





# Dynamic Networks and Social Media

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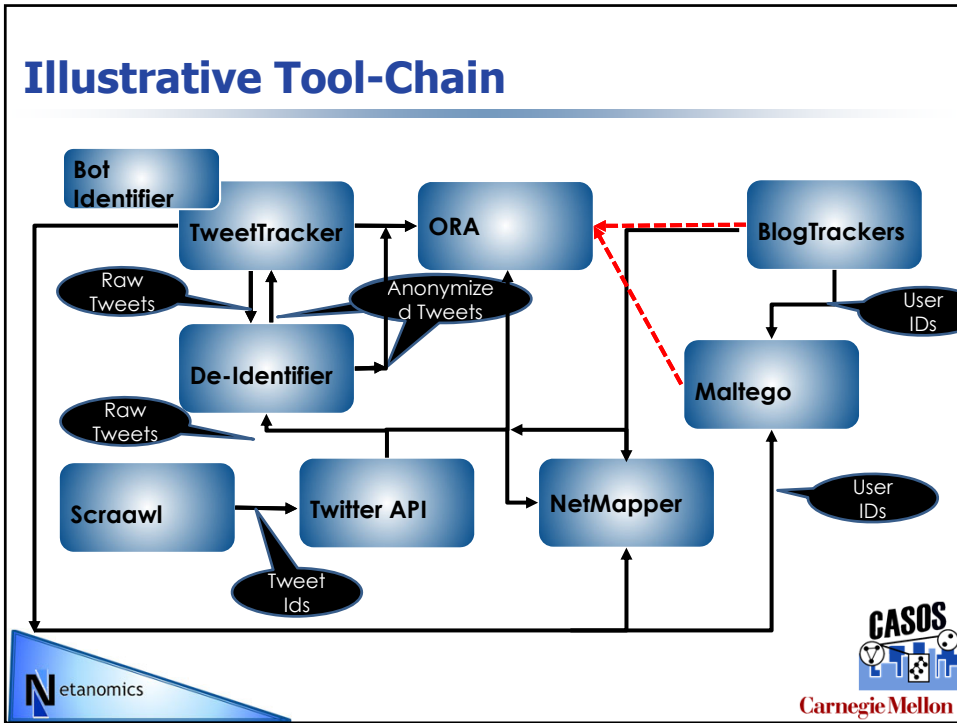



## Illustrative Component Systems

All developed with some ONR sponsorship 

	Purpose	Presenter
TweetTracker	Capture and visualize large number of tweets	Arizona State University – Huan Liu & Justin Sampson
BlogTracker	Capture and visualize blog information	UALR – Nitin Agarwal
Scraawl	Capture and visualize small number of tweets, but in depth assessment	Rebecca Goolsby
De-Ident	Removal of personally identifiable information for tweets	Netanomics – Kathleen M. Carley
ORA	Social and topic network analysis and visualization, key actor identification, trend analysis, spatial analysis	Netanomics & Carnegie Mellon University – Kathleen M. Carley & Jeff Reminga
NetMapper	Extract networks and sentiment from texts	Netanomics Kathleen M. Carley
Maltego	Identification of user across multiple social media	UALR – Nitin Agarwal




### Understanding the Digital Landscape

- Finding and tracking Topic Oriented Communities
- Finding key actors
- Finding narratives
- Comparing groups
- Comparing narratives
- Altering groups
- Altering narratives
- Creating groups
- Creating narratives

