9^{th} International Conference on Computational Social Science IC^2S^2
July 17–20, 2023, Copenhagen, Denmark

Computational Analysis of Online Climate Change Backlash Discourse

Keywords: climate change, computational communication, backlash, machine learning, social media

Extended Abstract

The hotter global climate is making extreme weather events worse, according to US National Oceanic and Atmospheric Administration scientists. 2022 had devastating examples: Pakistan's floods submerged one-third of the country in water and displaced 8 million people. Europe's wildfires burned an area three times the size of Luxemburg. The Horn of Africa's extreme drought led to the food insecurity of 21 million people. These disasters have been increasing in size, intensity, and frequency worldwide.

Computational communication theories and tools are sorely needed for governments to analyse climate discourse on social media and effectively implement climate policies. Climate discourse can reach up to 2 billion daily users on Facebook, according to the company's Press Office. Facebook also shared with BBC News that its users interacted over 200 million times with English climate change content from October 2020 to October 2021 alone. Computational analysis of extreme weather events (EWEs) content is of particular interest. EWEs are physical manifestations of climate change felt powerfully across the world. Social insights can help to more effectively communicate EWE policies and reduce the risk of public backlash.

The climate change debate in the US and elsewhere has become increasingly politicized, especially online. Many studies have documented polarization, dis- and misinformation, and how powerful actors seek to influence the debate. Here we are particularly interested in 'backlash', when public figures or members of the public seek to counteract the need to address climate change. Backlash is likely to become ever more important as debates over when to blame others, or who or which country is responsible for climate change and its costs, become intensified. Our theoretical approach is to adopt a neutral, 'objective frame of reference' stance when analyzing backlash so that backlash consists of misaligned frames; in this case, in relation to the causes or existence of EWEs.

Our **research question** is: How can we objectively identify backlash to social media content about extreme weather events? Social media analytics researchers find that data collection challenges are understudied. We conceptualize social media content as information about peoples' climate experiences that is couched in bias. We introduce the concept of an "objective frame of reference" as an analytical tool for creating datasets of Facebook Posts about climate. This approach is a set of variables which uses expert information to define a social group online and the climate experiences that they talk about.

We define backlash as comments that express frames misaligned with a post's frame, contained within an "objective frame of reference" dataset. We focus on backlash to the causes or existence of extreme weather events (EWEs). We develop three categories of backlash: 1. Suspicion, or the belief that another person is using a frame to fabricate a misleading perception of an event in society, 2. Doubt, or concern about which frame best interprets an event, and 3. Dismissal, or the belief that a certain type of frame is never appropriate to interpret any event.

Aim and Methods. In this study, we use our theoretical framework to develop computational techniques for analyzing backlash against climate change. First, we use US Library of Congress archives and US National Weather Service map to identify a social group on Facebook: local newspapers' Facebook Pages in the US Western Weather Service region that discuss EWEs. In the eight states of this region, these local outlets have between 210,000 Page followers and

a million followers (total for all eight states: 7.6 million followers). Second, we use the US National Center for Environmental Information to define a set of EWE experiences: natural disasters that cause more than $1 billion in damage. They include six main types: wildfire, drought, storm, tropical cyclone, winter storm, or flood. There were 46 such events in the US with 986 lives lost. We use the variables of social group and climate experience to create a Facebook post dataset for the two full calendar years 2020 and 2021. The dataset contains 2,933 posts about EWEs among the 544,859 posts overall. An exemplary post headline about drought is "The effects of severe drought and climate change are especially evident at Hoover Dam, which will soon hold the smallest amount of water since it was filled in the 1930s." Drought, floods and wildfires are the most common posts, but this varies by state (for example, wildfire and drought posts are most common in California).

The 2,933 EWEs posts have 36,435 comments. We code these comments as either 'backlash' or 'not backlash', using the three-point defintion of backlash above. An example of 'backlash' to a drought EWE post is: "Enough with the fake crisis horse-pucky. There are real crisis however with over-reaching government, lying media, cancel culture, and inept leadership." 'Not backlash' means the commenter agrees with the EWE frame expressed in the post or does not refer to post's EWE frame. An example of 'not backlash' to a drought EWE post is "That's the thing about Man Made Climate Change. No matter how much people deny it, it's still happening." Intercoder reliability between two and three coders is 87% and 77%. One of the main reasons for lack of coding agreement, as might be expected, is where irony or humor makes it difficult to identify the intended meaning of the poster.

