

# Networks and Narratives

## Bots, Trolls, and Mobs

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Collaboratorium for Social Media and Online Behavioral Studies (COSMOS)

University of Arkansas – Little Rock

Dr. Nitin Agarwal

Director, Collaboratorium for Social Media and Online Behavioral Studies (COSMOS) <http://cosmos.ualr.edu/>

Jerry L. Maulden-Entergy Endowed Chair & Distinguished Professor of Information Science, University of Arkansas – Little Rock <https://profiles.ualr.edu/na10/>

He studies digital and cyber social behaviors that emerge and evolve constantly in the modern information and communication platforms. At COSMOS, he is leading projects with a combined funding of over \$20 million from U.S. federal agencies including Department of Defense, DARPA, Department of State, National Science Foundation, Department of Homeland Security.

He has published 10 books and over 200 articles in top-tier peer-reviewed forums including the NATO's Defense StratCom Journal, with several best paper awards and nominations.

He developed publicly available social media analysis tools (Blogtracker and vTracker), assisting NATO Strategic Communications and Public Affairs, European Defense agencies, Australian Defense Science and Technology agency's strategic policy group, Singapore government, Arkansas Attorney General's office, among others. Dr. Agarwal participates in the National Tech Innovation Hub launched by the U.S. Department of State to defeat foreign based propaganda.

His work has been covered by local, national, and international media including Bloomberg, US News, KUAR, Arkansas Business, Arkansas Times, Arkansas Democrat Gazette, and many others.

Dr. Agarwal has spoken at over 100 public and professional, national and international forums such as the NATO's StratCom COE (Riga, Latvia), DARPA, US Department of State, US Naval Space and Warfare (SPAWAR), US Pentagon's Strategic Multilevel Assessment groups, US National Academies of Sciences Engineering and Medicine, US Office of the Director of National Intelligence, Facebook Asia Pacific HQ, Twitter Asia Pacific HQ, US Embassy in Singapore, Singapore Ministry of Communication and Information, NATO Senior Leadership meetings, USIP, among others.

He is a fellow of IARIA, AAoC, ARA

He has received University-wide Faculty Excellence Award in Research and Creative Endeavors in 2015 and 2021.



## Collaboratorium for Social Media and Online Behavioral Studies

COSMOS is developing big data analytical tools to understand digital behaviors and forecast trends to achieve social good. With multi-year multi-million dollar funding from various federal and state agencies, COSMOS is able to bring together several international academic, industry, and government institutions as partners in this venture.



**@cosmographers**

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

26 grants (total funding over \$45 million and \$10 million to COSMOS-UALR):

- Army Research Office
- Office of Naval Research
- Air Force Research Lab
- DARPA
- Department of State
- Department of Homeland Security
- National Science Foundation
- NATO
- Arkansas Research Alliance
- Jerry L. Maulden/Entergy Endowment



**ArkansasResearchAlliance**  
Coming together to move Arkansas forward.





- Over 30 members
  - Undergraduate students,
  - Graduate students (MS, PHD)
  - Postdoctoral fellows
  - Administrative staff
- Over 20 graduated
  - Industry (Walmart, Acxiom, FirstOrion, Windstream, Dillard, Amazon, LinkedIn, HP, Cisco)
  - Academia
  - Pursuing higher education



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

## Academics

- Arizona State University, Carnegie Mellon University, Creighton University, Emory University, University of Central Oklahoma, University of North Carolina-Chapel Hill, George Mason University, George Washington University, University of Pittsburgh, Penn State, University of Memphis, University of New Haven, University of Hawaii, University of Michigan, University of Southern California, West Virginia University, Vilnius University, National University of Singapore, University of Sydney

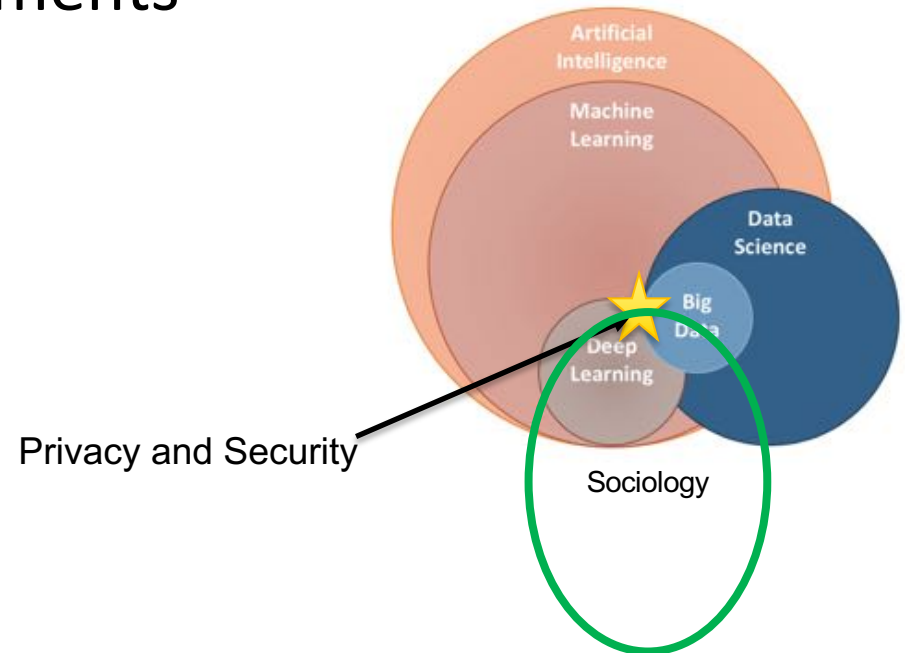
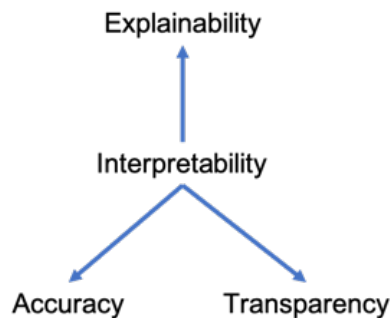
## Industry

- Atlantic Council (DFRLab), Wal-Mart Inc., LinkedIn, Intelligent Automation Inc., Charles River Analytics, Galisteo Consulting Inc., CarleyTech, Netanomics, Kairos Inc., Bond.AI (fintech)

## Government

- AR Attorney General's Office, US Defense Agencies, US ARCENT, EUCOM, US Cyber Command, Naval Postgraduate School, US SPAWAR, US Joint Information Operations Warfare Center, III-Marine Expeditionary Force (III-MEF), Army Research Lab, Office of Naval Research (Global), Air Force Research Lab, Singapore Government, Canadian PMO, NATO, StratCom COE, European Defense Agencies, FVEYS – intelligence coalition

- Smart Health and AI
- Campaigns and Movements
- Deviant Behaviors
- Social Cybersecurity





Flash Mobs in  
Public Places



Saudi Women's  
Right to Drive  
protest



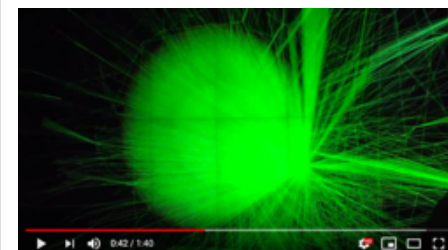
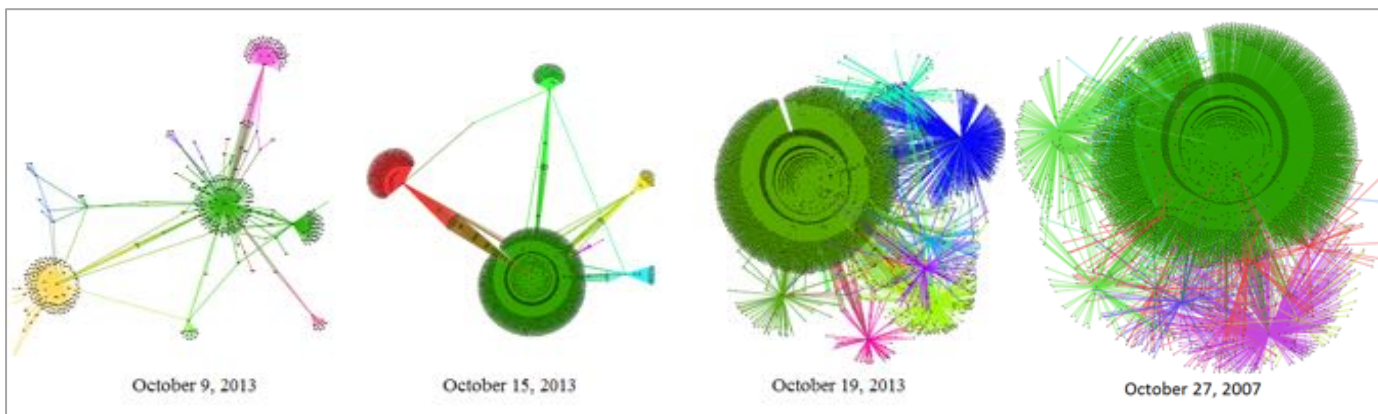
Autism  
Awareness  
Campaign



Starbucks Racial  
Controversy



2011 Arab  
Spring Social  
Movement



**NSF and DoD funded projects (over \$1,000,000) on advancing understanding of cyber-collective actions**





## Forms of Collective Action

**Collective action:** defined as all activity of common or shared interest among two or more individuals (Olson, 1977)



Flash Mob Dance in a Shopping Mall



Hashtag activism: #NotInMyName  
Campaign by Young British Muslims to  
Counter ISIS' Extremism and anti-  
Muslim sentiment



2011 Arab Spring Social Movement

An influential individual may not be effective at organizing a campaign or social movement. Often a key set of actors coordinate such an act.



# Saudi Arabian Women's Right to Drive



## Saudi Women Driving Campaign's October 26 Site Hacked



“Organizers tell the AP that at least 60 women took part in Saturday’s protest. More than 20 women posted videos of themselves driving in Saudi Arabia today.”

*NPR, October 26, 2013*

“Several Saudi supporters of the October 26th Women's Driving Campaign told CNN that at least 25 women drove Saturday.”

*CNN, October 26, 2013*

theguardian

News | US | World | Sports | Comment | Culture | Business | Money

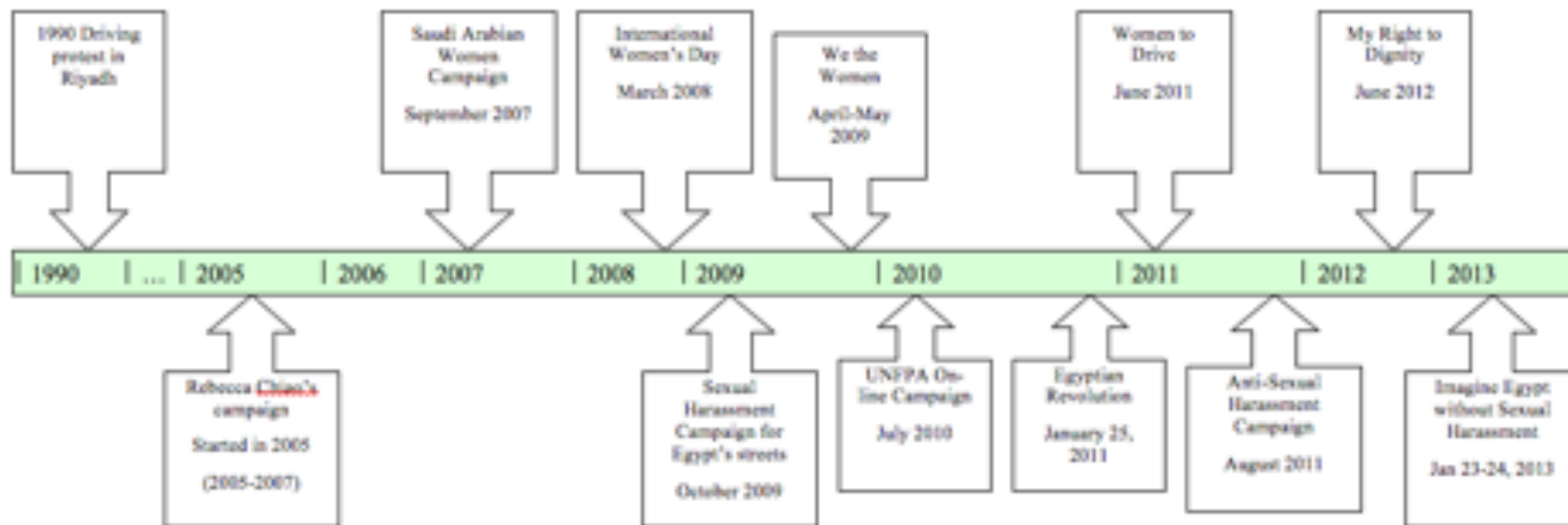
News > World news > Saudi Arabia

## Saudi Arabia's women hold day of action to change driving laws

Government warily observes public reaction as media joins calls for ban on female drivers to be rescinded

Ian Black, Middle East editor

“Efforts to publicise the issue by the "October 26 driving for women" group have been described as the best-organised social campaign ever seen in Saudi Arabia, where Twitter has millions of users and is used to circulate information about the monarchy and official corruption.”