It's the actors

It's the conversation



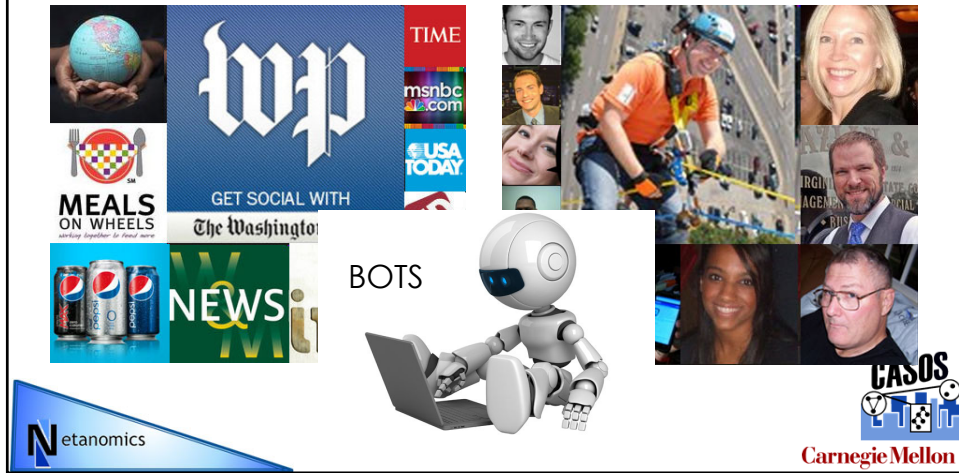
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## Who's on Social Media?

- Organizations

- Individuals



## Key Actor Analysis In Twitter

- Super Spreaders
  - High in influence
  - Look at twitter report
  - Who are top
- Super Friends (Super Reciprocals)
  - Use sum of mentions and retweets then save only the reciprocal (minimum)
  - Look at key entity report
  - Who are top in degree centrality
- Who is in echo-chambers
  - Do locate groups – local patterns cliques
  - Look at who in most cliques



## Key Theories

- Social Influence
  - A person's opinions are a function of the opinions of those with whom they interact
  - In social media, most users cannot discriminate between bots, corporate accounts, and individual users and so are influenced by all of those
- Generalized Other
  - "what everyone thinks"
  - People don't recall each person – but instead generalize about people as groups and infer information about individuals based on group membership
  - In social media, people tend to think everyone knows the top items in the scroll window
- Confirmation Bias
  - People have a tendency to form opinions quickly and then to only pay attention to data that confirms that opinion
  - In social media, if you can affect which messages are at the top of the scroll you control the initial opinion

## Key Theories

- Super-spreader
  - A communicator who has exceptional ability to spread information
  - In social media, a combination of communicates frequently, frequently followed, frequently mentioned, crosses between platforms
- Reciprocity & Super-friends
  - Reciprocity is mutual communication/mention ...
  - A communicator who is in a particularly large cliques of users all of whom mutually communicate
- Echo Chamber
  - A group of users and topics that are strongly interconnected
  - In an echo chamber ideas reflect back and forth through reciprocated links confirming what everybody knows and escalating emotions

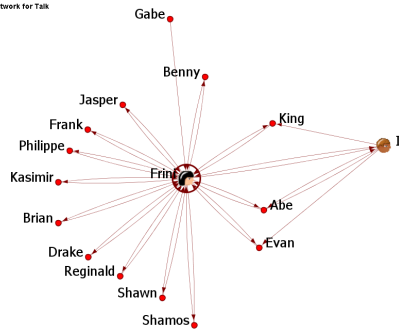
## Seeing Top Actors

- Take top person
- Run sphere of influence visualization – what do you see
- Take top person
- Run total degree over time – What do you see

