– Independent Work Report Fall 2023 –

Climbing Through Time: A Forum-Based Exploration of Evolving Rock Climbing Practices and Attitudes

Tyler Benson
Adviser: Christiane Fellbaum

Abstract

This research paper examines changes in the rock climbing community through an analysis of online forum discussions, particularly from mountainproject.com. The research addresses four key areas: the adoption of new climbing techniques, the role of difficulty and temperature in climbers' enjoyment, climbers' awareness of their environmental impact, and changes in sexism within the community.

Employing natural language processing, I analyze sentiment trends in forum discussions, focusing on topics such as sport climbing, route chipping, bolt chopping, and the sport's environmental impact. The aim is to provide insights into the climbing community's evolving practices and attitudes, reflecting on broader societal issues like environmental ethics and gender dynamics. Ultimately, this paper offers an overview of the complex and changing landscape of rock climbing culture and its interaction with wider social and environmental concerns.

1. Introduction

Rock climbing has witnessed notable transformations in practices, ethics, and cultural perspectives throughout its relatively recent history. As these changes occur, the intimate relationship between the sport's inherent danger and its influence on the environment can shift. Therefore, understanding climber attitudes about changing ethics, environmental impact, and interpersonal interactions within the sport is important for prioritizing safety and environmental preservation.

One example of these shifts is found in the emergence of sport climbing, a new form of climbing getting its start in the 1980s [11]. Sport climbing, characterized by the strategic drilling of "bolts" into natural rock to use as protection during ascents, marked a departure from traditional climbing

techniques. This technique was seen as unnatural to a subset of traditional climbers – a few of whom began "chopping" the bolts directly off of the rock walls [8]. This controversy raised some questions that inspired this research. How do climbers perceive their interaction with nature? What are the ethical boundaries in a sport that's inherently risky yet intimately connected with the environment?. In this paper, I'll delve into online climbing forums, a rich source of climbers' sentiments and attitudes, to understand these intricate relationships within the community. Specifically, mountainproject.com acts as a social media for climbers [3], even if it is primarily used for its community-curated information on routes and crags. Excitingly, mountainproject.com/forum is a popular forum page that houses discussions on ethics, politics, and climbing history as it unfolds.

1.1. Research Questions

To refine the specificity of my research, I narrow my exploration to four research questions that each generally deal with a change over time:

1. How are new climbing techniques accepted by the climbing community?
2. How does difficulty and temperature play into a rock climber's enjoyment of the sport?
3. Have climbers become more cognizant of their environmental impact?
4. How has sexism in the community changed over time?

Question 1: In order to effectively be able to respond to Question 1, I will inspect how climbers reacted to the introduction of sport climbing. Sport climbing's introduction and adoption is a very important part of rock climbing history. Even though there have been many other new techniques introduced in recent history, understanding sport climbing's acceptance will provide the most insight. Also, route chipping, or altering and impacting the rock itself to allow ease of climbing, is a controversial and relevant issue in climbing ethics and new techniques and thus this topic will be included.

Question 2 stems from a personal inspiration. Particularly, I saw in "THE RED 2nd edition climbing guide-book" a description an easier route that read something like *this route is surprisingly fun for the grade* [24], implying that easy routes are rarely fun. This raised questions about how and when

climbers decide that a climb is worth doing.

Question 3 refers to the obvious interconnections between the sport and the environment – getting an understanding of how climbers think about this interconnection is important to reducing their negative impact.

Question 4: Lastly, climbing is a historically male-dominated sport [33]. I want to see if this community is biased by its skewed demographics into a heightened amount of misogyny.

In summary, this research serves as a lens through which we can view broader societal changes. With the sport's growth in popularity, it begins to interact with issues of environmental conservation, gender equality, and the balance between tradition and innovation. My research aims to map these intersections by exploring how they are reflected in the conversations and attitudes of climbers.

2. Related Works

This section will discuss related research that applies natural language processing to understanding how rock climbing community dynamics have changed over time. Notably, I am unable to find any scholarly articles using mountainproject as a source for natural language processing and analysis on climbing culture; however, there is research that responds in varying degrees to the questions highlighted in the Introduction section. And separately there is extensive research that applies natural language processing to forums to inspect how communities may have changed over time. For this section, I'll organize the works into which of my four questions they respond to.

Let's first understand the few pieces of research I found that integrate climbing and natural language processing. Firstly, rock climber's are historically adjacent to counter-culture in community attitudes [20]. This brings with it atypical discourse patterns that may influence my analysis of forum posts. I read a thesis written by Potgeiter that specifically aims to understand how climbers engage in discourse that implies that I shouldn't worry too much about atypicality [27].

NLP has been applied to large data sources gathered from reddit.com subreddits of r/climbing and r/yoga [34]. Specifically, this paper built models to classify the source (r/climbing or r/yoga) of a post to understand the how conversations may differ slightly between the two related communities

and doesn't apply NLP to understand any change in the community over time. Excitingly, described in a blog post on his site, Ritter performs data analysis on data that he scrapes from mountainproject [31, 32]. However, the work is exploratory data analysis of statistics on what climbs that people are doing. Ritter also applies modern generative models (GPT 2) to generate accurate descriptions of routes [30].

2.1. Question 1: sport climbing + adoption of new practices

My first question explores how new climbing techniques, particularly sport climbing, are adopted into practice. Unfortunately, there isn't a large corpus of scientific research on this topic; however, there is plenty of articles that helped me understand how sport climbing came about and how it was received.

"Cleaning Up Climbing History. The Truth Behind 13 Pivotal Ascents and Events" by Erickson (2022) discusses controversial events in rock climbing history. The events described include misogyny, bolt-chopping, as well as sport-climbing hatred [15]. It was a great place to start to understanding controversies in the sport. To explore bolt-chopping and its history, I explored other articles that offer historical recounts of bolt-chopping, on Cerro Torre [26] and in Joshua Tree [13].

"Where's the Line Between Chipping and Cleaning?" by Stefani (2008) presents a survey of 1080 climbers about their views on chipping climbs. This work offers insight into the community's perception on a climbing practice that directly alters the rock [14]. This article shows that route chipping is very controversial in the climbing community, and inspired me to look into how opinions on this topic may have changed over time.

2.2. Question 2: climber enjoyment of the sport

Gathering a whole-picture understanding of climbing culture was important to beginning my research. I found that climbing culture has sometimes glorified self-imposed, life-threatening danger. Analysis into the specifics of this glorification exists [18, 23]. Also, rock climbing is considered more than just a sport to many of its participants. That is, many climbers are "lifestyle climbers" that maintain hypermobile, minimalist lifestyles in the full-time, non-professional pursuit

of the sport [28]. Climbing injuries are mostly overuse [25], suggesting that climbers find enjoyment in the sport's extreme pursuance.

I also wanted to see how seasons contribute to the complexity in how climbers enjoy the sport. Research exists to analyze how climbers travel in a 'mecca' style to climb at places with temperate climates [22, 29].

2.3. Question 3: environmental impact

The relationship between climbing's growing popularity and its potentially negative effects on the environment has been explored [17]. Notably, climbing is found to have an impact on lichen richness in popular crags [6]. Also, climbers have an economic impact on the areas they climb at, and analysis exists that explore climber opinions on the economic impact of open access climbing areas [35].

To form my hypotheses I wanted to find articles describing how climbers think about the environment and found that climbers are generally pro-environment and have a self-in-environment consciousness [12]. Also, as rock climbing grows in popularity the sport has seen 'indoorization', with rock climbing gyms proving economically viable. This brings controversy with it, as traditional climbers start to doubt the authenticity of "gym climbers" [10].

2.4. Question 4: sexism

Climbing has historically been, and still is a male-dominated sport. Research diving into how gender plays into climbing culture provided a background for this research question [33, 9]. Additionally, age-ism exists in the sport, and research into this relationship exists [19]. My research includes analyzing whether or not a specific body of text is misogynistic in nature. To understand how to do this, I looked for articles that detected sexism in tweets, a format of text that would be similar to the forum posts of mountain project. Specifically, I found papers that detected sexism using CNNs of misogynistic tweets [7] as well as reddit posts [16].

3. Approach

To respond to the research questions I denoted above, I collected large amounts of data from mountainproject.com, parsed it for sentiment and sexism, generated subsets of the data to categorize the discussion topics, and then identified trends over time through time-series analysis. As mentioned in the Related Works section, most other approaches that respond directly to my questions either used surveys for data collection or attempt to answer using historical trends. An approach that directly takes climber conversations from the source, without biases that accompany surveys or gaps in understanding that may occur from historical analysis, will allow more confidence in any conclusions drawn.

4. Implementation

Throughout this section, I will describe the specifics in how I implemented the approach denoted above. For even more fine-grained specifics, my github repository houses all of the code used in this research paper [2].

4.1. Data Acquisition

The data for my research was collected through web scraping mountainproject.com. The goal was to gather a substantial dataset that covers climber opinions on a diverse range of topics to reflect any trends throughout the community. I wrote web-scraping scripts in python (`scrape_forum.py`, `scrape_ticks.py`, and `scrape_routes.py`) to collect information from the forum pages, as well as comments and "Ticks" on a subset of popular climbs.

The General forum, being the most active and diverse section, provided 360,000 posts, offering a wide array of discussions. This data will be used primarily in the time-series analysis. A typical forum post included scrape-able information as follows:

```
Date: 2005-08-02
Username: Richard Rossiter
Body: This post was originally a comment in Boulder ...
Number of Likes: 2
```

Location: Boulder, CO
User Joined: Jul 2002
User Clubs: Access Fund Member
Title: Dogs at the Crags

In addition to forum posts, data for "Ticks" was scraped. "Ticks" are climbers' self-reported records of climbs they have completed. Because of the substantial amount of ticks that mountainproject.com has, I only recorded ticks for the top 20 most popular climbs ("classics") in the "Red River Gorge" and "Yosemite" climbing locations. This resulted in 166,000 ticks being recorded. A typical tick entry included information like this:

Date: Oct 13, 2022, 12:00 am
Style: TR (Top Rope)
Lead Style: Flash
Pitches: 1
Text: TR. Slipped halfway up, coming back for a send and a lead.
User ID: 201453831
User Name: Natasia Caldwell

In addition to ticks, these popular climbs also have comments on them. Each comment includes a variety of information, with notable information being a user "grade" where the climber submits how hard they believe the climb to be. An example comment would look like:

Username: -Ty-
Comment: Watch your head on the trees. Also, I found i...
Location: Salt Lake City, UT
Climbing Area: Yosemite Valley
User ID: 105997635
Route Grade: 5.5
Date of Post: Aug 1, 2007

Besides the challenge of no pre-existing APIs to assist with data acquisition, it was difficult to scrape through all 360,000 forum posts. The difficulty arose from the fact that only 15 or so posts are loaded per webpage hit, and thus I'd need to make a high volume of GET requests to the site. This took a long time and, because I was using my own laptop for scraping, the script often wouldn't finish before my laptop would close or shut down. In order to surmount this issue, I changed my script to write data to the file after every forum post instead of when it had finished all 360,000 and

wrote in a "warm start" argument for my script such that it would start from the previously collected forum page and begin scraping from where it previously left off.