- Sexual Harassment is global in nature demonstrating the universality of this crime against women.
- These forms of collective action are not isolated events.
- There are shared goals of collective awareness and aspirations of addressing gender inequality promoting women's rights.



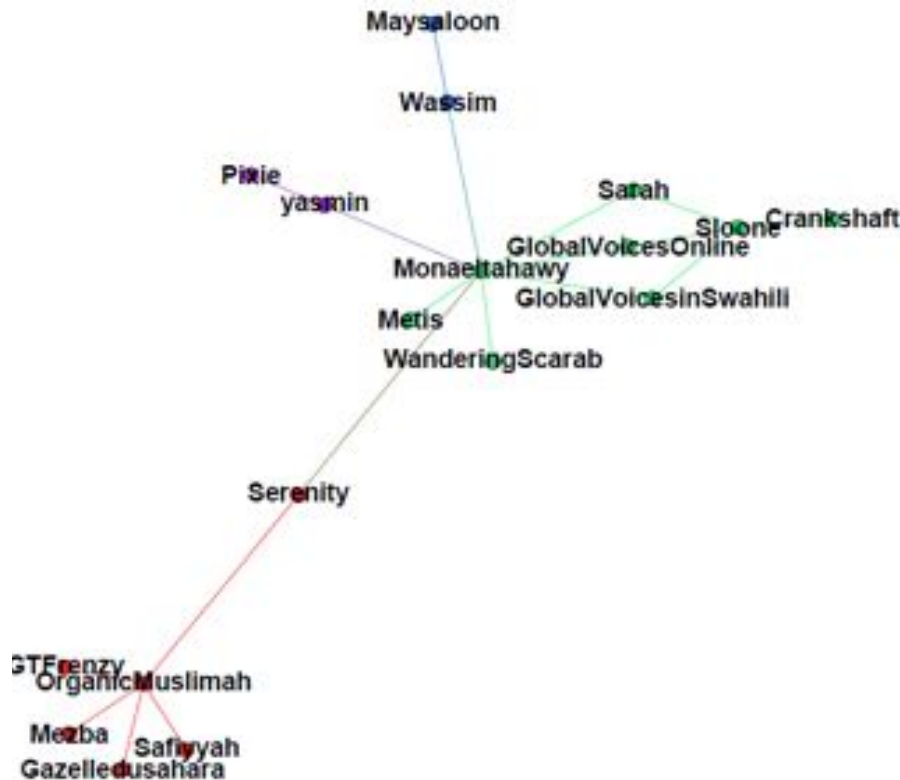


Network of bloggers for 'Women to Drive' and 'Sexual Harassment' online collective actions

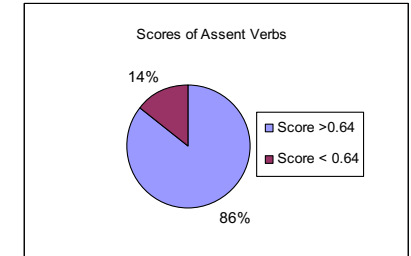
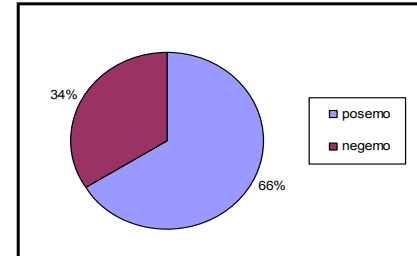




Bloggers participating in 'Women To Drive' and 'Sexual Harassment' movements



Interactions in the cooperative network between the members common to both collective actions with-in the larger blogger network



Serenity's comment on Monaeltahawy's entry:

**"Thank you** so much for writing this, Mona! **Thank you** for speaking up for those of us who are too cowardly to do so (at least yet!), Mona! God bless you and give you more courage and strength!"

GTfrenzy's comment on OrganicMuslimah's entry:

"Just read it and I love it! I couldn't **agree** with you more...."

Mezba's comment on OrganicMuslimah's entry:

"I **fully agree**. I say leave the judgement to God..."

Marahm's comment on Hala:

**"Good** question, Hala, and **good** answer"

Gazelledusahara's comment on OrganicMuslimah:

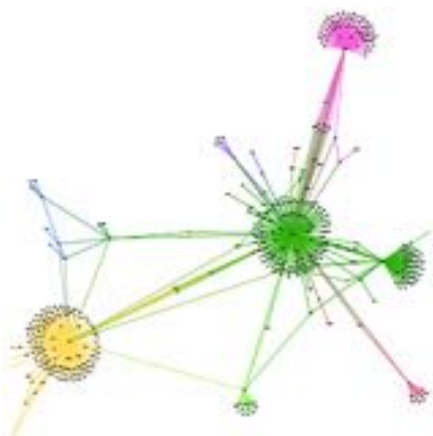
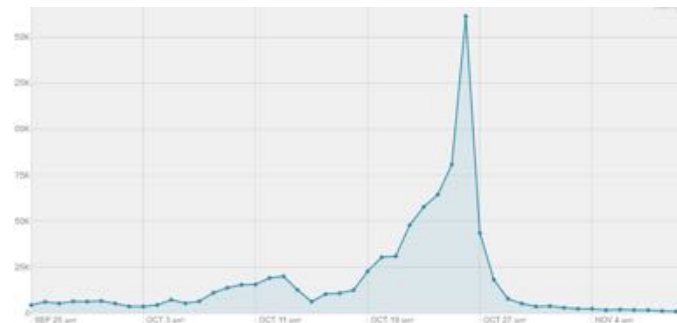
"I am in Egypt in now and my classmates and I can totally relate to Everything that you wrote about"

Laylah's comment on Saudiwoman:

"I linked your post to my blog, thanks for the translation ☺"



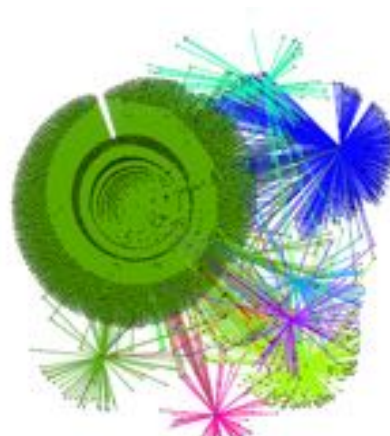
- Track formation of collective action
- Given the definitive nature of hashtags, we investigate the co-evolution of hashtag usage and campaign network growth
- Methodological approach for Twitter data:
  - Data classification
  - Overlap detection, and
  - Network construction and visualization
- Create tweet-retweet networks for each day