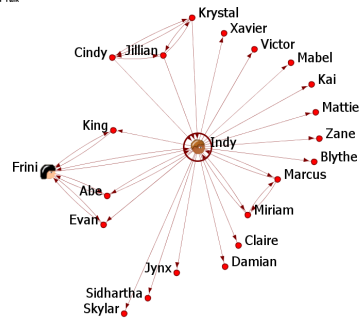
## Social Influence

- Influences 14
- Influenced by 15
- Influences 18
- Influenced by 7

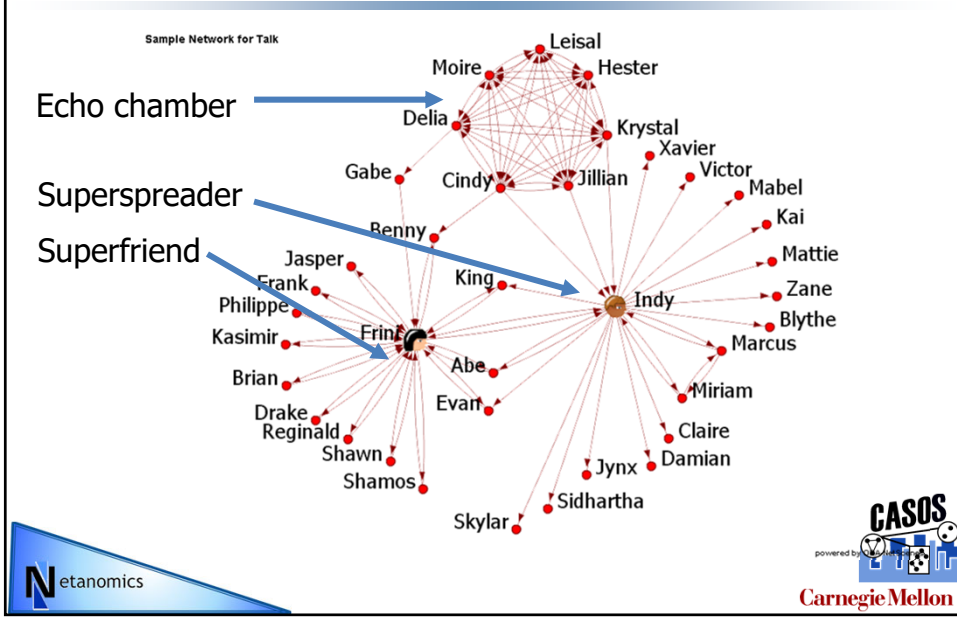
Sample Network for Talk



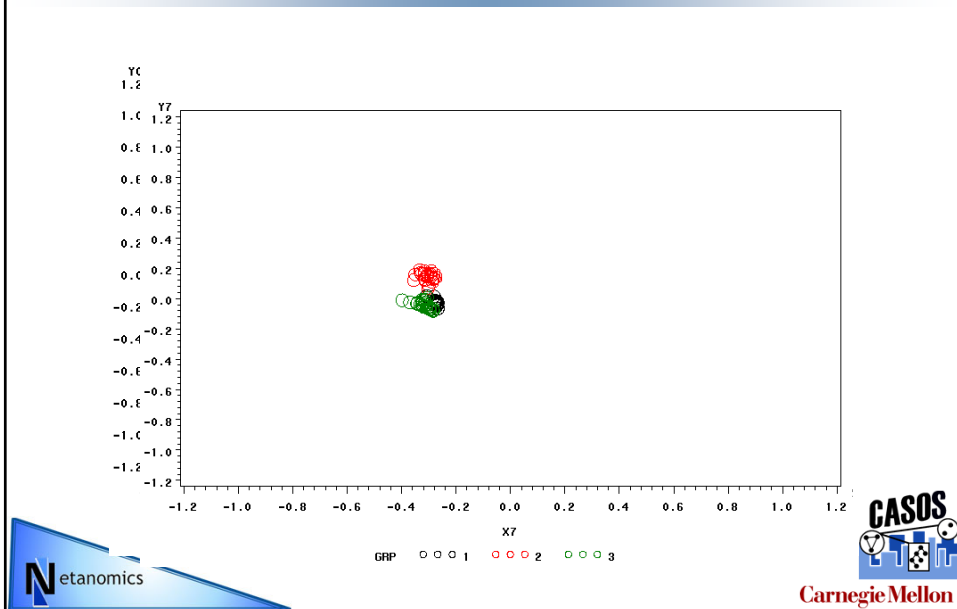
Sample Network for Talk



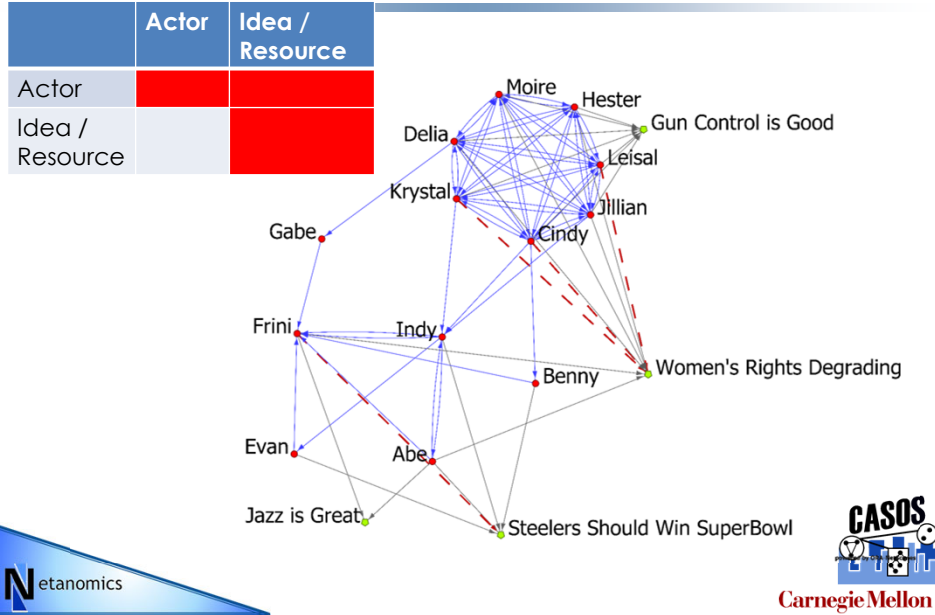
## In the Overall Network the Influence Looks Different



## Social Influence Your Beliefs depend on Beliefs in Your Network



## Relies on High Dimensional Networks



## Coordination & Manipulation Involve

- Increase community size
- Increase density
- Promote particular messages
- Promote particular people
  - Relying on "the generalized other"
  - Coordination - Ensure that "everyone knows"
  - Manipulation - Create an impression that "everyone knows"



# Exploiting Technology and Social Cognition

## Technology

- Scroll through technology
