



Exploring Polarization in Climate Change Debate on Twitter

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Motivation

- Social Media is used to debate around complex social issues
- Climate change is one such complex issue
- Study polarizing communities debating climate change issue
- Find disinformation stories in communities
- Recognize topics within these communities
- Bot Activity within these communities



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Case Study : UN's COP24

- United Nation's Conference of Parties (COP)
 - Annual conference to discuss progress and establish obligations
 - COP24 - Held in Poland between 2nd December - 15th December 2018
- Collected ~1.3M tweets using keywords and hashtags related to Climate Change



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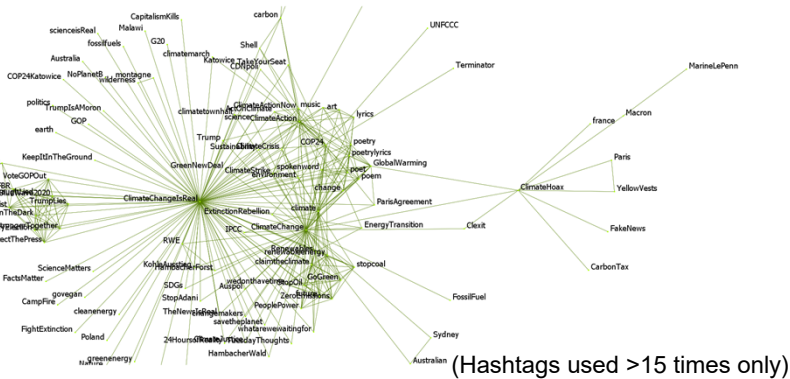
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Image Source: <https://www.enel.com/>

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Community Detection Using Hashtags

- Classify users into Believers, **Deniers** and Neutral
- Found "#ClimateHoax" used by **Deniers** and "#ClimateChangeIsReal" used by Believers



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(Hashtags used >15 times only)

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Community Detection Using Hashtags

- Classify users into Believers, **Deniers** and Neutral
- Found “#ClimateHoax” used by **Deniers** and “#ClimateChangeIsReal” used by Believers
- Used weighted hashtag x hashtag co-occurrence network to find other hashtags
- Aggregate hashtags used by each user to classify user
- 8,413 tweets from **2,170 Deniers**
- 120,497 tweets from **15,640 Believers**

Deniers	Believers
climatehoax	climatechangeisreal
yellowvests	ClimateActionNow
qanon	factsmatter



Isolating Disinformation and BOT Detection

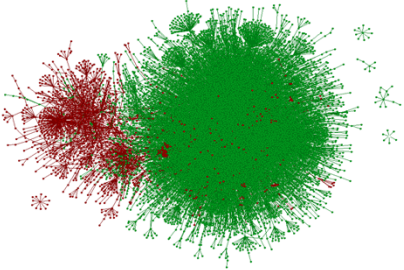
- Disinformation:
 - Break tweets into unigrams and bigrams
 - Match the unigrams and bigrams with disinformation related words/phrases
- Bot Detection- CMU’s Bot Hunter



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Believer and Denier Networks

network



powered by GNA

Denier and Believer Retweet Network

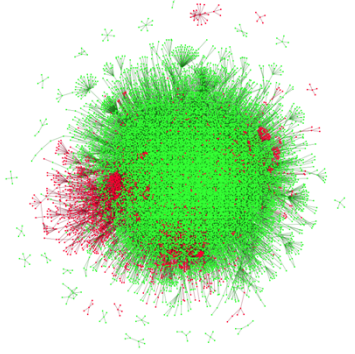
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This slide displays a network graph titled "Believer and Denier Networks" under the heading "Retweet Network". The graph shows two distinct clusters of nodes: a red cluster on the left and a green cluster on the right. The nodes are interconnected by lines, representing retweets. The red cluster is more densely packed, while the green cluster is more spread out. The text "Denier and Believer Retweet Network" is centered below the graph. The slide footer includes the CASOS logo, the date "11 June 2020", the name "Aman Tvagi", and the page number "7".