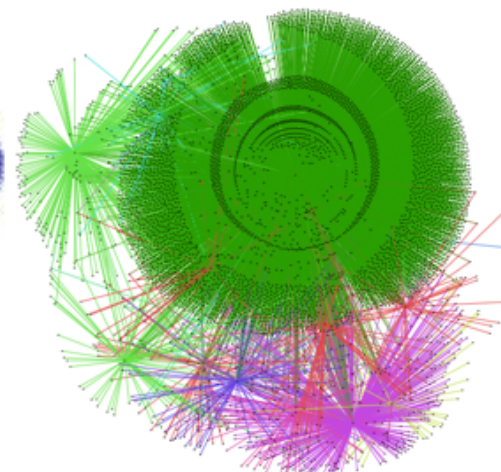
October 9, 2013



October 15, 2013



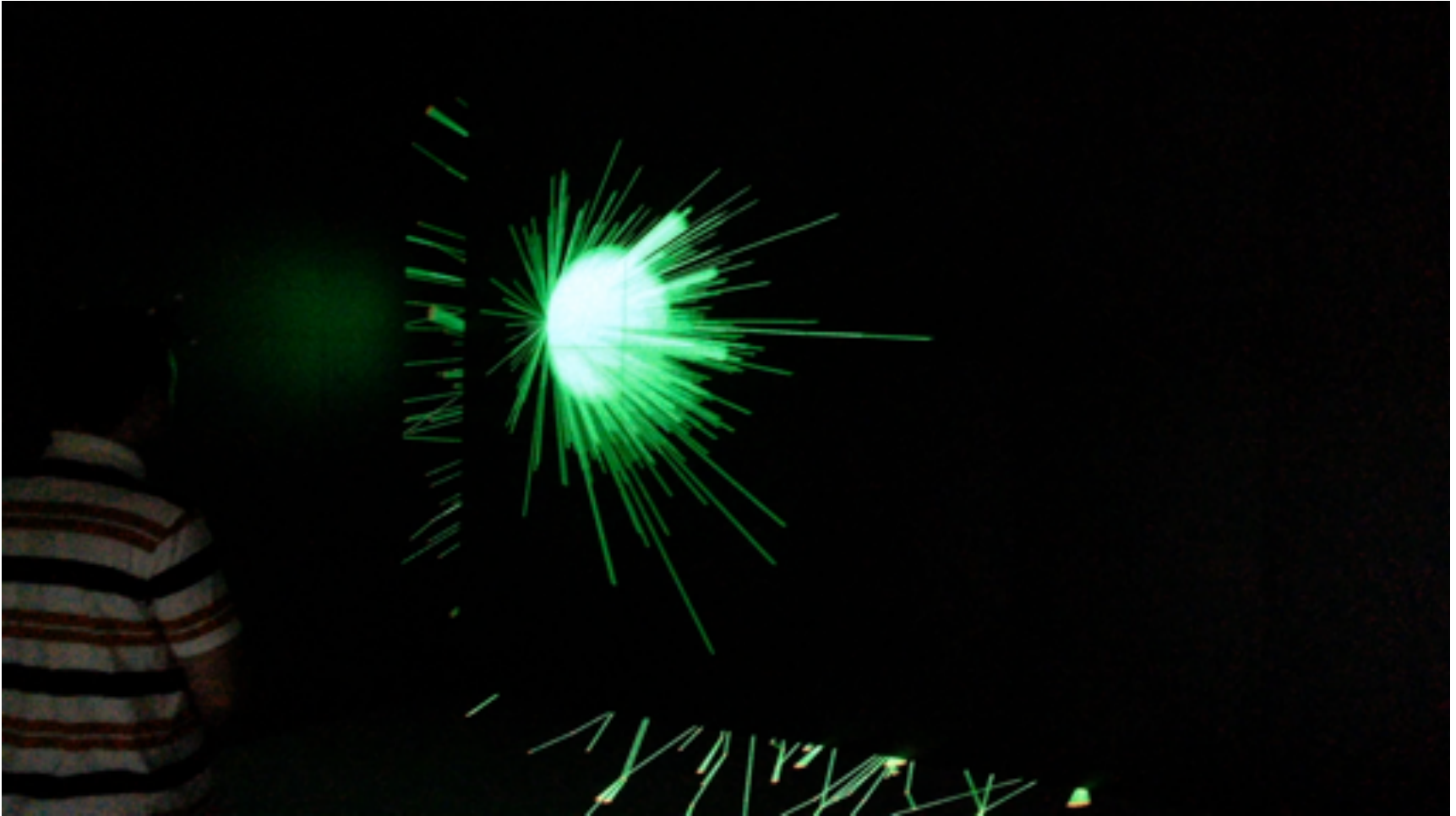
October 19, 2013



October 27, 2013

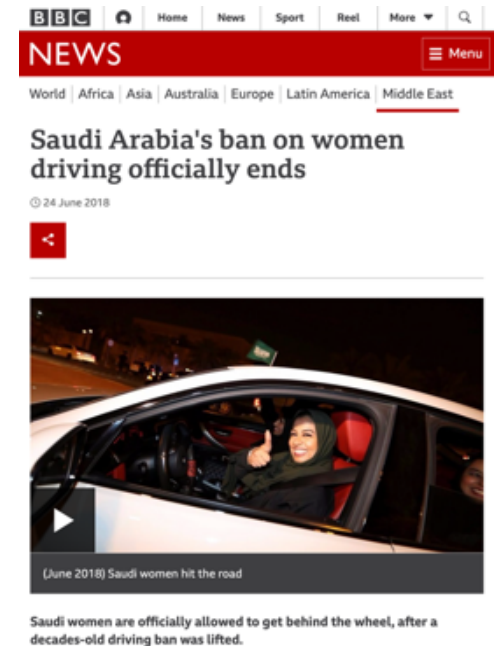
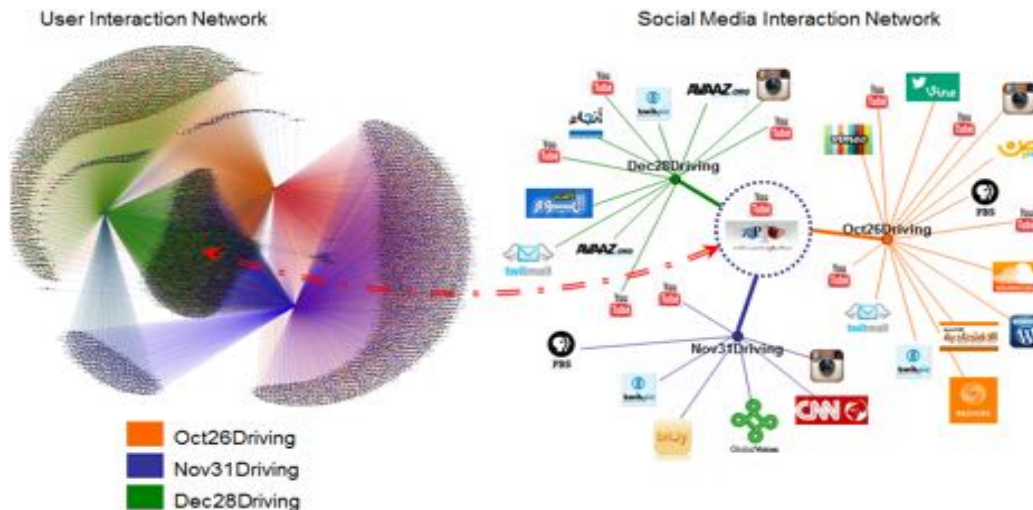
# Saudi Women 'Right to Drive'

Twitter Campaign Network 3-D Visualization - <https://www.youtube.com/watch?v=FVKCgYYPHWA>



**Best Information System Publication of the Year** by the Senior Scholars Consortium of the Association for Information Systems.  
Given to one publication selected from among all the IS publications worldwide for the year.

- Spillover of supporters, activists, and resources
  - Social Movement Spillover Theory (Meyer and Whittier 1994)
  - Resource Mobilization Theory (McCarthy and Zald 1977)

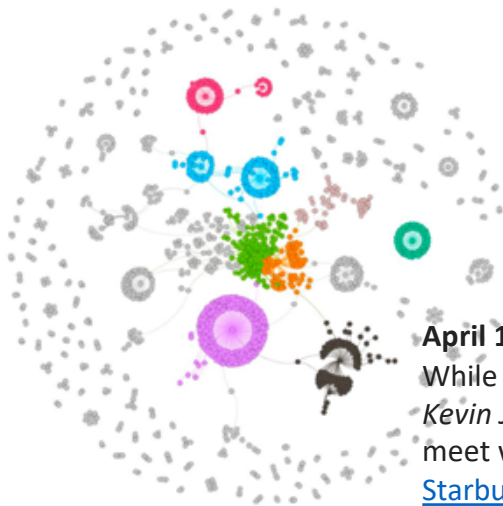
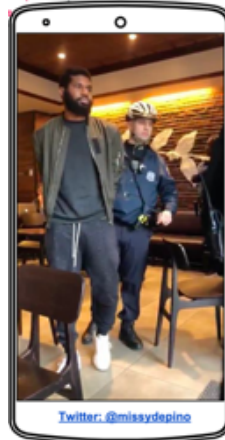




# Starbucks Racial Controversy



12-April-2018  
Philadelphia



**April 17, 2018**

While protests continue, Starbucks CEO *Kevin Johnson* comes to Philadelphia to meet with Nelson and Robinson.

[Starbucks announces it will shut down](#) its 8,000 U.S. stores on May 29 to conduct racial-bias education for 175,000 employees.

**Experts call the move unprecedented.**

## Sentiment Analysis - Starbucks Apr 13 - 21



	2018 April	
	Friday 13	Saturday 21
Sign		
negative	30.51%	34.44%
neutral	53.20%	12.16%
positive	16.28%	53.41%



## Weaponizing Narratives



## Deviant Hackers Networks (DHNs)



**ISIS  
Recruitment  
Radicalization  
Propaganda**



## Anti NATO Propaganda

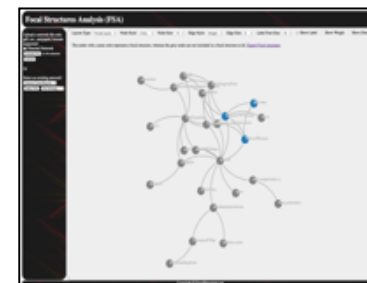


## Anti-West Narrative



## Fake News

**Several multi-year  
DoD funded studies  
totaling over \$10  
million**





- Tracking anti-West, anti-EU, anti-NATO propaganda and influence campaigns
- Participated in various NATO exercises to assist public affairs in social media monitoring



Dragoon Ride  
2015



Trident Juncture  
2015



Brilliant Jump  
2016



Anakonda  
2016



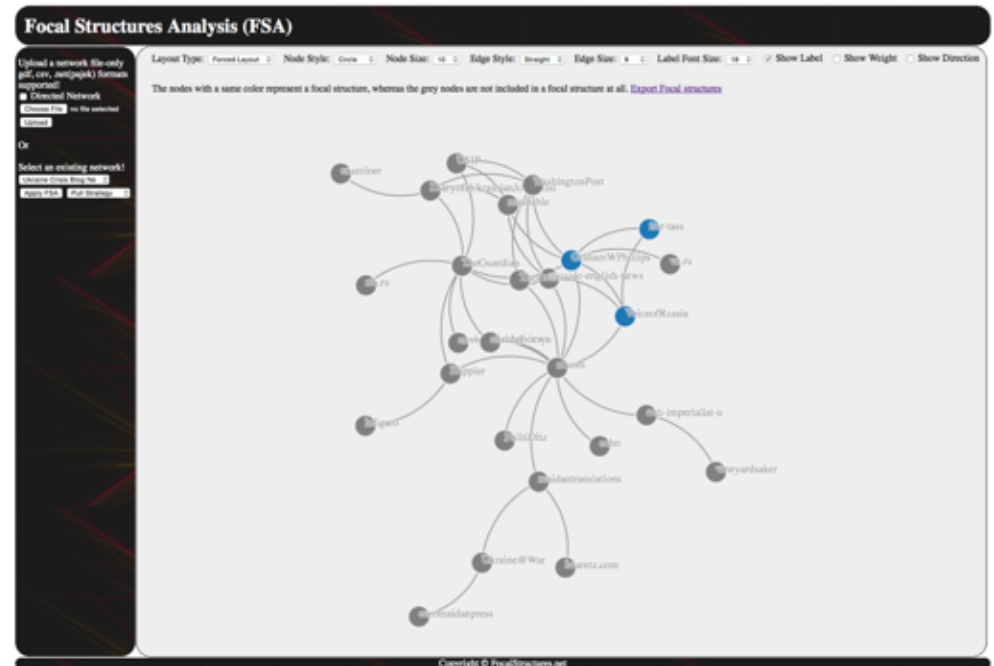
Trident Juncture  
2018



Baltic Operations  
2019

- Study terrorist and hacker groups
- Study 2019 Canadian Elections
- Monitor disinformation campaigns in the Asia Pacific region (Singapore Ministry of Communication and Information, Australian DoD, Univ. of Sydney)
- Monitor COVID-19 disinformation campaigns (FVEYS intelligence coalition, AR AG office)

- Key coordinating pro-Russian actors during Ukraine-Russia conflict (Crimean annexation)
- A sample of blog network for Russia-Ukraine conflict containing 18,000 blog posts from 26 blogs.
- **Nodes** represent blogs and **Edges** represent link between blogs (out-links).
- The structure with **blue nodes** is identified as a focal/coordinating structure.
- Although RT.COM is the most central node, the triad “**Graham Phillips – Russian News Agency – Voice of Russia** ” is a more influential coordinating structure for information dissemination.



Published in SNAM 2016

- Graham W. Phillips is a British journalist and blogger.
- He went to Ukraine to cover the voice of Ukrainians during Euromaidan.
- He reported that Ukrainians are “happy” with the previous pro-Russian government of Ukraine.
- He used Vlogging to cover the events.
- His Vlogs made him an influential blogger & an enemy to the current Ukrainian government so they banned him from entering Ukraine for three years.
- Once he was banned from entering Ukraine he went to Russia instead of going back to England.