  - Frequent or repeated at top
  - Infrequent at bottom
- Prioritization
  - Which followers get messages
  - Which topics & actors get recommended
  - Appears to take into account group density and opinion leaders
- Abandoned accounts
  - Re-purposed

## Social Cognition

- Create apparent consensus – relying on the generalized other
- Create groups – us/them
- Stereotype
- Infer from individual to a group
- Use of weak ties for news and strong ties for controversy

## Cognition

- Confirmation bias
- Intimidation
- Escalation of commitment

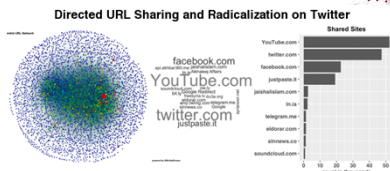
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# Topic Groups at the heart of exploits



- Topic Groups
- IVCC Method for Topic Group Detection
- Co-clustering on social network and knowledge network



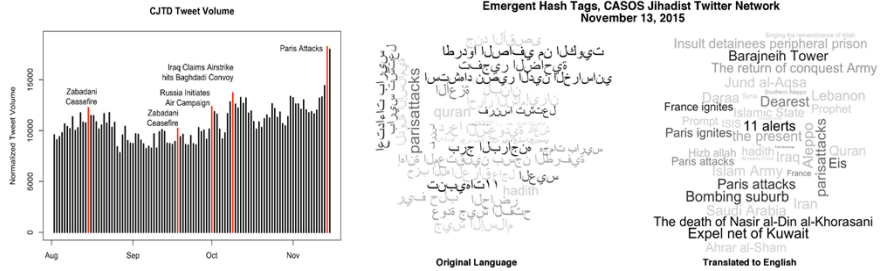
	Tweeter	Hashtag
Tweeter	A	B
Hashtag	$B^T$	C