After the initial scraping, the data underwent a cleaning process to ensure its integrity and usability. This included removing duplicates, correcting formatting errors, applying accurate types, and adding some features extracted from the body. One challenge arose because mountainproject records recent posts with a '12 Days Ago' stamp instead of the actual date. I had to make a function that would subtract the number of days from the current day (at the time of scraping) to fix these as datetime objects instead of strings.

4.2. Sentiment Analysis

TextBlob was applied to analyze the sentiment of the relevant data [1]. TextBlob is a lexicon-based sentiment analyzer and thus calculates sentiment based on labeling each word as positive or negative. This python package produced both sentiment and subjectivity values, where subjectivity is how factual or opinionated a body of text is written to come across as.

4.3. Sexism Detection

In order to detect sexism in the scraped forum posts, a HuggingFace large language model (LLM) titled "bertweet-large-sexism-detector" was applied [5]. This is a BERT-based LLM fine-tuned on tweets which achieved a 89% accuracy on the Explainable Detection of Online Sexism dataset [21]. Detecting sexism using this model took 80 hours and more RAM than my laptop had available for the 360,000 posts. Therefore, I uploaded the script to Princeton's Adroit computer clusters and scheduled the analysis as a Slurm job [4].

4.4. Exploratory Data Analysis

I wanted to get an understanding of the data that I was working with. As is convention in research working in natural language processing, visualizing the word frequency of my textual data is useful in comparison to other datasets and verification of its reliability. That is, most word frequency graphs of natural language model a similar trend, and so we expect this trend in our data as well.

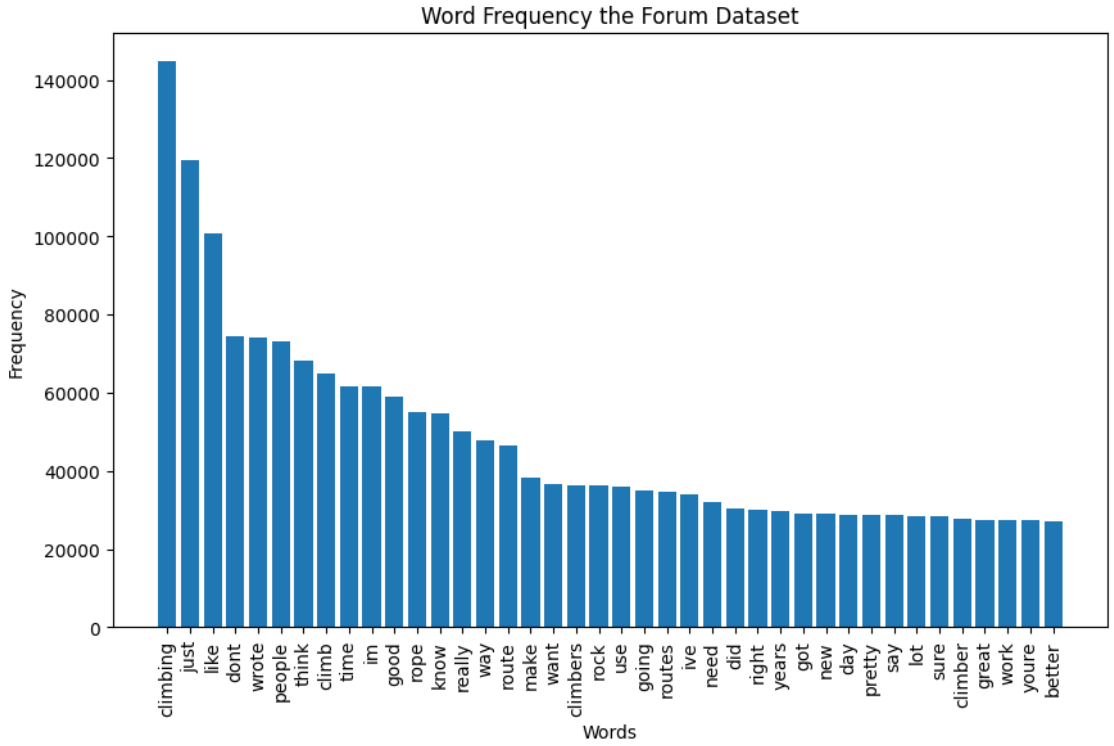

Figure 1: Word frequency graph of the dataset of 360,000 forum posts scraped from mountainproject.com. The top 40 words are shown with stop words removed.

We see in Figure 1 that this expectation is met, with a long tail of infrequent words and a small subset of highly frequent words relevant to the topic of discussion.

I began by looking at the various distributions present in the data. For example, I wanted to see the average like per forum post grouped by the location of the author, shown in Figure 2

Also, because of my interest in how this dataset has changed over time, time series graphs will be very useful in understanding. I visualized how sentiment has changed over time alongside how mountainproject.com has grown in popularity in Figure 3. As will be common throughout this paper, there are only a few posts in the year 2005 and thus the data from this year will often be thrown out as outliers.

Lastly, we've extracted some numerical features from the data that may have some interesting co-linearity. To inspect this quickly we can make a correlation map that compares each of the numerical columns in our dataset to each other. This is shown in Figure 4. We can see that the average sentence length is positively correlated with word count. Notably, subjectivity has a positive

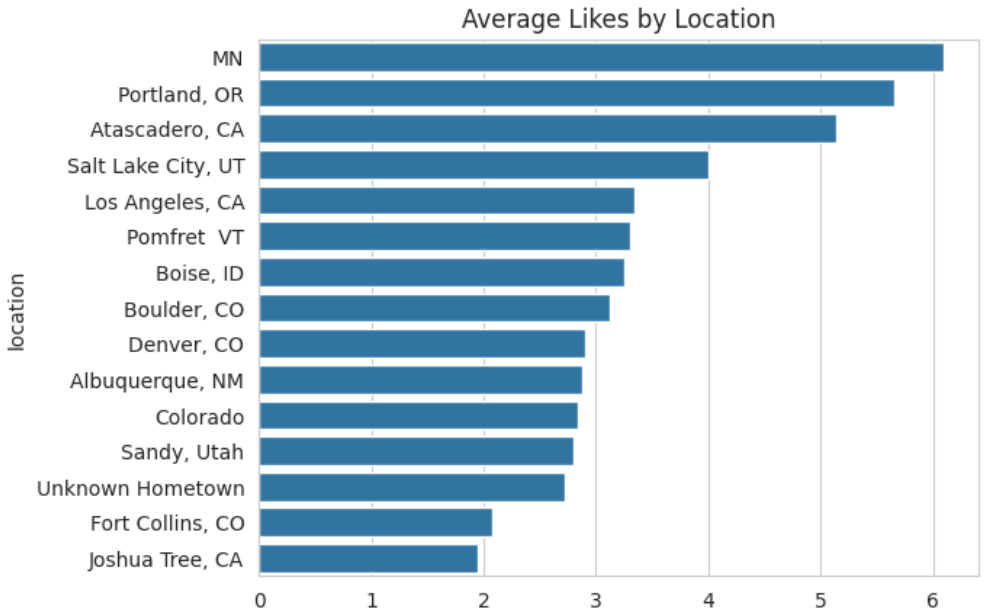

Figure 2: The average number of likes shown broken down by location. The top 15 locations with the highest average likes per post are shown.

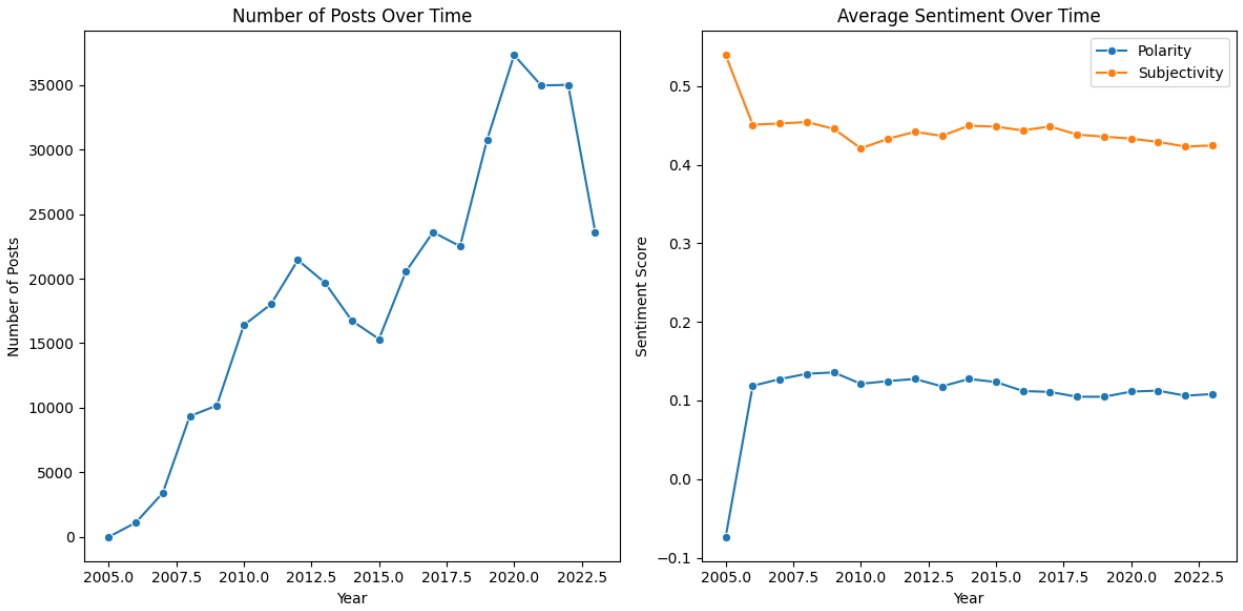

Figure 3: Time series graphs that show the increasing number of posts to mountainproject.com over time on the left and the average sentiment of all posts grouped by year on the right. The outlier of 2005 in sentiment is such because there were a small amount of recorded posts during this time.