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

$$\text{Subject to} \quad \delta_i = \{d\bar{c}_1 \leq d\bar{c}_2 \leq d\bar{c}_3 \leq \dots \leq d\bar{c}_i\} - \overline{d\bar{c}_j} \quad \forall i, j \quad (2)$$

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

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

$$D_G^L = \frac{1}{n} \sum_{i=1}^n d_i^r \quad (5)$$

$$D_G^L < d_i^r \leq D_G^U \quad \forall i \quad (6)$$

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

$$AC_G^L = \frac{1}{n} \sum_{i=1}^n a_i^r \quad (8)$$

$$AC_G^L < a_i^r \leq AC_G^U \quad \forall i \quad (9)$$

$$\bar{c}_v = \{\bar{c}_1, \bar{c}_2, \bar{c}_3, \dots, \bar{c}_j\} \quad \forall i, j \quad (10)$$

$$\bar{c}_{\delta_{i \times k}} = \bar{c}_{\delta_i} \quad \forall i \quad (11)$$

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

$$\max \sum_{j=1}^n e_j^M \quad (13)$$

$$\text{Subject to} \quad e_j^M = \{e_1, e_2, e_3, \dots, e_j\} \quad \forall j \quad (14)$$

$$\delta_j = \{\bar{c}_1, \bar{c}_2, \bar{c}_3, \dots, \bar{c}_m\} - \bar{c}_{\delta_{i \times k}} \quad \forall i, j \quad (15)$$

$$B = A_{ij} - \frac{dd^r}{2g} \quad \forall i, j \quad (16)$$

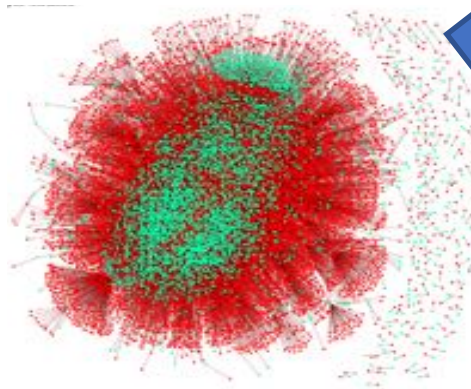
$$\xi_j = \{\bar{c}_{\delta_i} \cup \delta_j | \bar{c}_{\delta_i} \neq \delta_j\} \quad \forall i, j \quad (17)$$

$$e_j = \frac{1}{2m} \text{Tr}(\xi_j B \xi_j^T) \quad \forall j \quad (18)$$

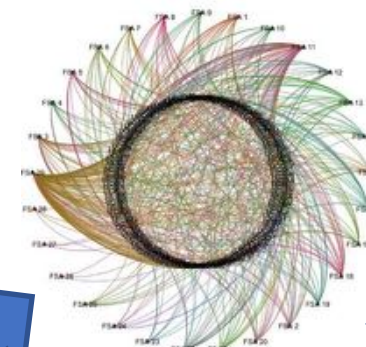
$$e_j^L \leq e_j \leq e_j^U \quad \forall j \quad (19)$$

$$c_j^r = \max\{e_1, e_2, \dots, e_j\} \quad \forall j \quad (20)$$

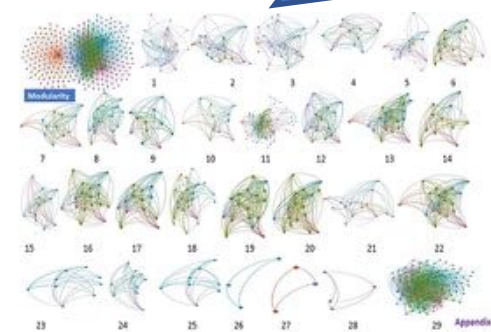
Multi criteria optimization formulation to identify disinformation spreaders.  
(Alassad, Agarwal, et al., 2021)  
Central European Journal of Operations Research, Springer



YouTube COVID-19 misinformation video-user network

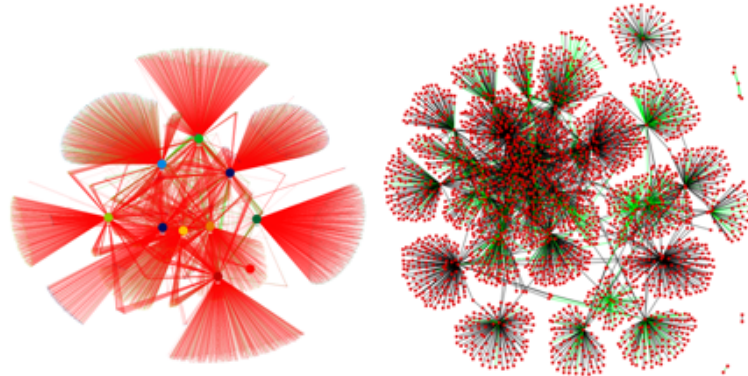


Identifying disinformation spreaders



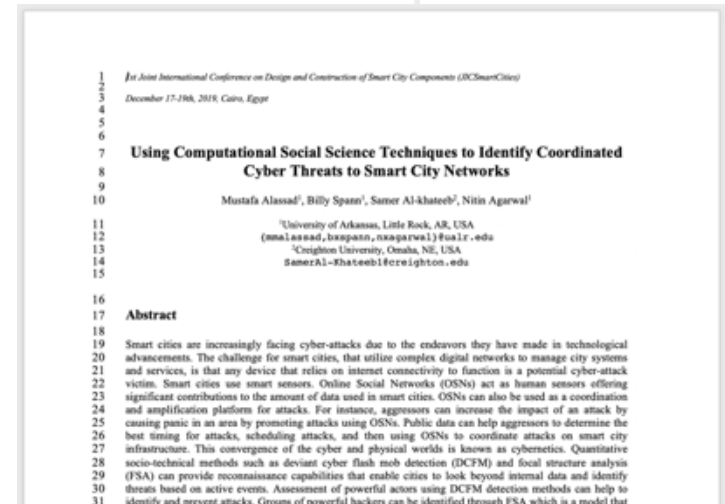
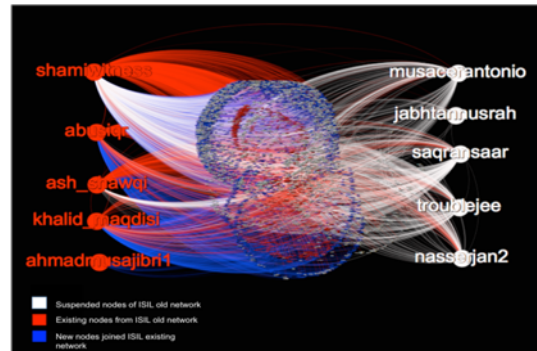
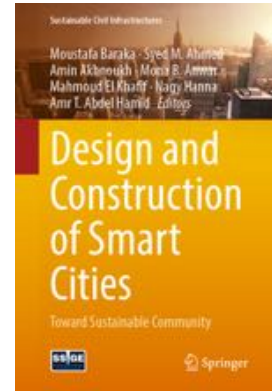
Sorted on effectiveness





ISIS Recruitment Network

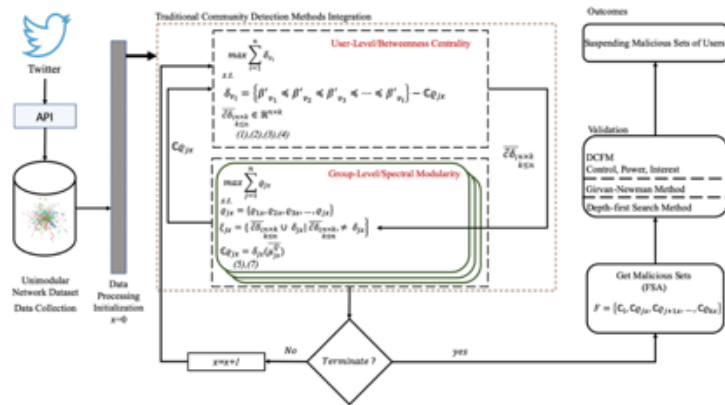
Black Hat Hacker Network



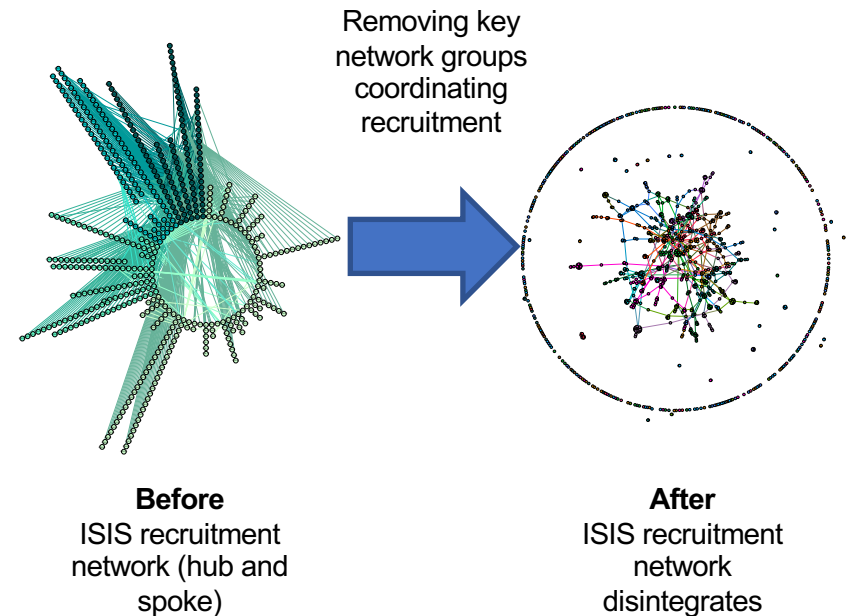


# Terrorist and Hacker Networks





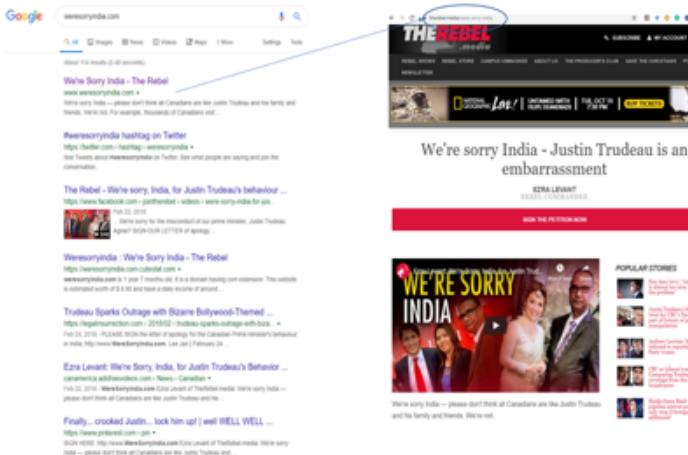
Algebraic transformation of the model to identify key network groups coordinating deviant acts grounded in **Collective Action theory**. (Alassad, Agarwal et al., 2020) Journal of Information Processing and Management, Elsevier






## Canadian Federal Elections 2019

One such fake website  
“weresorryindia.com” amplified anti-  
Trudeau narrative suggesting he is not a  
friend of the Canadian-Indian  
community. The website tops the results  
in search engines.



Coordinated *deepfakes*



1		<b>BREXIT</b> Norwegian navy frigate collides with oil tanker in fjord Weapons Of The World - 331K views - 1 month ago An oil tanker and a Norwegian navy KDM hedgehog frigate collided near the coast of western Norway. The KDM hedgehog...
2		This is How U.S. Marines Will Take the Fight to Russia in the Arctic US Defense News - 229K views - 1 month ago About 100 Marines from the 3rd Marine Expeditionary Unit from Camp Lejeune carried out a mock air assault in Iceland last week...
3		EC vengravl / Poccia ecumena vosekine opyere na yachewas Trident Junction R G S NEWS - Poccia ecumena vosekine opyere na yachewas - 212K views - 3 weeks ago Poccia ecumena vosekine opyere na yachewas... <a href="https://t.me/yachewas">https://t.me/yachewas</a> Mu in Telegram - <a href="https://t.me/yachewas">https://t.me/yachewas</a> Mu in Telegram... <a href="https://t.me/yachewas">https://t.me/yachewas</a> Mu in Telegram...
4		News Alert: Massive Allied Armed Forces Arrived in Norway, Joint NATO Response Force YouTube Monitor - 139K views - 1 month ago News Alert: Massive Allied Armed Forces Arrived in Norway, Joint NATO Response Force Several allied armed forces, with heavy...
5		During Exercise Trident Juncture 18 NORWAY (V.O.U) MILITARY - 139K views - 1 month ago During Exercise Trident Juncture 18 NORWAY (V.O.U) 10,000 US Marines and 10,000 British troops will be deployed to Norway...
6		Dox war Trident Juncture 2018 - Bundeswehr Bundeswehr - 112K views - 3 weeks ago Dox war Trident Juncture 2018 - Bundeswehr... <a href="https://www.bundeswehr.de">https://www.bundeswehr.de</a> ...
7		High Alert: Massive Warships Heading To NATO's Largest Exercises Near Russia YouTube Monitor - 100K views - 1 month ago High Alert: Massive Warships Heading To NATO's Largest Exercises Near Russia... <a href="https://www.youtube.com/watch?v=...">https://www.youtube.com/watch?v=...</a>
8		A Russian 'Ingou' a GPS during a Trident Juncture 2018 Vista - 82K views - 3 weeks ago A Russian 'Ingou' a GPS during a Trident Juncture 2018... <a href="https://www.vista.com">https://www.vista.com</a> ...
9		News Alert: NATO U.S. Abrams Tanks Takes To The Streets, Show Of Force To Russia YouTube Monitor - 82K views - 1 month ago News Alert: NATO U.S. Abrams Tanks Takes To The Streets, Show Of Force To Russia... <a href="https://www.youtube.com/watch?v=...">https://www.youtube.com/watch?v=...</a>
10		Welcome to Trident Juncture 18 Forcast - 82K views - 5 months ago NATO's exercise Trident Juncture takes place in Norway this autumn. We welcome all participants...