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## Analysis: Volume and Hash Tag Analysis



- CASOS Jihadist Twitter Network (CJTN):
  - 16,000 active tweeters promoting one or more of the major Sunni Jihadist groups engaged in Syria, Northern Iraq and Yemen.
  - Topic group is
    - Driven by events – events alter discourse and membership
    - Segmented by language

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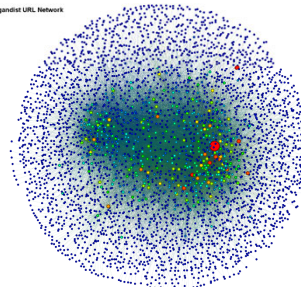
## Analysis: Key Users and Roles

### Recruiters and Propagandists

- Twitter is needed for broad reach, but is relatively insecure for communication
- A recruiter must use the @mention to point recruits to propaganda or move the discussion to a more secure platform
- Extracting tweets with @mentions and URLs highlights recruiters, recruits, propaganda, and applications used for more secure communication



CJTC 1603 Propagandist URL Network



powered by ORA

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## Linking Social Media to Real World

- People with reciprocated social media ties are more likely to have real world tie 73%
- Stronger links, reciprocated ties, more likely to be used for controversial information or personal information
- News or entertainment – equally likely on any tie
- Real world networks are more “perfect” than on-line – more dense, fewer “hangers on”
- So ...
- Online topic groups often have a real world group, real world group more of an echo-chamber
- Sending messages to excite an existing topic group results in longer half-life of message

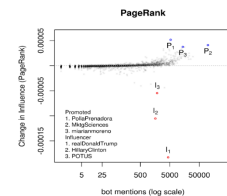
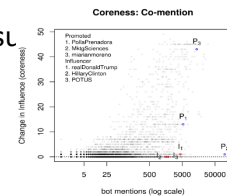
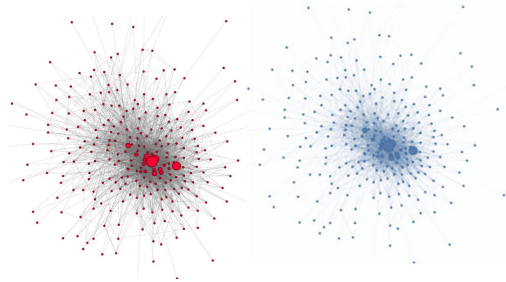
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## Russian State Destabilization Strategy

- Two topic groups - differ on basic issue e.g. gun control
- Social influence bots retweet opinion leader of choice
  - Dramatically escalates opinion leader increases their spread
  - Bots get prioritized and their messages appear in member scrolls
- Send messages that are more extreme
- Exploits generalized other – apparent consensus fosters escalation of commitment

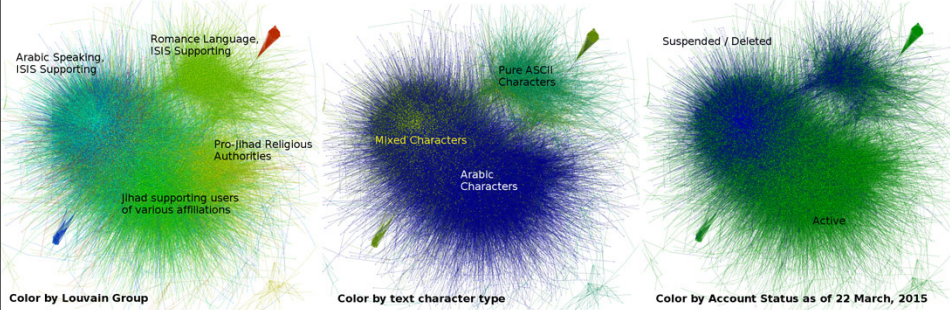


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## Isis/Syrian Issues Topic Group