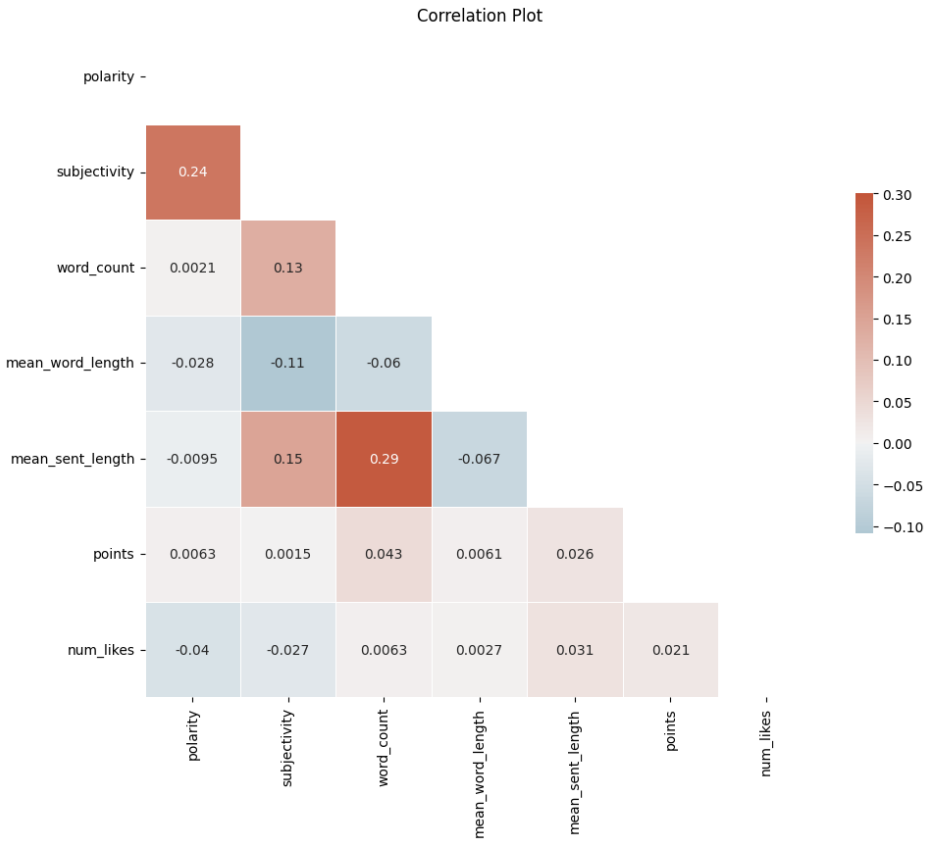

Figure 4: Correlation map of the numerical columns of the forum post data.

correlation with polarity (note: polarity is a synonym for sentiment), word count, and average length of sentence.

4.5. Subset Creation

In order to respond to the questions delineated above, I need to create subsets of data that categorize the forum posts into topics of discussion. First, I'll compile a list of keywords for each topic. Then I will create the subset if either the post body or discussion title includes one of the keywords. For Question 1, I'll refine the data such that I only include forum posts discussing 'route chipping', 'bolt chopping', and 'sport climbing'.

The keywords I used are as follows:

- Keywords for Route Chipping: chip, chipping, chipped, drill, rock modification, manufactured hold, artificial hold, rock alteration, glued holds, gluing
- Keywords for Bolt Chopping / Sport Climbing: Rock climbing evolution, Climbing gear advancements,

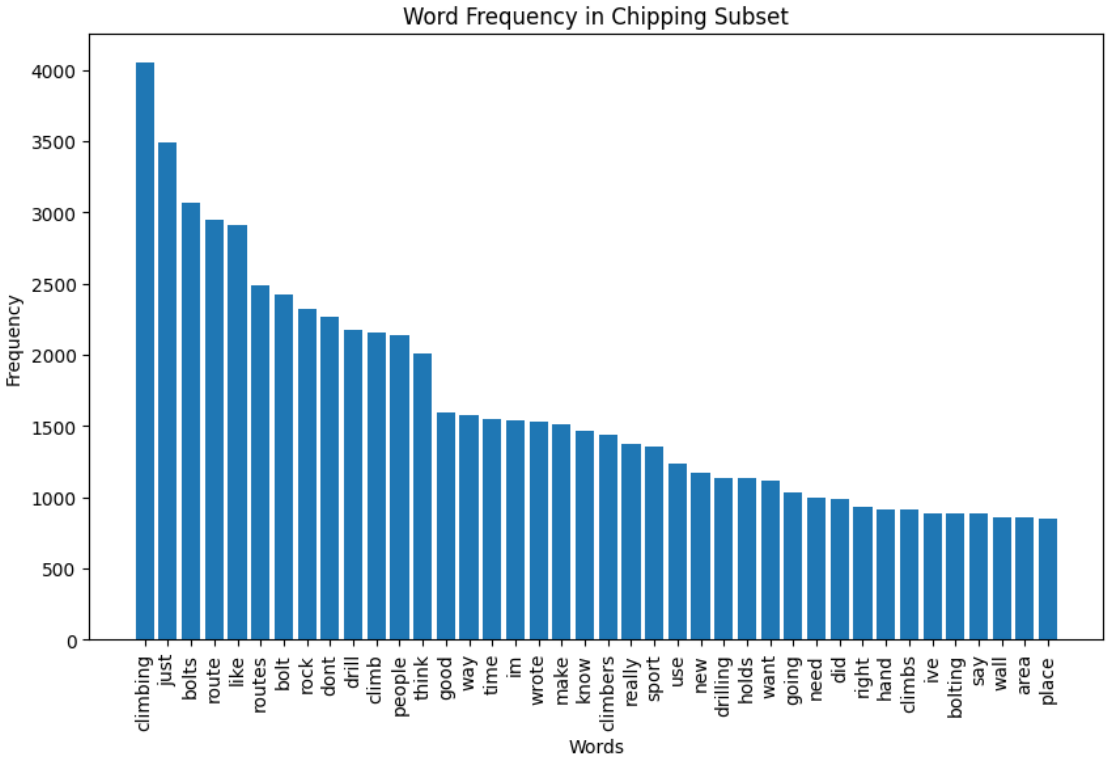

Figure 5: Word frequency graph of the subset of forum posts discussing route chipping. The top 40 words are shown with stop words removed.

Climbing gym growth, Bouldering vs. sport climbing, Climbing community changes, Trad climbers on sport climbing, Traditional ethics, purism, Trad vs. sport, Climbing philosophy, Old-school climbing, Climbing conservation, Climbing tradition, Bolt chopping, retro-bolted, Bolt removal, chopping, chopped, Ethics of bolting, Climbing bolt controversy, Rock climbing preservation, Bolt wars, Climbing route alteration, Bolt debate, Anchor removal

As mentioned before, word frequency maps are very useful in understanding the corpus that we're working with. To ensure that my subsets were reliable and included words that I believe to be relevant to their intended discussions, I inspected the word frequency graphs for the route chipping subset in Figure 5 and the bolt chopping subset in Figure 6.

For Question 3, my keywords are attached in appendix 22. We can inspect the word frequency of this subset about climbing's impact on the environment in Figure 7.

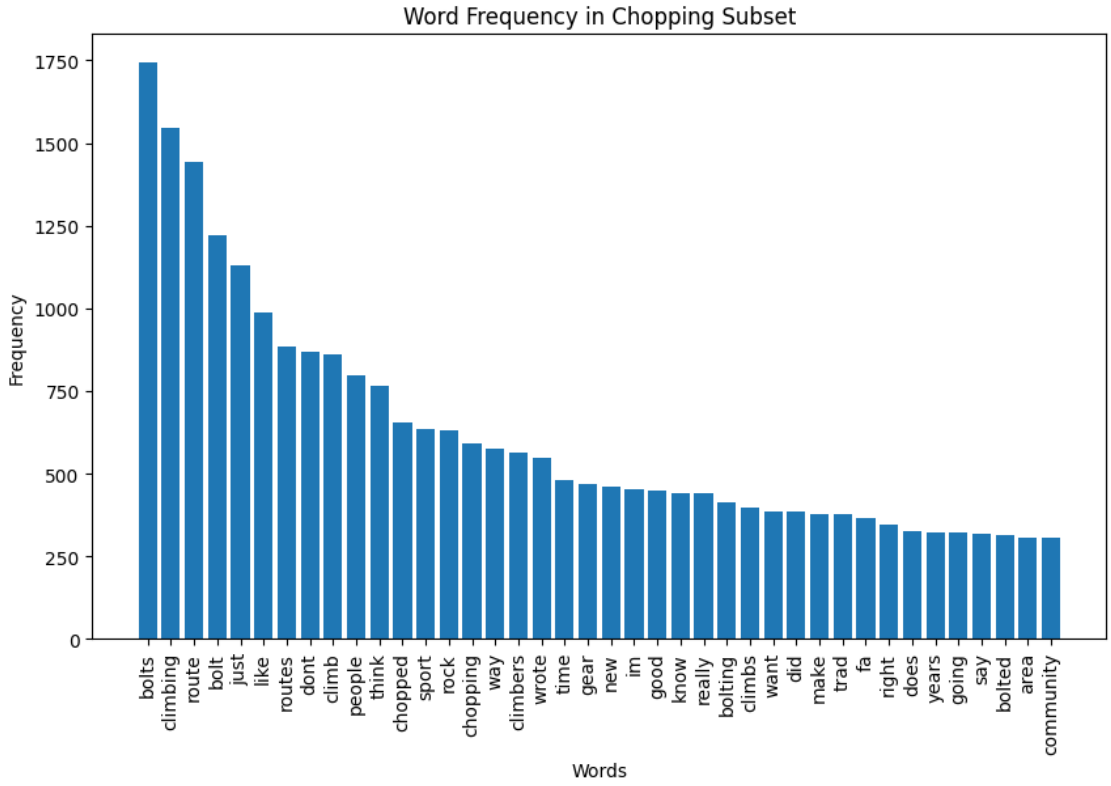

Figure 6: Word frequency graph of the subset of forum posts discussing bolt chopping. The top 40 words are shown with stop words removed.

