Developing a Typology of Ad Hominem Arguments and Responses in Online Environmental Deliberation

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Abstract

This study examines the expression and response mechanisms of ad hominem arguments, or personal attacks, in online environmental deliberation, aiming to investigate the impact of such arguments on the quality of discourse. This study offers a typology of ad hominem arguments and responses to provide empirical insights into the potential and limitations of online platforms as spaces for environmental deliberation. While such arguments can polarize discussions, they may also serve as legitimate attempts to question credibility or expose bias, rendering their role in online environmental discourse ambiguous.

By analysing public discussions on environmental issues on the Reddit platform, this study identifies five types of ad hominem arguments expressed at a trait-focused level and two types at a structural level. This study also identifies six types of response strategies, such as terminating the conversation and engaging in mutual attacks. The findings suggest that ad hominem arguments may undermine the principles of equal participation embedded in Habermas's ideal speech situation, but can also serve as tools to expose power relations or assess the credibility of information. Furthermore, features of computer-mediated communication, such as the absence of social cues, may exacerbate misunderstandings and hinder the realization of rational discourse.

Keywords: ad hominem arguments, online deliberation, environmental deliberation, argumentation typology

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Abbreviations

Abbreviation	Description
AHAs	Ad Hominem Arguments
CMC	Computer-Mediated Communication

1. Introduction

Environmental governance has become one of the most pressing issues in contemporary society (Erbaugh et al. 2024). However, certain characteristics of environmental challenges make the decision-making process particularly difficult. These challenges involve scientific uncertainty, transboundary impacts, and the urgent need to balance environmental sustainability, national development, and legislative legitimacy (Berg & Lidskog 2018). Environmental issues often require the reconciliation of multiple objectives to meet societal needs, involving trade-offs among competing considerations, such as natural resource use, technological applications, health impacts, cultural heritage, land use, religious values, and economic costs (Apostolakis & Pickett 1998). These complexities render environmental issues especially intricate and contentious.

Given these characteristics, deliberation has emerged as one of the mainstream approaches to addressing environmental issues (Apostolakis & Pickett, 1998). According to Erbaugh et al. (2024), deliberation is a form of reciprocal communication in which citizens sincerely examine their preferences, views, and values regarding matters of public interest. In instrumental terms, deliberation is considered an effective mechanism for policymaking, as it can reflect collective decisions on environmental issues and reveal citizens' actual preferences (Erbaugh et al. 2024). Moreover, deliberation is typically grounded in a set of normative ideals, including respect, non-coercion, equality, empathy, a focus on the common good, transparency, accountability, and sincerity (Erbaugh et al. 2024). These principles align with the evaluative standards applied to environmental issues and support the inclusion of all relevant stakeholders in the decision-making process, further demonstrating the instrumental importance of deliberation (Erbaugh et al. 2024).

Beyond its instrumental effectiveness, deliberation also exerts a constitutive influence, regardless of its direct impact on final decisions or policy outcomes. For example, deliberation is believed to shape citizens' perceptions, attitudes, and ideologies related to environmental topics (Erbaugh et al. 2024). Some studies suggest that deliberation can enhance citizens' scientific literacy, deepen public understanding of complex topics, and raise awareness of environmental concerns (Erbaugh et al. 2024). Additionally, deliberation has proven effective in identifying common ground among individuals with divergent opinions and in significantly reducing political and ideological polarization (Erbaugh et al. 2024). These examples illustrate that deliberation contributes not only to effective policymaking but also to the shared understanding of complex environmental

challenges, revealing the significance of its constitutive role in addressing environmental issues.

However, in environmental deliberation, the focus often shifts to participants' identities. This shift reflects a distinctive aspect of environmental discourse, in which relevant knowledge is continuously contested due to inherent uncertainties and the absence of a unified epistemic authority. This is evident in environmental issues, where questions of legitimacy and representation have become increasingly prominent (O'Neill, 2001). Unlike other social issues, where participants' legitimacy in deliberation can be established through shared identity within the core group or election by members of that group, representatives in environmental matters often gain legitimacy primarily by demonstrating expertise and specialized knowledge (O'Neill, 2001).

Another reason why environmental issues often revolve around identity is their complexity and their involvement with highly specialized information. According to the concept of cognitive heuristics, when a topic involves high complexity or overwhelming amounts of information, the public tends to rely on the source of information or the identity of the arguer to decide whether to accept a claim (Meinert & Krämer, 2022). This process serves as a simple and efficient shortcut, helping individuals avoid cognitive overload and interact more efficiently with incoming information (Meinert & Krämer, 2022). These characteristics cause environmental issues, which often involve large amounts of complex information and specialized knowledge, to place a strong emphasis on participants' identities.

Considering these two reasons, identity, particularly the perceived competence to speak on environmental issues, becomes a central focus in environmental debates. This dynamic may lead to the dismissal of claims made by individuals without formally recognized expertise or perceived identity, regardless of the validity of their arguments or the value of their contributions. Such dismissals, which target a person's identity rather than the substance of their claims, can be understood as ad hominem arguments (AHAs).

AHAs attempt to dismiss a person's claim by questioning or challenging aspects of their identity. On the one hand, such challenges can raise legitimate concerns and serve as critical inquiries into participants' credibility and bias (Hinman, 1982). On the other hand, they may lead to the exclusion of individuals who lack formally recognized expertise, even when these individuals offer valuable lived experiences or unique insights (Deetz 1992; Eemeren & Grootendorst 2016; Lidskog & Sundqvist 2018). This practice can restrict open dialogue and equal participation, reinforcing existing power hierarchies and narrowing the diversity of voices represented in environmental discussions. As a result, it is crucial to

examine how AHAs function in practice and to identify their impact on environmental deliberative processes.

The emergence of computer-mediated communication (CMC) platforms has altered the dynamics through which AHAs operate within deliberative spaces. CMC refers to communication mediated through computer interfaces, as well as technologies such as mobile devices, the printing press, radio, and television. (Thorne 2008). The rise of CMC platforms such as social media, online forums, messaging apps, and blogs has become a significant arena for online public discourse, or online deliberation in a broad sense, on environmental issues (Bächtiger et al. 2018; Falkenberg et al. 2022). These digital channels offer citizens opportunities to articulate opinions, show support, or express dissent on environmental matters, even when such discussions do not directly influence formal policymaking.

The rise of online platforms offers new opportunities for public deliberation. For example, with broader internet access, these platforms provide increased space for diverse participants to engage in discussions (Bächtiger et al. 2018). However, they are also notorious for fostering polarized debates. One contributing factor is the defensive reactions provoked by identity threats (Northrup 1989 as cited in Harel et al. 2020). An identity threat occurs when an individual's identity is criticized or invalidated. This occurs when their beliefs, actions, or values are condemned, thereby denying their legitimacy (Northrup 1989 as cited in Harel et al. 2020). When people encounter others who threaten their identity, they begin to categorize them as an out-group (Northrup 1989 as cited in Harel et al. 2020). This process of differentiation extends beyond obvious differences and further polarizes the conversation at an affective level (Northrup 1989 as cited in Harel et al. 2020).

Considering these dynamics, AHAs are especially concerned with online environmental deliberation. For example, many studies have suggested a positive relation between polarized debate of climate change and social media platforms (Falkenberg et al. 2022). In such contexts, AHAs are often understood as forms of uncivil discourse (Anderson & Huntington 2017; Chen & Lu 2017; Björkenfeldt & Gustafsson 2023; Chen et al. 2024). However, AHAs can also serve as legitimate challenges to one's claims when participants seek to assess a source's credibility or the truthfulness of their claims (Walton 1998; Woods & Walton 1989 as cited in van Eemeren et al. 2012).

Given that AHAs are both constitutive in environmental deliberation and can significantly impact CMC discussions, it is vital to assess their impact on the

deliberative process across different discursive conditions, examining both how these arguments are deployed and how they are responded to.

1.1 Aim and Research Questions

Given these concerns, this study aims to examine how AHAs are expressed and responded to in relation to environmental issues in online discussions. Specifically, it seeks to understand the patterns of AHAs and the strategies individuals use to respond, to further explore the broader implications of AHAs for online environmental deliberation. The focus of this research consists of:

1) How do users challenge others with AHAs in online environmental deliberation?

2) How do users respond to AHAs in online environmental deliberation?

In this study, Walton's argumentation schemes and Habermas's theory of communicative action are applied to examine and evaluate AHAs in online environmental deliberation. The former provides a systematic tool for identifying and classifying various AHAs in daily language, while the latter offers the critical criteria for evaluating their implications within modern deliberative contexts. A detailed introduction is presented in Section 3.

1.2 Research Significance

By analyzing the dynamics of online interactions, this study enhances our understanding of AHAs in environmental deliberations on CMC platforms. It sheds light on the implications that such arguments have for the quality of deliberative discourse. In addition, this research examines the typologies of responses, which have received limited attention in previous studies. Through this analysis, the study elucidates the connection between the pattern of AHAs and the overall communicative quality within environmental deliberative spaces. Ultimately, by exploring these argumentative and reactive patterns, the research offers valuable insights into the role of CMC platforms as an environmental deliberative arena, highlighting both their capacity to facilitate public deliberations and their constraints in promoting constructive engagement.

2.   Literature Review

In the literature review section, two different parts are presented. This first section outlines the established typologies of AHAs. Building on this foundation, the following section reviews prior discussions on the application of AHAs in deliberation from various perspectives.

2.1 Ad Hominem Arguments

AHAs are commonly understood as personal attacks in both academic discourse and everyday language. According to Walton (2000), an AHA involves at least two participants, where one individual targets the character or identity of the other, rather than engaging with the substantive content of their argument. Such arguments invalidate, criticize, or reject a claim by solely appealing to another speaker's personal trait. Hence, the concept of AHAs has long been examined for its fallacious, or illogical, nature. For example, in a conversation between Speaker A and Speaker B, Speaker B initially presents a claim. In response, Speaker A states, "I do not agree with your claim because your face is ugly." This example clearly illustrates how Speaker A dismisses Speaker B's argument by attacking their physical appearance, without offering any substantive counter-evidence to the claim itself.

Following this definition, Samoilenko and Cook (2024) refined the classification of AHAs, which was previously developed by Walton (1998), into three main categories (see Figure 1). These three main categories include: (1) abusive (direct) ad hominem, (2) circumstantial ad hominem, (3) bias ad hominem.

