Does the Reddit user audience report feelings of empathy after watching the movie "Avatar: The Way of Water "?

Luise Warda

Faculty of Behavioural, Management and Social Sciences, University of Twente

Master's Thesis Positive Clinical Psychology & Technology

1st Supervisor: Dr. A.M Sools

2nd Supervisor: Dr. P.M ten Klooster

27th of August, 2024

Abstract

As environmental protection becomes increasingly urgent, films like "Avatar: The Way of Water" can play a pivotal role in influencing viewers' attitudes and behaviours through narrative persuasion. The study employs a qualitative exploratory text mining approach, combining topic modelling with computer-assisted text analysis to explore empathy-related discussions within the Avatar-2 fan community on Reddit. By filtering and analyzing 733 posts and comments using Latent Dirichlet Allocation (LDA), ten key topics are identified, which are further examined through the lens of the four components of empathy: Perspective-taking, Empathic concern, Personal Distress, and Fantasy.

The findings reveal that all four empathy components were present within the discussions, with perspective-taking being the most experienced by the fan community. Empathic concern was also frequently observed, particularly in topics involving strong emotional relationships between characters. Personal distress was less commonly elicited. These insights suggest that character relationships and narrative development significantly enhance empathy for non-human characters in environmental films.

This study's strength lies in using qualitative data collection from real-world, natural textual responses on Reddit, offering a nuanced exploration of empathy-related discussions among Avatar-2 fans. However, limitations include potential respondent bias due to the fan-centric Reddit community and challenges in topic selection using LDA modelling, which relies heavily on researcher judgment. Future research should expand to diverse social media platforms, enhance keyword sets, and consider advanced NLP methods like transformer-based models to improve data completeness, context interpretation, and the generalizability of findings across different audience segments.

Keywords: environmental movies, empathy, narrative persuasion, natural language processing, Reddit, Avatar, perspective-taking, empathic concern

Does the Reddit user audience report feelings of empathy after watching the movie Avatar: "The Way of Water "?

Global climate change is an increasingly urgent concern for present and future societies (Maslin, 2019). Recently, scientists studying conservation have brought attention to the possibility of using visual storytelling to educate big audiences about environmental issues (McCormack et al., 2021). Movies that evoke empathy for human characters have been shown to influence the audience's environmental attitudes and behaviour choices (McCormack et al., 2021). Although empathy mechanisms have been extensively researched in connection to human characters in films, there is a lack of research outlining how viewers perceive empathy for non-human creatures (Edwards & Shafer, 2022). Empathy for the more-than-human world could however fundamentally change how individuals perceive and interact with nature. This shift can lead to a deeper understanding and appreciation of the intrinsic value of all living beings, fostering a sense of responsibility and stewardship towards the environment (McCormack et al., 2021). The most widely-known environmental movies are the Avatar movies by James Cameron which feature the more-than-human world through the representation of the Na'vi, the deep human-Na'vi relationships, and the ethical and emotional narratives that resonate with audiences, encouraging them to see and feel from the perspective of the non-human characters. Hence these movies can provide a good case for researching empathy related to non-human characters.

Climate change causes extreme weather like floods and heatwaves and melts Arctic ice and global glaciers. Human actions, from deforestation to using concrete extensively, have altered landscapes significantly (Maslin, 2019). This not only harms nature but also brings health risks like water scarcity, food insecurity, and the spread of diseases and allergens (Maslin, 2019; Franchini & Mannucci, 2015). Despite concerns dating back to the 1980s, society still struggles to adopt environmentally friendly behaviours (Baird, 2005; Sörqvist & Langeborg, 2019), partly due to reduced contact with nature, which limits health benefits and positive attitudes toward the environment (Soga & Gaston, 2016).

Hence, establishing a stronger connection to nature is crucial to changing society's behaviour toward the environment, with the film industry playing a role in raising awareness through environmental movies using mechanisms like evoking feelings of empathy (McCormack et al., 2021). Via social media or online forums like Reddit fan communities of movies like Avatar engage in discussions and share their opinions and experiences about different aspects of the movie (Eberhard et al., 2019). Hence, these posts and comments can

provide valuable insight into reports of empathy concerning the movie "Avatar: The Way of Water".

This research investigates the expressions of empathy towards non-human characters in online responses of the Reddit community dedicated to Avatar fans.

Research on Environmental movies

Eco-friendly values are being promoted more and more in contemporary media, such as cinema, television, and digital media, to entertain and influence viewers' behaviour and way of thinking (Seelig, 2019). A study by Janpol and Dilts (2016) found that watching documentaries about the built or natural environment has a big impact on people's attitudes and actions toward the environment and can even increase donations to charities. Recently, scientists studying conservation have brought attention to the possibility of using visual storytelling to educate big audiences about environmental issues (McCormack et al., 2021). For example, in documentaries like Earth, which had the highest opening weekend for a nature documentary, and Oceans, which became the third-highest-earning feature-length wildlife film at the time (Seelig, 2019). Especially using narratives to alter attitudes, actions, and convictions can be a successful strategy to influence pro-environmental behaviour (PEB) (McCormack et al., 2021).

The Theoretical framework: how environmental movies influence viewers.

While substantial research exists on environmental and scientific communication, few studies use the narrative persuasion lens (McCormack et al., 2021). This framework examines how stories influence attitudes, beliefs, and behaviours by engaging listeners emotionally and cognitively. This study explores how environmental films affect viewers' identities through social comparisons, social learning, and parasocial relationships with characters. It highlights the persuasive potential of character identification, the role of empathy in connecting with human and non-human subjects, and the impact of anthropomorphism on audience reactions (McCormack et al., 2021).

Environmental films can shape viewers' identities by enabling social comparisons with depicted characters, reinforcing their understanding of themselves in relation to values and beliefs (McCormack et al., 2021; Perosanz, 2010). This process motivates individuals to aspire to an "ideal" version of themselves. Additionally, viewers may learn from characters' behaviours observed on the screen, enhancing their belief in their capability to adopt similar behaviours, which is crucial for overcoming self-efficacy barriers, especially in environmental films. Viewers may also develop parasocial relationships with characters, akin to friendship, aiding in reconciling their own identity and reinforcing their connection with nature

(McCormack et al., 2021). This phenomenon creates a short circuit in the narrative inspection process, as viewers who identify with characters may struggle to produce objections or counterarguments regarding the underlying message (Perosanz, 2010).

Specifically, empathy, the ability to understand and care about others' experiences, plays a crucial role in human–nature relationships, motivating attitude and behaviour change. Environmental films can evoke empathy for both humans and non-humans, either through cognitive empathy, fostering understanding, or affective empathy, allowing emotional connection (McCormack et al., 2021).

The Avatar movies by James Cameron

Although news reports and documentaries appear to be the main source of factual information on environmental issues and science-related topics are also found in fiction, with the number of science-related books and movies rising significantly (Bilandžić & Sukalla, 2019). In particular, fictional narratives now tend to focus on climate change.

The most widely known and successful environmental fiction movie in the industry is the film "Avatar" from 2009 directed by James Cameron. Not only did the movie earn $2.8 billion in the first two years following its launch it also won two Golden Globe awards and three Oscars (Taylor, 2013). The movie emphasizes the importance of environmental politics that moves beyond feelings of disconnection and outdated ideas about belonging to a specific place (Bergthaller, 2012). In his Golden Globes speech, Cameron encouraged the audience to recognize the interconnectedness of everything between human beings and the Earth. It emphasizes that the marvel of our world is here on Earth, and if one has to travel to a fictional planet to appreciate it, that's the enchantment of cinema (Taylor, 2013).

Cameron's second Avatar movie "Avatar: The Way of Water" served as a continuation of the 2009 film "Avatar." Set in the fictional world of Pandora the movie follows the journey of Jake Sully, a deceased marine who joined the Na'vi clan. In this instalment, Jake and Neytiri, his Na'vi mate, embark on a quest to explore the oceans of Pandora, encountering new creatures and facing environmental challenges. The film explores themes of environmentalism, colonization, and the connection between humanity and nature, while also showcasing groundbreaking visual effects and immersive 3D technology. Engaging with all these sensitive topics the possibility of evoking emotions like empathy is high. Overall, this movie serves as a compelling exemplary case for researching the impact of environmental movies due to its thematic depth, emotional resonance and ability to provoke reflection and action on environmental issues. The movie is especially a good case for studying empathy for non-human characters as it features a diverse cast of non-human

characters, primarily the Na'vi, who possess distinct personalities, emotions, and cultures. This depth encourages viewers to empathize with them as they would with human characters. Further, the relationships between human characters like Jake Sully and the Na'vi, including his deep bond with Neytiri, demonstrate cross-species empathy.