**Environmental Impact**

**Disturbs Local Economy**

**Mistreatment by NATO Troops**

**Mocking/ridiculing NATO**

**NATO is a joke – Not a real threat**

**'Stop NATO' Protests/Astroturfing**

**Threatening Stability**

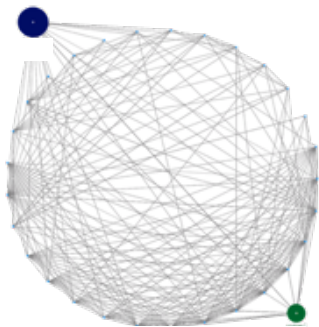
**NATO poking 'Russian Bear'**

**NATO is aggressive**

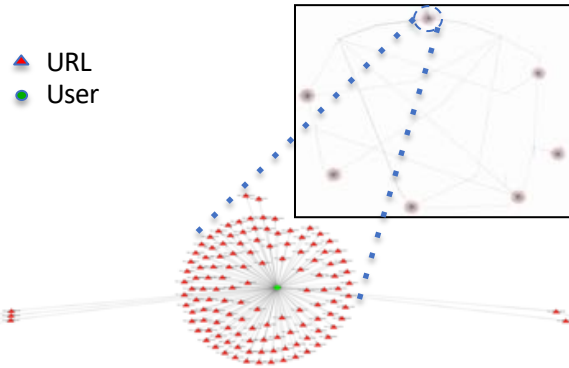
*\*published in NATO SPS 2019*

From bots → botnets → social bots

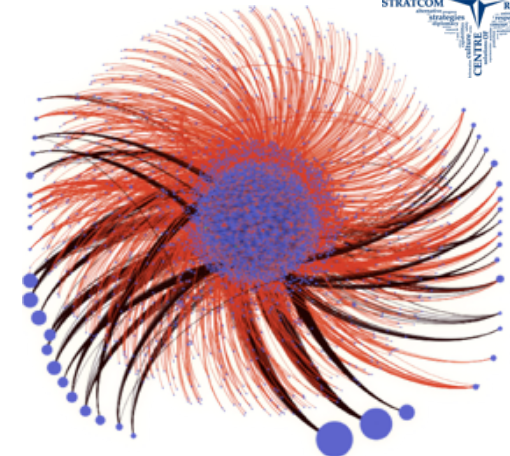
Published by NATO StratCom COE



Mutual reciprocity.  
*IFYM & FMIFY*



No mutual reciprocity.  
Coordination in information network



Organizational hierarchy.  
Core and peripheral bots

**COORDINATION/BEHAVIOR COMPLEXITY**



Crimean Invasion 2014



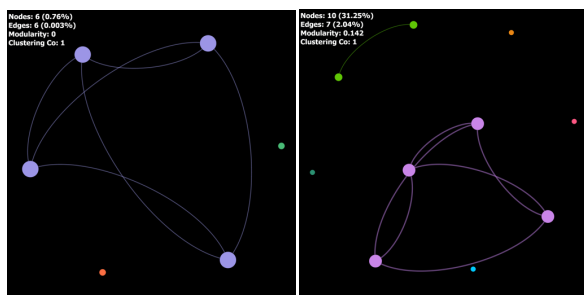
Dragoon Ride 2015



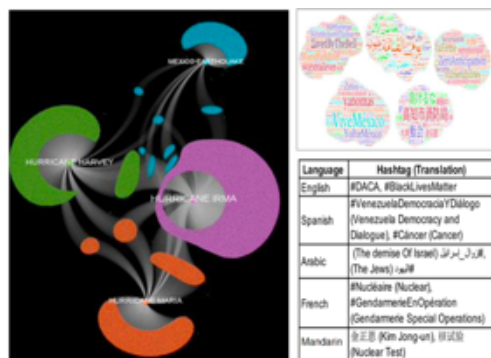
Trident Juncture 2015



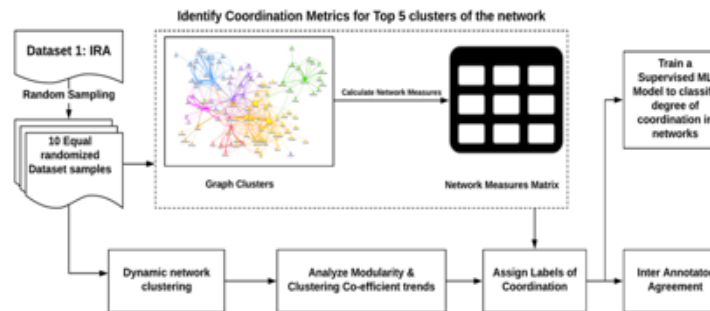
ISIS Propaganda 2016



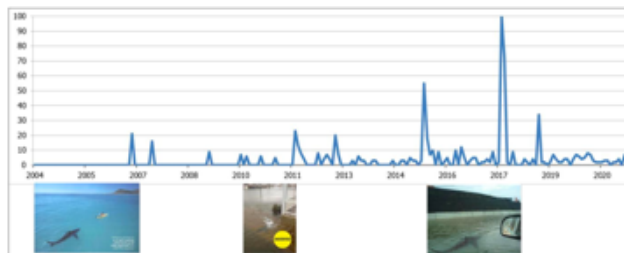
## IRA Twitter bot data released by US Intelligence Agencies



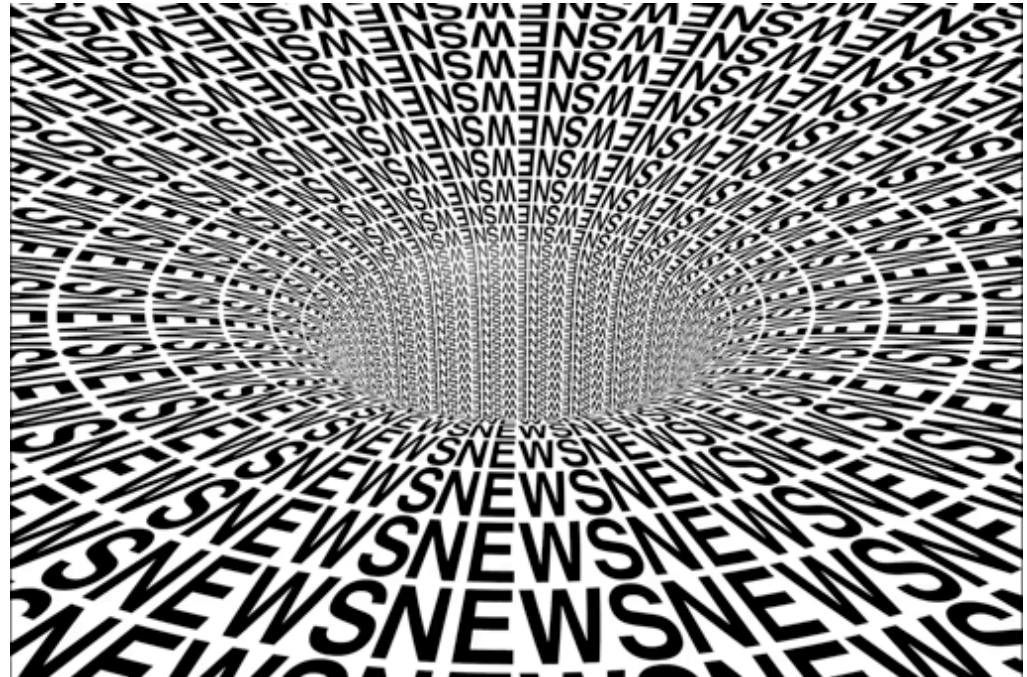
Detecting coordination among Twitter social bots (Khaund & Agarwal, 2020) SBP-BRiMS



## Bot coordinated misinformation during Hurricanes



- 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.





Computational propaganda tactics on YouTube detected using a groundbreaking multimedia processing approach based on color theory.  
Research received Best Paper award at the International Conference on Human and Social Analytics (HUSO), Oct.18-22,2020

Video ID: OMSvaF2kzPA  
Title: China vs US The War in the South China Sea already Start  
Channel: Breaking News TV

Video ID: GuCmudyXY2o  
Title: China vs US The War in the South China Sea already Start  
Channel: DOT COM US

Similar videos detected on different YouTube channels using barcode approach. Below, network of channels identified deploying crowd amplification tactic.

1

Crowd amplification tactic successfully manipulated YouTube's search results. "Hot News" - a prominent channel disseminating anti-US videos related "South China Sea" conflict - shows up at top of the search results.

2

Video barcode technique has been transitioned to YouTubeTracker

Video barcode technique allows us to navigate interesting narrative elements for a collection of videos pertaining to an event (above) or a single video (below)

3

Virality over veracity!

## How to observe, identify, and measure algorithmic bias?

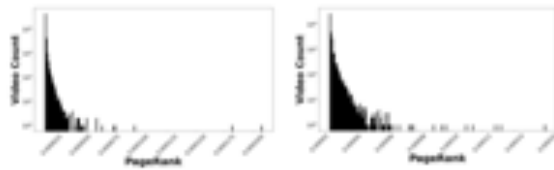


Fig. 1. Distribution of PageRank values in the recommendation graphs 1 (left) and 2 (right). We observe similar results in all recommendation graphs. The count of videos is represented in log scale on the y-axis.

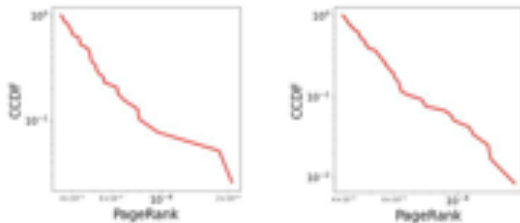
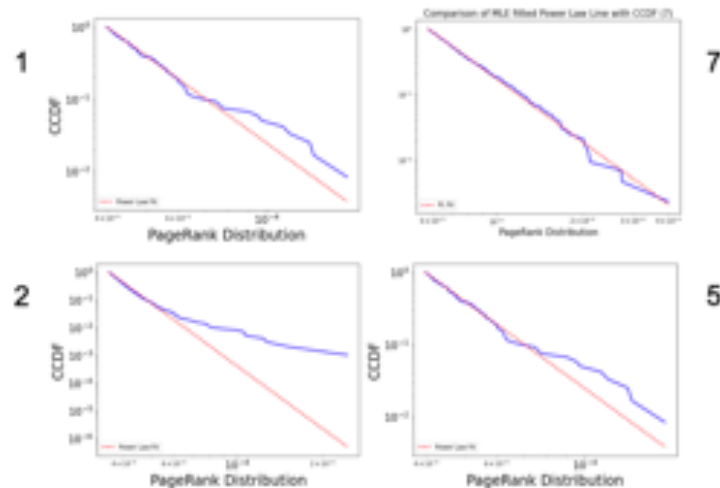


Fig. 2. Complementary Cumulative Distribution Function (CCDF) Plots of PageRank Scores in each Recommendation Graphs 1(left) and 2 (right).

