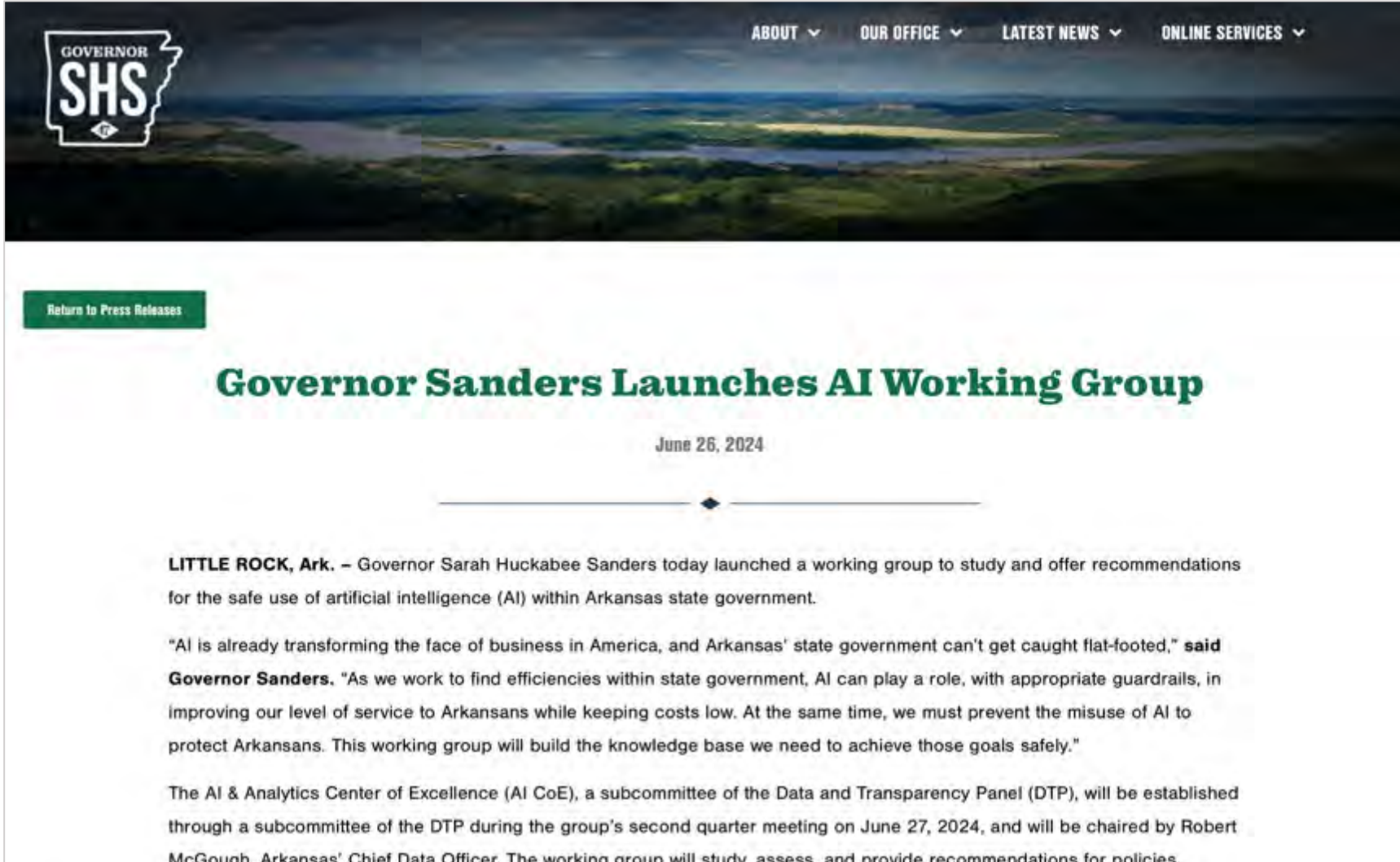
Results

- Developed the COVID-19 Misinformation Tracker, which was recognized by the WHO as one of the key technological innovations used to address the COVID-19 pandemic.
- Developed a Computational Framework for Analyzing Social Behavior in Online Connective Action (Top Paper Award at Americas Conference on Information Systems 2022).

Anticipated Impact

This research may help design strategies that will help individuals, communities, and military units become cognitively resilient to misinformation campaigns.