Definition and Conceptualization of Empathy

One aspect of identification is the concept of empathy. There are many definitions of empathy as there are differences in the conceptualization of empathy by academics and practitioners resulting in an imbalance between how empathy is studied and addressed in therapeutic and educational initiatives (Mann & Barnett, 2012). These differences mostly result from difficulties in differentiating empathy from other aspects like sympathy, and whether empathy is cognitive or affective, congruent or incongruent. Based on a close examination of a variety of definitions of empathy, Cuff et al. (2014) proposed to define empathy as "an emotional response (affective), dependent upon the interaction between trait capacities and state influences. Empathic processes are automatically elicited but are also shaped by top-down control processes. The resulting emotion is similar to one's perception (directly experienced or imagined) and understanding (cognitive empathy) of the stimulus emotion, with recognition that the source of the emotion is not one's own "(Cuff et al., 2014, p.7). Consistent with the conceptualization of empathy by Perosanz (2010) in the context of identification, this definition also highlights the relevance of cognitive as well as affective/emotional aspects of empathy.

This multidimensional (cognitive and affective) approach to empathy was proposed by Davis (1983). According to him, four primary components of empathy can be identified namely, "Perspective-taking", "Empathic concern", "Personal Distress" and "Fantasy" (Davis (1983), as cited in Delgado et al., 2023). Perspective-taking is the propensity to take on the viewpoint of others or to understand another person's inner emotions from a cognitive perspective, i.e., realizing that the other is in pain (Delgado et al., 2023; Davis, 2007). The capacity to feel warmth, compassion, and care for others is referred to as empathic concern, and it evaluates empathy in a positive emotional way to suffering, focusing on the affective part of empathy. Involved in this component are emotional responsiveness and sensitivity (Delgado et al., 2023; Davis, 2007; Brems, 1989). A self-centred approach to empathy and a negative emotional resonance towards pain, including emotions of distress and uneasiness while seeing others' suffering, is referred to as the "personal distress" component which takes a cognitive and affective approach to empathy. This component typically involves causing worry and psychological suffering, which is why it is negatively correlated with the capacity

for successful coping (Brems, 1989). The fourth component is Fantasy, which describes an individual's capacity to identify with fictitious people and events in plays, movies, and literature. This component can be categorized as affective (Delgado et al., 2023; Davis, 2007).

The four components of empathy can be measured by the Interpersonal Reactivity Index (IRI), a common questionnaire for assessing empathy. While the IRI's Fantasy subscale measures empathy with fictional characters, Nomura and Akai (2012) suggest reconsidering this approach. Their study found a strong correlation between the Fictional IRI and the original IRI, indicating that empathy with fictional characters functions similarly to empathy with real individuals. They recommend using the original IRI for fictional characters, specifically the Perspective-taking, Empathic Concern, and Personal Distress scales, while the Fantasy scale assesses the enjoyment of fictional stories. This framework helps researchers understand different audience responses relevant to empathy.

Research on Empathy Responses to various media

While extensive research measures empathy in face-to-face interactions and through questionnaires like the IRI or neuroimaging techniques, empathy in social media contexts remains underexplored (Otterbacher et al., 2017; Nomura & Akai, 2012; Neumann & Westbury, 2011). Understanding empathy on text-based platforms is crucial, as millions use them. In addition, analyzing naturally occurring social media data offers a unique and powerful way to study empathy as it happens in real life, providing insights that are both broad and deeply rooted in everyday human behaviour (Kern et al., 2016). Traditional methods like IRI or brain imaging are unsuitable for analyzing large social media datasets. Mawani and Nderu (2020) addressed this gap by using text-mining techniques to study empathy in online counselling, developing an AI algorithm for generating empathetic responses.

Similarly, qualitative methods for measuring empathy in response to movies are lacking. Most research has used quantitative methods or physiological measurements, such as the study by Westbury and Neumann (2008), which measured skin conductance and empathy ratings in response to film stimuli concerning non-humans. However, qualitative methods are essential for exploring the depth and complexity of emotional reactions. They allow for a detailed understanding of personal experiences, the emotional and cognitive dimensions of empathy, and the contextual factors shaping viewers' reactions, advancing our knowledge of how movies evoke empathy and influence audience perceptions (Grossoehme, 2014).

Research on empathy with fictional characters and non-humans

One might think that there is a great difference between having empathy with real persons and fictional characters, as the ontological status of the subjects of empathy differs from one another, meaning that people exist whereas fictional characters do not. There are indeed differences however, from a psychological perspective these differences are rather small. According to Petraschka (2021), numerous kinds of mental exercises, like visualizing, mimicking, and so on, are not dependent on the real-life presence of their objects. Nevertheless, there are differences between empathizing with a fictional character or a real person. Emotional states must be inferred from the text for characters, leading to cases where two readers with different emotional interpretations empathise with the same character, unlike in empathy with existing individuals (Petraschka, 2021). Further, research suggests that the difficulty in empathising with characters varies depending on the literary work and its approach to character development. On the one side empathizing with characters is more difficult due to their nonstandard situations and emotions, as well as the opposing view that literature often provides ample support for empathizing with characters, making it easier than empathizing with real persons (Petraschka, 2021).

Reviewing all these methodologies of measuring empathy it can be said that there is a lack of qualitative research measuring empathy, specifically concerning empathy responses to movies as well as to non-human characters.

Aim of this study

As the need for environmental protection from humans gets more urgent technologies serve as a successful medium to communicate pro-environmental messages (Liu & Li, 2021). This study aims to explore the impact of environmental films, with a focus on the influential movie "Avatar: The Way of Water," on viewers' attitudes, behaviours, and connection to nature. Identification with the characters of a narrative can have a great impact on people's pro-environmental choices. Especially, feeling empathy for the movie figures enhances identification (McCormack et al., 2021). However, the specific factors for achieving empathy in films, remain unclear. Given the known influence of identification with human characters of narratives on the audience's attitudes, beliefs and behaviours, there is a lack of research on how these elements influence identification with non-human characters (McCormack et al., 2021). Hence, investigating what factors in movies constitute or increase the identification and empathy with non-humans like figures in the movie Avatar needs further research. This study will utilize natural language processing (NLP), specifically text mining techniques to analyze audience reactions on the online platform Reddit, providing valuable insights into

viewers' empathic opinions and experiences concerning non-human movie characters in environmental films.

Therefore, the following research question (RQ) is asked:

RQ: What empathy-related experiences are expressed in online responses of the Reddit community dedicated to Avatar fans?

Methods

Study design

The study employed a qualitative exploratory text mining approach, combining text mining with the use of computer-assisted text analysis and qualitative research, exploring the linguistic discussions within the Avatar-2 movie fan community on Reddit. Analyzing the specific topics via automated topic modelling, the dataset is inspected, unravelling specific topics related to empathy for non-human subjects. In addition, these results of the topics content are examined from the four components of empathy to detect specific features within the movie that elicit empathy responses in the Avatar fan community.

Materials: Online Platform Reddit

Reddit is one of the most widely used social media platforms on the internet (Proferes et al., 2021). Furthermore, Reddit offers extensive data accessibility through its API (Application Programming Interface), allowing researchers to scrape and analyze large volumes of data efficiently compared to other social media platforms such as Facebook or Twitter (Proferes et al., 2021). This access to structured data enables researchers to conduct in-depth analyses, identify patterns, and derive meaningful insights.

For this study, the data were scaped from the subreddit (Avatar WoW2) specifically from the Avatar fan community with more than 382.019 subscribers. Reddit users who were subscribers to the Avatar subreddit were the participants, hence using secondary data removed the need for participant recruiting. Subreddits are user-created communities on a broad range of topics in which members are welcome to engage. As a result, users are able to either submit posts directly connected to the subreddit or leave comments on posts already connected to it. Reddit offers the possibility to exclude posts and comments from a subreddit that are relevant to a certain filter in terms of content (Lavertu & Altman, 2019). The subreddit was filtered by an automated filter on Reddit as the entire subreddit proved to be too large for the platform Reddit. The "Avatar" subreddit is further filtered using the filter keywords "Avatar WoW2" and "empathy", "empathise", and "empathic" in order to decrease the amount of material in the dataset. As a result, the subreddit is filtered by Reddit settings and arranged according to

these designated terms (Naik et al., 2015). Consequently, the posts and comments from the "Avatar" subreddit that are associated with the filters "Avatar WoW2" and "empathy", "empathise", and "empathic" make up the dataset for this study.

