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Climate Denialism on Social Media: Qualitative Analysis of Comments on Portuguese Newspaper Facebook Pages

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Abstract: Climate denialism represents a significant challenge to public awareness and the implementation of effective environmental policies. In Portugal, as in other countries, social networks have been the place where denialist ideas are disseminated, influencing the public perception of the climate crisis. This research aims to understand how denialist discourse manifests and spreads on digital platforms. The research question of this work is: how does climate denialist discourse manifest itself on social media in Portugal? This work has two objectives: (1) to analyze the arguments and discursive strategies used by climate deniers in comments on Facebook, specifically on the pages of the three largest Portuguese newspapers, and (2) to understand the social and discursive dynamics that underpin their beliefs. This work adopted a qualitative methodology that involved manual data collection during the month of September 2024. Posts about climate that were informative were selected. The comments were examined manually and categorized by type of discourse. This approach enabled capturing specific nuances and contexts of denial discourses, providing a deeper understanding of the phenomenon. The study concluded that (I) comments that use fallacies or rhetoric that deny the climate crisis tended to receive more "likes" and approval from users; (II) fallacies that do not offer scientific evidence to refute the existence of climate change were identified in all these comments.

Keywords: climate denialism; social; discursive strategies; digital; fallacies; perception

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1. Introduction

The consequences of climate change are widely discussed in various media, such as scientific articles, newspapers, and blog posts, revealing a wide range of opinions, themes, and feelings on the subject (Cody et al., 2015). Although a 98% consensus agrees that most climate change is caused by human activities (Helsdon, 2009; Van der Linden et al., 2015), the debate persists publicly and online.

The last ten years have seen a significant shift in consumption from traditional media (newspapers and television) to social networks (Twitter, Facebook, Instagram, among others) (Boykoff, 2012). Social media has become fundamental to contemporary communication, allowing newspaper and magazine companies with social media platforms to reach a wider audience more quickly (Özkent, 2022).

Climate denialism has found a favorable environment on social media (Treen et al., 2020). Once disseminated digitally, disinformation can pose a significant threat to society, as news, whether substantiated or not, that is accepted as true by individuals can influence their beliefs and behaviors (Frenda et al., 2011; Zhu et al., 2010). In response, platforms such as Facebook have introduced measures, including fake news warning labels, to

combat the spread of misinformation (Turrentine, 2022). Authors such as Björnberg et al. (2017) and Treen et al. (2020) in their literature review on climate denialism, identify four categories that oppose climate science: trend denial (denies that global warming is significant), attribution denial (disregards anthropogenic origins), impact denial (minimizes the negative effects on the environment and society), and consensus denial (questions the scientific consensus on the human cause of climate change). Negative comments receive much attention on the web, manifested through reactions such as "likes" and views. Comments of this kind can influence others to adopt a similar view due to psychological, social, and algorithmic factors. Users can perceive a social consensus on that view when they see multiple negative comments, even if it is false (Cherry, 2022; Jones et al., 2011). Algorithmic amplification also plays a role, as algorithms promote content that generates a connection, regardless of its veracity (Huszár et al., 2021). This phenomenon contributes to negative comments reaching a larger audience. In addition, confirmation bias means that users predisposed to doubting science find validation for their beliefs in negative comments (Casad & Luebering, 2023; Suzuki & Yamamoto, 2021).

Evaluating these comments' content helps us understand how ideas contrary to science spread and which arguments are more persuasive, allowing us to identify patterns that favor the spread of these beliefs. According to Jones et al. (2011), understanding this phenomenon is essential for tackling the challenges of scientific literacy. These negative comments highlight gaps in the population's scientific literacy. Analyzing these comments offers insights into ignorance or resistance to scientific evidence, making identifying the main myths and misunderstandings easier. This is fundamental for formulating more effective educational strategies that can mitigate the spread of misinformation.

2. Materials and Methods

In the context of this research, using a qualitative methodology, Facebook comments were analyzed to identify and understand climate denialism. Qualitative research is ideal for exploring complex social phenomena, where subjectivity and the nuances of human behavior play a key role (Aspers & Corte, 2019). Within the qualitative methodology, we use content analysis, where comments were categorized by type of denialism and rhetoric used (Harwood & Garry, 2015). We opted for manual data collection, which enabled researchers to select and analyze particularly relevant or representative comments, avoiding the superficiality often accompanying the analysis of large volumes of data. This method allowed for a deeper immersion in the discourses analyzed, making it possible to identify patterns (Mattimoe et al., 2021).