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Believer and Denier Networks

MentionNet



powered by GNA

Denier and Believer Mentions Network

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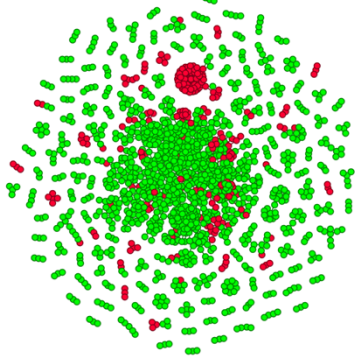
This slide displays a network graph titled "Believer and Denier Networks" under the heading "Mentions Network". The graph shows two distinct clusters of nodes: a red cluster on the left and a green cluster on the right. The nodes are interconnected by lines, representing mentions. The red cluster is more densely packed, while the green cluster is more spread out. The text "Denier and Believer Mentions Network" is centered below the graph. The slide footer includes the CASOS logo, the date "11 June 2020", the name "Aman Tvagi", and the page number "8".



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Believer and Denier Networks

ReplyNet



powered by OSA

Denier and Believer Reply Network

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Echo-chamberiness of Both Groups Decreases on Adding Neutrals

	Echo-chamberiness (Nodes)	Echo-chamberiness with Neutrals (Nodes)
Deniers	0.007 (2,170)	0.003 (435,181) ↓
Believers	0.006 (15,640)	0.003 (432,944) ↓

- Each group is talking more to themselves

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Keywords in Discussion

Deniers (Red text): macron, yellowvests, policy, global, french, planet, industry, scam, agw, nuclear, hoax, fakenews, travel, record, potus, bernie, sanders, trump, change, people, climate, carbontax, month, crisis, great.

Believer (Green text): climateactionnow, world, climatechangeisreal, renewableenergy, climateemergency, climate, fact, climate, leader, end, katowice, bcpoli, change, cop, science, year, record, climatestrike, globalwarming, cdpoli, climate, auspol, keepitinthe-ground, poland, solar, takeyourseat, climateaction.

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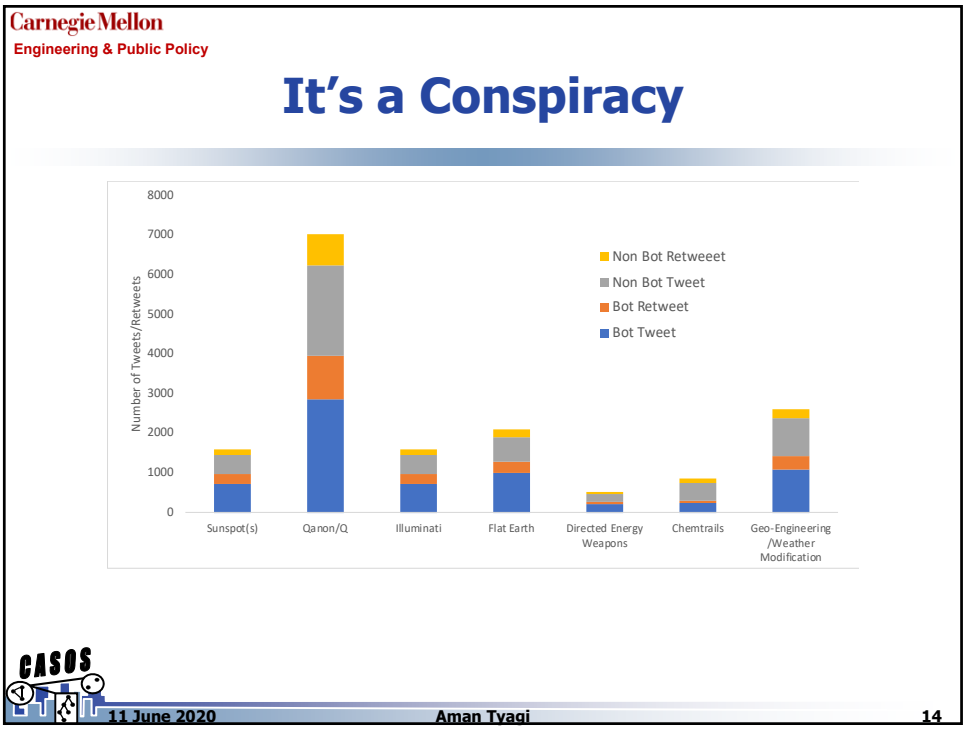
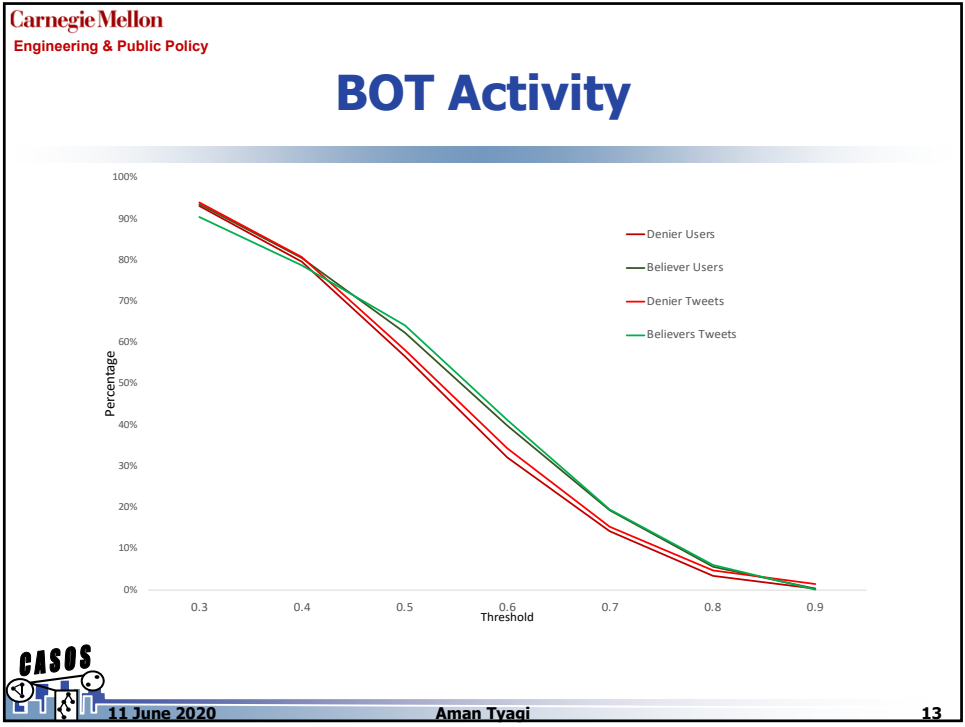
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Unigram Topic Analysis – Using LDA