The "Avatar" subreddit has statements, comments, and posts that make up the filtered dataset used in this study. This filtered dataset overall consists of 733 statements including 40 posts and 693 comments. The average age of Reddit users is 23, with a percentage of 63,6 % male users and 36,1 % female users (Duarte, 2024). Yet the demographics can differ as some age groups or genders might be more engaged within the Avatar Fandom community. In most cases, time, upvotes, or certain filters are used to arrange posts inside subreddits. The posts that received the highest number of comments and upvotes were categorized as the "hottest" posts in the subreddit for the purpose of this research. It is important to remember that membership requirements, including guidelines and limitations, might vary according to the subreddit. The "Avatar" subreddit contains rules that all users have to stick to. These include obligatory topic relevancy, member respect, no low-effort material for example spam, appropriate content (like no sexual material), a spoiler policy, and policies for art, fanfiction, and marketing.

Data analysis

In recent years, there has been a growing utilization of NLP methods in scientific investigations to analyze extensive text data. NLP constitutes a field of research and application dedicated to exploring how computers can comprehend and process natural language text or speech to perform practical tasks (Chowdhary, 2020). Text mining is one approach that uses NLP to understand the human language. To extract meaning and underlying themes from textual data topic modeling is used. Initially, the research employs topic modelling analysis on the entire pre-processed dataset related to the occurrence of empathy to identify topics and patterns within the Avatar community users' comments.

Topic modelling

Text mining is a statistically valid approach to efficiently and accurately analyze big textual data sets (Caballero-Juliá & Campillo, 2021). It is multidisciplinary and involves preprocessing, classification, grouping, extraction of information, and visualization to derive valuable insights from unstructured texts (Hotho et al., 2005). Topic modelling is one of the most commonly applied types of text mining. Finding the traits that data points have in common is one of the most important objectives of data analytics (Vayansky & Kumar, 2020). Topic modelling entails figuring out what topics or events a document addresses in text analysis. Even though this information is obvious to a human reading the text, a program is

provided with simply the text as it is composed, not the content of each document. Topic modelling is a technique used by data scientists to complete this task in software (Vayansky & Kumar, 2020).

In natural language processing, Latent Dirichlet Allocation (LDA) is a valuable method for revealing underlying topic patterns in huge text datasets. LDA allows for the automated detection and analysis of topics by assuming that documents are mixes of subjects and topics are combinations of words (Kherwa & Bansal, 2018). In most cases, the words with the highest probability within a subject provide a clear indication of the topic (Jelodar et al., 2018). This algorithm is strictly a bag-of-words method. It disregards the definitions, grammatical construction, and everyday application of words, concentrating entirely on their frequency within the body of text, disregarding the context (Leeson et al., 2019). LDA is based on a statistical approach oftentimes presenting topics based on traits in language, which often seem irrelevant for individuals who do not have domain-specific knowledge (Lau et al., 2010). Hence, the topics are usually manually labelled by the researchers carrying that specific knowledge (Lau et al., 2010). In general text mining is a statistically valid approach to efficiently and accurately analyze big data sets (Caballero-Juliá & Campillo, 2021).

For the text processing and topic modelling in this study, Orange Data Mining Software version 3.35.0 was used. Orange is an open-source tool for data mining, machine learning, and data exploration that visualizes and analyzes data (Sharma & Paliwal, 2023). It offers a visual programming interface that allows users to manipulate and analyze datasets without needing to write code. It provides a wide range of widgets within the toolbox. With these widgets, individuals can perform tasks such as data preprocessing, visualization, clustering, classification, regression, and data mining (Sharma & Paliwal, 2023). In Figure 1 the pipeline utilized in this study is displayed.

Figure 1

Orange pipeline used in this study
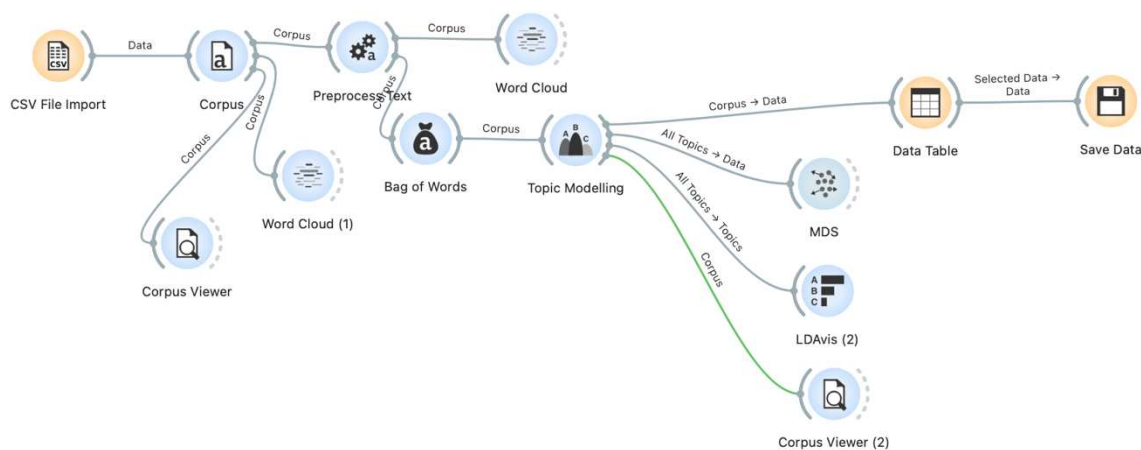
Pre-processing

      The pre-processing of data is an important and critical step in preparing the data for meaningful topic modelling analysis. First for the subreddit "Avatar" the filter "Avatar WoW2" was applied to receive related content to only the second Avatar movie as it represents more recent user reactions to the environmental movie. In addition, the filter containing the words "empathy", "empathise", and "empathic" was used because in that way mostly content-related information is displayed in the data, thus increasing the quality of the data and at the same time limiting the number of comments and posts. Afterwards, this dataset was derived from Reddit with Python. The package API Wrapper was used to filter out posts and comments in the subreddit and to transform the data. Further, the data was preprocessed to only receive textual data from the comments and posts of the users. To use the data in Orange, it was converted into an Excel (.xls) file.

      The next step involved executing standard preprocessing techniques namely, filtering stop words, removing URLs, converting text to lowercase, and tokenizing, a procedure that divides text into tokens that represent linguistic units (words). These different elements of pre-processing were tested iteratively in different arrangements ensuring the highest quality of the data. Within the Orange pre-processing widget, the standard list of English stop words was included, as well as an additional list of stop words created by the researcher. Terms that often times appeared in the topic modelling analysis, but added no interpretable value to the

study were removed (see Appendix 1). Because stop words like articles and prepositions are so widely used, eliminating them from a text won't fundamentally change its meaning.

Finding a suitable number of interpretable topics for extraction using LDA topic modelling was the last pre-processing step. Literature indicates that there isn't a one-size-fits-all method to determine the ideal quantity of topics (Jacobi et al., 2015). One method is to evaluate coherence scores, which estimate how comprehensible a topic and its vocabulary are. These ratings reveal how well a topic resonates with human judgment. Alternatively, researchers can figure out how many topics best suit the corpus material by using their domain knowledge. Coherence ratings were shown to be less helpful in this research since the corpus's focus, the movie Avatar presents difficulties in understanding certain words and concepts only understandable in the context of the movie. Consequently, the researcher manually selects the number of topics based on what seems most reasonable meaning which additional number of topics add important value based on the domain-specific knowledge. This decision-making process is subjective and strongly influenced by the researcher's judgment (Jacobi et al., 2015).

Ten topics are set as the standard in the LDA module in Orange. A list of ten topics, each consisting of the most frequent words that indicate a particular topic, is produced as a result of the topic modelling study. By experimenting and making adjustments, the number of topics can be refined until key parameters are determined in the topic modelling process. After several rounds of adding and deleting themes, ten was determined to be the most interpretable amount. The reason for this choice was due to the lack of valuable information offered by any number of topics exceeding ten. This method relied on the researcher's judgment and required subjective decision-making.