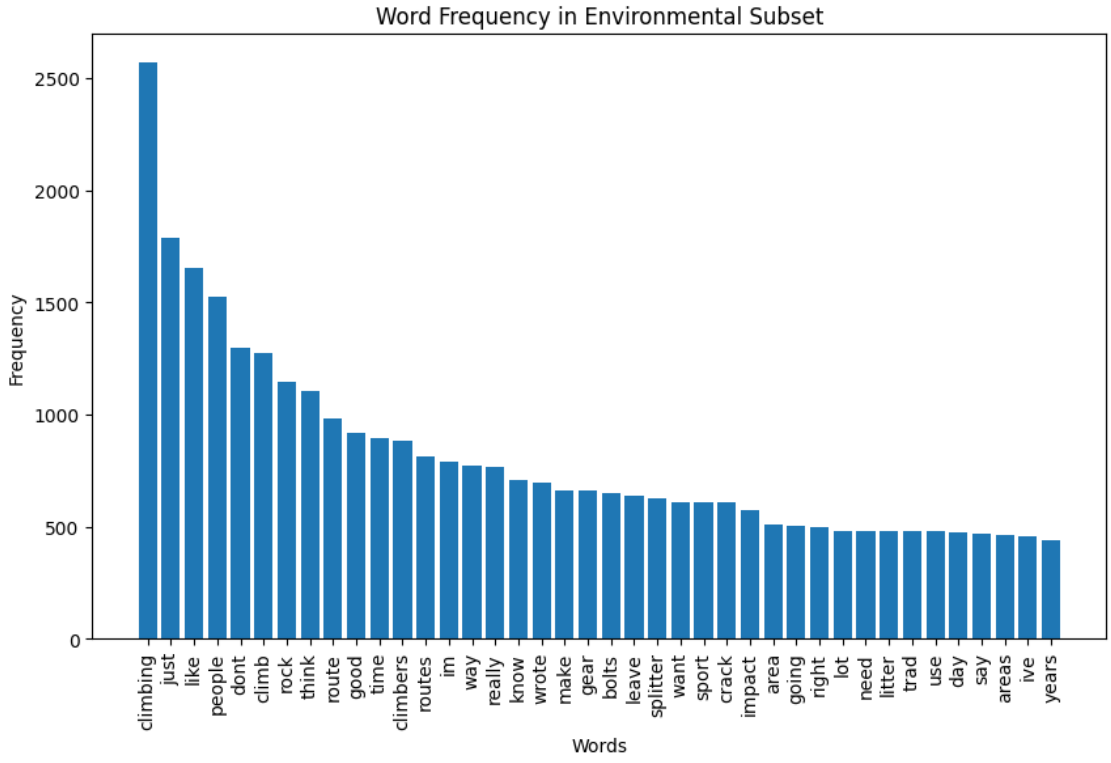

Figure 7: Word frequency graph of the subset of forum posts discussing the environment. The top 40 words are shown with stop words removed.

5. Results & Discussion

In this section I'll explore the direct analysis of the research questions proposed. For each question, we'll explore time series shifts and compare them to proposed hypotheses.

5.1. Question 1: How are new climbing techniques adopted into practice?

As mentioned previously, I'll explore bolt chopping as a means of accepting sport climbing as a new climbing technique. Also, I'll take a look at how discussions about chipping routes have changed over time. My hypothesis is that I expect a downward trend in sentiment and a decrease in the amount of posts documenting bolt chopping. I expect a downward trend in sentiment as I expect the general consensus surrounding such a destructive act will become more negative. This would represent an acceptance of sport climbing, because bolt chopping is directly **against** sport routes, and more negativity towards the destructive act might imply an increase in discussions that support sport climbs and their bolting practices. Also, I expect there to be a decrease in posts regarding bolt chopping which would imply that chopping is happening less often, a trend that would mean an acceptance of sport climbing. To evaluate my hypothesis, I visualized how sentiment has changed year over year in my subset of bolt chopping forum posts in Figure 8.

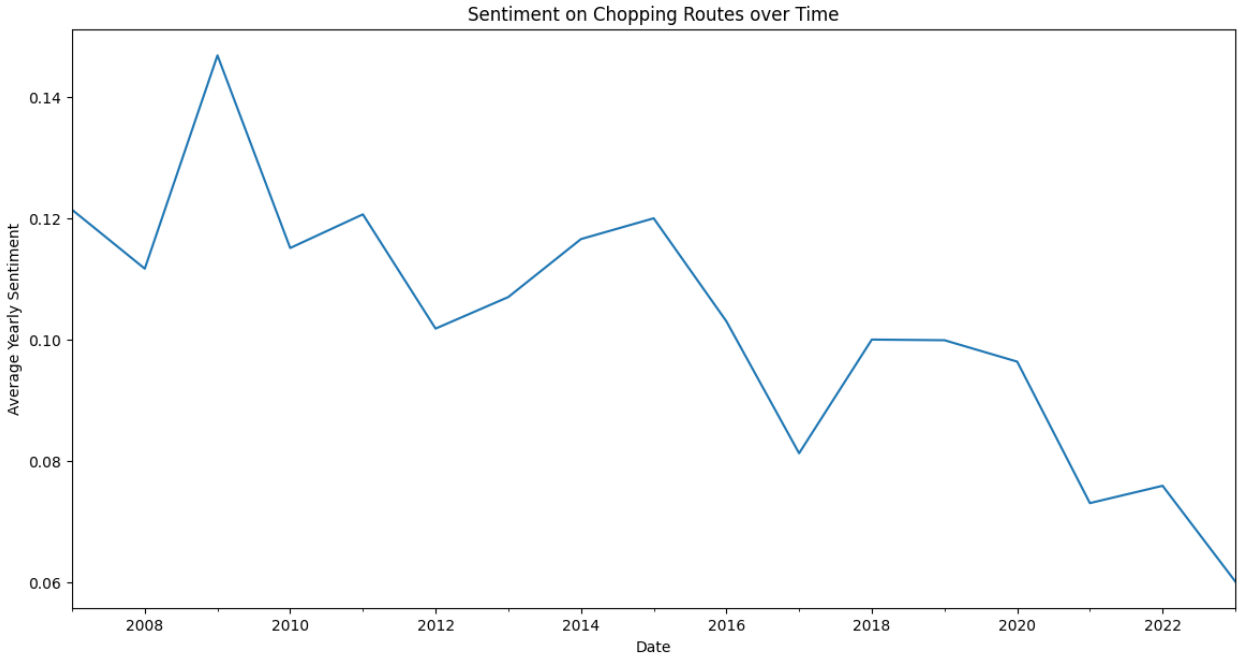

Figure 8: Average sentiment of the forum posts discussing bolt chopping over time. The years 2007 to 2023 are shown.

Our subset only includes one entry for 2006 and thus this year is thrown out. The yearly sentiment on chopping has an average year-over-year slope of '-0.0038'. The sentiment decreases over time which supports my hypothesis. Next we'll look at the distribution of number of posts; however, simply looking at the number of posts would include biases as the total number of posts is increasing over time. Therefore, I'll understand any time-series analysis including a number of posts to calculate it as a proportion of total posts. We can see that the proportion of posts about chopping sees a slight increase with Figure 9. Even though there are some spikes in earlier years, recently we see a consistency in discussion of bolt chopping. This implies the bolt chopping is still a pressing issue and there are climbers who still won't accept sport climbing,

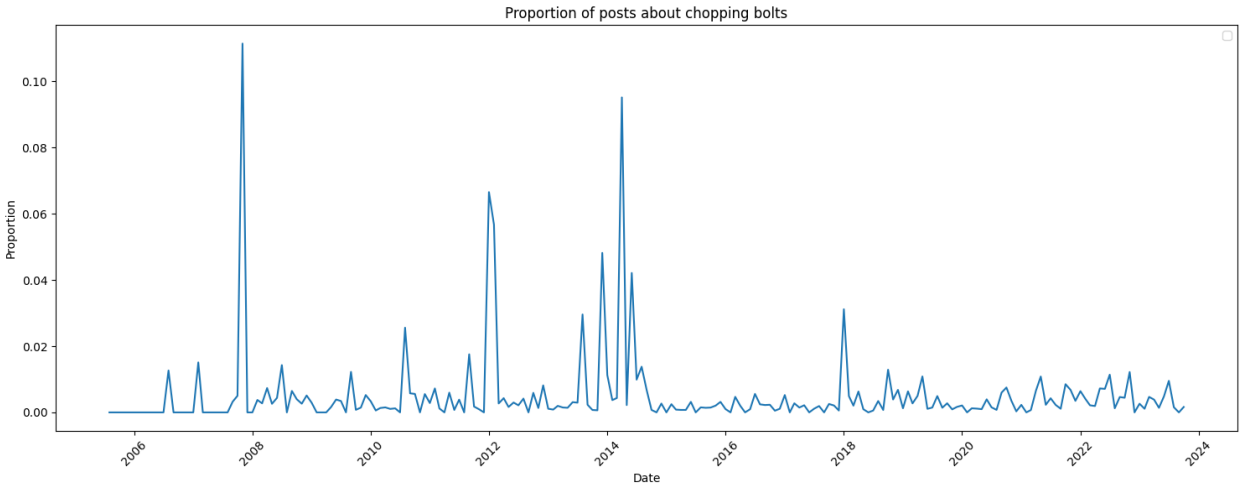

Figure 9: The proportion of posts about bolt chopping submitted to mountainproject.com per month.

As promised, I'll perform identical analysis to the route chipping subset as well. In Figure 10, I see high variation in the early years as those years have only a few (22) posts about chipping and what looks like a steady increase in proportion beginning in the year 2010, with an average proportion increase of %1.4 from this year onward. Additionally, Figure 11 shows that there is no observable trend in sentiment. These results imply that people are discussing route chipping more often, yet there has been no change in general sentiment surrounding the act.