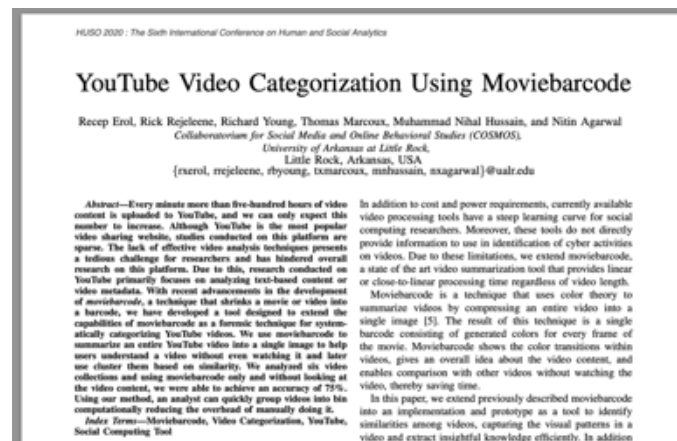
Topic drift and decrease in relevance was observed.

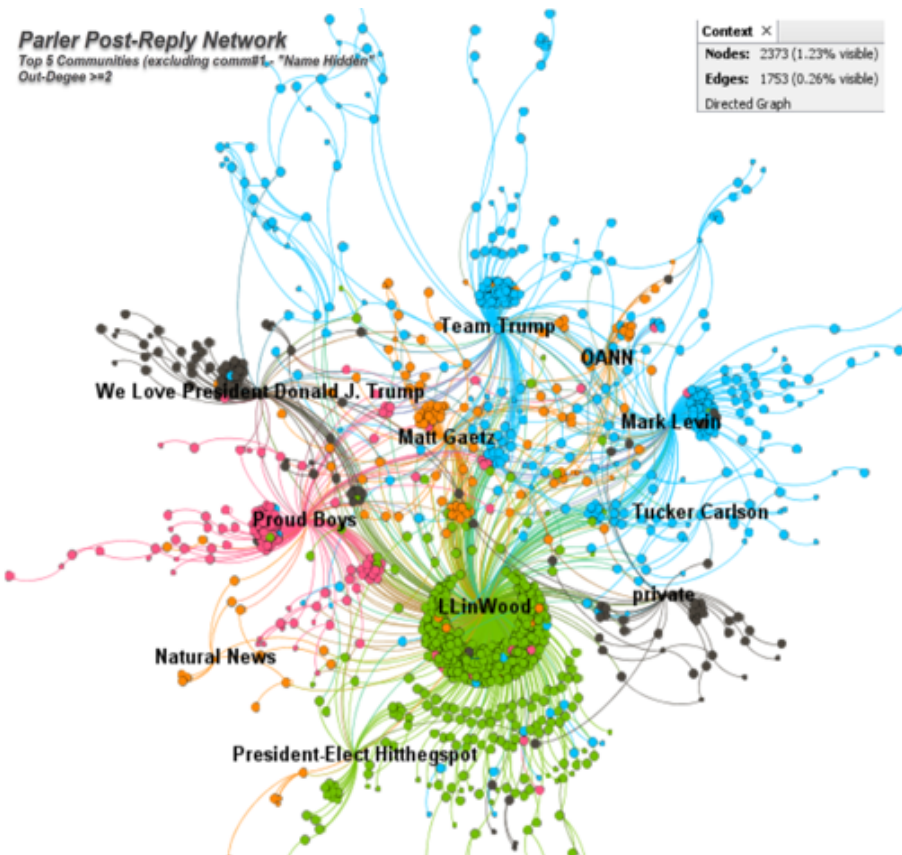
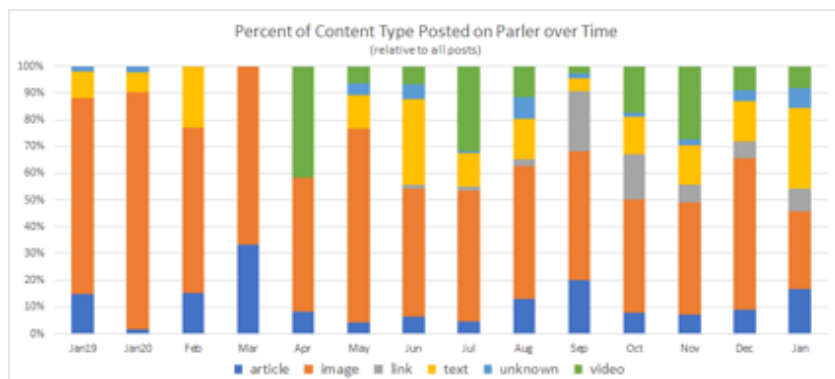
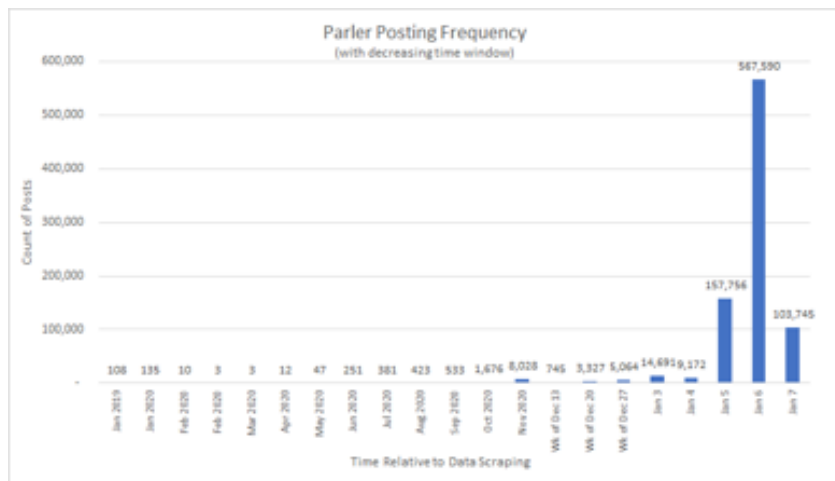


Top PageRank videos were removed weeks or months after their appearance in the recommendation network. Reason for content removal is violation of platform terms and services.



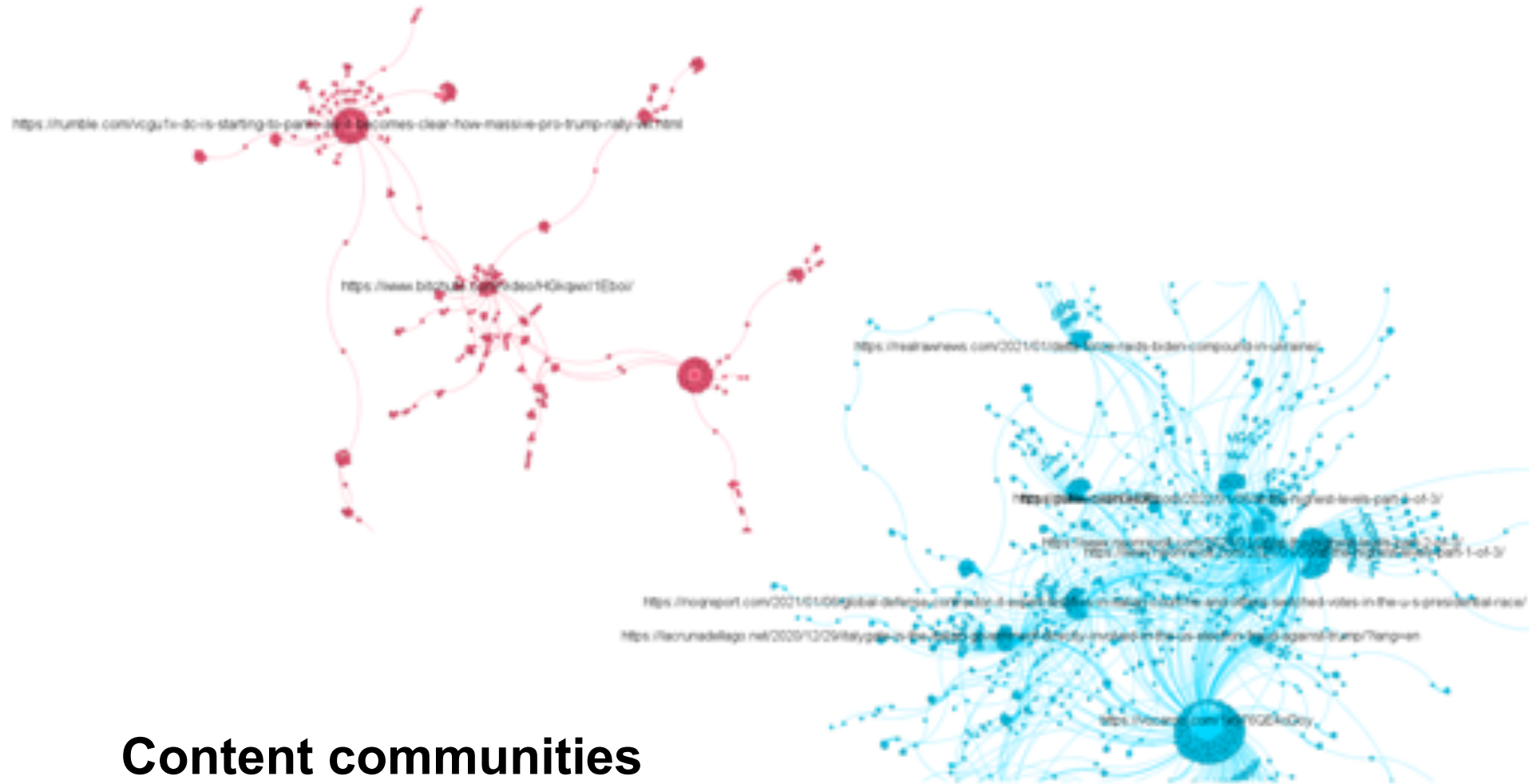
## Human and Social Analytics 2020 – Best Paper