Topic interpretation

First, the pre-processed data is utilized to identify the primary themes in the audience's empathy responses to the Avatar film. It is possible to find existing themes in the dataset by doing a topic modelling analysis. The discovered topics' marginal topic probabilities show how likely it is for that particular subject to appear in the dataset. Appropriate labels for each topic's key terms were created with ChatGPT's-4o help. The prompt that was used to get inspiration from ChatGPT was: "Based on the following key terms from the movie "Avatar: The Way of Water" please formulate topic headings/labels". The final labels that were suitable for each topic were then created using these labels as guidance and tailored appropriately based on the researchers' domain-specific knowledge. Next, the ten topics were then analysed based on the components of empathy namely, Perspective-taking, Empathic

concern, Personal Distress, and Fantasy. By investigating users' comments that include the keywords of each topic specific formulations gave indicators for which component of empathy was experienced. For example, for the component of perspective taking one comment said: "if an alien did that to me I'd be […] uncomfortable around them as well" (see Topic 1). By employing this method, it becomes possible to identify the most significant characteristics of empathy, thus uncovering which aspects of the film evoke empathy in the viewer.

Reflexivity statement

The effectiveness of topic modelling heavily relies on the pre-processed data. Pre-processing the dataset is, however, susceptible to introducing researcher bias, which can impact outcomes (Hickman et al., 2020). Because data cleansing involves subjectivity, a clear and robust technique is essential. Choices made during data refinement, such as manually removing stop words, may subtly introduce biases.

Furthermore, researcher choices impact how topic modelling is performed (e.g., number of topics) and interpreted (e.g., labelling), underscoring the existence of bias. This study is specifically geared towards identifying empathy features in audience expressions, with a focus on empathy as the main analysis theme. Topics selected during the analysis intentionally point out empathy based on prior research. As a result, there may be some researcher bias in the process of topic modelling, especially in the interpretation and selection of topics. Hence, it is necessary to know the influence these research biases might have on the reliability of the results of the study and to consider this as a limitation (Hickman et al., 2020).

Results

The following sections display the outcomes of the final topic modelling, the ten most frequent tokens in each topic, and the topic labels generated by the researcher as well as an Interpretation of the topics. Afterwards, every topic is further examined and interpreted based on the four components of empathy to see which components are mostly reported as evoking feelings of empathy in the audience.

The users' comments with the application of the filter previously mentioned discussed many different topics with some words occurring more often throughout the 10 different topics than others, thus a few topics being more present than others. Even though ChatGPt was used in combination with the researchers' domain-specific knowledge, coming up with meaningful and sufficiently distinct labels to interpret each topic was challenging. Because the interpretation is entirely based on the researchers' investigation and knowledge about the

movie it was difficult to differentiate which topics of the movie did the researcher remembers as significant and which might also have been significant but not remembered as important.

Topic Analysis

Table 1

Top 10 key terms, Marginal Topic Probability (MTP), topic labels for each of the ten topics for the user's comments

Topic	MTP	Keywords	Label
1	0.08	spider, think, rda, quaritch, want, neytiri, enough, people, humans, earth	Power struggles and Ambition
2	0.09	avatar, vi, na, pandora, think, rda, earth, movie, plot, post	The Complexity of the Plot
3	0.07	earth, vi, na, movie, way, avatar, killing, pandora, human, jake	Human Na'vi Conflict and Its Violent Consequences
4	0.13	jake, spider, lo, ak, people, think, neytiri, brother, pandora, way	The Power of Family Bond
5	0.07	movie, think, spider, people, planet, pandora, quaritch, way, want, na	Conflicting relationship between Spider and Quaritch
6	0.09	people, billion, land, going, vegan, com, eat, right, well, eating	Earth's Billion People and the dilemma of ethical feeding
7	0.12	way, movie, life, jake, people, quaritch, avatar, vi, na, us	Quaritch and Jake's Journey in the Movie
8	0.07	way, movie, life, jake, people, quaritch, avatar, vi, na, us	Na'vi Culture: Spiritual Resilience, Love, and Identity
9	0.09	think, avatar, movie, people, neytiri, good, humans, way, love, film	Neytiri's Compassion: Love and Empathy
10	0.15	rda, people, na, vi, think, quaritch, movie, jake, back, pandora	Communication between Earth and Pandora

Topic 1: Power Struggles and Ambition

Important keywords within this topic are spider, rda, quaritch, Neytiri, and want. Based on these words it is suggested that this topic is about characters, conflict, and desire for power. The RDA, led by the ruthless Colonel Quaritch, represents human greed and exploitation as they seek to mine the valuable mineral, unobtanium, on the planet Pandora. Neytiri, a member of the Na'vi tribe, becomes entangled in this conflict as she navigates her loyalty to her people and her growing bond with the protagonist, Jake Sully. Further characters like Colonel Strickland similarly embody the desire for power and control as they exploit the mysterious amphibious creature discovered in the facility. Hence, one user wrote "Quaritch is on Pandora simply because he wants to fight […] He didn't want Jake to succeed in peacefully getting them to leave Hometree." Additionally, the conflict between Spider and Neytiri shows different viewpoints: "I think Neytiri's dislike of Spider, and humans in general, is pretty understandable. I mean... they blew up her home and killed her family, if an alien did that to me I'd be pretty fucking uncomfortable around them as well." On the other hand, one user stated "Out of all the humans to hate, with only the exception of his connection to Quaritch, he is the most unfair to hate". He was just stuck there, no choice on whether he could stay or not." These characters' ambitions and goals drive the narrative forward, leading to clashes between opposing forces and ultimately prompting reflection on the consequences of unchecked power and the importance of empathy and understanding.

Topic 2: The complexity of the plot

Based on the key terms, the second topic particularly focuses on the conflict and narrative plot surrounding the Na'vi, Pandora, the RDA, and reflections on Earth based on the key terms navi, pandora, rda, earth, plot. At its core, the plot revolves around the clash between the indigenous Na'vi people and the exploitative forces of the RDA (Resources Development Administration), representing corporate interests and environmental degradation. The plot is punctuated by themes of resistance, resilience, and the enduring bond between the Na'vi and their sacred land. All these meaningful themes in the movie are interconnected and influence each other creating an understanding of these topics and how they are related. Especially the plot involving the individual characters seems to be of great interest within the Avatar fan community. For example, one user wrote "I think people are thinking that a "simple" plot will give you all the details you need, when it's a bit more complicated than that. I wouldn't say avatar has a simple plot, I think it's more of linear progression of events, which actually allows to focus more on the various sides of each character".

Topic 3: Human Na'vi Conflict and its Violent Consequences

The terms that encompass topic three include killing, pandora, human, navi, and earth. This topic delves into the harrowing realities of conflict and violence as humanity clashes with the indigenous Na'vi in the world of Pandora. Pandora becomes the battleground for a brutal struggle between the Na'vi, the planet's guardians, and the intruding forces of humanity. As the plot thickens, viewers are confronted with scenes of destruction and killing as the Na'vi fight to protect their land and way of life from human exploitation. Most members of the audience see the war as an unpleasant experience disagreeing with the fact that Na'vi chose to fight back. One comment that highlights this topic is "the attack on the RDA was seen as not only futile but also a violation of the Tulkun way, that killing only brings more killing." Many experienced negative feelings witnessing the character's death in the movie "I don't know why I didn't see it before, but I think Neteyam being on the periphery almost telegraphs his death, but I was still shocked. People in my cinema were really upset by it, you could feel it in the air."

Topic 4: The Power of Family Bond

Important key terms in topic 4 are jake, spider, loak, brother and neytiri. Based on these words the topic seems to revolve around the characters and their relationships. Specifically, these characters are associated with being a family even though Spider is human. Jake and Neytiri raised Spider as one of their own biological children. Hence, spider and Loak were raised as brothers. Spider, likely an elder or experienced member of the Na'vi tribe, serves as a mentor and friend to Loak, a younger member of the community. Spider imparts wisdom, guidance, and support to Loak, helping him navigate the complexities of life on Pandora and the challenges facing their people. Loak, in turn, looks up to Spider and respects his experience and knowledge. The strength of these relationships that ultimately drives the narrative forward, serves as a testament to the resilience of the human and Na'vi characters alike. The appreciation of the strong relationship between the family is underlined by the comment "And personally, the only life Spider has taken away from someone is when he punches a GDR guy in the face and takes off his helmet. Not to mention he did it so he could run off the boat with his brothers." The users mention the emotional impact of this family bond "Perhaps unsurprisingly, this extended to how he felt about Neytiri. […] Finding real love and companionship under the threat of existential devastation, and somehow prevailing against it together […] None of it happened to me, but the emotional intensity of it all was somehow indistinguishable from my own experiences, and they left their mark all the same."