This approach allows for the exploration of the diversity of opinions and arguments users use to deny or minimize climate change, including interpreting textual elements such as words, phrases, metaphors, and the discursive structure of comments (Kleinberg & Toomey, 2023). By categorizing and analyzing these discursive elements, the study goes beyond simply counting occurrences, seeking to understand how users construct and communicate their perspectives on the topic. One aspect that reinforces the choice of a qualitative approach is the analysis of the use of "emojis" in the original posts of the respective newspapers. These visual elements offer valuable insights into the emotional tone and intent of readers/users. The interpretation of emojis can reveal nuances such as sarcasm, irony, support, or indignation, providing a richer and more contextualized understanding of user interactions (Was & Hamrick, 2021).

We analyzed posts on climate change published in September 2024 by three national newspapers with large follower bases. These media channels were chosen based on their relevance in the Portuguese media panorama, covering a wide national audience (all with more than one million followers on Facebook) and presenting a strong presence on social

networks. They publish diversified content covering various topics relevant to the Portuguese public (politics, economy, society, science, environment, culture, and technology).

Comments were selected that directly addressed the topic of climate change and that received the highest number of interactions, such as reactions and types of responses. To identify and select the comments classified as climate deniers, we followed the definition of Climate Denialism dictated by (Godulla et al., 2024; Oxford Dictionaries, 2025), considering that it is characterized by:

Denial of the existence of climate change
Denial of the human role in causing climate change
Minimizing the impacts of climate change
Discrediting climate science or scientists
Irrelevant comments, such as spam or messages unrelated to the topic, were excluded.

3. Results

Table 1 presents a detailed analysis of the comments collected on posts by three of Portugal's leading newspapers on Facebook (identified as newspapers 1, 2, and 3), focused on climate change issues. Each entry in the table includes the newspaper's name, the date and title of the publication analyzed, the text of the comments with the most reactions, the type of negationist identified (when identified), and the discursive or rhetorical strategy used by the comment's author. In addition, the table counts reactions in emojis, offering a richer insight into the emotional tone and reception of these comments by the audience and the acceptance or rejection of these opinions by the online community, revealing social dynamics of validation and support.

Discursive rhetoric and fallacies in comments on online platforms refer to argumentation strategies that aim to convince or persuade readers, often using reasoning that is not logically sound or diverts the focus of the discussion. These features are common in posts involving climate change, politics, or other controversial topics (Arnold, 2023; Guedes, 2011). Here are some of the main categories of fallacies and rhetoric found in our specific example:

1: False Equivalence

Table 1. Analysis of Climate Change Denialist Comments on Newspaper Posts on Facebook.

Journal/Date	Post Title	Comment Text	Type of Negationism	Discursive/Rhetorical Strategy	Post Reactions
Journal 1 26-09	Satellite images reveal impact of record temperatures in southern Greenland	"Here comes the narrative about the same subject. This newspaper does not inform, it does propaganda! Why don't they say that the opposite is happening in Antarctica?"	Discrediting scientific sources and minimizing the problem	False equivalence 1	👍 (33) 😆 (75) 😢 (34) 😮 (12)
		"Reading the comments is really fun. Umberto Eco was right when he said that the "internet has given voice to a legion of imbeciles"	Not applicable	Ad hominem 2	
		"Every day the same subject, it gets tiring"	Minimizing the problem	Media saturation fatigue 3	