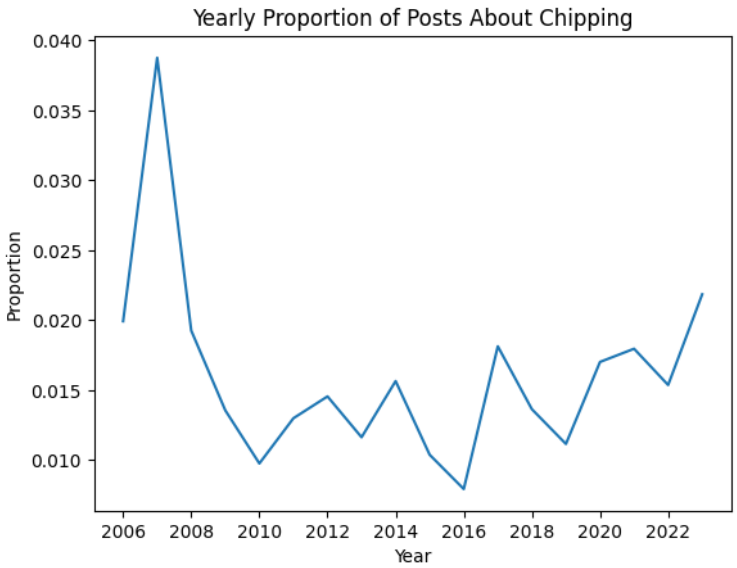

Figure 10: The proportion of posts about route chipping submitted to mountainproject.com per year.

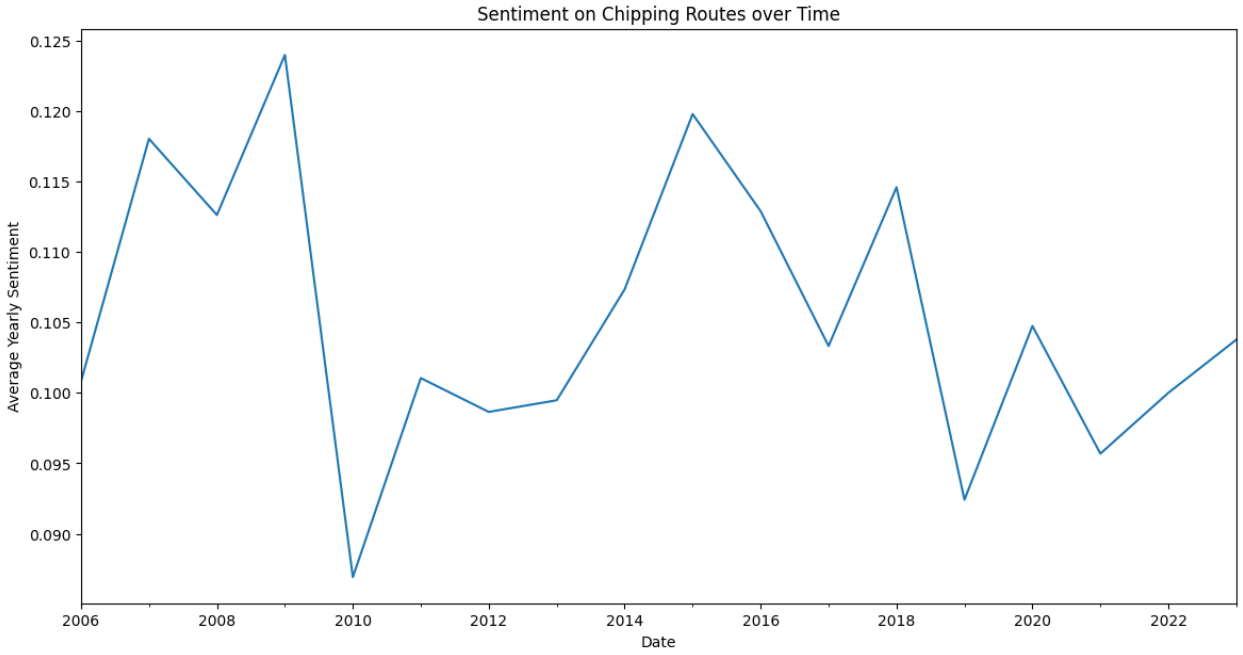

Figure 11: Average yearly sentiment of posts discussing route chipping.

5.2. Question 2: How does difficulty and temperature play into a rock climber's enjoyment of the sport?

I hypothesized in the introduction that climbers may enjoy more difficult climbing routes more than those that are easier. Table 1 shows a breakdown of the collected dataset of ticks. This dataset was grouped in two ways. I categorized the 40 routes that I looked at into difficulties of 'beginner' (5.4 - 5.8), 'intermediate' (5.9, 5.10), and 'advanced' (5.11 - 5.15) as well as sentiments into 'Negative' (<-0.05), 'Neutral', and 'Positive' (>0.05). These categories were selected to attempt to get an even number of comments in each category (33%). We can see in Table 1 the highest percentage of ticks that were positive in sentiment were those that were in the beginner category (80%) and, similarly, the highest percentage of negative ticks were present in the advanced category (10%). Thus, because the harder routes are commented on negatively more often than the easier routes, my hypothesis is not supported.

Also, I wanted to explore if climbers enjoy climbing depending on the temperature of their experience. Because mountainproject.com is primarily and almost exclusively used in the United States, I expect the seasonality of climber enjoyment to reflect the seasons of the U.S. That is, I

difficulty / sentiment	Negative	Neutral	Positive
beginner	7%	13%	**80%**
intermediate	8%	17%	75%
advanced	**10%**	23%	67%

Table 1: Breakdown of the sentiment categories of submitted ticks, grouped by difficulty of route.

expect sentiment to increase in the warmer months of the summer (May-Aug) and decrease during the winter (Oct-Mar). Because I want to look at the enjoyment of climbing experiences rather than the climbing community sentiment overall, I used my dataset of 7,502 collected comments for 40 popular climbs, 20 in Red River Gorge, Kentucky and 20 in Yosemite, California. Figure 12 shows the monthly average climber sentiment in my dataset of comments. We can see a max positivity in July and minimum in January, which supports the hypothesis; however, besides this there is no observable trend. As an extension, I wanted to see if the trends of sentiment between months was similar year-over-year. Figure 13 shows this. We can see that between the months of June-July and January-February, almost every average sentiment increased. The consistency year over year trends implies a seasonality which supports my hypothesis.

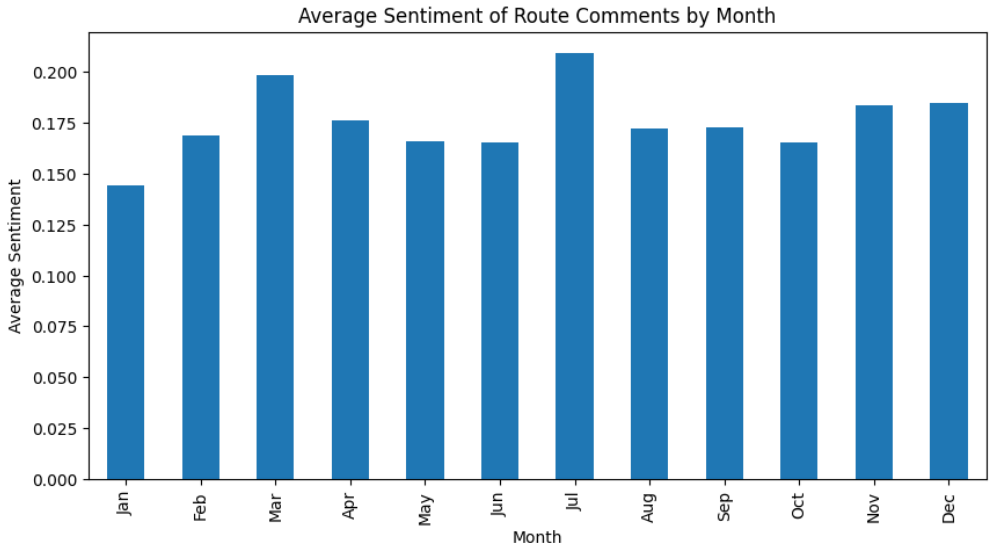

Figure 12: Average sentiment of route comments grouped by the month that they were submitted.

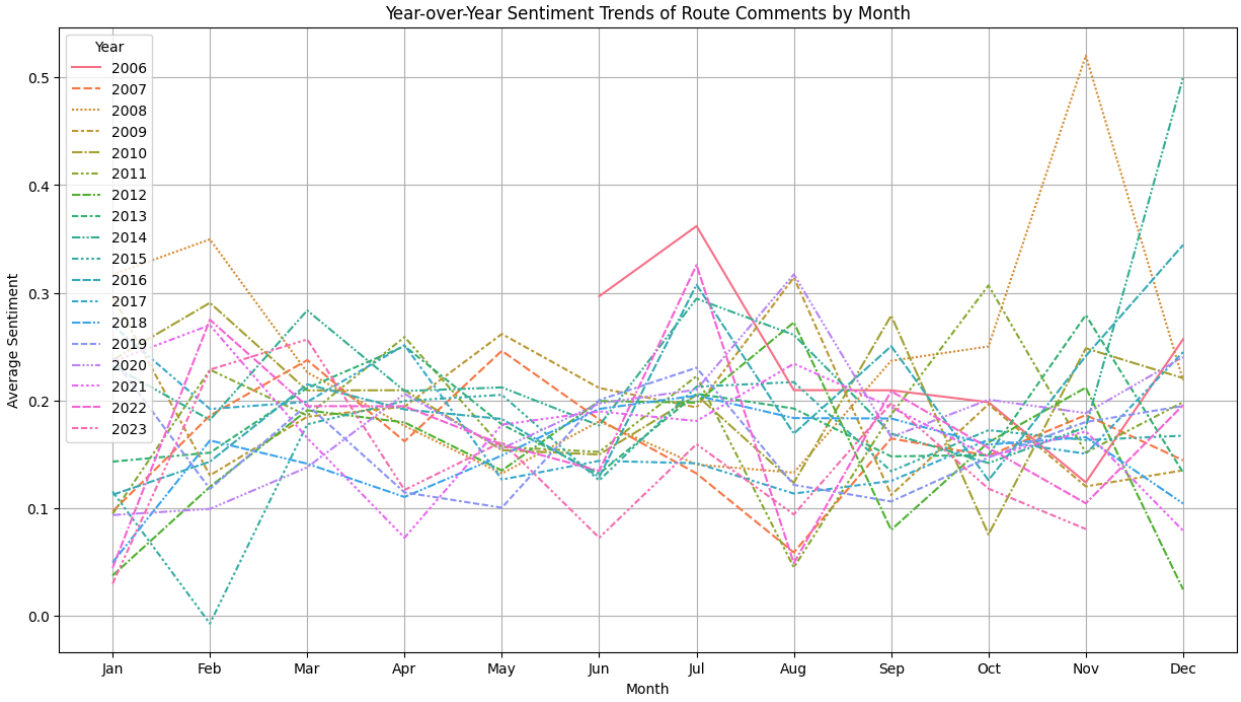

Figure 13: The trend in sentiment of route comments shown for each year. 2005 is not included because of the minimal number of comments submitted.