Topic 5: Conflicting relationship between Spider and Quaritch

The most important keywords here are think, Quaritch, want, spider, and planet main topic appears to revolve around conflict, particularly the tension between characters such as Quaritch and Spider, and their desires and motivations on the planet Pandora. Quaritch embodies the ruthless pursuit of power on Pandora, manipulating others like Spider to achieve his goals. Quaritch seeks to dominate the planet, seeing it solely as a resource for human gain. Spider, however, operates in the shadows, prioritizing his own survival over allegiance to Quaritch. While Quaritch's desire for power drives conflict, Spider navigates the situation with cunning, driven primarily by a desire for self-preservation and perhaps a strive for freedom. Also, the personal relationship between these two being father and son but still having different interests and values builds tension and conflict. Their tense relationship underscores the themes of power, survival, and manipulation in the film. Comments that underscore this complicated relationship are for example "spider talks about how knowing who your father is isn't always that great." or "If you understand Spider from the POV of an orphan, you will understand how complicated his relationship with his father is." As well as " My thoughts exactly. Quaritch seems to be the only person that actively showed he cared and had the desire to have some sort of familial relationship with him, as bad as he was. You simple can't blame him for taking anything he can get with the life he's had."

Topic 6: Earth's Billion People and the dilemma of ethical feeding

Based on the keywords: billion, land, vegan, people, eat, this topic is about the ethical dilemmas of feeding the billions of people on Earth. It explores themes of environmentalism, cultural clash, and resource exploitation, highlighting the clash between the Na'vi's sustainable way of life and human greed. The comments illustrate that there is a debate on whether all humans should have a vegetarian or vegan diet as some users agree that there is not enough land to feed the whole population with land-grown nutrition. For example, one user wrote "If you literally only change them, not the factory farm consumption, you are adding 3 billion people worth of farms to the world. That is a lot of farms. The "average" amount of land needed to feed one person for a year from a farm is at least 2 acres". In addition, other members highlight the negative ethical facts of an animal-based diet with one comment saying "Deforestation of the amazon, climate change, droughts, human starvation, suffering of animals, ocean destruction. All of the things you're stating are a direct cause of humans eating meat and animal based products" or "Every living being has its worth and deserves to live in peace, that was the whole point of the first move I thought. James Cameron alledgedly being vegan should only contribute to that."

Topic 7: Quaritch and Jake's Journey in the Movie

In Topic 7 the focus is mainly on Quaritch and Jake and the way how both of their lives are going. Jake's attitude and mission towards the world of Pandora and Na'vi within the first movie completely changed. Thus, Jake and Quaritch went from being companions working on claiming Pandora to make it a new home for humanity to Jake doing anything to protect Pandora and its living being from being taken away from them and killing its population. Still, there are some similarities between their two journeys which is that they both lost their human body. One comment mentioned, "Quaritch basically did exactly what sully did, sully also wanted to complete his mission, and had litlle to no interest towards Na'vi but he got shown everything slowly and fell in love with it, quaritch witnessed very few examples, and at the end of the day sully and quaritch are not so diffet anymore, both lost their human body and both are now fully Pandoran."

Topic 8: Na'vi Culture: Spiritual Resilience, Love, and Identity

Key terms in this topic include vegan, love, time, way, and navi. The topic is mainly about Navis's relationship with nature, their connections through love and their understanding of time being the interconnectedness of past, present and future. Central to the narrative is the Na'vi's deep reverence for nature, embodied in their commitment to veganism and their belief in the interconnectedness of all living beings. For the Na'vi, living in harmony with nature is not just a way of life but a fundamental aspect of their cultural identity. Love emerges as a powerful force that transcends boundaries, uniting individuals and communities in transformative ways. Whether it is the love between Jake Sully and Neytiri or the bonds of friendship among the Na'vi, love serves as a guiding force that empowers characters to overcome adversity and embrace their true selves. For example, one user talks about the resilience the society of Na'vi holds in their way of living and values "The RDA's downfall could be attributed to a combination of factors. One possibility is that they underestimated the power and connection to nature that the Na'vi had with Eywa." Further, the comments make clear that this love between the characters especially the love between Neytiri and Jake touched the audience "especially liked you talking about how the main characters care for each other. This true, pure, selfless love hit me so hard when watching the movie ..."

Topic 9: Neytiri's Compassion: Love and Empathy

Based on the keywords: good, Neytiri, love, people, and think, the main theme here is empathy, morality, and the transformative power of love, particularly illustrated through characters like Neytiri. As the narrative unfolds, viewers witness Neytiri's unwavering belief in the goodness of people and her capacity for compassion in overcoming adversity. Through her journey, the film challenges audiences to reflect on the importance of empathy in building

meaningful relationships and fostering a more compassionate world. One user commented "She's a beautiful warrior and her strength is the way she loves totally and unconditionally her family" as well as the statement of another member "Aliens coming from another star, invading her world, slaughtering her son, her father, her sister, much of her entire clan and obliterating their home and their tangible, physical link to their loved ones, while also revelling in performing all of the actions that are explicitly and absolutely forbidden in Na'vi culture, right in her face.... so yes, she sees spider, and she sees the son of the man responsible for all of that. That fact she tolerates him (and other humans) as much as she does gives her the patience of a saint."

Topic 10: Communication between Earth and Pandora

Topic 10 has the highest Marginal Topic Probability (MTP), hence the importance of this topic is big. Important key terms of the last topic are: back, rda, jake, quaritch, pandora. The theme in this topic revolves around the continued struggle between the Na'vi people and the RDA, with a focus on the communication between Pandora and Earth. A key aspect of the plot involves communication between Pandora and Earth, specifically as the word "back" is mostly related to this theme. Fan's comments reflect the complexities of this conflict, noting that those sympathetic to the Na'vi stayed behind on Pandora, while those who returned to Earth could manipulate the narrative to suit the RDA's interests. This dynamic suggests a deliberate effort by the RDA to control information, likely enforcing Non-Disclosure Agreements to prevent leaks about their activities on Pandora. To give an example one user wrote "Anyone sympathetic to the Na'vi stayed behind on Pandora, which means the people who went back could spin any story they wanted." or " The RDA also probably made everyone sent back to Earth sign Non-Disclosure Agreements under the pain of losing their job and getting blacklisted to prevent any leak."

Table 2

The 10 Topics from the Topic Model categorized into the Components of Empathy

Topics	Components of Empathy			
	Perspective-taking (cognitive)	Empathic concern (affective)	Personal distress (cognitive & affective)	Fantasy

1 Power struggles and Ambition		X	X		X
2 The complexity of the plot					X
3 Human Na'vi Conflict and its Violent Consequences				X	X
4 The power of family bond	X		X	X	X
5 Conflicting relationship between spider and Quaritch	X				X
6 Earth's Billion People and the dilemma of ethical feeding	X		X		X
7 Quaritch and Jake's Journey in the Movie	X				X
8 Na'vi Culture: Spiritual Resilience, Love, and Identity	X		X	X	X
9 Neytiri's Compassion: Love and Empathy	X		X		X

10 Communication between Earth and Pandora	**X**		**X**

Components of Empathy in Avatar Reddit Statements

    Perspective taking

        This component of empathy was shown to appear most frequently across the ten different topics. The fan community often adopts the point of view of other characters in the movie. The character's individual interests and goals seem to elicit taking different perspectives within the audience. Often the character Quaritch as well as the RDA are seen as the enemy however, some statements specifically in topic 10 show taking the perspective of these two parties' understanding of the motivations and perspectives of both the sympathetic individuals who stayed on Pandora and those who returned to Earth. The speaker considers how the returnees might alter the narrative to suit their agenda, showing an awareness of different viewpoints. Additionally, these statements involve understanding the actions and motivations of the RDA and Quaritch in controlling the narrative and the returnees' compliance due to fear of consequences and in the same regard Topic 7 communicates an understanding of the similarities between Quaritch and Sully's experiences and motivations. The speaker recognizes that, like Sully, Quaritch initially had little interest in the Na'vi but was gradually exposed to their world.