Deniers					Believers				
climate	climate	climate	cop	yellowvests	cop	science	climate	climatechangeisreal	cop
scam	change	bernie	parisagreement	maga	climat	climate	change	climatechange	climateaction
change	globalwarming	sanders	climate	trump	stopblablah	year	like	auspol	climate
nuclear	world	travel	climateaction	carbontax	die	keepitinthe-ground	ipcc	climatestrike	katowice
industry	carbon	potus	katowice	france	talanoa	climateemergency	fridaysforfuture	climateactionnow	world
fakenews	climatehoax	month	energy	macron	tico	record	ambition	greennewdeal	takeyourseat
crisis	people	change	auspol	policy	est	renewableenergy	renewables	climate	leader
record	new	planet	ipcc	french	klimaschutz	bcpoli	support	cdnpoli	solar
global	know	great	climatchangehoax	people	sur	end	scottmorrisonmp	stopadani	change
agw	like	face	unfccc	hoax	cambioclim	fact	australia	globalwarming	poland

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Denier's love Conspiracies

Tweet Type	Percentage
Neutral Retweet	1%
Neutral Tweet	2%
Denier Retweet	3%
Denier Tweet	20%
Believer Retweet	1%
Believer Tweet	8%

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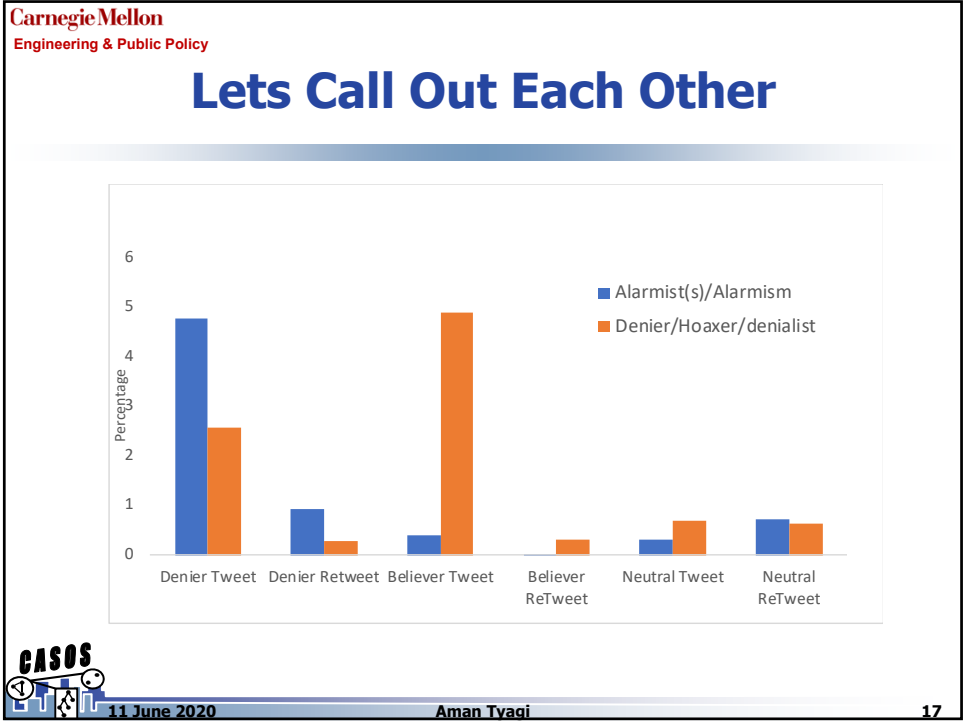
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Example: Deniers Target Exaggerations