5.3. Question 3: Have climbers become more cognizant of their environmental impact?

My hypothesis is that I expect an increase in the proportion of posts and a decrease in sentiment of discussions regarding rock climbing's impact on the environment. I form my hypothesis on the basis that people are discussing environmental issues more often and with more seriousness. The increase in proportions will show how often discussions occur and the decrease in sentiment will imply a heightened seriousness. Similarly to the results of Question 1, I will evaluate my hypothesis by inspect the trend of the proportion of posts as well as yearly sentiment of posts.

Figure 14 shows a sharp decrease in 2005-2007 and a consistent increase from the year 2017 onward in proportion of posts evaluated yearly; however, any overarching trends are lost as the proportion of posts is mostly variable. Figure 15 shows the average sentiment grouped yearly and does not visually seem to have any general trend. In this way, my hypotheses is not supported.

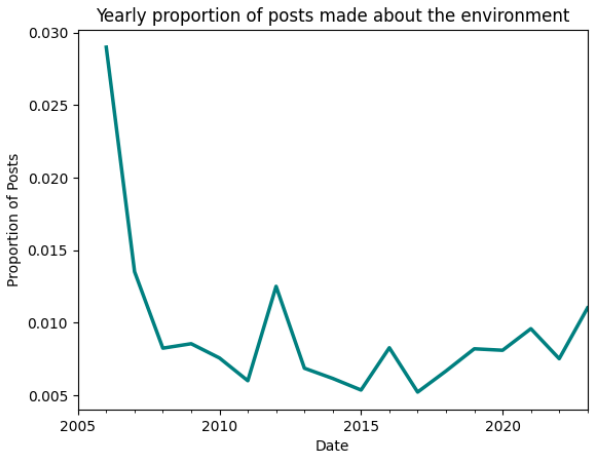

Figure 14: Yearly proportion of posts discussing the environment.

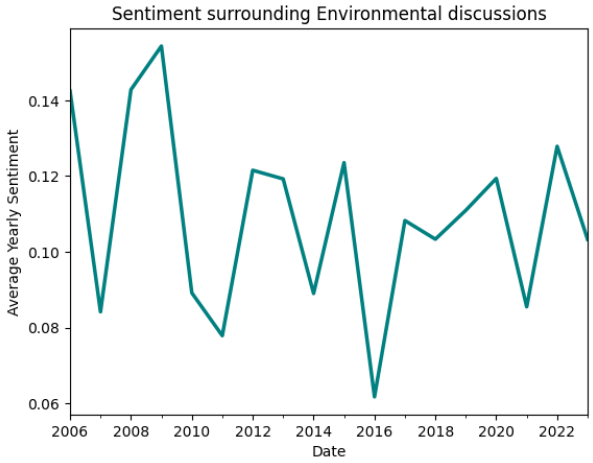

Figure 15: Average yearly sentiment of posts discussing the environment.

5.4. Question 4: How has sexism in the community changed over time?

My hypothesis is that sexism in the climbing community follows global trends of increasing awareness. That is, I expect that sexism in the climbing community occur less frequently over time. After applying the misogyny detection LLM to the dataset of forum posts, we end up with 350,000 posts being labeled as 'not sexist' and 2,500 as 'sexist'. Let's first look at how the proportion of sexism has changed over time in Figure 16. Here we exclude the years of 2005-2006 because only 3 sexist posts were detected. We can see a downward trend in the proportion of detected sexism, supporting my hypothesis.

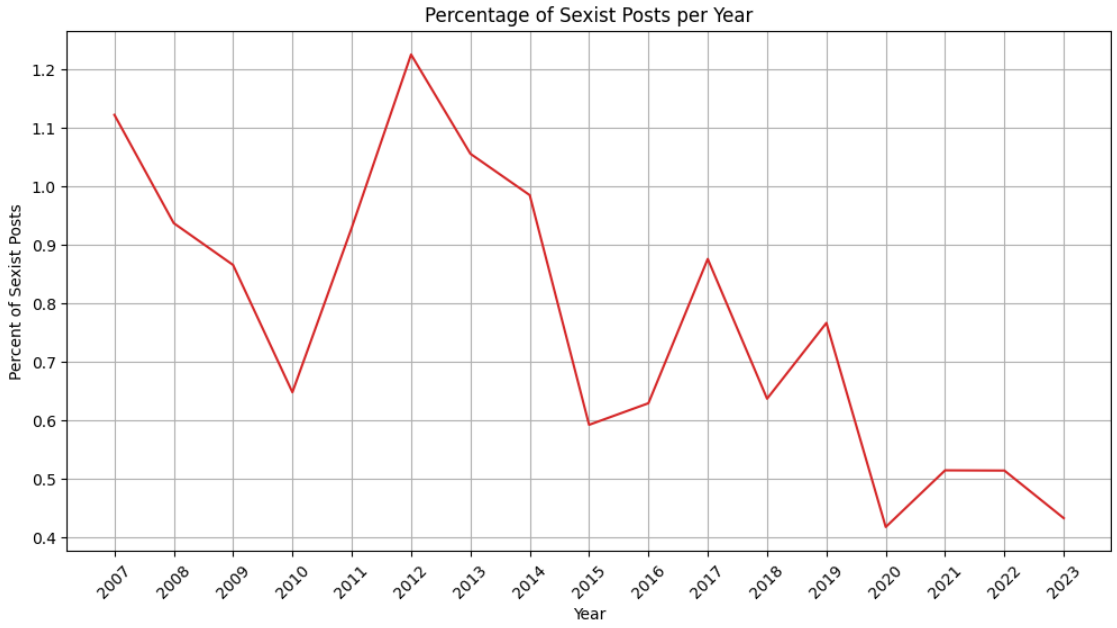

Figure 16: Yearly percentage of posts detected to be sexist.

A sexism detection rate of 0.7% offers only a small amount of data to work with; however, we can focus on moments in history where sexism may have spiked during discussions that are more relevant to gender to better grasp how sexism has changed. That is, I want to see how the proportion of sexism changes before and after notable achievements occur by women. For this I will focus on five historic events: Sasha DiGiulian's ascent of Pure Imagination, Sasha DiGiulian's ascent of Bella Vista, Ashima Shiraishi's ascent of Horizon, Margo Hayes' La Rambla ascent, and Anak Verhoven and Angy Eiter's ascents occuring in September of 2017. To inspect these events, I visualize a sliding window of proportions of sexist posts 180 days before and after the event. Figure 17 shows this visualization for Sasha DiGiulian's first influential ascent. The additional 4 visualizations are attached in the appendix.

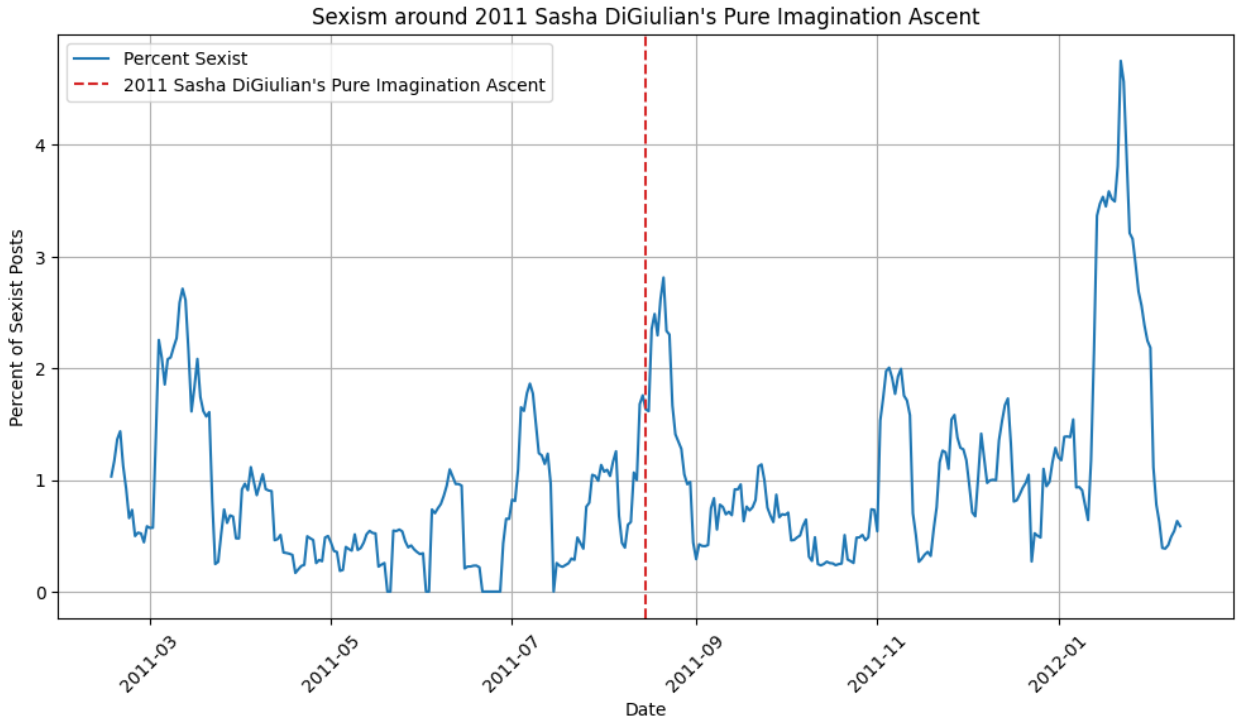

Figure 17: Visualization of the proportion of sexist posts surrounding Sasha DiGiulian's Pure Imagination Ascent.