Firstly, abusive or direct AHAs arise when one party attempts to discredit another by attacking their personal character rather than addressing the substance of their argument (Walton 1998). This type of argument follows the reasoning:

> "Person *A* has a bad personal character; therefore, Person *A*'s argument, *a,* should not be accepted." (Walton 2000, p.105)

Such arguments shift the focus from the issue under discussion to the personal qualities of the speaker (Walton 1998). To understand comprehensively about which personal traits are being attacked in this argument, Samoilenko and Cook (2024) identified five different aspects, which include veracity, prudence, perception, cognitive skills, and morals.

Secondly, circumstantial AHAs target the opponent's circumstances rather than their character. In this study, circumstantial AHAs follow the narrow definition refined by Walton (1988), which emphasizes the notion of pragmatic

inconsistency as its central feature. Pragmatic inconsistency arises when a speaker's actions are perceived to contradict their stated position, commonly explained as "you don't practice what you preach." This form of AHA highlights a disconnect between a person's argument and their behavior rather than its actual content. For instance, a child may question a parent's advice to avoid smoking by pointing out that the parent is a smoker (Walton 1998).

Bias ad hominem is the third type of identified AHAs. This form of AHA portrayed the speaker as insincere or unreliable due to personal affiliations or interests (Walton 1998). This form has great potential to undermine a speaker's credibility by casting doubt on their motives or suggesting a conflict of interest. It may lead to a strong delegitimizing effect, as it excludes the targeted participants from meaningful participation in the discourse by discouraging others from engaging with them.

Further refining the classification of AHAs, Samoilenko and Cook (2024) distinguished two levels of AHAs in climate science discourse, which are trait-focused and structural AHAs (see Figure 1 and 2). Trait-focused AHAs concentrate on specific personal attributes of the target, whereas structural AHAs involve systematically labelling individuals with negative traits according to certain discursive patterns or rhetorical structures (Samoilenko & Cook 2024).

In this refined framework, different aspects of abusive and bias AHAs are reclassified under the trait-focused level, while circumstantial ad hominem and its variant, guilt by association, fall under the structural level. Guilt by association is a type of argument that targets individuals' claims by linking them to a widely condemned group or ideology (Walton 1998).
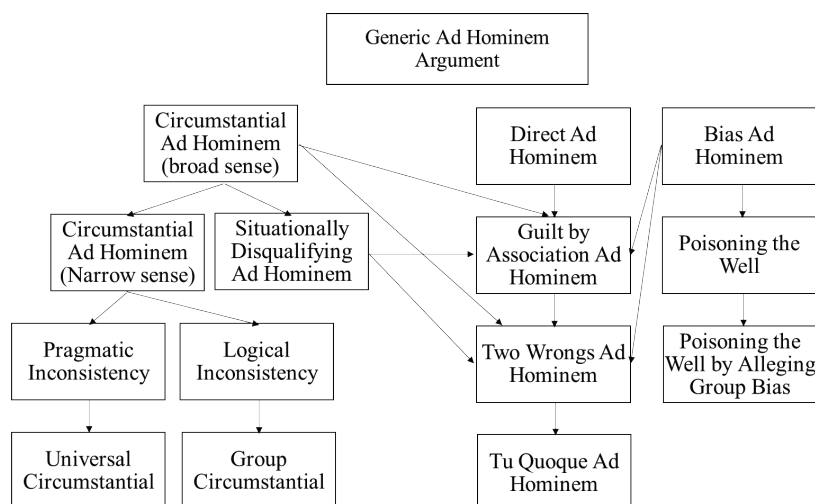
Figure 1. The typology of ad hominem arguments developed by Walton (1998) and refined by Samoilenko and Cook (2024)
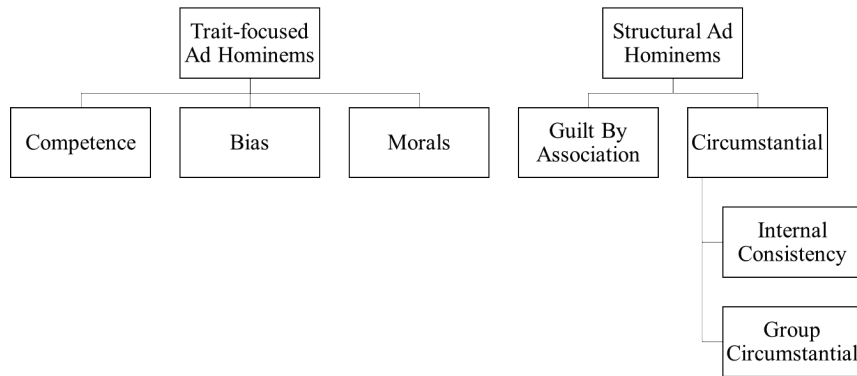
Figure 2. The typology of ad hominem arguments developed in climate science by Samoilenko and Cook (2024)

This classification of two levels and the definition of each AHA type serve as the foundation for further identification and categorization in this study, offering important reference points for subsequent data analysis. The application of this classification in the context of the present study will be detailed in Section 4.

2.2 The Application of Ad Hominem Arguments in Deliberation

The use of AHAs has become a controversial issue in deliberative contexts due to its dual nature. On the one hand, AHAs are generally considered logical fallacies (Walton 2000; Harris et al. 2012). For example, the use of AHAs may shift the focus of discussion by targeting a participant's character. Such arguments are typically irrelevant to the substance of the argument and represent a derailment of strategic manoeuvring (Walton 2000; van Eemeren et al. 2012). Additionally, AHAs are frequently employed as persuasive strategies in political discourse to influence public opinion (Benoit 2017; Samoilenko & Cook 2024). In such contexts, they may serve as rhetorical or deceptive tools to delegitimize a speaker's claims or to discredit their participation in the dialogue (Walton 2000; Samoilenko & Cook 2024). For instance, some studies have identified AHAs used to deny climate science by targeting the identities of climate scientists (Coan et al. 2021; Samoilenko & Cook 2024). The impact of these arguments on climate scientists can be particularly harmful, as they can be as damaging as empirical evidence (Barnes et al. 2018; Samoilenko & Cook 2024).

In addition, AHAs can be used as tools to undermine the legitimacy of individuals in deliberative processes. According to the theory of legitimation, legitimation and delegitimation involve the reclassification of actions, systems, groups, or individuals (Jost & Major 2001). This process plays a vital role in stabilizing power structures and establishing normative standards. Within social interactions, where at least two parties are involved, legitimation and delegitimation are closely related to the agreement and disagreements with the justifications or moral grounds proposed by the other party (Jost & Major 2001). Identity and organizational affiliation are among the levels often assessed to determine the legitimacy of a claim (Jost & Major 2001), which aligns with the definition of AHAs.

The theory of legitimation illustrates how AHAs impact power structures. For example, discrediting an individual's contributions on the basis of their identity serves to reinforce existing hierarchical structures upheld by prevailing social norms (Habermas 2001). Likewise, according to the theory of communicative action, all participants should have an equal opportunity to contribute to discourse (Habermas 1984) . When AHAs are employed to delegitimize individuals based on their social identity, they violate the principle of equal participation and undermine the conditions for a deliberative space free of power imbalances (Habermas 2001). This can be understood as a systemically distorted communication issue, as it privileges expert authority while suppressing the participation of marginalized voices in deliberation (Deetz 1992).

Furthermore, according to the understanding of pragma-dialectical theory, AHAs are also seen as violations of the rules governing the confrontation stage of argumentation. At this stage, the objective is to allow participants to clearly express their disagreements (van Eemeren et al. 2012). Attacks directed at a person, rather than their arguments, may hinder communicative freedom and information transparency (van Eemeren et al. 2012; Eemeren & Grootendorst 2016).

On the other hand, despite these negative implications, AHAs can be considered reasonable and meaningful in certain deliberative contexts. For example, Hinman (1982) argues that AHAs may serve as important tools for assessing credibility when determining information is lacking. This view aligns with Walton's perspective (1998) that bias AHAs may be acceptable if the aim of using them is to uncover the truth, and Samoilenko and Cook's understanding (2024), as they claim that the legitimacy of such arguments depends on the speaker's intent.

Hinman (1982) also proposed that in a situation where the consequences of a decision are potentially impactful and severe, AHAs serve as a higher standard to

demonstrate the truthfulness of the arguments. Hinman (1982) illustrated this through the example of market intervention, arguing that the background and intentions of the experts are critical for determining the certainty and precision of their suggestions in interfering with free markets. Despite this, Hinman (1982) further argues that AHAs can only serve as significant questions about credibility, and it is still unjustified when they function as the only basis of rebuttal without any substantive arguments (Hinman 1982).

Additionally, Samoilenko and Cook (2024) also emphasized the reasonable use of AHAs as a response to arguments appealing to authority. Arguments appealing to authority refer to the arguments that are supported by the arguer's intelligence, education, status, power, or some other reason that is regarded with a certain authority by the public (Goodwin 2011). AHAs are sometimes considered valid critical questions against arguments appealing to authority, especially when authority is invoked without adequate justification and substantive evidence (Samoilenko & Cook 2024). Samoilenko and Cook (2024) propose that there is a symmetry between arguments from authority and those against the person, as both involve considerations of credibility. In this context, the arguers of the AHAs can be seen as having an anti-authoritative status, and the use of AHAs is acceptable (Samoilenko & Cook 2024). Similarly, based on the pragma-dialectical theory, in the argumentation stage, where the aim is to persuade and win over participants' opponents, AHAs may be permissible, particularly when one party appeals to authority. AHAs are deemed inappropriate only when they suppress the other's right to speak at this stage (van Eemeren et al. 2012).

Moreover, Woods and Walton (1989, as cited in van Eemeren et al. 2012) also emphasized the reasonable use of AHAs in the context of complex or highly specialized issues. From this perspective, an AHA can be justified when it addresses a topic requiring expertise and cannot be replaced by generalised knowledge or experience. When the arguers lack specialised expertise, their opponents are justified in challenging them with an AHA, regardless of whether the arguers appeal to authority.

This literature review section provides an overview of previous studies and their perspectives on the application and reasonableness of AHAs in various deliberative processes and contexts. To better analyze the use of ad hominem argumentation, Habermas's theory of communicative action is adopted as the evaluative framework. More detailed information will be provided in Section 3.