        Furthermore, the culture and values of the Na'vi evoke perspective-taking in the audience. Topics 8 and 6 illustrate this as comments recognising RDA's failure to understand the deep spiritual connection the Na'vi have with Eywa and nature. This connection with nature, initiated discussions regarding plant-based diets with the community taking the intrinsic value of all living beings and recognizing their right to live peacefully. Also acknowledging the broader environmental and social issues caused by human behaviour, specifically meat consumption. This shows an understanding of the complex interplay between human actions and global problems.

        Still, most perspective-taking occurs regarding the character's relationships as topics 4, 5, and 9 reveal. Regarding the family bond, the speaker considers Spider's perspective, explaining his behaviour in a specific context and acknowledging his intentions to protect and escape with his brothers. Also taking Spider's perspective as an orphan to understand his complex relationship with his father, acknowledging why Spider might accept Quaritch's

attempts at a familial relationship despite Quaritch's flaws. Further, the speaker vividly describes the traumatic experiences the character of Neytiri has gone through, showing an understanding of her perspective and the pain she must feel. By empathizing with her view of Spider and her tolerance towards him and other humans the speaker demonstrates a nuanced understanding of her complex emotions and situation as well as her emotional depth and resilience.

Empathic concern

Similar, to the component of perspective-taking empathic concern, meaning most feelings of warmth or compassion reported by Reddit users are towards the main characters of the movie. For instance, the recognition of Spider's need for familial connections and understanding of his acceptance of Quaritch's care. The comments show empathy towards Spider's emotional needs, defending Spider against unfair hatred and recognizing the unfairness of his situation. Also, the community addresses the pain and loss Neytiri has experienced, and articulates the understanding and compassion for her discomfort and dislike towards humans. In addition, the comments demonstrate deep empathic concern by describing the emotional intensity of the characters' experiences as indistinguishable from their own. The results also display that the speaker is moved by the selfless love and care the characters show for each other. The speaker's emotional response indicates a deep compassion for the characters. The topic of ethical feeding includes reports of empathic concern too. The user's mention of human starvation, the suffering of animals, and environmental destruction reflects a deep concern for the suffering of both humans and animals, indicating empathic concern.

Personal distress

The experience of personal distress is one of the components that was discussed the least by the avatar community. Yet it was reported by some Reddit members always related to the character's experiences and their storyline. In topic 4 the speaker indicates experiencing personal emotional distress by stating that the emotional intensity of the characters' experiences left a mark on them, despite not having gone through it personally. This reflects a vicarious emotional response to the character's situation. Also the phrase "hit me so hard" within a comment of topic 8 suggests that the speaker felt a significant personal emotional reaction to the scenes of love and care, indicating a component of personal distress. Another user statement mentions feeling the emotional intensity in the cinema, indicating a personal reaction to Neteyam's death and the shared distress among the audience. This reflects an internal experience of discomfort and emotional upset.

Fantasy

As the movie is based on fictional characters and stories all topics are related to the component Fantasy. However, Topics 1,2,4,7,8, and 9 where the main focus is on the character's traits, goals and relationships encompass this component most strongly. Topic 6, on the other hand, discusses ethical feeding and the positive and negative aspects of a meat-based and plant-based diet for the humanity and environment, which evolved out of the fictional storyline but finds its direct relation and discussion to reality.

Discussion

The aim of the study was to examine "What empathy-related experiences are expressed in online responses of the Reddit community dedicated to Avatar fans?". Based on one possible pathway on how environmental movies can influence the audience's pro-environmental attitude and behaviour empathy is presented to be an important component. Consequently, in order to analyse audience reactions on Reddit regarding the environmental film "Avatar: The Way of Water," the four components of empathy previously mentioned are used as indicators of whether or not the audience is likely to experience feelings of empathy.

Main findings

Overall, all four components of empathy suggested by … were detected within the ten topics from the topic model, hence the Reddit user audience reports feelings of empathy after watching the fantasy movie "Avatar: The Way of Water". The component that was found to be most present across the topics was the cognitive component of perspective-taking. In contrast, only a small number of topics appeared to elicit personal distress in the fan community. The results suggest that empathic concern is also often experienced by the audience as it is present in half of the topics. Especially topics involving the character's strong emotional relationships such as family bonds and love between the two main characters appeared to evoke all components of empathy.

Perspective taking

This empathy component was found to be experienced the most among the fan community. The users' comments demonstrate that the audience takes perspectives of different characters independent of the sympathy level created by the storyline of the movie leading to the conclusion that some viewers are sympathetic or able to understand the viewpoint of characters that were initially created as the enemy. Thus, showing characters with different experiences, relationships and roles may reach a wider audience because they might relate to some characters more than to others or have different attitudes based on their own experiences. Most perspective-taking took place in the context of the character's

relationships and emotional bonds. A study by Hsu et al., (2022) found that integrating relationships between characters in romantic and family films is positively connected with evoking emotional reactions and emotional arousal. Hence, including strong emotional relationships within the narrative of the movie like the relationships within the Na'vi family or between Neytiri and Jake leads to more emotional audience responses like empathy.

Empathic concern

Similar to perspective taking, the most empathic concern reported by the Reddit users was about the main characters of the movie, particularly Spider and Neytiri. They recognized Spider's need for familial connections and defended him against unfair criticism, while also understanding Neytiri's pain and dislike towards humans. Spider is looking for a connection to his father even though they have completely different interests and goals and his father hurts Spider by fighting against him and his Na'vi family. As well as for Neytiri stands in between wanting to protect Spider despite him looking for something good in his father but also knowing that his father killed many of their Na'vi population. Although these difficulties and disruptions in family dynamics are portrayed in an overdramatic way and in the context of war, which is likely uncommon and has little to do with daily life for most of the Avatar fan community, the topic of difficulties in family dynamics still exists for most people in reality to different extends. According to research the argument that reading literature frequently offers sufficient support for character empathy, making it easier than empathizing with actual people, counters the claim that reading about characters makes it harder to sympathize with them because of their unusual circumstances and feelings (Petraschka, 2021). The results of this study suggest that it is possible for the audience to empathise with the fictional character regardless of their nonstandard circumstances because the viewers witness events in the movie such as problems in the context of family but also other events like death, love, friendship, and betrayal are portrayed in detail in the movie, providing support for empathizing with the characters. This supports the first argument from the research by Petraschka (2021). Additionally, the movie displays topics about ethical considerations, initiating discussions on ethical feeding which showed users' concern for human starvation, animal suffering, and environmental destruction, indicating a broad empathic concern as these topics are also very relevant in our real world.

Personal distress

The study also found that personal distress was one of the least discussed topics among the Avatar community on Reddit. However, some users reported vicarious emotional responses to characters' experiences, significant personal reactions to scenes of love and care,

and shared distress over Neteyam's death, indicating internal discomfort and emotional upset. A lot of unexpected events often lead to changes in emotion for the viewer. Changes in emotion might arouse interest or anxiety about the futures of specific characters, and this dramatic tension may encourage viewers to watch the upcoming episodes in an effort to decompress. Audiences are more likely to be emotionally involved and attracted back to follow the characters' struggles if they feel a connection to the characters. The abrupt emotional change might inspire significantly more incentive for both the first viewing and the follow-through. For instance, the audience may experience such abrupt emotional swings when a character goes through an unexpected and upsetting occurrence (such as an accident, attack, or breakup) (Nabi & Green, 2014).

Fantasy

As mentioned in the introduction when one wants to examine how much a person enjoys fiction, the Fantasy scale is a better fit (Nomura & Akai, 2012). However, this study focused on empathy hence, no conclusions can be drawn on the enjoyment the audience felt watching the movie.

Concludingly, this study provides evidence that empathy for non-human fictional characters within the audience from the environmental movie "Avatar: The Way of Water" is frequently experienced. Combining the findings on every component of empathy, it can be concluded that especially the character's relationships and their development evoke the most components of empathy either simultaneously or on their own. The narrative appeared to enhance or clarify viewers' emotions, potentially altering them. By creating a relatable character and incorporating suggestiveness, challenges, and various vagueness in the narrative, it essentially provides a toolkit with clues to increase the chances of this emotional shift happening (Oatley, 2002).