- "entire nations could be wiped off the face of the Earth by rising sea levels if the global warming trend is not reversed by the year 2000" (Spielmann, 1989).
- This story was shared 14 times, all by accounts we classified as **Deniers**.

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- ## Key Takeaways
- For all the types of networks, we found that both **deniers** and **believers** talk within their group more than with the other group
 - this is truer for **deniers** than for **believers**
 - We found that in both **deniers** and **believers** bot-like accounts were equally active
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Key Takeaways

- Tweets and Retweets containing words or phrases related to conspiracies are more frequent in **denier's** conversations
 - Conspiracies are Tweeted more than Retweeted
- Exaggerations made by **believers** were targeted by **deniers** to strengthen their argument
 - **deniers** call out **believers** as Alarmists
 - **believers** call out **deniers** as Hoaxers



Exploring Polarization in Climate Change Debate on Twitter ORA-Demo

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Import Twitter Dataset

ORA 3.0.9.107

File Edit Preferences Data Management Generate Networks Analysis Simulations Visualizations System Help

Meta-Network Name
Meta-Network Time

What would you like to do?

- Design a meta-network
- Import Excel or text delimited files
- Import from another analysis tool
- Import XML network data
- Import other data formats
 - JSON data
 - Twitter data**
 - Blogtrackers data
 - Citibid data
 - YouTube data
 - Talkwalker data
 - Pulse data
 - NexaIntelligence data
 - VK data
 - Survey Monkey data
 - Shapelle data
 - Bibliography & Citations data
 - TAVI data
 - TRINK data
 - Reddit data
 - Import Email
 - Import from a database

Description
Import one or more twitter files and create one new dynamic meta-network per file.
Enter the type of data you want to import to show an available importer.

Cancel < Back Next > Finish

Meta-Network Manager

No Meta-Network Loaded

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Import Dataset

ORA 3.0.9.107

File Edit Preferences Data Management Generate Networks Analysis Simulations Visualizations System Help

Meta-Network Name
Meta-Network Time

Select the twitter data format:
Twitter JSON

Select one or more data files:
/Users/mohit/Desktop/aman/climate_change.json

Create a separate dynamic meta-network per file: Success

The import was successful.
Tweets parsed: 15615
Earliest date: 2009-08-28 09:37:16
Latest date: 2018-12-20 05:41:42

General options:
 Create only nodes
 Anonymize tweets

Filter options:
 Ignore tweets from
 Ignore tweets after: 2020 June 1 00:00:00
 Import Location nodes and networks

Cancel < Back Next > Finish

Meta-Network Manager

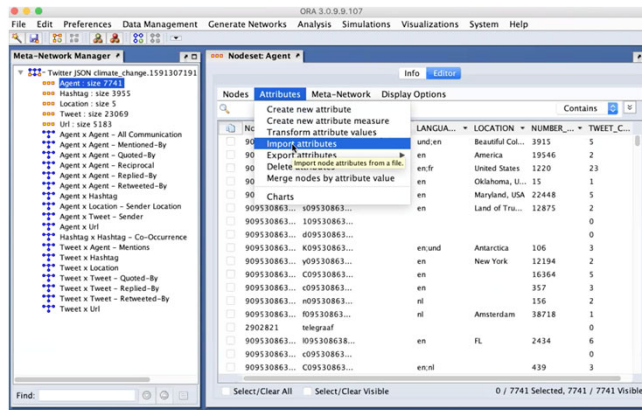
Meta-Network: Twitter JSON climate_change