3. Theoretical Framework

This theoretical framework section outlines the frameworks used in the study, including argumentation schemes and the theory of communicative action. The first framework provides a structured understanding of AHAs and is introduced to identify and classify them in this study. The second one provides criteria to assess the implications of AHAs within deliberative contexts.

3.1 Argumentation Schemes

Argumentation schemes are structured patterns of reasoning used to identify and evaluate argumentation in everyday discourse (Walton et al. 2008). Argumentation schemes serve as an analytical tool within argumentation theory, which investigates the practice of arguments, to help categorize and assess arguments (Walton et al. 2008; Lewiński & Mohammed 2016). Among various models, Walton's framework (2008) is particularly influential due to its focus on everyday dialogue and its wide applicability across fields such as political debate, legal reasoning, communication, artificial intelligence, and education.

A key contribution of Walton's argumentation schemes lies in their treatment of defeasible arguments (Walton et al. 2008). Defeasible arguments are those in which the premises support the conclusion, yet the conclusion can be challenged or revised when new information is introduced (Walton et al. 2008). While such arguments are considered fallacious within formal or mathematical logic, where only deductive reasoning is accepted, they are common in everyday discourse (Walton et al. 2008). Walton's schemes offer a more dialogue- and context-sensitive approach that enables meaningful evaluation of constitutive but deductively fallacious arguments, such as AHAs (Walton et al. 2008).

Another key characteristic of Walton's argumentation schemes is their incorporation of enthymemes in the process of identifying arguments (Walton 2005). An enthymeme refers to an argument in which a premise or the conclusion is not explicitly stated but is implicitly understood either contextually or based on assumed universality (Lumer 2024). This feature is particularly significant as everyday arguments often appear incomplete, but are still considered valid and persuasive depending on the context (Lumer 2024). By accounting for enthymemes, Walton's scheme (2008) aligns more closely with everyday discourse, where such deductively incomplete arguments are frequently employed (Lumer 2024).

Furthermore, Walton provides a set of critical questions corresponding to each identified argumentation scheme (Lumer 2024). Together, the argumentation

schemes and their associated critical questions form a comprehensive toolset for evaluating the strength and validity of arguments within specific contexts. These critical questions function as prompts that opponents can use to challenge arguments, uncover implicit assumptions, or propose potential rebuttals (Walton et al. 2008). By examining an argument's structure and premises, these critical questions facilitate the assessment of non-deductive reasoning dialogue, offering flexible, realistic, and implementable methods for analyzing everyday argumentation. (Reed & Walton 2005; Walton et al. 2008). Although the critical questions are not the primary focus of this study, they are included here to present a complete picture of the theoretical framework employed.

Building on these foundational principles, Walton developed a range of argumentation schemes to classify different types of AHAs (Walton 1998). To ensure clarity and consistency in classification, Walton and Macagno (2015) outlined a set of requirements for constructing a classification system suitable for everyday conversational arguments. These criteria serve as a basis for further refinement and are discussed in greater detail in Section 2.

> "1) A classification system should be helpful to users for the task of attempting to identify whether a given argument in a text of discourse fits a particular scheme or not.
>
> 2) A classification system should be able to help users deal with what are taken to be the most common arguments of the kind that appear in everyday conversational discourse.
>
> 3) Where there are borderline cases where a given argument fits or appears to fit more than one scheme, there should be additional criteria stated that enable the user to have an evidential basis for classifying the argument as fitting one scheme rather than another.
>
> 4) A classification system should pick out some general feature common to all groups of schemes that are closely related to each other, and use it to group the schemes together.
>
> 5) A classification system should not be more complex than users will find helpful.
>
> 6) A classification system may have different ways of grouping different types of schemes together where these differences result in a classification that is more useful."
> Walton and Macagno (2015)

Walton's argumentation schemes provide a systematic taxonomy of AHAs based on both academic and pragmatic dimensions. In this study, they are used as a framework for identifying AHAs and contributing to a deeper understanding of how such arguments function in discourse. Furthermore, the requirements for the argumentation classification system will serve as the main principles for developing a typology of AHAs in this study to ensure both consistency and clarity.

3.2 The Theory of Communicative Action

In this study, Habermas's theory of communicative action serves as a framework to examine the implications of AHAs and their impact on the quality of deliberative space. Habermas's theory is widely recognized as a meaningful contribution to modern deliberation, where equality and mutual understanding are emphasized (Sulkin & Simon 2001). This section provides a brief description of the theory and its relevance to deliberation.

The theory of communicative action, which is proposed by Habermas (1984; 1987), is rooted in a critique of modern society's increasing reliance on instrumental rationality. As Gaspar (1999) and Flecha et al. (2001) emphasize, this theory is based on the idea that with industrialization, both state and corporate systems have progressively encroached upon the lifeworld, leading to the process in which bureaucratic and market imperatives erode human autonomy and communicative capacities.

Building on this foundation, the theory of communicative action explores the relationship between communication, mutual understanding, and social interaction. Habermas (1984) argues that human beings fundamentally rely on communication to achieve shared understanding and cooperation within society. This claim is rooted in the assumption that human nature is inherently social (Habermas 1984). According to Habermas (1984), individuals inevitably find themselves in social settings and, therefore, cannot constitute themselves and their agendas other than through social interaction.

Under this assumption, as Fryer (2012) explains, Habermas (1984, 1987) argues that the operation of social interaction and maintenance of social order are built into communication. In this respect, Habermas (1984) draws a particular distinction between communicative action and strategic action. Communicative action seeks to establish shared understanding, while strategic action aims at manipulating or influencing others to fulfil individual objectives (Fryer 2012). Habermas (1984) argues that only communicative action can serve as the foundation for people to reach mutual understanding. Even strategic action requires social coordination, and only communicative action enables strategic action (Fryer 2012). As quoted from Habermas (1984, p.287), "reaching understanding is the inherent telos of human speech", which confirms the primary role of communicative action in achieving intersubjective understanding.

An important element of Habermas's theory of communicative action is the concept of the ideal speech situation (Fryer 2012). The ideal speech situation is a model of dialogical engagement that enables communicative action to fulfil its inherent goal, reaching intersubjective understanding (Habermas 1984, 1990 as

cited in Fryer 2012). According to Fryer (2012), Habermas (1990) argues that a communicative decision is considered valid only if it is the outcome of a discourse in which the following ideal speech conditions are met:

"1) Every competent subject is allowed to participate in discourse.

2) Everyone may question any assertion.

3) Everyone may introduce any assertion into the discourse.

4) Everyone may express their needs, desires, and attitudes.

5) No speaker may be prevented, by internal or external coercion, from exercising these rights." Habermas's (1990, p.89 as cited in Fryer 2012)

Two central concepts are highlighted in the ideal speech situation. The first is the principle of equal participation for all individuals, regardless of their identities. According to Fryer (2012), Habermas (1990) emphasizes that the ideal speech situation is open to all participants. Every speaker should speak without being coerced by external power (Habermas 1990 as cited in Fryer 2012). When interactions are influenced by prejudice, preconceptions, predefined personal identities, or objectification, they hinder the open and authentic mutual understanding (Deetz 1992). Such conditions further lead to communication distortion rooted in the system, or systematically distorted communication (Deetz 1992).

The second central concept is that every participant must be allowed to raise and critically challenge the four validity claims proposed by Habermas (2001). Every speech act can be contested and defended based on the validity claims (Habermas 2001). The validity claims include:

"1) Intellibiligy: the intellibiligy of the utterance

2) Truth: the truth of its propositional component

3) Normative Rightness: the normative rightness of its performative component

4) Sincerity: the sincerity of the intention expressed by the speaker" (Habermas 2001, p.448)

These four factors are the key components that make up a claim aimed at achieving intersubjective understanding (Habermas 2001). In addition, the validity claims are open for listeners to critical scrutiny (Habermas 2001). According to Habermas (2001), listeners must be able to question the validity claims to decide whether to accept or reject them. Any disagreements identified

during this process can then be addressed through negotiation and consensus-building until mutual understanding is achieved (Fryer, 2012). In other words, the meaning of a statement is constituted through the validity claims that can be intersubjectively justified (Niemi, 2005). Mutual understanding only occurs when participants in communication accept the validity claims (Habermas 2001).

To assess the quality of deliberation affected by AHAs, this study uses the theory of communicative action, particularly the concept of the ideal speech situation, as the primary framework for analysis. Both the application of the AHAs (the expression of the AHA) and the potential responses to the AHAs (the response typology) are examined to explore their potential to facilitate or hinder the realization of the ideal speech situation in online deliberation. However, it is important to note that the realization of the ideal speech situation relies on intersubjective understanding. This study is limited to highlighting only the potential role of AHAs in contributing to the deliberative process.

4. Methods

This section outlines the methodology in the study, divided into data collection, data analysis, limitations, and ethical considerations. The data collection subsection details the procedures used to scrape data from the social media platform, while the data analysis subsection describes the process of identifying typologies of AHAs. The limitations and ethical considerations subsections offer insight into potential biases and related concerns in this study.

4.1 Data Collection

To collect data from online platforms, Reddit was chosen as the primary platform. According to Proferes et al. (2021), Reddit has 55.2 million active members. Although it is one of the largest social platforms, X (formerly Twitter) and Facebook are also considered prominent platforms in communication studies (Proferes et al. 2021). However, concerning the 140-character limit on X and potential biases brought from the operating account on Facebook, these two platforms were not considered in the study (Proferes et al. 2021). Therefore, Reddit was chosen based on its user base, clear expression mechanism for users, and its privacy policy for research.

The first step in data collection involved identifying debated environmental issues on Reddit. The selection of the environmental issues followed the definition proposed by Berg & Lidskog (2018) as interpreted: 1) These issues involve complex scientific claims that are uncertain and contested; 2) These issues are transboundary, encompassing both temporal and spatial dimensions; and 3) These issues are embedded in dilemmas since they involve the competitive advantage in capitalism, the legitimacy of domestic policy, and the sustainable development of the environment.