Strengths and Limitations

One strength of this study is the usage of a qualitative data collection method, real-world natural textual responses to the movie. Qualitative research methods provide a thorough exploration of personal feelings and experiences, capturing the nuances and complexities of emotional reactions. Unlike quantitative approaches, which focus on evaluating empathy through predefined metrics, qualitative methods enable a detailed and nuanced analysis of personal experiences, delving into the emotional and cognitive aspects of empathy, and understanding the contextual factors that influence viewers' responses to movies (Grossoehme, 2014). In addition, there are several advantages of using the online platform Reddit to extract data concerning the posts and comments of users about the movie

"Avatar: The Way of Water". First Reddit's format encourages open and candid discussions among users. The platform's anonymity and user-driven content contribute to genuine and unfiltered conversations, making the data extracted more authentic and reflective of real-world sentiments (Proferes et al., 2021).

On the other hand, Reddit also has some limitations. Instead of including the opinions of every audience member, the study mainly gathers the thoughts of fans which can lead to respondent bias. Diverse parts of audiences are more or less likely to use and engage on different social media and internet platforms. Reddit is an open accessible network, yet there are also more social media sites with different viewpoints. The dynamics specific to Reddit could impact findings transferability, as users might express themselves differently than on other platforms or in real-life interactions (Shelton et al., 2015; Shatz, 2017). Different conclusions could be drawn from data from other networks like Facebook or Twitter. As such, this study presents restricted demographic data predictions of participants and likely represents the opinions of the Avatar fan base that is active on Reddit.

Furthermore, a challenge to applying LDA topic modelling in qualitative research is that deciding on relevant topics for the research is entirely based on the researcher's judgement which questions the validity of the outcomes as some important topics might be ignored or considered less relevant (Nikolenko et al., 2016). Thus other researchers could end up with different topics as they might looked into different research or have different memories about the movie. Another aspect that can be considered a limitation is that the application of filters within Reddit consisting of the words "empathy", "empathic", and "empathise" might not comprise all the data that is connected to empathy. When retrieving posts from a subreddit or user, Reddit typically returns up to 1000 posts per request (Amaya et al., 2019). Hence it was not possible to download the data with all comments and posts, thus limiting the validity of the data that was collected. Even though the data was thoroughly preprocessed, the most frequent keywords in several different topics tended to be similar, hence researchers must be thorough and thoughtful going through the most applicable materials to appropriately label the topics. For this reason, it is challenging to interpret the main themes of the topics just on the key terms (Sanjaya et al., 2018). Lastly, it is also important to mention that the study's focus on a specific movie fan community raises concerns about generalizability; findings may not apply universally to viewers of the movie, limiting their broader relevance (Meyer & Tucker, 2007).

Implications for Future Research

Given these limitations, several implications for future research arise. Future studies should include a broader range of audience opinions and diverse social media platforms like Facebook and Twitter to give a more representative perspective on experiences of empathy. Researchers should also examine how platform-specific dynamics affect user expression and the transferability of findings by comparing data across different platforms. Also expanding the keyword set beyond terms like "empathy" can improve data completeness, and more sophisticated preprocessing techniques are needed for accurate topic labeling and theme interpretation. For example, modern transformer-based models like the Bidirectional Encoder Representations from Transformers (BERT) have many advantages. Besides not requiring any pre-processing these models are highly effective at interpreting context, which enables them to perform complex language-related tasks more accurately, naturally, and effectively (Gillioz et al., 2020). Even though the specific methodologies on how ChatGPT works are unknown it might also be of consideration to use ChatGPT for NLP. While traditional methods like LDA are effective for topic modelling, ChatGPT offers a more flexible and context-aware approach. Its ability to understand and generate language in a human-like manner, combined with its advanced NLP capabilities, makes it well-suited for identifying and interpreting topics in large, complex text datasets (Rijcken et al., 2023).

It is useful to have a measure that automatically evaluates topics according to their prospective relevance to researchers to find 'interesting' study concepts. A well-designed measure would firmly align with human judgment, simplifying the process of eliminating boring topics and comparing various topic models. There could be the possibility for researchers to select the models and subjects that best suit their requirements. Better subject quality indicators will require further study because existing ones are not ideal (Nikolenko et al., 2016). Finally, studying multiple fan communities can enhance the generalizability of findings and their applicability to various audience segments for different movies.

Conclusion

This study explored empathy-related experiences in the Reddit community dedicated to "Avatar: The Way of Water." All four empathy components of perspective-taking, empathic concern, personal distress, and fantasy were present in audience reactions, with perspective-taking being the most prominent. Empathic concern was often expressed, especially towards main characters like Spider and Neytiri.

Future research should include a broader range of social media platforms and incorporate modern methods for topic modelling, such as transformer-based models. Studying multiple fan communities can enhance the applicability of findings.

Overall, the study highlights how strong character relationships and emotional narratives in environmental fantasy films can boost viewer empathy and engagement. Further research is needed to improve topic quality metrics and explore empathy across different contexts.

References

Alma, H., & Smaling, A. (2006). The meaning of empathy and imagination in health care and health studies. *International Journal of Qualitative Studies on Health and Well-being*, *1*(4), 195–211. https://doi.org/10.1080/17482620600789438

Amaya, A., Bach, R., Keusch, F., & Kreuter, F. (2019). New data sources in social Science Research: Things to know before working with Reddit Data. *Social Science Computer Review*, *39*(5), 943–960. https://doi.org/10.1177/0894439319893305

Baird, S. L. (2005). Global warming: if you can't stand the heat: all of the top ten warmest years on record have occurred since 1990. *The Technology Teacher*, *65*(3), 13-17.

Bergthaller, H. (2012). A sense of No-Place. *European Journal of English Studies*, *16*(2), 151–162. https://doi.org/10.1080/13825577.2012.703820

Bilandzić, H., & Sukalla, F. (2019). The role of fictional film exposure and narrative engagement for personal norms, guilt and intentions to protect the climate. *Environmental Communication*, *13*(8), 1069–108
6. https://doi.org/10.1080/17524032.2019.1575259

Brems, C. (1989). Dimensionality of empathy and its correlates. *Journal of Psychology (Washington, D.C. Online)/the Journal of Psychology*, *123*(4), 329–337. https://doi.org/10.1080/00223980.1989.10542989

Caballero-Juliá, D., & Campillo, P. (2021). Epistemological Considerations of Text Mining: Implications for Systematic Literature review. *Mathematics*, *9*(16), 1865. https://doi.org/10.3390/math9161865

Cuff, B. M. P., Brown, S., Taylor, L., & Howat, D. (2014). Empathy: A review of the concept. *Emotion Review*, *8*(2), 144–153. https://doi.org/10.1177/1754073914558466

Davis, M. H. A. (2007). Empathy. In *Springer eBooks* (pp. 443–466). https://doi.org/10.1007/978-0-387-30715-2_20

Delgado, N., Delgado, J., Montesinos, M. B., Bonache, H., & Harris, L. T. (2023). What is the Link Between Different Components of Empathy and Burnout in Healthcare Professionals? A Systematic Review and Meta-Analysis. *Psychology Research and Behavior Management*, *Volume 16*, 447–463. https://doi.org/10.2147/prbm.s384247

Eberhard, L., Walk, S., Posch, L., & Helic, D. (2019). Evaluating narrative-driven movie recommendations on reddit. In *Proceedings of the 24th international conference on intelligent user interfaces* (pp. 1-11).

Edwards, A. D., & Shafer, D. M. (2022). When lamps have feelings. *Projections*, *16*(2), 27–52. https://doi.org/10.3167/proj.2022.160202

Feldman, R., & Sanger, J. (2006). *The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data*. Cambridge University Press.