### ISIS Supporting Reciprocal Mention Network



Distinct communities would likely be interpretable by analysts

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## Social Influence Bots

- Create an echo chamber
- Gain entry through linking to superspreader
- Appear as superfriend
- Tricks twitter
  - into recommending
  - Prioritizing messages Creates a second echo chamber
- Alter message by promoting benefactor



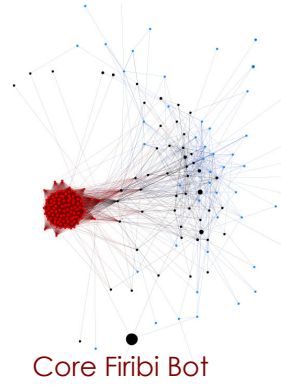
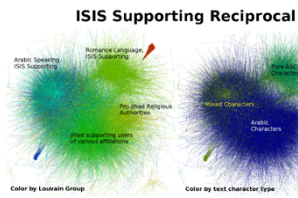
Firibinome bot – dense network built through mentions

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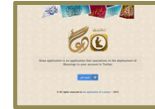


# Bots Can Manipulate Community Structure

Syria Focused Extremist Topic Group  
"Dense Community"



Firibi Benefactor



App Sign Up, solicits donations for children of Syria

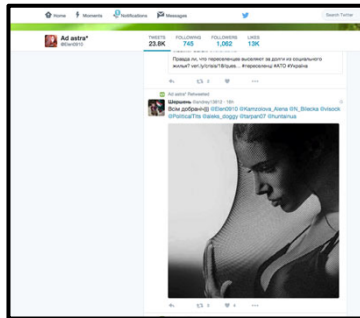
Firibi Follower



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# Spreading Narratives



Sophisticated use of @mentions can be used to increase size and interconnections within topic groups

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## Bots Building Community

- Two distinct topic groups
  - Alt-right topic group
  - Evangelical topic group
    - Appear to be middle aged American Women
  - Both have a core agenda
- Both densely connected
- Social bot used in connecting groups
  - Makes it appear that each group is in favor of other's agenda
  - Might be bridging the evangelical community with a particular candidate
  - Might be simulating a fake grass-roots movement

## Using Community

- SI-bots
  - Follow general opinion leader
    - Increasing the spread of the message
  - Mention each other
    - Create the appearance of wide spread agreement to follow opinion leader
    - Causes Twitter to recommend the "benefactor" accounts
    - These accounts can contain apps
      - If you join they then tweet from your account
      - Increasing the appearance of wide spread agreement
  - Scroll through technology puts most recent on top
    - High volume of posts ensures much to scroll through
    - Without constant attention and groveling through "old" material – you don't even see that your account is being used

# SI-Bots Promote Accounts and Impact Influence - Alt Right

The top community influencers in Table 3 and 4 counts one would expect to be influential within centered around far-right political and the Euro ment, respectively. In contrast, manual inspection accounts highlights a variety of promotional ly sarily relevant interests. One obvious promol is pornography, highlighted by promoted users 10 in Table 3, and nearly all promoted users in tressingly, although datasets were seeded fro different set of users, we see that promoted ac and 8 appear in both datasets. Promoted acco 9 in Table 3 all provide links to third party con agement applications that facilitate core bot acti of "cyborg" subscribers. This case will be discu depth in Section 5.2. Finally, promoted account pear to be bloggers who subscribe to some type t management application as their timelines appe xpts containing human language, while others c of @mentions.

Although similar behavior is observed in the S3 it is not at the same scale as what we observe i and ALT16-datasets. We expect this is due in p servative choice of  $p$  used here. Consequently, method may be improved by leveraging a mo mechanism of selecting the  $p$  parameter of  $\gamma$ .