This step was done by searching for the keyword "environmental" on Reddit's search engine and sorting the results by comment count to get the posts with the highest levels of user engagement. All the posts selected for the data collection were archived posts, which were published for more than six months and were no longer accepting comments and votes, to ensure consistency in data analysis (*Community settings* 2025). The terms "environment" and "environment*" were not used because they yielded multiple irrelevant results, including topics related to gaming, relationships, and other unrelated fields. The top five archived posts with the most comments and defined environmental topics were selected as research material.

Once the posts were selected, the first 500 comments with the sorting algorithm "top" were collected for data analysis. The algorithm "top" ensured that the most "upvoted" comments were prioritized and helped eliminate the operating account's inherited bias. "Vote" is a function in Reddit that users may upvote or downvote the comments they like or dislike. According to the official Reddit website (*What are upvotes and downvotes?* 2024)," upvote" is a mechanism that users can agree with someone if they think this comment is contributing. Notably, when users' comments and posts get upvoted, users increase their "karma", or an internet point created by Reddit (*What is karma?* 2024). The collected data included comments responding to the posts and subsequent replies, along with usernames and the order of the replies. Since the conversation was presented in hierarchical comment threads (or sometimes understood as nested threads), recognizing the sequence of each comment helped to understand the dynamics of the conversation (Aragón et al. 2017).

It should be noted that only the first-level comments that directly replied to the posts were sorted by "top". The second-level or lower-tier comments remained in chronological order. If any comments were deleted by users or removed by moderators, these comments appeared as "[deleted]" or "[removed]." The final number of the analysed comments is present in Table 1.

Table 1. Overview of Comment Processing Outcomes and Final Analyzed Comments

Post Index	The number of removed comments	The number of deleted comments	The number of final analysed comments
POST1	0	24	476
POST2	4	37	459
POST3	10	16	474
POST4	7	12	481
POST5	2	24	474

The data collection process was conducted by the Reddit Data API (application programming interface) and the Python package PRAW. Reddit Data API is a service provided by Reddit to allow developers to access the data on Reddit by using a programming tool (*Developer Platform & Accessing Reddit Data* 2025). PRAW is a package aiming for users to scrape Reddit's comments through its Data API, and it abides by the internal API rules on Reddit (*PRAW 7.7.1 documentation* n.d.). The comment scraping process was conducted on Google Colab. The script was configured to scrape comments sorted by "top" with a limit of 500 comments per post, including both first-level comments and subsequent replies (see Appendix 1). If any user account was deleted, the username was set to be displayed as "[deleted]," but the content of the comment remained.

4.2 Data Analysis

The data analysis subsection consists of two components. The first is thematic coding analysis aimed at identifying the genres used in AHAs. The second focuses on the understanding of the typology of responses through a combined approach that integrates conversation analysis and thematic coding analysis.

4.2.1 Typology of Ad Hominem Arguments

To begin with, to determine whether comments qualify as AHAs, this study adopted the criteria defined by Walton (1998), which states that such arguments occur when conversationalists reject an argument by appealing to a personally relevant characteristic, such as personal traits, social identities, or other individual attributes. Based on this, the linguistic features used in these arguments were closely analyzed. To avoid overinterpretation, only comments in which AHAs were explicitly expressed are analyzed in this study. However, to understand the dynamics of AHAs and deliberation, a statement was still considered an AHA if it was perceived as such by another participant, either through direct accusation or reasonably inferred interpretation. In such cases, these statements were analyzed regardless of the speaker's specific phrasing.

Following the identification of AHAs, the classification process of AHAs in this study adopted thematic coding analysis. According to Robson and McCartan (2016), thematic coding analysis is a qualitative method used to explore the effects of experience, meanings, or perceived reality among participants within a given discourse in society. This study followed the thematic coding procedure outlined by (Robson & McCartan 2016).

The first step of the analysis involved gaining a general understanding of the comments by thoroughly browsing all available data (Robson & McCartan 2016). The aim of this stage is to identify relevant material and eliminate data that is not analyzable (Robson & McCartan 2016).

Once a basic comprehension of the comments was achieved, the coding process was initiated (Robson & McCartan 2016). The coding process entailed breaking down the text into meaningful segments and categorizing these segments into distinct themes and interpretations (Robson & McCartan 2016). The initial coding followed the previously developed typology of AHAs presented in Section 2.1 (Walton 1998; Samoilenko & Cook 2024). Surprising types of AHAs were also anticipated in this study to help adapt the existing scholarship to a real-world case (Robson & McCartan 2016). To identify such potential cases, this study referenced the codes developed by impoliteness online comments against journalists from Björkenfeldt and Gustafsson (2023) (see Table 2). To facilitate

the coding process, Microsoft Word, a computer software, was utilized to assist with the coding process. Since the focus of this research was to discover as diverse results as possible, the frequency of AHAs was not analyzed in this research.

Table 2. The codes developed by Björkenfeldt and Gustafsson (2023)

Initial Codes	Final Thematic Codes	Subtheme
Intellectual Derogation	1. Character Debunking and Identity Assault	1.1 Personal attacks
Personal Derision	1. Character Debunking and Identity Assault	1.1 Personal attacks
Sexist Remarks	1. Character Debunking and Identity Assault	1.2 Sexism and racism
Racist Remarks	1. Character Debunking and Identity Assault	1.2 Sexism and racism
Direct Threats	1. Character Debunking and Identity Assault	1.3 Threats
Political Bias Accusations	2. Systemic Critiques of Journalistic Practice	
Hypocrite Accusations	2. Systemic Critiques of Journalistic Practice	
Judgment Criticism	3. Questioning Professionalism and Integrity	
Competency Critique	3. Questioning Professionalism and Integrity	
Shaming Tactics	4. Moral Enforcements and Public Humiliation	

After the coding process, the themes were generated based on the previous coding themes. (Robson & McCartan 2016). Lastly, the themes were organized to identify the patterns of AHAs and were further interpreted to uncover their underlying meanings (Robson & McCartan 2016).

4.2.2 Response Typology

The second part of the analysis aims to identify and classify the response mechanisms to AHAs. This involved examining the comments that directly followed the appearance of AHAs. This analysis was also conducted through a combination of conversation analysis and thematic coding analysis to identify the response typology.

Conversation analysis is developed to investigate the social events, actions, and interactions during naturally occurring conversations (Nevile 2015). It examines how social order and context-dependent rules shape interactions between participants (Heap 1997). It has also been widely used in analysing online conversations, offering a lens for examining the structure of conversations, such as sequencing and turn-taking. (Paulus et al. 2016). In this study, responses were defined as conversationalists taking a turn to respond following AHAs. Therefore, this method was employed as this study highlighted the turn-taking dynamics and how responses occurred after AHAs appeared.

The steps of conducting response typology data analysis still followed the theme coding analysis tips recommended by Robson and McCartan (2016), as described in the first part of the analysis (see Section 4.2.1). In the response analysis, the different ways of dealing with disagreement developed by Hallgren et al. (2018) served as the coding theme reference (see Table 3). Since the previous relevant research was rather rare, most of the themes were generated newly or revised to match the case in this study.

Table 3. Different ways of dealing with disagreement developed by Hallgren et al. (2018)

Index	Different ways of dealing with disagreement
1	The disagreement is initiated and articulated as disagreement after third turn but reconstructed in the Nth turn into consensus or creative problem-solving after argumentation, persuasion, compulsion, or manipulation.
2	The disagreement is initiated as disagreement after third turn but interrupted and postponed after the second, third, or N^{th} turn.
3	Participants deploy jokes as indicators but not performers of disagreement.
4	Questions are used as proxies for initiation of disagreement but not treated as disagreement after the first turn.
5	Equivocal initiation of disagreement leads to doubts about intersubjectivity.
6	Disagreement appears as a meta-discursive object but is not performed.

4.3 Limitation

In this research, some limitations may bias the results and hinder this study from finding a comprehensive and unbiased outcome.

Firstly, since all conversation analysis in this study was conducted manually, time and resource constraints may have limited the ability to obtain comprehensive results. On the one hand, the number of comments analyzed was limited due to time constraints and the availability of human resources. Although this research intends to explore as diverse themes as possible, the limited number of comments

may have hindered a comprehensive exploration of the dynamics. On the other hand, previous studies have investigated the combined expression of trait-focused AHAs, suggesting that AHAs may not be expressed in only a single way (Samoilenko & Cook 2024). However, this study did not analyse the combined expressions of AHAs due to the lack of resources.

Secondly, the insufficient information about conversation timestamps may have hindered this research from getting a comprehensive understanding of the conversational dynamics. Firstly, since all the conversations were displayed in a hierarchical way, it was hard to follow the right chronological order of the conversation. Especially since the posted time was too long ago to track detailed information about the exact chronological order. For example, most of the timestamps just showed "one year ago" but did not mention specific details. Hence, this may have influenced the understanding of the conversational context. Additionally, the edited comments did not indicate timestamps of modifications. This lack of transparency may have affected the accuracy of the conversation's timeframe and consequently biased the interpretation of interactions.

Thirdly, this study did not consider the impact of Subreddits and Reddiquette. A Subreddit is a topic-specific community on Reddit where each post and comment must adhere to that Subreddit's own set of communicative rules and norms (*What are communities or 'subreddits'?* 2024). Reddiquette is an informal expression of the values shared by many Reddit users, intended to show how people can interact respectfully (*Reddiquette* 2025). However, since comments that violated Subreddit rules were removed and Reddiquette was not mandatory for users to follow, the influence of these two factors was not taken into consideration.

Lastly, one potential limitation of this study stemmed from biases in the analytical methods. According to social constructionism (Craig 1999), language is a socially constructed system of symbols deeply embedded in cultural contexts. As a result, the interpretation of utterances is inherently subjective. Although in this study, the theoretical framework provides a foundation for identifying AHAs, it could still lead to biased analysis or misinterpretations due to the author's cultural background.

4.4 Ethical Reflection

This subsection outlines how the study addresses a set of issues related to ethical standards

In this study, all the data presented remains anonymous except for the content of the comments. As the primary focus of this research lies in the content of comments and their interplay for and following AHAs, the original expression of

the comment was revealed unless certain user information or the name of public figures was mentioned.

Furthermore, to avoid assuming the gender of participants and to maintain gender neutrality in this study, gender-neutral pronouns are used in the following sections for the sake of fluidity. The use of pronouns follows the gender-neutral pronouns proposed by Moser and Devereux (2019) (see Table 4).