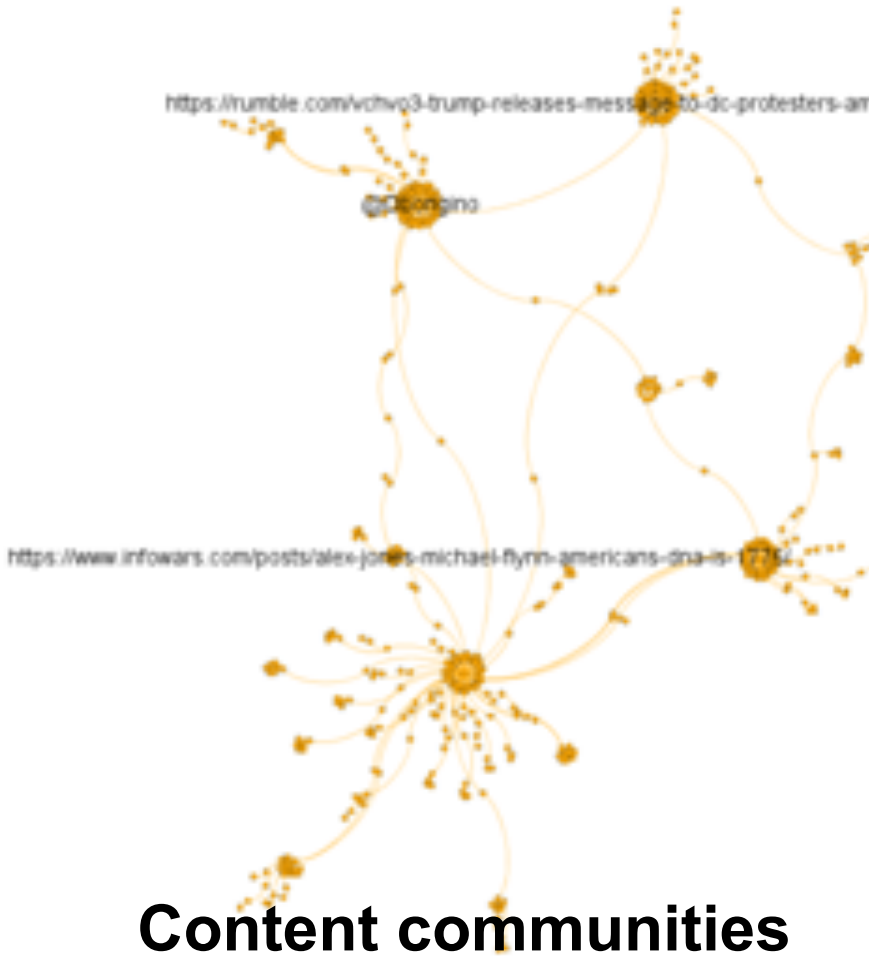


Over 70 Terabytes of data





## Content communities



COVID-19 misinfodemic presents an example of emerging cyber-social threats. While there are similarities with other disinformation campaigns (e.g., anti-NATO, anti-US, anti-EU, anti-West in Indo-Pacific region), COVID-19 disinformation campaigns have their nuances such as global and regional narratives; high topical diversity (health, policy, religion, geopolitical affairs, etc.); high volume, velocity, veracity, and variety of false narratives. COVID-19 misinformation tracker tool developed in collaboration with the Arkansas Office of the Attorney General to support detection, investigation, and mitigation of cross-platform COVID-19 disinformation campaigns and scams to assist policy makers. Our efforts demonstrate that when researchers coordinate with policy makers it can make a difference, especially when that coordination remains an ongoing process.



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



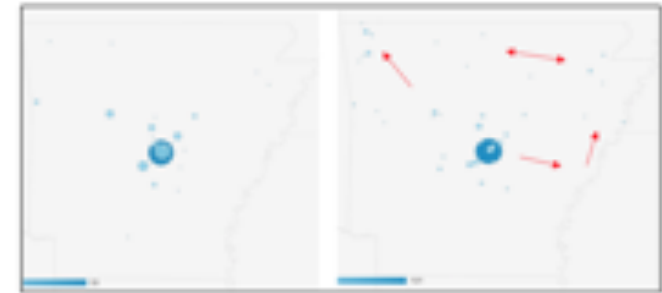
Education component of the effort



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



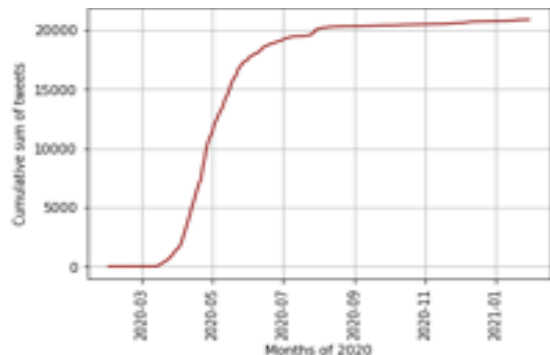
Increased penetration into rural areas of Arkansas as annotated by the arrows in the figure on right demonstrates the effectiveness of the tool and communications strategies.



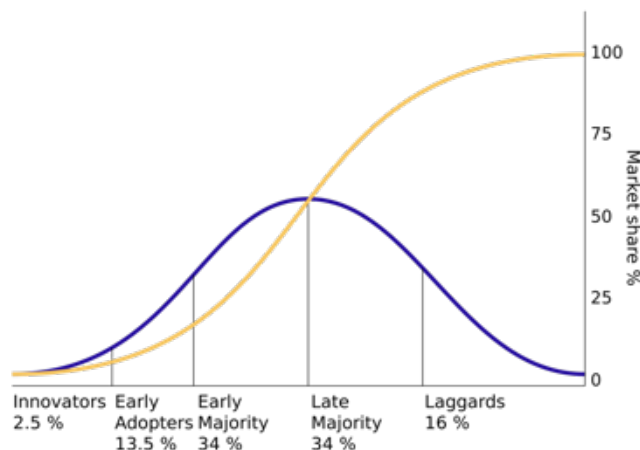
Arkansas Office of the Attorney General Press Release on our COVID-19 Misinfo Tracker

<https://cosmos.ualr.edu/covid-19>

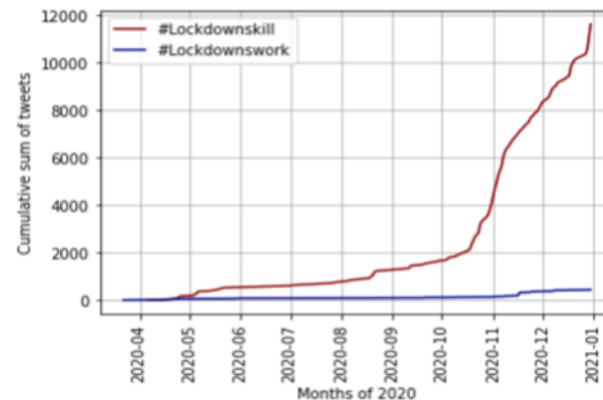
#BillGatesVirus



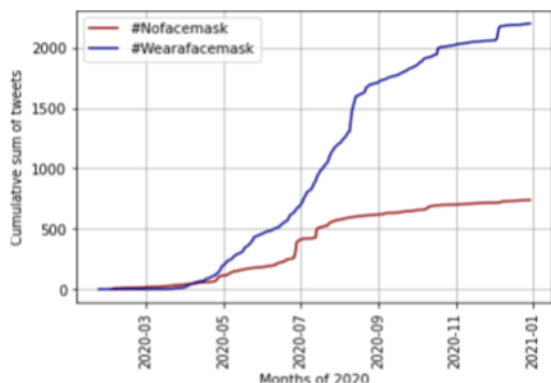
Theory of diffusion of innovations



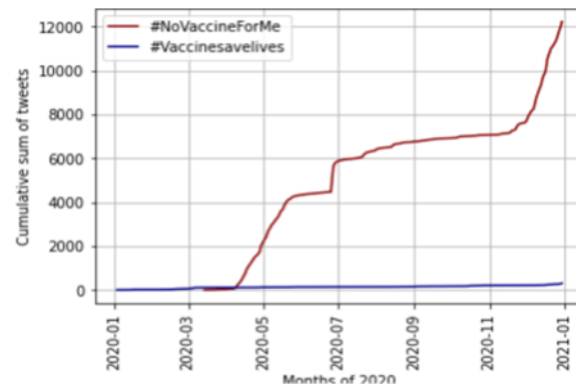
#Lockdownskill vs. #Lockdownswork



#Nofacemask vs. #Wearafacemask



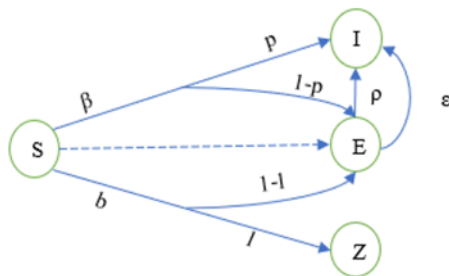
#NoVaccineForMe vs. #Vaccinesaveslives





How misinformation spreads? Leveraging epidemiological model.

(Maleki, Agarwal, et al. 2021) European Conference of Operations Research (EURO) 2021



SEIZ model

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

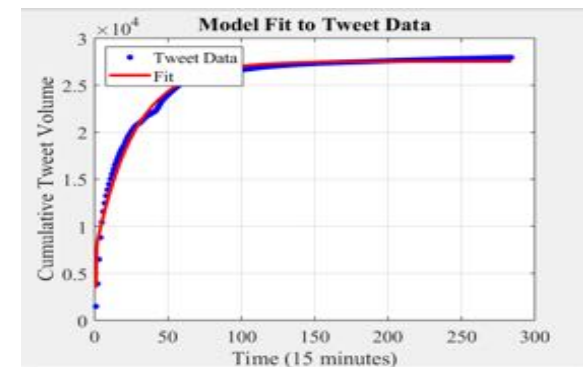
$$\frac{dS}{dt} = -\beta S \frac{I}{N} - bS \frac{Z}{N}$$

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

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

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

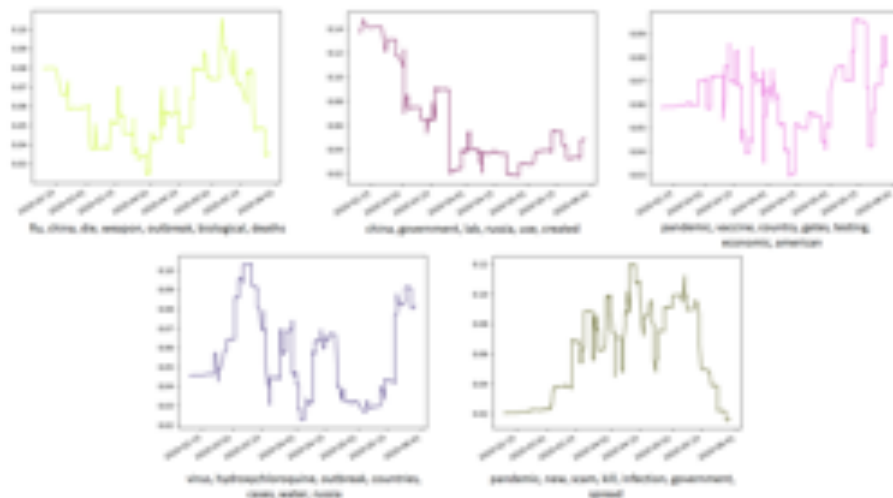
Parameter	DEFINITION
$\beta$	Contact rate between S and I.
$b$	Contact rate between S and Z.
$\rho$	Contact rate between E and I.
$p$	Probability of S to I given contact with I.
$1-p$	Probability of S to E given contact with I.
$\epsilon$	Transition rate of E to I (Incubation rate).
$l$	Probability of S to Z given contact with Z.
$1-l$	Probability of S to E given contact with Z.



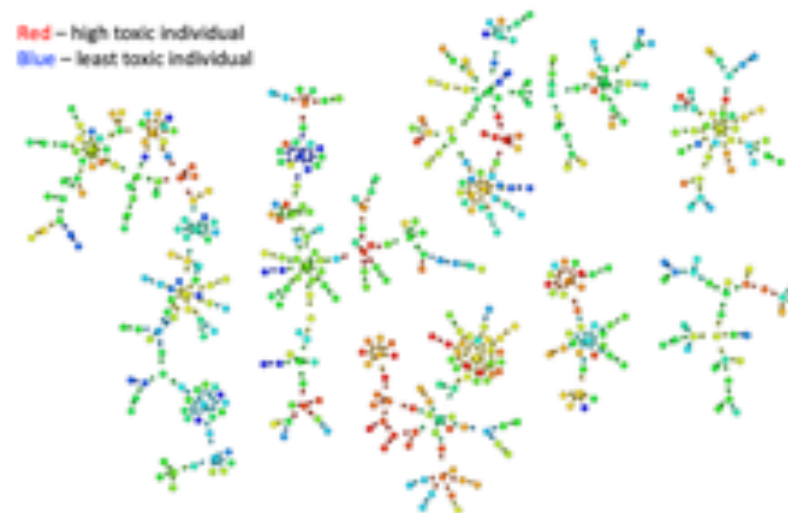
Misinformation regarding the unrest in Washington, D.C. in March 2020 propagated using the #DCblackout hashtag

Error = 0.019

Data collected during the effort led to development of predictive behavioral models to assist policymaking and crisis communications. Two examples are shown below.