These visualizations aren't enough to make any evaluations of my hypothesis. To evaluate if there is a statistically significant increase in misogyny after the event occurs, I employ a t-test. Here we evaluate the 28 days of rolling window mean proportion of sexism before (Pre-Event) and after (Post-Event) to see if there was a significant shift. The results of the test are provided in Table 2. The conventional p value of 0.05 is used, and thus we can see two moments of statistical significance. Sasha DiGiulian's 2011 ascent saw a increase in sexism while Margo Hayes' 2017 ascent saw a decrease in sexism after their events occurred.

Because of such a small sample size, it is difficult to confirm whether the events themselves influenced the influx in misogyny; however, it is interesting to hypothesize that the more modern event of 2017 may have decreased sexism as uplifting notable achievements by women becomes the norm.

Event	Date	Pre-Event	Post-Event	t_statistic	p_value
2011 Sasha DiGiulian's Pure Imagination Ascent	2011-08-15	0.597	1.317	-1.980	0.048
2013 Sasha DiGiulian's Bellavista Ascent	2013-08-14	0.994	0.687	0.854	0.393
2016 Ashima Shiraishi's Horizon Ascent	2016-03-22	0.050	0.000	1.000	0.317
2017 Margo Hayes' La Rambla Ascent	2017-02-01	1.245	0.149	4.007	0.000063
Post-Sept 2017 Anak Verhouven and Angy Eiter A...	2017-09-30	1.189	1.466	-0.885	0.376

Table 2: T-tests for the rolling window proportion of sexist posts before and after notable achievements by women.

6. Conclusions

This research paper explored the evolving practices, ethics, and attitudes within the rock climbing community, leveraging a wealth of data from online forums. The findings provide a broader understanding of the complex relationships at play between climbing practices, environmental awareness, and community dynamics.

6.1. Insights and Implications

1. **Adoption of New Climbing Techniques:** The data suggests a gradual acceptance of sport climbing. The decreasing sentiment towards bolt chopping, coupled with ongoing discussions, indicates a community that challenges but eventually accepts new techniques. Additionally, the gradual increase in conversations about route chipping reflects a community actively engaged in ethical debates.
2. **Climber Enjoyment and Difficulty:** Contrary to the initial hypothesis, the data reveals that climbers express more negative sentiments towards advanced routes, suggesting that higher difficulty does not necessarily equate to greater enjoyment. This finding challenges the notion that greater challenge brings greater satisfaction in climbing.
3. **Environmental Awareness:** The varied trends in discussions about environmental impact do not allow a broad implication; however, the consistent increase in environmental discussions from 2017 onward could continue upwards and ensure climbers discuss the environment first among any concerns.
4. **Sexism in Climbing:** The analysis finds a general decrease in sexist posts. Also, the statistically

significant shifts in detected sexism before and after notable female ascents may indicate a community that follows broader societal changes regarding greater gender equality and a reduction in online misogyny.

6.2. Limitations and Future Research

My research is not without limitations. The reliance on online forum data may not fully capture the breadth of opinions within the climbing community as discussions may be informative or practical-oriented. That is, posts are often made by people trying to find a climbing partner or trade gear – conversations that may not contribute to any intricate understanding of the climbing community. Additionally, the LLM used to detect sexism was fine-tuned on a dataset of tweets. These tweets may not correctly embody a forum post submitted to mountain project and thus the misogyny detection algorithm may not be perfectly reliable.

In addition to fixing the limitations mentioned above, future research could focus on:

- Further exploration of misogyny in the climbing community by following its trends in route names or descriptions.
- Expanding the scope to include other online platforms.
- Data that includes years prior to 2005.
- Comparative studies across different outdoor sports communities for an understanding placed in a global context.

6.3. Final Thoughts

This research highlights the evolving nature of the climbing community, reflecting wider societal trends in how we think about the environment, gender issues, and the balance between tradition and innovation. As rock climbing continues to grow in popularity, understanding these dynamics becomes crucial not only for the community itself but also for broader conversations around sport, culture, and environmental ethics.

A. Appendix

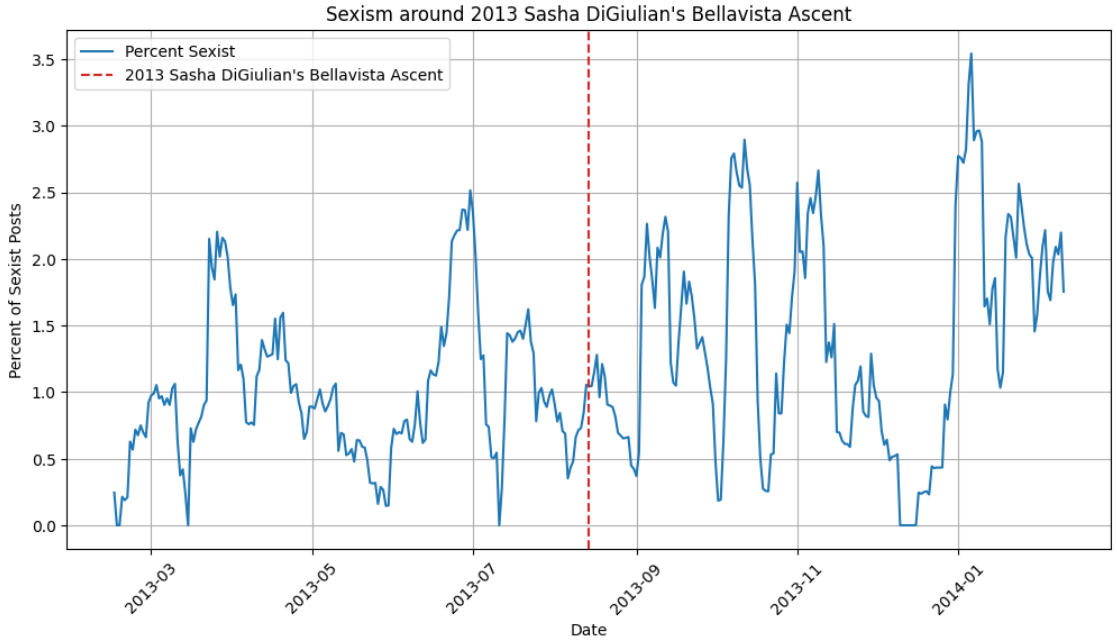

Figure 18: Visualization of the proportion of sexist posts surrounding Sasha DiGiulian's Bellavista Ascent.

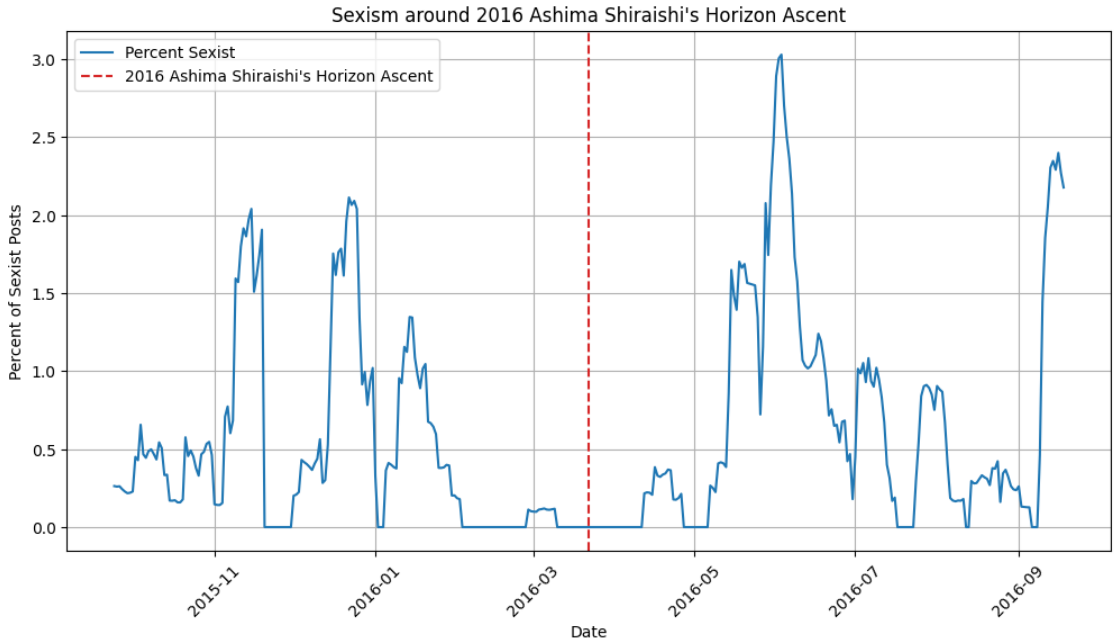

Figure 19: Visualization of the proportion of sexist posts surrounding Ashima Shiraishi's Horizon Ascent.

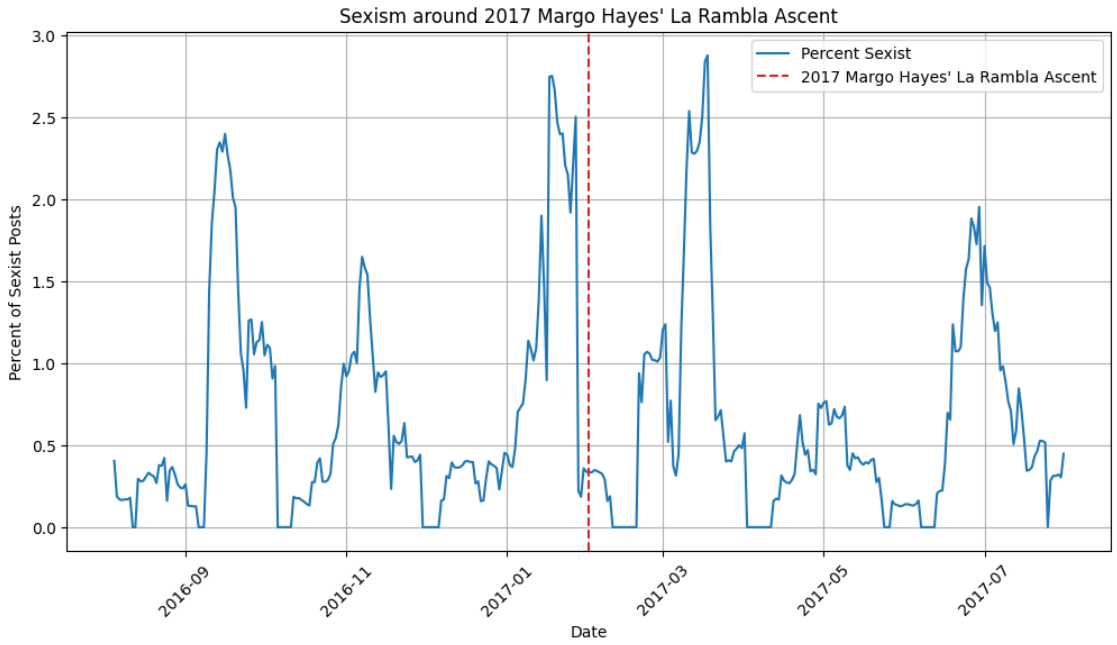

Figure 20: Visualization of the proportion of sexist posts surrounding Margo Hayes' La Rambla Ascent.