Table 4 Gender-neutral pronouns proposed by Moser and Devereux (2019)

Nominative (subject)		Oblique (object)	Possessive adjective/determiner	Possessive pronoun	Reflexive
Traditional pronouns					
	He	him	his	his	himself
	She	her	her	hers	herself
Gender-neutral pronouns					
	E	er	er	ers	erself

5.   Results

In this section, three key findings are presented. First, the focus is on the AHAs identified in this study at both the trait-focused and the structural levels, based on the referencing typology and definitions developed by Walton (1998) and Samoilenko and Cook (2024). Second, this section outlines the different response mechanisms identified in the study.

5.1   Trait-Focused Ad Hominem Arguments

In the study, five types of trait-focused AHAs are identified (see Figure 3). Among them, three align with the categories developed in the previous research (see Section 2.1), namely prudence, competency, and morals (Walton 1998; Samoilenko & Cook 2024). Two newly identified types are intention accusation and user information. One type previously identified by Walton (1998) and Samoilenko & Cook (2024), bias, is reclassified as a subtype under intention accusation.
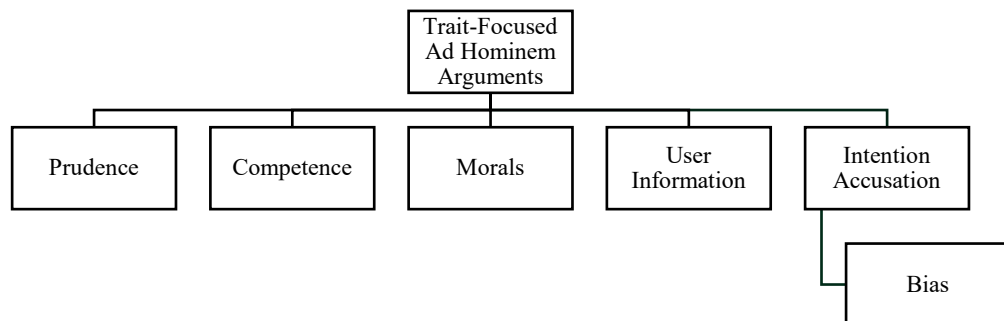
Figure 3. The typology of trait-focused ad hominem arguments

The first category involves arguments that attack, assume, or question a person's prudence, mental state, or sanity in order to counter the substance of er argument. For example:

> "Imagine being so detached from reality that you think you're tying the laws of physics into over population." (POST3)

In this example, the speaker discredits the opponent's arguments by framing e as having an abnormal mental state. Rather than engaging with the substance of the arguments, the speaker dismisses the arguments solely on the basis that the opponent has lost their rationality. This reveals the speaker's reasoning for rejecting the arguments by assuming the opponent is mentally unstable.

The second type illustrates how conversationalists disagree with other participants by questioning their knowledge of specialized topics. This refers to conversationalists questioning others' intelligence, knowledge level, expertise, and cognitive ability required to participate in a professional discussion. This can be shown from the following examples:

> "Policies related to technology, yes.Nothing else except technology is saving us at this point.you're seemingly not capable of understanding the scale of what's happening." (POST4)

> "Not sure what "science" you have learned. […]" (POST4)

> "If we had a backbone their tantrums wouldn't be a problem. Expecting an oil company to be your salvation is just outright stupid. […]" (POST3)

These examples involve speakers questioning their opponents' cognitive ability, scientific literacy, or intelligence in order to undermine their legitimacy as participants in the discussion. The first example suggests that the speaker views the topic as too specialized, complex, or difficult for the opponent to fully comprehend. The second example reveals that the speaker believes the opponent lacks a basic understanding of science. The final example establishes a cause-and-effect relationship between the opponent's argument and a perceived decline in intelligence, suggesting that the speaker dismisses the argument due to the other participant's perceived lack of cognitive capacity. Collectively, these examples demonstrate that the speakers believe participants should possess a certain level of knowledge, scientific literacy, or intelligence in order to contribute meaningfully to the discussion.

The third category centres on moral inquiries, in which speakers question the other party's morals to refute or counter an argument. In this context, speakers portray the opposing party's arguments, behaviour, or ideology as evil, hypocritical, or immoral, emphasizing that they violate fundamental moral principles. By attacking the moral integrity of others, speakers discredit and invalidate the other party's arguments.

The following examples demonstrate how speakers characterize other conversationalists as holding morally unacceptable social identities or engaging in morally questionable behaviour. In the first example, the speaker directly labels

the other party as an "eco-totalitarian", which is a political ideology that demands individuals sacrifice their personal interests to create a more sustainable environment. This label carries negative connotations, as totalitarianism is often associated with dictatorship, which is generally viewed as a threat to democracy and thus morally unacceptable due to its concept of suppression of individual freedoms (Borowski 2017). In another example, the speaker highlights a violation of shared moral principles, noting that the other participants who argue differently are obscene. These two examples both show how speakers dismiss other conversationalists' claims by questioning or challenging their morals.

> "Eco-totalitarianism. Find something new every day." (POST4)

> "Its obscene anyone ever argues differently. Regulation is the ONLY way to stop climate change. Anyone in government administration can show you until something is regulated it will be abused. Period. This is especially true in sustainability projects such as waterworks." (POST3)

The fourth type highlights how user information becomes the focal point of AHAs. This type reveals speakers' attempts to invalidate an argument by making judgments based on the other users' profile information. In the following example, the speaker questions the user's mental state by referencing their username, linking two unrelated traits. While the immediate attack targets the user's prudence, the underlying logic implies that the speaker assesses mental competence solely based on the username.

> "[...] Upon seeing your username, I have to ask; are you tripping? [...]" (POST1)

The fifth type is intention accusation, where speakers reject the other participants' arguments by claiming they have a hidden agenda or motive. Within this type, bias is identified as a specific subtype. Although both forms question participants' intentions and sincerity in contributing to the conversation, they differ according to whom loyalty is shown. In bias AHAs, targeted participants are perceived as being more loyal to their identity or affiliations than to the conversation itself. Their contributions are seen as persuasive and deceptive, as they serve the interests of their social group, such as political parties or interest groups, rather than offering a neutral perspective. In contrast, intention accusation focuses more broadly on questioning the sincerity, good faith, or honesty behind an individual's argument, regardless of group affiliation. This distinction lies in the contrast that bias AHAs highlight group loyalty, whereas intention accusations focus on personal motive. Notably, all targets of bias AHAs identified in this study were well-known figures or institutions, such as politicians, public figures, or government entities.

"[...] lashing out in any general direction and tossing out a ton of generalizations because you're hurting.but we're all hurting because of this climate crisis. [...]" (POST3)

"[...] But then again, you've gotta be a troll, because nobody can be this dumb." (POST4)

"Speaker 1: We also need to reduce consumption from those corporations. Don't forget why they exist. They don't have self-sustaining businesses. They need people to buy their products in order to keep operating."

Speaker 2: This is just shifting the blame again.It is not reasonable to expect people to deeply research every product they buy, infact it's completely unreasonable.. people have kids, long hours at their jobs, hobbies to stay sane, they do not have time to bury into the minutiae of something as simple as buying a pint of milk." (POST3)

The above examples illustrate how speakers accuse the other parties of having hidden motives, providing conversational contexts in which speakers target psychological motivations, emotional drives, or the intent to derail the conversation. The first example shows that the speaker adopts a psychological perspective, analyzing the hidden psychological processes of the opponent rather than addressing the substance of the arguments. This suggests that the speaker considers the opponent's arguments unreliable, as they are perceived to be suffering from a psychological breakdown. In the second example, the opponent is perceived as a troll, which refers to an individual who aims to upset other participants and derail topic-focused discussions on online platforms (Sun & Shen 2021). The last example demonstrates how the arguer frames the opponent's argument as a tactic to shift the blame and deflect corporate responsibility onto consumers. These instances illustrate how speakers challenge others by accusing them of engaging in the discussion without good faith or sincerity.

"[...] He described (a politician's name) as a literal "dementia patient" and I was like come on man, I'm coming to you for educational stuff here. Not that I even am a big (a politician's name) supporter or anything, but it was evident that his perspective was skewed, and that would influence the rest of his content. Had to unsub after that." (POST3)

Rather, the above example reveals a bias AHA, which aims to discredit a claim by accusing the arguer of lacking objectivity and having a conflict of interest. The speaker begins by criticizing the judgment of political issues in the educational material, suggesting that such references indicate a skewed and ideologically slanted viewpoint. Although the speaker does not directly discredit or criticize the content, they explicitly express distrust toward it. This response clearly demonstrates the speaker's lack of confidence in the third party's material, based on perceived political bias and a lack of neutrality.

5.2   Structural Ad Hominem Arguments

At the structural level of AHAs, two distinct classifications are identified (see Figure 4). These two categories were both previously recognized by Walton (1998) and Samoilenko & Cook (2024). This study also identifies two novel subtypes within the category of guilt by association.
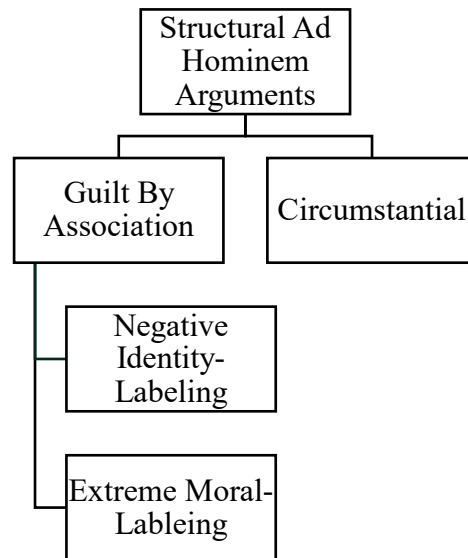
Figure 4. The typology of structural ad hominem arguments

The first type is guilt by association. This type of argument discredits a claim either by associating another party's position, intentions, behaviour, or ideology with morally condemned groups, or by distorting these traits to resemble universally recognized immoral positions. This strategy undermines the opposing party by linking their arguments to a source of guilt or disrepute.