Table 1. *Cont.*

Journal/Date	Post Title	Comment Text	Type of Negationism	Discursive/Rhetorical Strategy	Post Reactions
Journal 1 23-09	CO_2 is the factor that has determined global temperature over the last 485 million years	"What did the other climate changes do? Did they replace combustion vehicles with electric vehicles? Did they end meat consumption? What do we need to do this time?"	Discrediting scientific sources	False equivalence 1 Appeal to nature (naturalization of the phenomenon) 4	👍 (99) 😆 (293) 😮 (11)
		"And at that time (485 million years ago) gasoline cars and especially diesel cars were already to blame"	Discrediting scientific sources	False equivalence 1 Appeal to nature (Naturalization of the Phenomenon) 4	
		"So we can rest assured that its percentage in the atmosphere is only 0.04% (of CO_2) is only 0.04%)"	Discrediting scientific sources	False equivalence 1	
		"There are highly accredited scientists who guarantee that CO_2 is not the bad guy in this film and that human action does not have a weight greater than 2% in this equation. Where do we stand? Do we really have to believe the IPCC grantees, the fool Gretta, the pantomime All Gore or do we believe Professor Ricardo Felício or Professor Luiz Molion and others like them who remain faithful to science and refuse to sell their souls to the devil?"	Minimizing the problem Discrediting scientific sources	Ad hominem 2 Appeal to authority 5	
		"Anyone with a memory can easily recall Augusts that were hotter than this one, which was extremely mild for the time. The media is limited to ideological propaganda. The climate is manipulated to legitimize policies."	Minimizing the problem Discrediting scientific sources	Appeal to personal experience as evidence 6 False equivalence 1	
		"I've had Augusts that were much hotter than this year, I've been here for many Augusts"	Minimizing the problem Discrediting scientific sources	Appeal to personal experience as evidence 6	

Table 1. *Cont.*

Journal/Date	Post Title	Comment Text	Type of Negationism	Discursive/Rhetorical Strategy	Post Reactions
Journal 2 20-09	August was the hottest month on the globe and the tenth in Portugal since 1931	"So if there was a warmer climate in 1931, where are the climate changes?"	Discrediting scientific sources	Appeal to cherry-picking 7	😡 (50) 👍 (95) 😆 (202)
		"I must have hibernated in August, I didn't notice those hot days. Or the beach nights."	Discrediting scientific sources	Appeal to personal experience as evidence 6	
Journal 2 22-09	Extreme phenomena are more common and burn more forest than all year round	"Journalism is becoming less and less quality"	Discrediting scientific sources	Media saturation fatigue (Fatigue) 3	😡 (50) 👍 (95) 😆 (202)
		"I know of extreme human phenomena that are called murderers, incompetent, corrupt, tech thieves. Then we have a press that is also an extreme phenomenon, full of poetry, good morning"	Minimizing the problem	Deviation from topic (red herring) 8 Ad hominem 2	
Journal 2 22-09	Fuel-phase emissions must be reduced by 5% a year by 2030	"Very nice, yes ma'am, and what about the countries with the most pollution? They don't care, that is, and for the usual ones. Since the planet belongs to everyone, it's just another measure to penalize the usual ones."	Sense of frustration	Deviation from topic (red herring) 8	😡 (11) 👍 (78) 😆 (173)
Journal 3 9-09	The Earth boils: 2024 was the hottest summer on record	"News for climate freaks. Don't worry, things are boiling, but it's going to get worse."	Minimizing the problem Discrediting scientific sources	Ad hominem 2	👍 (152) 😆 (443) 😢 (79)
		"It is for these and other reasons that no one reads your pamphlet. For fiction we have literature which is much more interesting and exciting. Rubbish press"	Discrediting scientific sources	Ad hominem 2	
		"I have never been as cold as this summer"	Discrediting scientific sources	Appeal to personal experience as evidence 6	
Journal 3 06-09	Summer 2024 was the hottest ever recorded on Earth	"Spreading fear is not educating, much less inventing solutions for financial purposes. It was just to give a little hug to those affected by the climate."	Discrediting scientific sources	Ad hominem 2	👍 (91) 😆 (168) 😢 (18)
		"Porto is a place apart. It has been one of the coldest places in recent years"	Discrediting scientific sources	Appeal to personal experience as evidence 6	

False equivalence is a very common type of argumentative fallacy in online discussions, where two situations or concepts are treated as if they were equivalent when, in fact, they have significant differences. This type of argumentation can be identified in debates on social networks, where misleading simplifications or analogies are used to strengthen a point of view, ignoring the nuances of the issues involved (Effectiviology, 2024; Meyer, 1993; Sadler, 2017).

2: An "ad hominem" is a rhetorical strategy in which someone attacks the person or entity rather than focusing on the arguments or ideas that person or entity is presenting. Instead of refuting the content of the discussion, the comment veers towards personal criticism or insults directed at the interlocutor, other people/users, or the news outlet (Lillo-Unglaube et al., 2014).

3: Fatigue

The comment expresses a sense of fatigue with the topic, suggesting that the subject is being repeated excessively, which can be seen as an attempt to devalue or minimize the importance of climate change. The comment may imply that because the subject is being talked about so much, it should not be considered relevant or worthy of attention. This can mislead others into thinking climate change concerns are exaggerated or redundant (Han, 2014; Zhang et al., 2016).