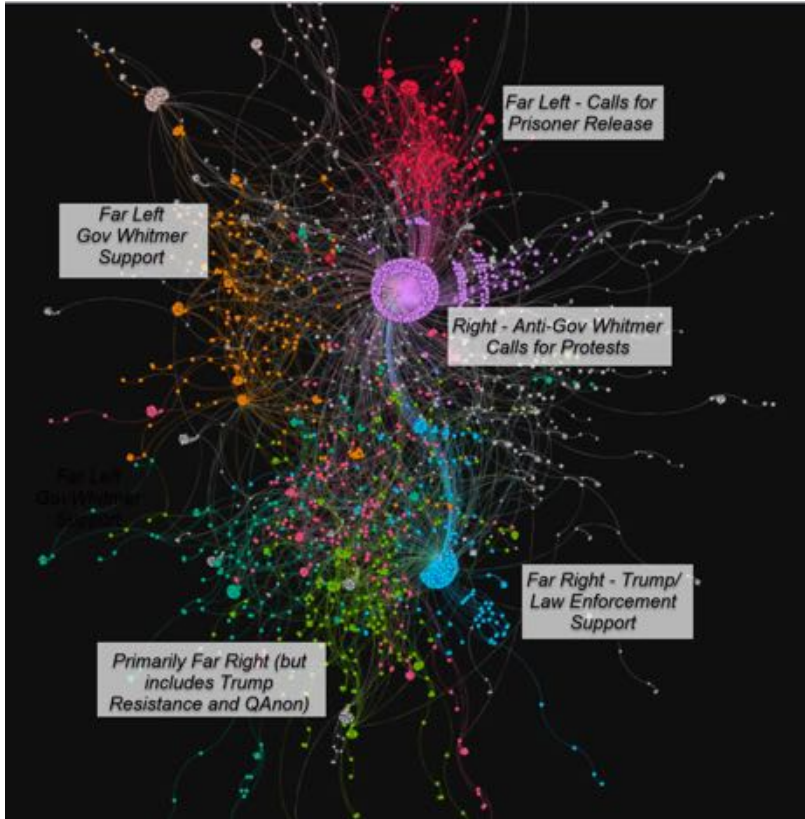


COVID-19 misinformation themes pushed on multiple platforms (blogs, twitter, YouTube, facebook, and other non-mainstream social media platforms). Recurring/periodic themes such as vaccine hesitancy, alternate medicines, conspiracy theories, etc. allow proactive communication strategies and policymaking to detect and mitigate emerging cyber-social threats.



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.

Working with LinkedIn and Arkansas Office of the Attorney General

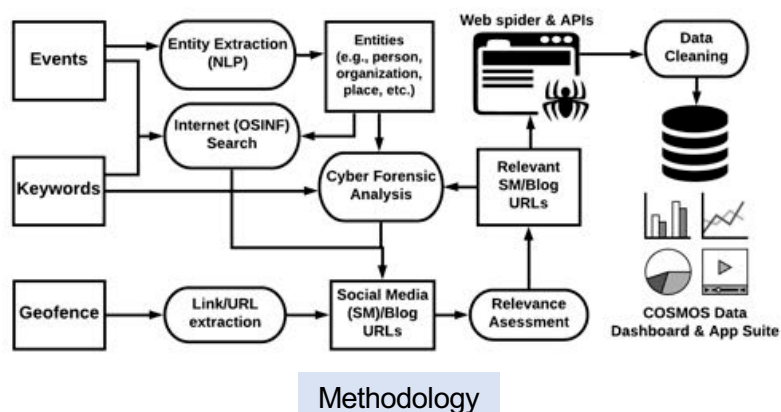


Michigan anti-lockdown protests communication network

- Michigan lockdown protest Twitter data (hashtags: #LetMiPeopleGo, #MiLeg, #Endthelockdown, #MichiganProtest)
  - April 1 to May 20
  - 16,383 Tweets
- Anti-lockdown communication network in Michigan
  - 3,632 nodes
  - 382 groups (focused on 5 most powerful groups)
- FSA/DCFM model showed powerful coordination among far-right twitter groups including QAnon calling for protest and actions against Gov. Whitmer as compared to far-left groups. FBI later unraveled a far-right wing plot to kidnap Gov. Whitmer.

Over 150 GB of data every day consisting of text, images, audio, video, networks, and metadata

Multi-threaded, distributed, resilient, and scalable data collection framework has been developed, evaluated, and deployed.

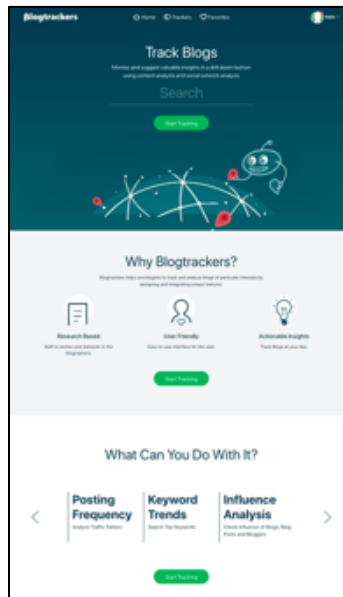


Dashboard



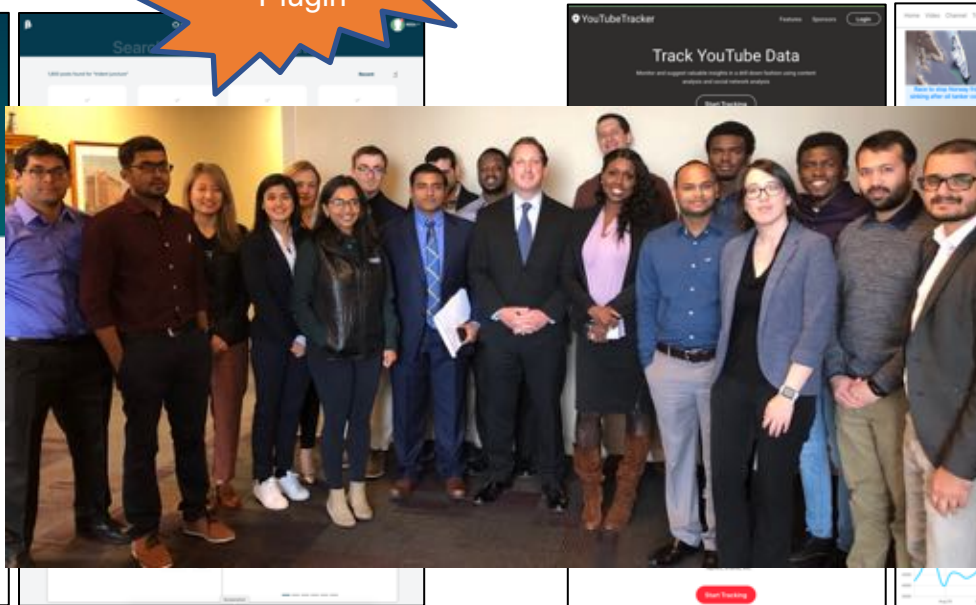
- Anti-Vaccination discourse
- COVID-19 misinformation
- Indo-Pacific influence campaigns
- NATO's 2015 – 2019 Military Exercises (Trident Juncture, Brilliant Jump, Anakonda, Baltic Operations)
- Canadian 2019 Prime Ministerial Elections
- US 2016 Presidential Elections (e.g., IRA social bot data)
- Migrant crisis (European Union)
- Ukraine and Russia conflict (Euromaidan, Crimean annexation)
- Ukrainian political affairs
- Balkan political affairs
- Venezuelan socio-political crisis
- Blogs
  - 27 attributes
  - 14,854 blog sites, 3,243,408 posts, and 13,794,757 comments
- Twitter
  - 24 attributes
  - 281,546,290 tweets and 42,624,095 users
- YouTube
  - 60 attributes
  - 9,778 channels, 440,950 videos, 160,638,256 comments, 107,551,703 likes/dislikes/views, and 11,563,003 related videos
- Alternate platforms
  - BitChute, Parler, Rumble, Gab, etc.
  - 24 attributes
  - 2,723,790 posts and 38,490,624 views/likes

Browser  
Plugin



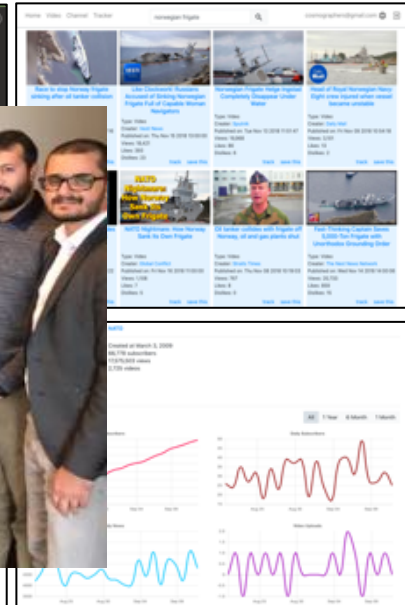
**Blogtrackers**

[btracker.host.ualr.edu/](http://btracker.host.ualr.edu/)



**YouTubeTracker**

[vtracker.host.ualr.edu/](http://vtracker.host.ualr.edu/)



**Selected in US Department of State Global Engagement Center's  
Tech Innovation program**

# Social Media Training Course

- III-Marines Expeditionary Force Information Group (III-MIG). July 2020
- NATO Strategic Communications Center of Excellence. 25-29 March 2019. Latvia
- Marine Expeditionary Forces (2MEF). 28-31 August 2018 at CMU, Pittsburgh.
- NATO Strategic Communications Center of Excellence. 20-25 March 2017. Latvia.
- US CyberCommand's CyberSchool, 3-6 August 2016. Ft. McNair

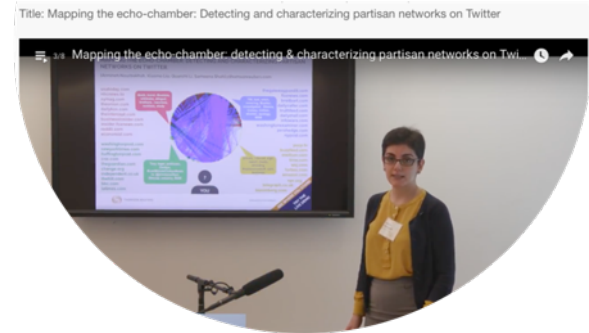


- Supported by NSF Big Data program
- Over 50 member institutions worldwide including researchers, policy makers, journalists, cyber security professionals
- Outcomes of the working group include
  - Policy briefs laying out the research agenda
  - Collective catalog of resources to spark innovation among researchers





- Social Computing, Behavioral-Cultural Modeling and Prediction Conference, Washington D.C., July 6-9, 2021. (over 200 participants)
- Supported by several federal funding agencies.
- <http://sbp-brims.org/>



- Develop publicly available technologies and solutions
- Social media companies need to be more proactive, [Algotransparency.org](https://algotransparency.org)
- Emerging technologies like blockchain for content validation, decentralized social media platforms
- Build collaborative networks of practitioners, researchers, policy makers to address this problem together
- Strengthen media literacy programs
- Need to advance the dialog on cyber diplomacy

Nitin Agarwal, [nxagarwal@ualr.edu](mailto:nxagarwal@ualr.edu)

COSMOS Tools Developed:

- **COVID-19** - <https://cosmos.ualr.edu/covid-19>
- **Blogtrackers** - <https://btracker.host.ualr.edu/>
- **YouTubeTracker** - <https://vtracker.host.ualr.edu/>
- **Focal Structure Analysis** - <http://fsa.host.ualr.edu/>

**Blogtrackers**

 **YouTubeTracker**



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

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