Within this type, two subtypes are identified. The first one is negative identity-labelling. In this subtype, speakers label others as belonging to a particular social group. However, in such contexts, the label carries negative connotations by either explicitly associating the group with unfavourable characteristics or implying those traits without directly stating them. For instance:

> "Speaker 1: Maybe we should move away from meat, and spend no resources on them, except the resources they manage to find on their own in the wild, away from the industrialized process as it stands now.But more to my point, they are perfectly capable of living a long time, we just kill them when they're babies
>
> Speaker 2: Ah that's right, no life is much better than a short life with a painless end. Such a humanitarian you are." (POST2)

> "The apathic, materialistic and brainwashed boomers literally **CAN NOT** [1] understand this. They really are unable to understand this is not a movie and is happening for real" (POST3)

In the first example, Speaker 2 does not address the content of the opposing argument. Instead, they reply with a focus on the opponent's ideology, labelling them with the social identity "humanitarian." "Humanitarian" is typically a neutral identity and not universally perceived as harmful. However, in this instance, the beliefs and values associated with being a humanitarian are framed negatively and become the central target of an AHA, even without being explicitly attacked. The second example follows a similar pattern. While "boomer" originally refers to individuals born during a specific era, in this example, it is used to imply that another party belongs to a social group, 'boomer, who are pervasively considered apathetic, materialistic, and brainwashed. These stereotypical traits are then cited as reasons why being labelled as a "boomer" implies lacking the cognitive ability to contribute meaningfully to the conversation. This label is thus used to justify the dismissal of the opponent's argument. Together, these two examples demonstrate how speakers associate negative traits with certain social groups in order to discredit others' arguments.

Another subtype is extreme moral-labelling, which indicates that speakers, rather than focusing directly on a social group, first distort the original argument into an extreme position and then associate it with a universally condemned ideology, behaviour, or political stance. This strategy is closely tied to morals AHAs, in which individuals invalidate a viewpoint by associating it with a generally immoral or socially unacceptable belief.

Take the following quotes as examples:

> "[...] Living in the modern world produces carbon emissions. If you're going the personal responsibility route, shouldn't you be a massive advocate for suicide? It completely halts your carbon emissions *and* [2] it guarantees you won't have kids. It's like double the effectiveness of simply not reproducing and doubles the time till civilization collapses." (POST4)

> "[...] When it come to race, it does not matter until you take breeding agency away, and doing so you take full responsibility of everything dealing with the outcome. A disproportionate amount of a people die due to virus and systemic racism? Sorry but if you enforce breeding restrictions, congrats you commit genocide. Allow them to breed more to catch up? Congrats you manipulated social power and artificially limit a demographics power." (POST4)

---

[1] According to Reddit's official formatting guide, using "**text**" will render the text in bold. (*Formatting Guide* 2025).

[2] According to Reddit's official formatting guide, using "*text*" will render the text in italics.(*Formatting Guide* 2025).

In the first instance, the speaker distorts the idea of "personal responsibility for climate change" by connecting it to "advocating for suicide." Yet, encouraging suicide is considered universally immoral and, in some cases, illegal. As a result, this label recasts "advocating for personal responsibility" as an unacceptable and malicious ideology. By drawing such an extreme comparison, the speaker reframes the original argument as morally equivalent to a universally condemned stance, thereby discrediting the opponent's position. A similar strategy appears in another example, where the concept of breeding restrictions is linked to genocide, and the opponent's ideology is portrayed as reflecting a potential to manipulate social power. Both cases reveal how speakers attempt to invalidate arguments by associating them with widely recognized immoral ideologies or stances.

The second type identified is circumstantial ad hominem. According to Walton's (1988) definition, circumstantial AHAs target the opponent's pragmatic inconsistency. However, in anonymous online forums, participants often have limited insight into each other's daily actions or advocacy, making it difficult to assess consistency. As a result, this type of argument identified in this study occurs when an action is universally consistent and perceived to contradict the opponent's stated position or behaviour.

> "If you stopped breathing you would help prevent climate change. Problem solved."
> (POST4)

From the above example, the speaker targets the opponent's act of breathing, which is an essential and unavoidable function for human survival. E frames this basic action as pragmatically inconsistent with the opponent's advocacy for climate action, using it as a basis to accuse the opponent of failing to abide by er own position. This reasoning illustrates a circumstantial AHA, where a universally necessary action is used to undermine the credibility of the opponent's position.

5.3   The Response to Ad Hominem Arguments

Among all the response mechanisms used to reply to AHAs, six main categories have been identified: discussion termination, mutual attack (tu quoque),

affirmative response, raising meta-communication issues, elaboration on the original focus, and position distinction (see Figure 5).