Regardless, however, results show that the me velp does a good job of differentiating betwe influencers and promoted accounts. After doing that promoted accounts served a variety of diffe most frequently pornography or subscriptions to catious that promote cyborg behavior. In the follo on, plus, leaves into the different M-SIN, and

Rank	Promoted Accounts	Community Influencers
1	PollaPrenadora	realDonaldTrump
2	MktgSciences	HillaryClinton
3	miarionmoreno	POTUS
4	monicadovos	YouTube
5	saravastiaris	FoxNews
6	Alicelovelb	CNN
7	welbcnfamosias	rhythmus
8	NidaArr969	mitshellvii
9	jimkocz69_jim	searhannity
10	verovvp	Cernovich

Rank	Promoted Accounts	Community Influencers
1	dilruba_jees	YouTube
2	PollaPrenadora	rianru
3	goodenough03	Pravilistvo_RF
4	NidaArr969	MID_RF
5	saravastiaris	KremlinRussia
6	Isobg69	history_RF
7	monicadovos	mod_russia
8	podiatfranchis	zevedanews
9	V_Samokhova	kpru
10	lenlekk	wordpressdotcom

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# Creating Apparent Consensus Through Topic Group Grooming

Alt-Right Twitter Search  
Dense Communities with 30 to 200 users

Bot Driven Communities

Evangelical  
1. #opisis  
2. #BoycottIsrael

#InfluenceMarketer  
Photo Sharing  
Pornography  
#followback

size

Weighted Density, Reciprocal Mention Network

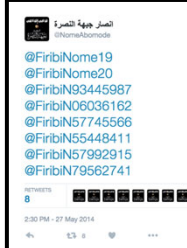
- Black circles were manually identified as SI-Bots
- All have political agendas
- Many others have this bot-like behavior
- Large size gives the impression of "everyone"
- Evangelical women's group grooming

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## Influence Manipulation with Social Influence Bots

FiribiNome Social Botnet  
Purpose: promote du3a.org



#Influencemarketing, #Kred:



Euromaidan Image Sharing  
Purpose: Build community of young males

Sophisticated use of @mentions can be used to grow communities, gain influence, or promote accounts

## Recruitment May Require 2 Narratives

- Translated hash tags retweeted by core si-bots within the Euromaidan Image Sharing topic group
- Black terms are predominantly associated with Euromaidan propaganda and Russian occupation of Crimea
- Grey terms are predominantly associated with the sharing of pornographic pictures



## Findings

- SI-Bots are used to inflate influence metrics through reciprocal mentioning behavior.
  - Some accounts drop in influence by 60% in network measures like coreness after removing SI-Bots
- SI-Bots form multiple sub-communities each with distinct intentions.
  - traditional foci (e.g. explicit influence marketing)
  - more nefarious goals (e.g. promoting particular political ideologies).
- Bot creators use directed social engineering to accomplish goals.
  - E.g., dataset sharing lewd images of women to attract young men interspersed with calls to violence

## Rhetorical Use Case

- Analyzing Content
  - Words
  - Strategies
  - Beyond words



## Analyzing Content

- Content Analysis
  - Counting words
- Key Entity Analysis
  - Language technology for finding people, organizations, locations
- Topic Analysis
  - Identifying groups of "concepts" and documents that go together
  - Latent Dirichlet Analysis - LDA
  - Latent Semantic Analysis - LSA
- Sentiment Analysis
- Theme Analysis
  - Identifying things that fit together via a focus or a strategy

## Key Theories

- Rhetorical Power
  - Use of words that get you to think about many different things, that are frequently used, that are related to many things - e.g. stereotypes
  - Messages with words with more rhetorical power have greater reach
  - In social media, create power by co-mentions and frequent mentions
- Conversational Drift
  - Shift from one topic to another - natural - due to half life
  - In social media, speed the process by what topics you choose
- Cognitive Dissonance
  - Feeling of unease due to discussions that are at odds with what you expect
  - Lead to increasing emotional stress, and either greater commitment to group or leaving of group
  - In social media, create dissonance through information strategies that lead to apparent contradictions