4: Appeal to Nature (Naturalization of the Phenomenon)

In the context of climate denialism, the appeal to nature manifests itself in the argument that climate change is "natural" because it has already occurred throughout the Earth's geological history, independently of human activities. This is used to suggest that current variations in the climate are of no concern or do not warrant corrective action, ignoring the scientific evidence that points to the significant contribution of human-caused greenhouse gas emissions (Daston, 2014; Hoogendoorn et al., 2020).

5: Appeal to Authority

The fallacy of appeal to authority occurs when someone relies on an argument from an authoritative figure or institution. In the context of climate denialism, this fallacy appears when authority figures or experts outside the field of climatology are cited to support the denial of global warming (Hruschka & Appel, 2023; Lewiński, 2022; Cohen & Nagel, 1957).

Detailed explanation: The author of the comment refers to scientists who deny the impact of climate change, such as Ricardo Felício and Luiz Molion, making a selective appeal to authority, where the author chooses authorities that corroborate his view, ignoring the global scientific consensus that climate change is largely caused by human action. The "experts" invoked in the comment are highly contested in the scientific community, and their works are not referenced in impact literature. They are best known in Brazil for their controversial views on climate change, which go against the established scientific consensus (Brazilian Academy of Sciences, 2022; Arreguy, 2023; Souza et al., 2021).

6: Personal Experience as Evidence

The fallacy of personal experience as evidence is an argumentative error where someone uses their own experience to generalize about a complex phenomenon, often disregarding scientific evidence or broader statistical data. In debates about climate change or other scientific issues, this argument is common and tends to be intuitively persuasive but is logically flawed. (Michal et al., 2021; Sambrook et al., 2021).

Explanation: The author uses his personal experience ("Anyone with a memory. . .") to argue that the current climate is not changing drastically. This strategy appeals to personal experience rather than scientific data. However, human memory is selective and limited, and the global climate is measured with scientific rigor over decades, which makes individual experience inadequate for discussing global climate trends.

7: Cherry-Picking

In discussions about climate change, cherry-picking is invoked time and time again to discredit the scientific consensus.

For example, one could select a short period in which global temperatures appear stable to argue that global warming is not happening, ignoring broader trends that show a consistent rise in temperature over decades. One could also cite isolated events of intense cold as proof that global warming is false, ignoring the natural variability of the climate and the concept of global warming as a global average of temperatures.

This approach is misleading because it gives the impression that the data selected are representative while actually ignoring a larger volume of information that would show a more complex and comprehensive reality. (Bauer, 2023; Gleick, 2012; META, 2022; Mayo-Wilson et al., 2017).

Explanation: The commentary chooses an isolated example (1931) to refute the consensus on climate change. While there may have been a particularly warm year in 1931, the current global context shows a trend of accelerated warming that isolated events cannot explain.

8: Red Herring

The red herring fallacy consists of introducing an irrelevant argument or diverting the focus from the central theme of a discussion to divert attention from important issues. In climate change debates, this fallacy is used to change the direction of the discourse, diverting the discussion from central points related to climate science to topics that, although they may seem relevant at first glance, do not directly address the causes and consequences of climate change or the necessary solutions (Beda & Smith, 2018; Grandia, 2007; Science & Technology, 2019).

This tactic is used to delegitimize the original argument by suggesting that if a similar (or more serious) problem exists elsewhere, the initial issue should be disregarded. (Lamb et al., 2020; Nadal, 2024).

Regarding emojis, in the news stories chosen about climate change, the most used emoji was "laughing" (😂), which can lead to a sign of disdain and disbelief. The use of the "laughing" emoji can indicate an attitude of disdain or sarcasm towards the content presented. In this context, users who use this emoji are likely to consider information about climate change to be exaggerated, alarmist, or even irrelevant. According to Matamoros-Fernández and Farkas (2021), in online debates, laughing emojis are commonly used to express disagreement or ridicule an argument that the author considers unconvincing or without merit (Garimella et al., 2018); using the "laughing" emoji in the face of serious news can be a way of diminishing the seriousness of the issue addressed. This is related to the strategy of "minimizing" or "normalizing" the problem, where users try to reduce the perceived seriousness of the issue by treating information with humor.