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                        ┌─────────────────┐
                        │  The Response   │
                        │ To Ad Hominen   │
                        │  Arguements     │
                        └─────────────────┘
```

| Discussion Termination | Mutual Attack (Tu Quoque) | Affirmative Response | Raising Meta-communication Issues | Elaboration On The Original focus | Position Distinction |
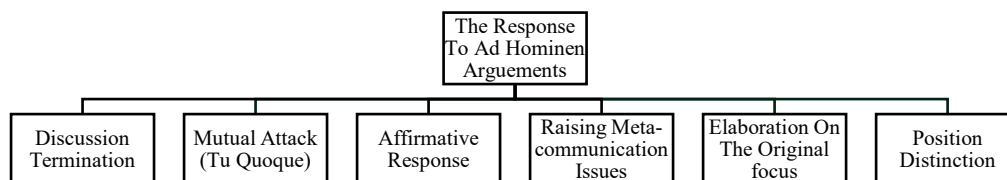
Figure 5. The typology of response to ad hominem arguments

The first classification, discussion termination, involves situations in which the discussion comes to an end, regardless of whether the focus concerns the argument itself or the speaker's identity. Within this category, two distinct scenarios have been identified. Both lead to the same outcome, in which participants are unable to further engage with either the content of the argument or its associated identity claims.

The first scenario refers to a conversation that ends with an AHA. In this scenario, the AHA remains the final comment in the thread, suggesting that one of the conversationalists has withdrawn from the conversation, and no further comments are made. As a result, no follow-up comments respond to the AHA, no further questions seek clarification, and no attempts to counter or elaborate on the original points are made. This lack of continuation prevents participants from exploring differing perspectives or clarifying each other's views, ultimately bringing the dialogue to an end.

The second one describes situations in which a speaker responds with a comment that signals an inability or unwillingness to continue the conversation. Rather than simply withdrawing or remaining silent, speakers offer a closing remark that conveys disinterest or disengagement. These responses suggest that speakers no longer see value or significance in continuing the conversation. For instance, in the following example, the conversation centres on the relationship between the value of climate change and eugenics. However, after several rounds of back-and-

forth, Speaker 2 ends the exchange with phrases like "check out" and "have a good one." Instead of reaching consensus or establishing a common ground for disagreement, this type of response reflects speakers' decisions to withdraw from the discussion.

> "Speaker 1: Is caring about the climate is a value that's passed on through our genes?
>
> Speaker 2: You say that like someone who is positive of the answer. Source?
>
> Speaker 1: I'm not arguing whether or not there's evidence that people with certain genes have morally superior values. I'm arguing that believing that's true is a form of eugenics. That's true *whether or not there's evidence to support that belief*.
>
> *Edit - To be clear, I'm saying that belief is eugenics. You're asking whether there's evidence to support eugenics. Those are two different conversations.
>
> Speaker 2: Morally superior values? I'm checking out, you've lost me. Have a good one!" (POST4)

The second main type of response mechanism focuses on participants replying with an AHA. In this case, instead of addressing the content of the topic, the individual counters by employing another AHA. This type of response shifts from discussing the issue to attacking identity, aligning with the previously identified type, "tu quoque fallacy." The tu quoque fallacy, from the Latin for "you too," refers to a situation in which a person responds to criticism by accusing the opponent of similar behaviour (Walton, 1998). This argument shifts the attention away from the substantive issue to the perceived hypocrisy by pointing out the opponent's flaws and thereby attempting to claim the moral high ground. The discussion moves from evaluating the behaviour itself to mutual blame.

The following example illustrates how a mutual attack is conducted in a conversation. To begin with, Speaker 1 accuses others of lacking sincerity to contribute meaningfully in the conversation, characterizing them as apathetic. In response, another speaker makes a similar accusation, arguing that Speaker 1 is the one intentionally fostering apathy. This conversation demonstrates that both parties are engaging in AHAs against each other.

> "Speaker 1: people have kids, long hours at their jobs, hobbies to stay sane, they do not have time.
>
> Speaker 2: You're just promoting apathy
>
> Speaker 1: Literally answered your fucking question in their original post. You're promoting apathy against reading." (POST3)

The third main type refers to situations in which AHAs receive affirmative responses from other participants and are treated as valid contributions to the discussion. In these cases, participants emphasize and accept AHAs, considering them reasonable within the conversational context. This response mechanism, identified in this study, occurs when the targets of AHAs are already presented within the earlier discussion. Two different situations are found under this category. In the first situation, AHAs function as a critical signal, encouraging participants to reassess the credibility of the information being presented. Take the following case as an example: Speaker 1 points out the conflicting identity of a particular researcher, and Speaker 2 accepts this as valid information, using it to reevaluate both the credibility of the source and the researcher's position on the issue.

> "Speaker 1: [...] The problem with all the articles denouncing the study is their authors are just as if not more biased than (a press) was. They are also almost all referencing one article by one author, (an author's name), who is a shill for the meat industry. From what I can gather from reading all of these is that they point out a bunch of data that even as a layman I can see as either statistically insignificant or don't tell the whole story on their own, much like what the authors of this article accuse (a press) of doing. I don't think (a press)'s research is flawless, but it's a lot better than his less educated critics who all seem to be hell bent on making meat ok regardless of facts.
>
> Speaker 2: I'll check that out. Not sure why you'd hate to tell a meat eater that thinks eating meat isn't terribly healthy that they might be wrong but thanks for the info." (POST5)

Another example involves participants agreeing with, emphasizing, and reinforcing the logic of AHAs. In these cases, participants not only accept AHAs but also actively support and expand upon their underlying reasoning. This situation occurs when participants already hold pre-existing opinions about the targets, such as the morals or biases of a well-known public figure or an organization. It can also happen when users refer to earlier comments made by other conversationalists and target their ideology or position as the basis of an AHA. For instance:

> "Speaker 1: People arguing about having less kids for climate change always seems very eugenics-y to me. Even worse when they focus on hypothetical overpopulation in developing countries when their carbon footprint is much less.
>
> Speaker 2: *Seem*, yes. It's in your mind. The argument in itself is all but eugenic, notwithstanding any additions which are the responsibility of the person." (POST4)

This example illustrates how Speaker 1 refers back to earlier comments to reconnect the concept of "having fewer children for climate change" with the ideology of eugenics. Another participant directly responds with agreement,

further reinforcing the link between this ideology and its associated negative labels.

The fourth main type involves replying with a meta-communication issue. In this type, participants neither agree nor disagree with AHAs but instead focus on the miscommunication occurring within the conversation. In this study, participants highlight either a misinterpretation between the parties or a lack of clarity. Three distinct situations are identified under this category.

The first situation involving meta-communication issues arises when participants believe their statements have been misinterpreted by another party and seek to correct the misunderstanding. In the following example, Speaker 2 attempts to clarify their original intent, redirecting the conversation toward its intended meaning. Additionally, E also explicitly criticizes the impoliteness and unreasonableness of assessing someone's cognitive abilities based solely on their argument.

> "Speaker 1: Policies related to technology, yes. Nothing else except technology is saving us at this point. You're seemingly not capable of understanding the scale of what's happening.
>
> Speaker 2: I think you misinterpreted what I wrote. Technology won't save us **on its own**.Also, it's weird and rude to remark what someone's capable of understanding based off of a single comment." (POST4)

The second example reflects the meta-communication issue of the presence of an AHA. In the following example, Speaker 1 initially asks about another party's experience with a movie. Later, the same speaker clarifies that the question was intended solely to avoid giving spoilers. However, the question may not be clearly understood by other participants and could be misinterpreted as an AHA, particularly as it has the potential to be understood as a question to challenge the other party's competence to participate in the discussion. To address this potential misunderstanding, Speaker 1 re-enters the conversation after it had paused, apologized for the lack of clarity, and restated the original intention behind the question. This example effectively illustrates meta-communication issues through a statement that resembles an AHA in form, but is not intended as such. These participants also highlight two potential reasons contributing to this miscommunication problem: the limited exchange of communicative cues and the assumptions made about each other's intentions on Reddit.

> "Speaker 1: Did you only see the movie?
>
> Speaker 2: say what you're going to say already.

Speaker 1: In the book it wasn't nukes, I wouldn't want to spoil it for you but if you liked the movie I definitely recommend the book

Speaker 1: Sorry to come back to this again so late but I've just been bothered I guess, what did you think I was going to say? Did my original comment come across as snobby and give the impression I was gonna shit on you for not reading the book? I'm sorry if that's the case, but if not I'm interested in what you expected from me. Since it's Reddit I imagine snarkiness.

Speaker 2: ya i was ready for the millionth and a half time for some random long winded digression. No worries though—glad it turned out not to be the case.

Speaker 1: Thank you for responding, I will try to work on my word choice in the future so I don't give the wrong impression.

Speaker 2: Heh, yeah classic Reddit. It's not always the words though.. on bad days I end up misreading others too. It's hard sometimes not to perceive things in a negative light in this medium of such limited inflection. Glad for the comment.

Speaker 1: That's more than fair, with Reddit you never know what to expect as people can be joking or dead serious about wild outlandish claims or opinions. It's better to be cautious when approaching a redditor lol." (POST4)

The third situation involves one party accusing another of inappropriately using an AHA. This is illustrated in the following example, where the conversation begins with one participant revealing er identity and attempting to validate er viewpoint by appealing to personal experience. Subsequently, Speaker 4 interjects and attempts to discredit Speaker 1's identity by labelling er as lacking scientific literacy. Following this, Speaker 3/5[3] also responds with an AHA that implicitly accuses Speaker 4 of interfering with others' lifestyle choices. Later, Speaker 4 accuses Speaker 3/5 of employing an AHA rather than engaging in meaningful and constructive discussion. As the situation escalates, the conversation shifts away from the original topic and becomes centred on mutual accusations of inappropriate communicative behaviour. Ultimately, Speaker 4 criticizes Speaker 3/5's previous comment for diverting attention from the substantive issues instead of focusing on the core argument at first.

This example illustrates the meta-communication issues that arise from the use of AHAs. It showcases that AHAs are regarded as neither a reasonable nor a valid response by other conversationalists. Additionally, it also presents the accusations made to reveal the other party's decision to dismiss Speaker 4's claims by appealing to er personal traits instead of engaging meaningfully in the conversation.

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[3] Due to the deletion of both Speaker 3's and Speaker 5's accounts, it is unclear whether these two users are the same individual.

"Speaker 1: Midwesterner here. All beef farms Ive ever known water their cattle with ponds. Typically, natural ponds. I think this is common. I'm sure this isn't true across the country, as not everywhere is as moist as here. However, the water usage is not really a concern for midwestern farmers. From the one I have personal experience with, watering cattle is not a cost they're concerned with.

Speaker 2: [deleted]

Speaker 3 He was responding to the idea that the water consumed by cows took from the water treatment process reducing the amount available for people, and with all the costs of water treatment.

Speaker 4: Farms drain aquifers, that's a fact, just because his midwestern buddies don't know basic science doesn't make their opinion true.

Speaker 3/5: Hmmm...I'm not sure, but are you one of those people living in a big city on the coast, telling everyone else how to live their lives?

Speaker 4: So going straight for ad hominem instead of responding on topic?

Speaker 3/5: Actually I did respond, first to the topic and then to your comment. You chose not to respond to my question because it betrays one of the givens of social media. "The more someone rants about the environment, farmers, cars, etc. the more likely it is that they choose live in a place with lots of cement and very few trees."

Speaker 4: You said "Hmm" that's not a discussion. […]" (POST2)

The fifth main type involves responses in which participants elaborate on er original claims instead of offering a direct rebuttal. In these cases, although the first speaker, who makes AHAs, attempts to shift the discussion toward the other participant's personal identity, the second speaker actively redirects the conversation back to the core issue.

In the following example, Speaker 1 uses bias AHA to reject the claim, "meat isn't expensive," previously made by Speaker 2. However, Speaker 2 does not engage with the AHA. Instead, E chooses to focus on the substance of the argument, expressing a willingness to provide more detailed evidence to support er claim. This highlights how respondents respond with elaboration by er claims, thereby shifting the focus back to the original topic.

"Speaker 1: "Meat isn't expensive" coming from someone who raises pigs is really funny.

Speaker 2: I'd love to give you a quick rundown of costs for free-range pigs and what that works out to for a farmer. It's not extremely compared, but a VERY small price to pay for treating the animals with dignity and respect." (POST5)

The final main type involves participants who seek to clarify the distinction between their personal beliefs or preferences and the negative labels applied to them. These participants are dissatisfied with how their ideology has been interpreted. Hence, they respond by rephrasing or clarifying their position, aiming to provide a distinction between their claim and negative traits ascribed to them. For example:

> "Speaker 1: [...] insisting that there's something special about your genes that make it easier to transmit good values to your biological children (instead of, say, any adopted children) is just eugenics [...].
>
> speaker 2: [...] Not really. It's evolution, isn't it? Isn't that why we're so driven to reproduce? Just like... the circle of life? Of course it could be eugenics, like if I have a genetic disorder I don't want to give to my kids so I adopt--that could count. Or if I only want to breed with the same race or something, definitely. However, people who think they'll be good parents typically don't think that because of eugenics." (POST4)

In the above conversation, Speaker 1 links the concept that "value can be passed on through genes" to eugenics. Speaker 2 disagrees with this association and responds by relabelling the ideology of "value can be passed on through genes" with a more neutral label, "evolution," while also providing supporting evidence. This case illustrates that respondents' attempt to dissociate their beliefs from notorious labels and articulate their viewpoint more clearly.

6. Discussion

In the discussion section, this study further explores the role of AHAs and the response mechanisms within deliberative contexts. The theory of communicative action and the concept of the ideal speech situation serve as the primary criteria for assessing the implications of both AHAs and responses on the deliberative process (see Section 3). This section also examines the influence of CMC on the role of AHAs and their interpretation within the context of the ideal speech situation. Lastly, this section outlines the directions for future research in this field.

6.1 Ad Hominem Arguments and Deliberation

In this study, several types of AHAs have been identified. Each type, or even each scenario, can have a varying impact on deliberation.

For example, some types of AHAs violate the principles of the ideal speech situation as they prevent equal participation and exclude certain identity groups. One of the most evident examples is found in the type of user information on the trait-focused level, where conversationalists target another user's information. Questioning others' user information does not challenge the validity of a claim, such as its intelligibility, truthfulness, rightness, or sincerity. Rather, it is simply an attack on someone's identity, aiming to disqualify their argument based on who they are. This behaviour violates the principle of equal participation and leads to systematically distorted communication.

Another example can be found in the negative identity-labelling subtype. Unlike trait-focused AHAs, which directly target an individual's characteristics, negative identity-labelling arguments undermine a person's credibility based on their perceived association with a particular group identity. This indirect form of discrediting undermines the principle of equal participation and excludes social groups without a perceived identity. Likewise, the competence type at the trait-focused level can be considered as a form to disqualify participants without perceived expertise or professional status. These two examples illustrate how AHAs deprive individuals of equal participation by reinforcing current power hierarchies and marginalizing certain social groups. This aligns with Deetz's account of disqualification as a form of systematically distorted communication:

> "The creation of managerial expertise (and management science to certify, institutionalize, and finally signify it) centers management capacity in certain locations and outside certain groups." (Deetz 1992, p.465)

However, some expressions of AHAs identified in this study may also be interpreted as legitimate challenges to the validity claims, particularly when speakers intend to foster mutual understanding. For instance, moral AHAs can be understood as participants critically engaging with the moral dimensions of certain preferences, ideologies, or behaviours. In such cases, the aim of the speakers appears to be establishing the rightness of a claim by debating whether the argument aligns with shared moral norms and thus placing the moral validity of a proposition at the centre of the discussion.

The second example can be found in both the type of intention accusation and its subtype, bias. These forms of AHA involve speakers questioning another participant's hidden agenda or motivations. Such critiques can be interpreted as targeting the sincerity of the claim or aiming to improve the transparency of the information exchange. This can be illustrated by one of the examples of the response mechanism, elaboration on the original focus. In this case, the first participant draws on personal experience as evidence for er claim. However, the respondent challenges the validity of the claim by targeting the speaker's identity, which had previously been used to support the argument. In this case, the identity itself becomes the focus of scrutiny, and the AHA functions as a means to raise questions about the truthfulness and sincerity of the original claim.

Likewise, another example from the affirmative response category illustrates how this type of AHA can introduce new information into the discussion. In this situation, a bias AHA is applied to bring in relevant evidence about one's identity and support the speaker's claim. This AHA is also acknowledged by the other party and functions as a valid claim for introducing evidence into the deliberative process. This allows the other party to reconsider er understanding of a proposition, potentially bringing the conversation closer to mutual understanding. These examples reveal that AHAs can contribute to the ideal speech situation by helping to reveal potential conflicts of interest or manipulative intentions, enriching the discourse, and serving as a constructive element in pursuit of mutual understanding.

Notably, although different types of AHAs may have varying impacts on the conditions of the ideal speech situation, their assertive tone may nevertheless undermine the legitimacy of genuine questions to validity claims. According to the principles of the ideal speech situation, all participants must be free to question any assertion. However, when an AHA, which is intended as a challenge to another's validity claims, is delivered assertively rather than posed as a sincere question or critical inquiry, its communicative legitimacy becomes problematic. In such cases, AHAs may function as a means of silencing or discrediting others and undermining the deliberative quality of the exchange, regardless of the

speaker's intentions. Consequently, the application of AHAs can still be considered a violation of the norms of open and inclusive dialogue according to the theory of communicative action.

6.2 Response Mechanism and Deliberation

This subsection illustrates how certain response mechanisms have the potential to redirect the conversation to the conditions of the ideal speech situation, even in the presence of AHAs. This aligns with Habermas' concept (1984, 1987) that participants can challenge and correct the normative use of language to preserve the rational structure of communication.

To begin with, some responses can function as a means to challenge others' validity claims. One of the most evident cases appears in the position distinction category, where the respondent challenges the normative rightness of another party's ideology. In this example, two individuals hold contrasting views on passing values through genes. One regards it as a form of eugenics and universally immoral, while the other sees it as a natural part of the evolutionary process. This disagreement raises a moral question about the normative rightness of the claim. As long as the speaker intends to deliberate about moral values and seek mutual understanding, rather than to dominate or persuade, the conversation aligns with the principles of communicative action.

Another example can be found in the meta-communication category, where participants question the comprehensiveness of a claim or attempt to clarify and reclaim their own reasoning. These interactions reflect a deliberate effort to restore communicative clarity and reaffirm mutual understanding. Such responses demonstrate the potential for redirecting discussions involving AHAs toward the conditions of the ideal speech situation, where the validity claims are evaluated openly.

However, some examples reveal the potential of certain responses to hinder mutual understanding. For instance, the withdrawal category illustrates cases where participants choose to disengage from the conversation entirely, thus losing the opportunity for deeper engagement and consensus-building. Such exits can be seen as detrimental, as they abruptly terminate the dialogue regardless of its trajectory or potential for resolution, eliminating the possibility of achieving mutual understanding.

Similarly, the mutual attack mechanism poses a challenge to deliberation. In this type of response, the participant accepts the redirection of the discussion away from the original proposition and toward personal identity, thereby further disrupting the conversation's coherence. This is demonstrated by one of the

examples within this type, where the dialogue shifts into a competitive exchange about who is promoting apathy, rather than continuing to address the substantive issue. This dynamic reflects a shift away from communicative action toward strategic interaction, which undermines the principles of the ideal speech situation.

These examples also reveal the different potential of steering communication back to the ideal speech situation. However, it is noted that the achievement of the ideal speech situation still relies on the intersubjective understanding among different conversationalists. These response mechanisms cannot serve as the standard for judging the ideal speech situation. Whether a response restores rational discourse or contributes to its breakdown depends largely on whether participants are genuinely oriented toward reaching mutual consensus rather than winning an argument.

6.3 The influence of computer-mediated communication

In this study, the CMC environment may play a vital role in preventing participants from achieving the ideal speech situation.

This can be illustrated in an example under the raising meta-communication problem type, in which two conversationalists highlight the intelligibility of a claim within their communicative process. This is reflected in the conversation, where one of the speakers initially asks about the other party's experience of watching a movie. Later, the same speaker clarifies that the question was intended solely to avoid spoiling the alert. However, this question may not be perfectly understood by other participants on Reddit and may be misinterpreted as an AHA, which challenges the other party's competence and experience to engage in the conversation. To clarify this concern, the same speaker first raises the problems of the limited exchange of communicative cues on Reddit, while another speaker agrees with this concern and emphasizes the recurring problem of miscommunication on Reddit.

This observation aligns with previous research on CMC, which indicates that such communication involves a limited exchange of social cues, including tone, body language, and facial expressions (Stromer-Galley et al. 2015). These limitations are further amplified into a significant communicative problem when participants expect CMC to function like face-to-face interaction, as the lack of communicative cues can lead to perceived impoliteness or misinterpretation of intent (Stromer-Galley et al. 2015). The absence of social cues increases the likelihood of misinterpretation, causing neutral statements to be perceived as

challenges or confrontational. This characteristic of CMC may hinder participants' ability to reach mutual understanding.

6.4 Limitations and Future Work

Based on the discussion of this study, it is evident that some types of AHAs have the potential to deprive participants of equal space in deliberation, while others may serve as legitimate challenges to the validity claims. Similarly, different response mechanisms may influence the potential to redirect the conversation toward or away from the ideal speech situation. However, the most crucial factor in maintaining the ideal speech situation lies in the participants' intersubjective understanding. This represents a limitation of the study, as the true intentions of participants and whether they achieve mutual understanding remain unclear. Furthermore, the detailed interrelation between CMC and AHAs and their impact on deliberation requires further investigation.

These limitations point to important directions for future research on AHAs. Given their constitutive nature and their dual role in the deliberative process, a key challenge lies in exploring how AHAs can be expressed in CMC in ways that are in line with the ideal speech situation and minimizing their negative effects on deliberation, especially in discussions of environmental issues.

Additionally, from a practical perspective, whether improvements in Reddit's mechanisms, moderator intervention, or participants' media literacy could mitigate the negative effects of AHAs on online platforms also remains an open question for future work.

7. Conclusion

By analysing public discussions on Reddit, this study reveals the complex role of AHAs and responses in environmental issues in online deliberation. The typology of AHAs identified in this study is on two distinct levels. At the trait-focused level, five types and one subtype are identified, including two newly proposed categories. At the structural level, two types are identified: guilt by association and circumstantial. Under the category of guilt by association, two new subtypes are developed, which are negative identity-labelling and extreme moral-labelling. In addition, six different types of responses to AHAs are also developed in this study, highlighting the variation of response mechanisms and the diverse dynamics AHAs bring to conversation.

The diverse conversational dynamics brought by AHAs showcase a varying potential to achieve or hinder mutual understanding. First of all, the variations of AHAs underscore their dual nature. On the one hand, AHAs can serve as a challenge to others' assertions. On the other hand, it may hinder equal participation in deliberation. Additionally, each response type also demonstrates diverse potential to redirect conversations toward or away from mutual understanding. Some response types show a promising capacity to refocus the discussion on reaching intersubjective understanding, while some may shift the focus away from reaching consensus. However, the constraints of CMC may further influence the dynamics of AHA usage, potentially obstructing participants from achieving mutual understanding.

In practical terms, future research may focus on exploring the constructive use of AHAs and their relationship with CMC. Specifically, how AHAs can be raised in a way that contributes to deliberation and achieving mutual understanding, and whether improvements to Reddit's platform design, moderator interventions, or users' media literacy can help mitigate their negative effects, remain open questions for further investigation.

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Popular science summary

This study explores how people use and respond to ad hominem arguments (AHAs), or personal attacks, in Reddit discussions about environmental issues. Rather than addressing the argument itself, AHAs target someone's character or identity.

The study identifies seven types of AHAs, along with six common response strategies. These findings reveal that, in some cases, AHAs help test the reasonableness of claims or the credibility of speakers. Yet, in other instances, AHAs can silence marginalized voices, particularly when used to question someone's identity rather than their argument. This raises concerns about openness and inclusion in online deliberation.

The way people respond to AHAs also matters. Some response strategies can be constructive and help keep conversations on track, such as refocusing on the issue or addressing misunderstandings. In contrast, some strategies, such as mutual attacks or participant withdrawal, may hinder participants from fully understanding each other's claims.

Finally, the study highlights the role of online platforms, as communication in these may contribute to confusion due to limited social communicative cues, such as body language or tone.

Overall, these findings suggest that the impact of AHAs remains unclear in the context of online environmental deliberation. Future research could explore how AHAs might be expressed in ways that would reduce their negative effects while preserving critical engagement and how the communicative mechanisms of online platforms could be improved to reduce miscommunication problems.

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Appendix 1

The following presents the script used to scrape comments from Reddit (see Section 4).

