Exploring Polarization in Climate Change Debate on Twitter

Aman Tyagi

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
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

Community Detection Using Hashtags

- Classify users into Believers, Deniers and Neutral
- Found “#ClimateHoax” used by Deniers and “#ClimateChangeIsReal” used by Believers

(Hashtags used >15 times only)
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

<table>
<thead>
<tr>
<th>Deniers</th>
<th>Believers</th>
</tr>
</thead>
<tbody>
<tr>
<td>climatehoax</td>
<td>climatechangeisreal</td>
</tr>
<tr>
<td>yellowvests</td>
<td>ClimateActionNow</td>
</tr>
<tr>
<td>qanon</td>
<td>factsmatter</td>
</tr>
</tbody>
</table>

- 8,413 tweets from 2,170 Deniers
- 120,497 tweets from 15,640 Believers

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
Believer and Denier Networks

Denier and Believer Retweet Network

Believer and Denier Networks

Denier and Believer Mentions Network
Believer and Denier Networks

Echo-chamberness of Both Groups Decreases on Adding Neutrals

<table>
<thead>
<tr>
<th></th>
<th>Echo-chamberness (Nodes)</th>
<th>Echo-chamberness with Neutrals (Nodes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deniers</td>
<td>0.007 (2,170)</td>
<td>0.003 (435,181) ↓</td>
</tr>
<tr>
<td>Believers</td>
<td>0.006 (15,640)</td>
<td>0.003 (432,944) ↓</td>
</tr>
</tbody>
</table>

• Each group is talking more to themselves
Keywords in Discussion

Deniers

Believers

climate | climate | climate | cop | yellowvests | cop | science | climate | climatechangeisreal | cop
scam | change | bernie | parisagreement | maga | | | | |
change | globalwarming | sanders | climate | trump | stopblablabla | year | like | auspol | climate
nuclear | world | travel | climateaction | carbon-tax | die | keeptinthesound | ipcc | climatestrike | katowice
industry | carbon | potus | katowice | france | talanoa | climateemergency | fridaysforfuture | climateaction | now | world
fakenews | climatechange | month | energy | macron | tico | record | ambition | greennewdeal | takeyourseat
crisis | people | change | auspol | policy | est | renewableenergy | renewables | climate | leader
record | new | planet | ipcc | french | klimaschutz | bpoli | support | cdnpoli | solar
global | know | great | climatechange | people | sur | end | scottmorris | emp | stopadani | change
agw | like | face | unfccc | hoax | cambioclimate | fast | australia | globalwarming | poland
Carnegie Mellon
Engineering & Public Policy

BOT Activity

It's a Conspiracy

Carnegie Mellon
Engineering & Public Policy

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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.
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
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

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ORA-Demo

Aman Tyagi
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

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.