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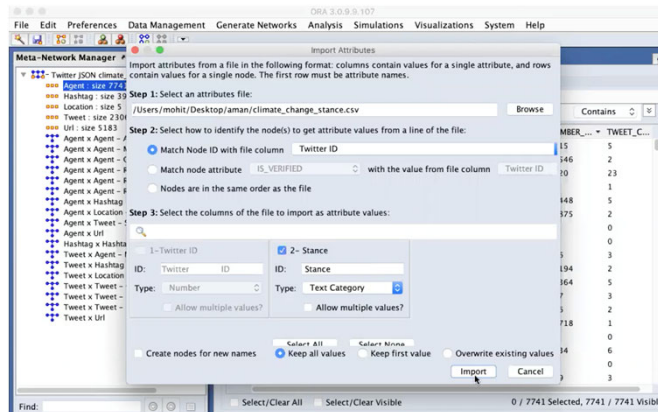
Import Stance Label

- Select Agent -> Editor -> Attributes -> Import Attributes



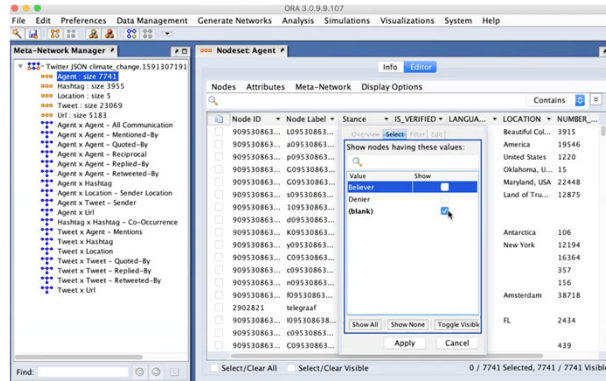
Import Attributes

- Use selections as in the screenshot and click Import
- In case of warning, press "Keep Results"



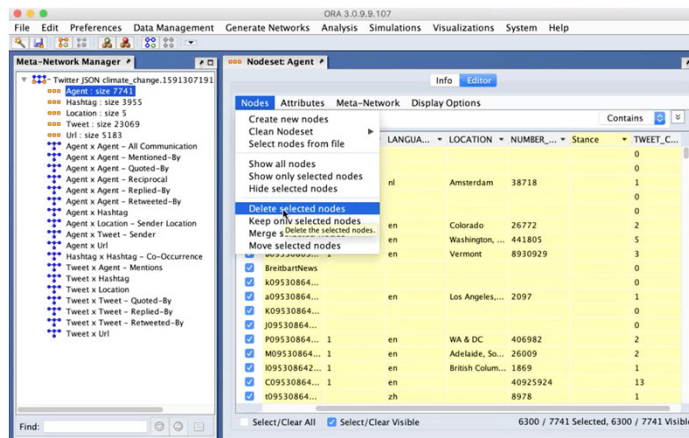
Delete Any Stance Category

- Select Stance -> Select -> Select the category to be deleted



Delete Any Stance Category

- Check "Select/Clear Visible" -> Select -> Nodes -> "Delete Selected Nodes"



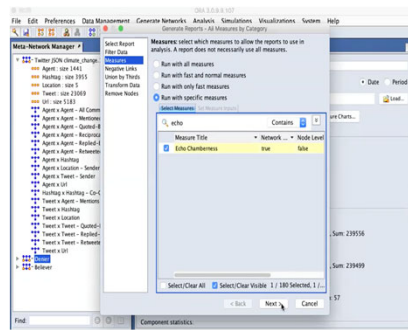
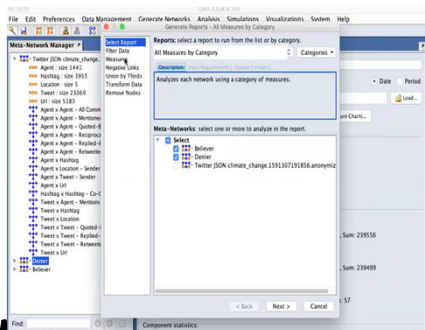
Delete Any Stance Category

- Drag and drop original meta network to make two copies
- Delete Believers from one network (method similar to last slide)
- Delete Deniers from the other network



Calculate Echo Chamberness

- Select any one meta network and click on "Generate Reports"
- Use the setting from the following Screen Shots



• Click Finish and Check the HTML file.

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Thank You!

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