Franchini, M., & Mannucci, P. M. (2015). Impact on human health of climate changes. *European Journal of Internal Medicine*, *26*(1), 1–5. https://doi.org/10.1016/j.ejim.2014.12.008

Gislason, M., Kennedy, A., & Witham, S. (2021). The Interplay between Social and Ecological Determinants of Mental Health for Children and Youth in the Climate Crisis. *International Journal of Environmental Research and Public Health*, *18*(9), 4573. https://doi.org/10.3390/ijerph18094573

Gillioz, A., Casas, J., Mugellini, E., & Khaled, O. A. (2020). Overview of the transformer-based models for NLP tasks. *Annals of Computer Science and Information Systems*. https://doi.org/10.15439/2020f20

Grossoehme, D. H. (2014). Overview of qualitative research. *Journal of Health Care Chaplaincy*, *20*(3), 109–122. https://doi.org/10.1080/08854726.2014.925660

Hotho, A., Nürnberger, A., & Paaß, G. (2005). A brief survey of text mining. *Journal for Language Technology and Computational Linguistics*, *20*(1), 19–62. https://doi.org/10.21248/jlcl.20.2005.68

Hsu, P., Li, J., & Lee, C. (2022). Romantic and Family Movie Database: Towards Understanding Human Emotion and Relationship via Genre-Dependent Movies. *2022 10th International Conference on Affective Computing and Intelligent Interaction (ACII),* 1-8. https://doi.org/10.1109/ACII55700.2022.9953881.

Jacobi, C., Van Atteveldt, W., & Welbers, K. (2015). Quantitative analysis of large amounts of journalistic texts using topic modelling. *Digital Journalism*, *4*(1), 89–106. https://doi.org/10.1080/21670811.2015.1093271

Janpol, H. L., & Dilts, R. (2016). Does viewing documentary films affect environmental perceptions and behaviors? *Applied Environmental Education & Communication*, *15*(1), 90–98. https://doi.org/10.1080/1533015x.2016.1142197

Jelodar, H., Wang, Y., Yuan, C., Feng, X., Jiang, X., Li, Y., & Zhao, L. (2018). Latent Dirichlet allocation (LDA) and topic modeling: models, applications, a survey. *Multimedia Tools and Applications*, *78*(11), 15169–15211. https://doi.org/10.1007/s11042-018-6894-4

Kern, M. L., Park, G., Eichstaedt, J. C., Schwartz, H. A., Sap, M., Smith, L. K., & Ungar, L. H. (2016). Gaining insights from social media language: Methodologies and

challenges. *Psychological Methods*, *21*(4), 507–525.

https://doi.org/10.1037/met0000091

Kherwa, P., & Bansal, P. (2018). Topic Modeling: A Comprehensive review. *ICST Transactions on Scalable Information Systems*, *0*(0), 159623. https://doi.org/10.4108/eai.13-7-2018.159623

Lau, J. H., Newman, D., Karimi, S., & Baldwin, T. (2010). Best Topic Word Selection for Topic Labelling. *International Conference on Computational Linguistics*, 605–613. https://www.researchgate.net/profile/Sarvnaz_Karimi/publication/221102629_Best_Topic_Word_Selection_for_Topic_Labelling/links/09e415081f727478cd000000.pdf

Lavertu, A., & Altman, R. B. (2019). RedMed: Extending drug lexicons for social media applications. *Journal of Biomedical Informatics*, *99*, 103307. https://doi.org/10.1016/j.jbi.2019.103307

Leeson, W., Resnick, A., Alexander, D., & Rovers, J. (2019). Natural Language Processing (NLP) in Qualitative Public Health Research: A Proof of Concept study. *International Journal of Qualitative Methods*, *18*, 160940691988702. https://doi.org/10.1177/1609406919887021

Liu, Y., & Li, X. (2021). Pro-Environmental behavior predicted by media exposure, SNS involvement, and cognitive and normative factors. *Environmental Communication*, *15*(7), 954–968. https://doi.org/10.1080/17524032.2021.1922479

Mann, R. E., & Barnett, G. D. (2012). Victim empathy intervention with sexual offenders. *Sexual Abuse*, *25*(3), 282–301. https://doi.org/10.1177/1079063212455669

Maslin, M. (2019). Climate change: essential knowledge for developing holistic solutions to our climate crisis. *Emerging Topics in Life Sciences*, *3*(2), 245–256. https://doi.org/10.1042/etls20180116

Mawani, A., & Nderu, L. (2020). Towards an online empathy assisted counselling web application. *EAI Endorsed Transactions on Context-aware Systems and Applications*, *7*(22), 167792. https://doi.org/10.4108/eai.23-12-2020.167792

Nabi, R. L., & Green, M. C. (2014). The role of a narrative's emotional flow in promoting persuasive outcomes. *Media Psychology*, *18*(2), 137–162. https://doi.org/10.1080/15213269.2014.912585

Naik, P., Sachin, A. S., & Kuri, V. (2015). Classification of posts on Reddit. *San Diego: University of California*.

Neumann, D. L., & Westbury, H. R. (2011). The psychophysiological measurement of empathy. *Psychology of empathy*, 119-142. https://research

repository.griffith.edu.au/bitstream/10072/44076/1/77247_1.pdf

Nikolenko, S. I., Koltcov, S., & Koltsova, O. (2016). Topic modelling for qualitative studies. *Journal of Information Science*, *43*(1), 88–102. https://doi.org/10.1177/0165551515617393

Nomura, K., & Akai, S. (2012). Empathy with Fictional Stories: Reconsideration of the Fantasy Scale of the Interpersonal Reactivity Index. *Psychological Reports*, *110*(1), 304–314. https://doi.org/10.2466/02.07.09.11.pr0.110.1.304-314

Oatley, K. (2002). Emotions and the story worlds of fiction. *Narrative impact: Social and cognitive foundations*, *39*, 69.

Otterbacher, J., Ang, C. S., Litvak, M., & Atkins, D. C. (2017). Show me you care. *ACM Transactions on Internet Technology*, *17*(1), 1–22. https://doi.org/10.1145/2996188

Perosanz, J. J. I. (2010). Identification with characters and narrative persuasion through fictional feature films. *Communications*, *35*(4). https://doi.org/10.1515/comm.2010.019

Petraschka, T. (2021). How Empathy with Fictional Characters Differs from Empathy with Real Persons. *The Journal of Aesthetics and Art Criticism (Print)*, *79*(2), 227–232. https://doi.org/10.1093/jaac/kpab017

Proferes, N., Jones, N., Gilbert, S., Fiesler, C., & Zimmer, M. (2021). Studying Reddit: A systematic overview of disciplines, approaches, methods, and ethics. *Social Media + Society*, *7*(2), 205630512110190. https://doi.org/10.1177/20563051211019004

Rijcken, E., Scheepers, F., Zervanou, K., Spruit, M., Mosteiro, P., & Kaymak, U. (2023). Towards interpreting topic models with ChatGPT. In *The 20th World Congress of the International Fuzzy Systems Association*.

Sharma, A., Miner, A. S., Atkins, D. C., & Althoff, T. (2020). A computational approach to understanding empathy expressed in Text-Based Mental Health support. *arXiv (Cornell University)*. https://doi.org/10.48550/arxiv.2009.08441

Seelig, M. I. (2019). Popularizing the environment in modern media. *The Communication Review*, *22*(1), 45–83. https://doi.org/10.1080/10714421.2019.1569449

Soga, M., & Gaston, K. J. (2016). Extinction of experience: the loss of human–nature interactions. *Frontiers in Ecology and the Environment*, *14*(2), 94–101. https://doi.org/10.1002/fee.1225

Sörqvist, P., & Langeborg, L. (2019). Why people harm the environment although they try to treat it well: An Evolutionary-Cognitive Perspective on Climate Compensation. *Frontiers in Psychology*, *10*. https://doi.org/10.3389/fpsyg.2019.00348

Taylor, B. (2013). *Avatar and nature spirituality*. https://doi.org/10.51644/9781554588800

van Lissa, C. J., Caracciolo, M., van Duuren, T., & van Leuveren, B. (2016). Difficult
Empathy: The Effect of Narrative Perspective on Reader's Engagement with a First-
Person Narrator. DIEGESIS: Interdisciplinary E-Journal for Narrative Research, 5(1).

Vayansky, I., & Kumar, S. A. (2020b). A review of topic modeling methods. *Information
Systems*, *94*, 101582. https://doi.org/10.1016/j.is.2020.101582

Westbury, R., & Neumann, D. L. (2008). Empathy-related responses to moving film stimuli
depicting human and non-human animal targets in negative circumstances. *Biological
Psychology*, *78*(1), 66–74. https://doi.org/10.1016/j.biopsycho.2007.12.009

Appendix

Appendix 1

Stop word list created by researcher

```
stopwords2
like
would
know
though
could
yeah
one
get
3
2
1
https
thats
see
tell
even
thats
oh
much
make
really
probably
read
said
also
first
something
go
```