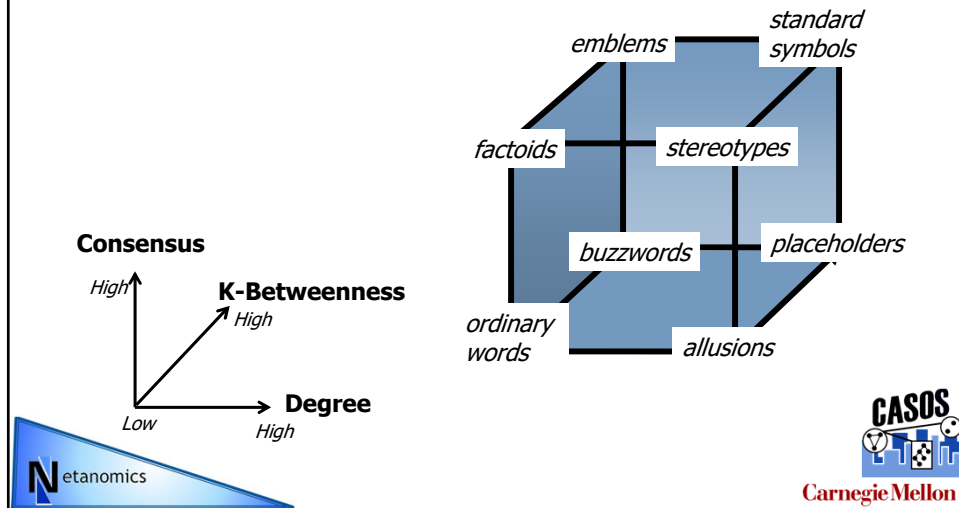
## Associated Information Strategies

- Apparent Consensus
  - Make it appear that there is wide spread agreement
- Shift Attention
  - Overwhelm the information space
  - Create competing topic
- Encourage Disassociation
  - Present false information
  - Making fun of

## Rhetorical Power

- Concepts are high in rhetorical power if they meet one or more of these criteria
  - Are frequently used by many people
    - E.g. #Trump
  - Are part of many conversations
    - Evokable & or Invokable
    - If used, makes you think of many other things
      - E.g., use of #NATO might evoke responses in
    - Many things that are said make you think of this
      - #Trump
  - Are frequently cycled through
- Stereotypes, allusions, symbols ... have high rhetorical power

## Cube analysis of communicative power



## Building Apparent Consensus

- Using concepts high in rhetorical power makes everybody think they understand what you are talking about
- Creates the appearance of consensus
  - E.g., we all agree that democracy is good
  - But we all mean different things by democracy
- Build grass roots support using messages in which concepts with rhetorical power are used



## Conversational Drift

- Conversations drift natural
- In general most “topic-groups” grow and change in response to real world events
- Encourage drift by
  - Spamming a large number of topics
  - Tricking twitter into prioritizing your message
  - Linking your message to existing topic – threadjacking
  - ...

## Conversational Drift is Diagnostic

- After a disaster when is the situation normal again?
  - When people start tweeting about Justin Bieber
- When is a situation critical
  - When it has a disproportional half-life
- Are people interested in you
  - How long do people stay on your issue?

## Cognitive Dissonance

- This makes me feel uncomfortable !!!
- People naturally try to reduce cognitive dissonance
  - Change yourself
  - Change who you interact with
- Creating cognitive dissonance
  - Strategy to build allegiance to a group
  - Strategy to rid the group of those you don't want

## Creating Cognitive Dissonance In Social Media

- Use of "off-color" humor
- Use of images
- Fake news
- Using URLs linked to fake news
- ----- but strategy has to be used "surgically"
- Key is to create dissonance only sometimes



## So what to do in Social Media

- Identify communities that are close in topics and interaction
  - Densely connected groups of individuals and topics
- Assess trending topics
  - See if any of these are promoted by bots
- Who is talking about what
  - Concepts used by many
  - Concepts special to a few
- Are key actors pointing to common urls
  - Common images
  - Common videos
- Who is using humor about whom