Research highlighted in the **US Army Research Office “Year in Review”** magazine as a success story for the **Social and Cognitive Networks Program**



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Governor Sanders Launches AI Working Group

June 26, 2024

LITTLE ROCK, Ark. – Governor Sarah Huckabee Sanders today launched a working group to study and offer recommendations for the safe use of artificial intelligence (AI) within Arkansas state government.

"AI is already transforming the face of business in America, and Arkansas' state government can't get caught flat-footed," **said Governor Sanders.** "As we work to find efficiencies within state government, AI can play a role, with appropriate guardrails, in improving our level of service to Arkansans while keeping costs low. At the same time, we must prevent the misuse of AI to protect Arkansans. This working group will build the knowledge base we need to achieve those goals safely."

The AI & Analytics Center of Excellence (AI CoE), a subcommittee of the Data and Transparency Panel (DTP), will be established through a subcommittee of the DTP during the group's second quarter meeting on June 27, 2024, and will be chaired by Robert McGough, Arkansas' Chief Data Officer. The working group will study, assess, and provide recommendations for policies.

Training Operators and Practitioners



Dates: September 25 – 28, 2024
Venue: COSMOS Research Center, EF
2801 S. University Ave., Little Rock, AR

Point of contact:
Dr. Nitin Agarwal, Ph.D.
Jerry L. Mauden-Entergy Chair & Doc
Director, COSMOS Research Center
University of Arkansas – Little Rock
Email: nagarwal@uark.edu

Objective: This training course will introduce state-of-the-art research in social media analysis and its applications in intelligence gathering. The course aims to teach emerging challenges and opportunities with social media, impart analytical skills to enhance understanding of the data and prepare the participants to learn innovative and interdisciplinary problem-solving approaches.

Registration: Visit the [registration portal](#) to register and pay for the training course. Select "COSMOS Social Media Analysis Training" from the list of courses. Scholarships of up to \$1,000 are available. Please indicate if you need a scholarship on the registration portal.

We've conducted training for PAO, info-ops, psy-ops officers from NATO member nations at StratCom COE, US CYBERCOMMAND, US Marine Information Group (3-MIGs)

GRAPHERS	CAREERS
Information and communication	
data analysis, and inferencing. crises. Interfacing the collected perform knowledge extraction, identify trends; leaders, sentiments, its, customers, and employees; media activities. Case studies will security, health, business, political public affairs, among others.	
8:00 AM – 2:00 PM	
Putting it Together: Case Studies	
Invited Talk	
Lightning Talks	
Lunch	
Wrap up	

Educating Future-Ready Innovators



- **5-year \$15 million grant from the U.S. Department of Defense, PI: Nitin Agarwal, Ph.D.**
- 20+ Graduate Research Assistants (MS/PhD)
(\$27k, Full Tuition coverage, Health Insurance covered)
- 10+ Postdoctoral fellowships
(\$60k - \$110k, Full benefits, Health insurance)
- 10+ Full stack developer, Dev Ops, Data engineer
(\$60k - \$100k, Full benefits, Health insurance)
- 2 System Engineer
(\$65k, Full benefits, Health insurance)

Apply at <https://cosmos.ualr.edu/careers/>
Contact Prof. Nitin Agarwal (nxagarwal@ualr.edu)

Hiring Now

Open Positions @ COSMOS

- Graduate Research Assistant
- Postdoctoral Fellow
- Data Engineer
- System Engineer
- Extra Help Assistant



More Information:

- Prof. Nitin Agarwal, nxagarwal@ualr.edu
- <https://cosmos.ualr.edu/careers/>
- COSMOS Research Center, UA Little Rock, Arkansas, USA



COSMOS
Collaboratorium for Social Media and Online Behavioral Studies

COSMOS Tools Developed:

- **Blogtrackers** - <https://btracker.host.ualr.edu>
- **V(ideo)Tracker** - <https://vtracker.host.ualr.edu>
- **Focal Structure Analysis** - <http://fsa.host.ualr.edu/>
- **COVID-19 Scam Tracker** - <https://cosmos.ualr.edu/covid-19>

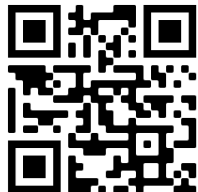
Blogtrackers

V tracker



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Prof. Nitin Agarwal, Ph.D.
 Director, COSMOS Research Center
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ACKNOWLEDGEMENTS

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