This work analyzed discursive rhetoric and fallacies, the most frequent of which were ad hominem (6), false equivalence (4), personal experience (5), media fatigue (2) and cherry picking, the fallacy of authority, and naturalistic fallacy with 1, respectively. They all play a crucial role in climate disinformation. In many cases, such rhetoric often shifts the focus away from the scientific facts and aims to delegitimize the severity of climate change, undermining public perceptions of the need for mitigatory action (Cook et al., 2017; Lewandowsky, 2020). Several reasons can motivate people to comment on social media about topics they do not know about or believe they know about, such as climate change; in this particular work, we can find the following: (1) Cognitive dissonance: people can feel uncomfortable when confronted with information that challenges their pre-existing beliefs. To reduce this tension, they may resort to arguments or comments that reinforce their worldview, even if they are not scientifically based (Festinger, 1957; Moser et al., 2022). (2) The Dunning-Kruger effect: this psychological effect describes how people with low

knowledge of a topic can overestimate their understanding. This can lead to overconfidence when giving opinions on complex subjects such as climate change (Belasubramanian, 2023); (3) The need for social validation: social networks offer an environment where likes, comments, emojis, and shares quickly validate opinions. People often comment to feel heard, approved of, or connected to a group that shares their opinions (Cialdini, 2009; Jenkins-Guarnieri et al., 2013).

4. Conclusions

The results of this study reinforce the existing literature by showing that misinformation about climate change is not only a matter of a lack of scientific knowledge but also a consequence of rhetorical strategies that exploit cognitive biases and psychosocial motivations. The literature in cognitive and social psychology, such as Van der Linden et al. (2017) and Lewandowsky et al. (2013), suggests that these attitudes may be motivated by factors such as social identity, cognitive dissonance, and the so-called "system justification effect", in which individuals resist accepting changes that challenge their ideological beliefs or lifestyle. These disinformation comments receive immense attention and effectively create uncertainty, even when there is a robust scientific consensus on the topic (Van der Linden et al., 2017). This study contributes to the field of science communication by highlighting the importance of understanding the rhetorical strategies and motivations behind denialist discourses. One of the main motivations for these comments is related to psychological resistance to scientific consensus and adopting climate measures, especially in contexts where trust in scientific institutions and the media can be low (Kahan et al., 2011). In addition, using fallacies such as ad hominem and false equivalence suggests a conscious effort to divert the debate to peripheral topics or undermine the credibility of sources, which aligns with theories of "uncertainty propagation" (Oreskes & Conway, 2010).

Recommendations for Future Studies and Mitigation of Disinformation:

Investigate the Effectiveness of Corrective Strategies: Studies such as Nyhan and Reifler's (2010) suggest that when confronted or refuted, denialist arguments may only be an effective strategy in some cases, but that they often face the "backfire" effect, where denialist individuals reinforce their beliefs when confronted with corrective information. Develop Media Literacy Education Programs: research highlights the importance of improving media literacy to help the public identify reliable sources and discern fallacious arguments (United Nations, 2021; Muroi & Bertone, 2019). Other recommendations could be to improve algorithmic moderation: social networks could invest in moderation algorithms that detect hate speech or fake news and identify patterns of disinformation on specific topics, such as climate. In addition to removing false content, it is important to provide additional context and educate users about the nuances of scientific debates. Encouraging Scientist Participation in Networks: The active participation of scientists and experts in online discussions can help correct misconceptions in real time and provide informed information directly to users. Encouraging this participation through visibility campaigns and partnerships with platforms can improve the quality of the debate.

Regarding emojis, the predominance of laughing emojis in comments about climate change suggests a combination of disbelief, devaluation, and active rejection of the evidence presented. This reveals a social dynamic in which the seriousness of scientific discourse is challenged by those who disbelieve and attempt to ridicule, often with the intention of influencing others to adopt the same stance. These reactions reflect individual attitudes and influence the collective perception and spread of misinformation on social media.

In conclusion, an in-depth understanding of the mechanisms of disinformation and common fallacies in online discussions about climate change is essential to combat the erosion of trust in scientific consensus and the urgency of climate action. Strengthening

scientific communication, improving media literacy, and developing collaborations with digital platforms are promising ways to mitigate the influence of denialist rhetoric. Continued research in this area is vital to adjust strategies and protect the informational space in which the climate debate occurs.

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