Previous Work on online climate discourse has found that most of the studies to date focused on Twitter [4]. There has been little work using computational approaches. One exception is Coan et al. [1], who categorized contrarian claims coming from think tanks. Another exception that is especially relevant here is the work of Bright and Oswald [2]: in their analysis of Reddit, they found, against expectations, that engaging climate skeptics or denialists with those taking the opposite view tended to solidify their opposition to the other side rather than bringing the two sides closer together. Concerning extreme weather events, Roxburgh et al. [3] analyzed Twitter in relation to Hurricane Irene, Hurricane Sandy and Snowstorm Jonas finding, among other things, that Jonas yielded less clear responses than the two hurricanes partly because it is more difficult to link climate change to snowstorms than to hurricanes. We are training machine learning classifiers to identify backlash / not backlash comments related to EWE Facebook posts and will be able to present larger-scale results at the conference.

References

[1] Travis G. Coan, Constantine Boussalis, John Cook, and Mirjam O. Nanko. Computer-assisted classification of contrarian claims about climate change. *Scientific Reports*, 22320, 2021.

[2] Lisa Oswald and Jonathan Bright. How do climate change skeptics engage with opposing views online? evidence from a major climate change skeptic forum on reddit. *Environmental Communication*, 16(6):805–821, 2022.

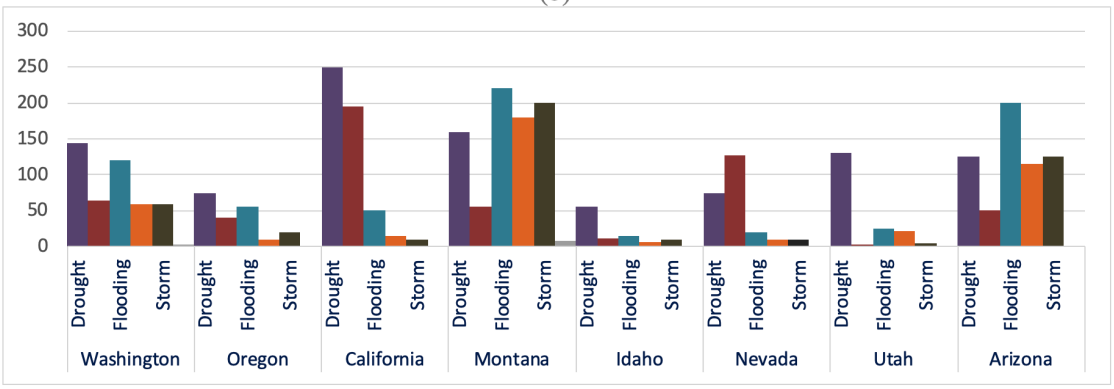
[3] Nicholas Roxburgh, Dabo Guan, Kong Joo Shin, William Rand, Shunsuke Managi, Robin Lovelace, and Jing Meng. Characterising climate change discourse on social media during extreme weather events. *Global Environmental Change*, 54:50–60, 2019.

[4] Kathie M. d'I. Treen, Hywel T. P. Williams, and Saffron J. O'Neill. Online misinformation about climate change. *WIREs Climate Change*, 11(5):e665, 2020.

(a)

	Western Region	Arizona	California	Idaho	Montana	Nevada	Oregon	Utah	Washington
Facebook Pages		Arizona Republic; Navajo Times; Arizona Daily Star; Arizona Daily Sun	Los Angeles Times; San Francisco Chronicle; San Diego Union-Tribune; Mercury News	Idaho Statesman; Idaho State Journal; Lewiston Tribune; Post Register	Billings Gazette; Great Falls Tribune; Helena Independent Record; Montana Standard	Review-Journal; Las Vegas Sun; Reno Gazette-Journal; Nevada Appeal	Oregonian; Statesman-Journal; Register-Guard; Skanner	Deseret morning news; Salt Lake Tribune; Standard-Examiner; Herald-Journal	Seattle Times; News Tribune; Seattle Post-Intelligencer; Spokesman-Review
Page Followers	7,600,000	1,000,000	3,600,000	170,000	210,000	600,000	680,000	650,000	680,000
All Posts	544,859	79,327	81,746	34,841	118,902	46,012	39,487	46,918	97,626
EWE Posts	2,933	550	503	95	754	232	190	170	439

(b)



Figures: (a) Local newspaper activity on Facebook by State in US Western Climate Region. (b) Number of posts created by local newspapers by Western State and EWE type.