```
!pip install praw
from google.colab import files
from google.colab import drive
drive.mount( )

file_path = My path for file storage

import praw
import os
os.listdir((My to connect with Google Drive ))

reddit = praw.Reddit(
    client_id= My_client_id_code,
    client_secret= My_client_secret_code,
    user_agent="My_reddit_scraper/1.0"
)

print(reddit.read_only)

post_url = "(post_url)"
submission = reddit.submission(url=post_url)

submission.comment_sort = "top"

submission.comments.replace_more(limit=None)

MAX_COMMENTS = 500
count = 0

def process_comment(comment, level=0):

    global count
    if count >= MAX_COMMENTS:
        return

    indent = "    " * level
    username = comment.author.name if comment.author else "[deleted]"

    with open(file_path, "a", encoding="utf-8") as f:
        f.write(f"{indent}- {username}: {comment.body}\n\n")
```

```python
        count += 1


    for reply in comment.replies:
        process_comment(reply, level + 1)
        if count >= MAX_COMMENTS:
            return

with open("reddit_comments.txt", "w", encoding="utf-8") as f:
    f.write(f" Reddit post topic: {submission.title}\n")
    f.write(f" post link: {post_url}\n\n")

for top_level_comment in submission.comments:
    if count >= MAX_COMMENTS:
        break
    process_comment(top_level_comment)

files.download(file_path)

print("finished")
```

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