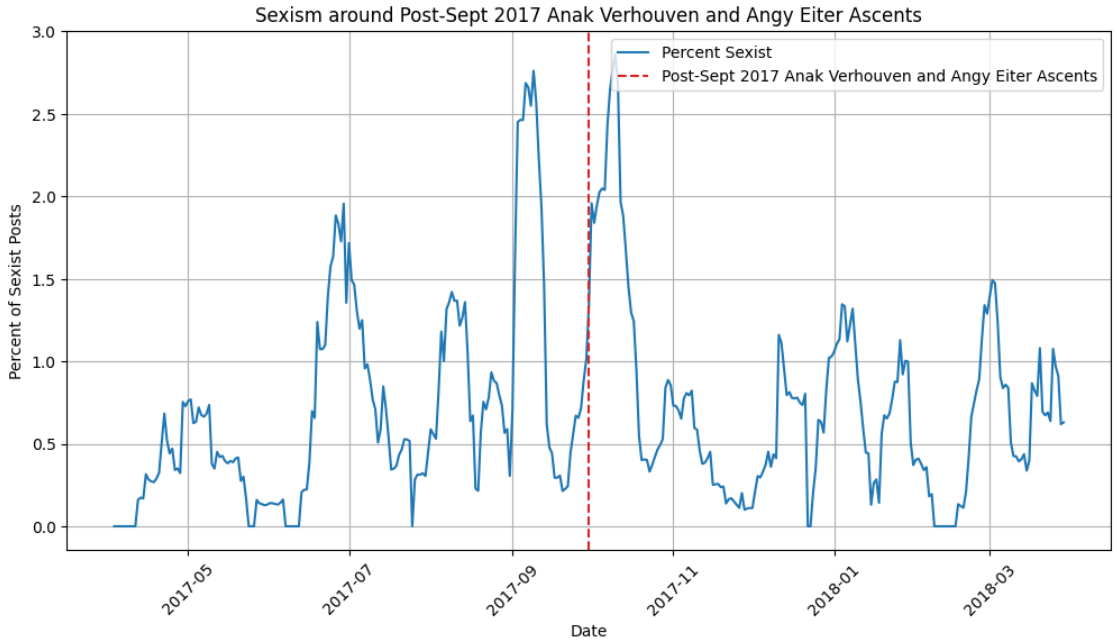

Figure 21: Visualization of the proportion of sexist posts surrounding Anak Verhouven and Angy Eiter Ascent's after September 2017.

```
environmental impact
environmental impact of climbing
environmental impact of rock climbing
environmental impact of bouldering
environmental impact of sport climbing
environmental impact of trad climbing
environmental impact of climbing gyms
environmental impact of climbing walls
environmental impact of climbing holds
environmental impact of chalk
environmental impact of climbing shoes
environmental impact of climbing gear
environmental impact of climbing equipment
environmental impact of climbing ropes
environmental impact of climbing harnesses
environmental impact of climbing cams
environmental impact of climbing nuts
environmental impact of climbing bolts
environmental impact of climbing anchors
leave no trace
route cleaning
gardening
litter
left a trace
ethics of trundling
trundling
```

Figure 22: The list of keywords used in creating the subset of discussions regarding the environment.

This paper represents my works in accordance with university policy. /s/ Tyler Benson

References

[1] "TextBlob: Simplified Text Processing — TextBlob 0.16.0 documentation," Jan. 2021, [Online; accessed 6. Jan. 2024]. [Online]. Available: https://textblob.readthedocs.io/en/dev

[2] "climbing-analysis," Dec. 2023, [Online; accessed 30. Dec. 2023]. [Online]. Available: https://github.com/tybens/climbing-analysis

[3] "Rock Climbing Guides: Routes, Photos & Forum | Mountain Project," Dec. 2023, [Online; accessed 29. Dec. 2023]. [Online]. Available: https://www.mountainproject.com

[4] "Adroit," Jan. 2024, [Online; accessed 6. Jan. 2024]. [Online]. Available: https://researchcomputing.princeton.edu/systems/adroit

[5] "NLP-LTU/bertweet-large-sexism-detector · Hugging Face," Jan. 2024, [Online; accessed 6. Jan. 2024]. [Online]. Available: https://huggingface.co/NLP-LTU/bertweet-large-sexism-detector

[6] M. D. Adams and K. Zaniewski, "Effects of recreational rock climbing and environmental variation on a sandstone cliff-face lichen community," *Botany*, vol. 90, no. 4, pp. 253–259, 2012. Available: https://doi.org/10.1139/b11-109

[7] M. A. Bashar *et al.*, "Misogynistic tweet detection: Modelling cnn with small datasets," in *Data Mining*, R. Islam *et al.*, Eds. Singapore: Springer Singapore, 2019, pp. 3–16.

[8] L. M. Bogardus, "The Bolt Wars: A Social Worlds Perspective on Rock Climbing and Intragroup Conflict," *Journal of Contemporary Ethnography*, vol. 41, no. 3, pp. 283–308, Dec. 2011.

[9] L. N. Breitwieser and J. B. Scott, "Femininity, body size, and (mis)fitting in rock climbing culture," *Fat Studies*, vol. 12, no. 1, pp. 149–161, 2023. Available: https://doi.org/10.1080/21604851.2021.2006959

[10] R. F. Camoletto and D. Marcelli, "Keeping it natural? challenging indoorization in italian rock climbing," *Annals of Leisure Research*, vol. 23, no. 1, pp. 34–51, 2020. Available: https://doi.org/10.1080/11745398.2018.1561307

[11] Contributors to Wikimedia projects, "Sport climbing - Wikipedia," Dec. 2023, [Online; accessed 23. Dec. 2023]. Available: https://en.wikipedia.org/w/index.php?title=Sport_climbing&oldid=1187983630

[12] P. Couper and S. Porter, ""environmental awareness" and rock climbing: changing pedagogies to enhance pro-environmental graduate attributes," *Journal of Geography in Higher Education*, vol. 40, no. 2, pp. 207–221, 2016. Available: https://doi.org/10.1080/03098265.2016.1141187

[13] S. Dawn, "Jtree bolting pressure cooker," https://www.commonclimber.com, accessed: 2023-11-30.

[14] S. Dawn, "Where's the line between chipping and cleaning?" https://www.climbing.com/places/survey-chipping-holds-rock-climbs/, Jun. 2023, accessed: 2023-11-30.

[15] J. Erickson, "Cleaning up climbing history. the truth behind 13 pivotal ascents and events," https://www.climbing.com/people/cleaning-up-climbing-history/, Jul. 2022, accessed: 2023-11-30.

[16] T. Farrell *et al.*, "Exploring misogyny across the manosphere in reddit," in *Proceedings of the 10th ACM Conference on Web Science*, ser. WebSci '19. New York, NY, USA: Association for Computing Machinery, 2019, p. 87–96. Available: https://doi.org/10.1145/3292522.3326045

[17] I. Heywood, "Urgent dreams: climbing, rationalization and ambivalence," *Leisure Studies*, vol. 13, no. 3, pp. 179–194, 1994. Available: https://doi.org/10.1080/02614369400390131

[18] I. Heywood, "Climbing monsters: Excess and restraint in contemporary rock climbing," *Leisure Studies*, vol. 25, no. 4, pp. 455–467, 2006. Available: https://doi.org/10.1080/02614360500333911

[19] D. Holland-Smith, "Social capital, social media and the changing patterns of participation in climbing," *Sport in Society*, vol. 20, no. 9, pp. 1101–1117, 2017. Available: https://doi.org/10.1080/17430437.2016.1269078

[20] J. Kiewa, "Traditional climbing: metaphor of resistance or metanarrative of oppression?" *Leisure Studies*, vol. 21, no. 2, pp. 145–161, 2002. Available: https://doi.org/10.1080/02614360210158605

[21] H. R. Kirk *et al.*, "SemEval-2023 Task 10: Explainable Detection of Online Sexism," *arXiv*, Mar. 2023.

[22] C. Kulczycki, "Place meanings and rock climbing in outdoor settings," *Journal of Outdoor Recreation and Tourism*, vol. 7-8, pp. 8–15, 2014. Available: https://www.sciencedirect.com/science/article/pii/S2213078014000267

[23] T. Langseth and O. Salvesen, "Rock climbing, risk, and recognition," *Frontiers in Psychology*, vol. 9, 2018. Available: https://www.frontiersin.org/articles/10.3389/fpsyg.2018.01793

[24] B. Leader, *THE RED 2nd Edition: Comprehensive Sport Climbing Crags*, 2nd ed. Onsight Photography and Publishing, 2022.

[25] M. Maitland, "Injuries associated with rock climbing," *Journal of Orthopaedic & Sports Physical Therapy*, vol. 16, no. 2, pp. 68–73, 1992, pMID: 18780992. Available: https://doi.org/10.2519/jospt.1992.16.2.68

[26] Planetmountain, "Cerro torre: the bolt chopping and its history as seen through the eyes of mario conti," https://www.planetmountain.com/en/news/alpinism/cerro-torre-the-bolt-chopping-and-its-history-as-seen-through-the-eyes-of-mario-conti.html, Feb. 2012, accessed: 2023-11-30.
[27] S. A. Potgieter, "Exploring rock climbing discourses," Ph.D. dissertation, University of Pretoria, 2006.
[28] J. M. Rickly, "Lifestyle mobilities: A politics of lifestyle rock climbing," *Mobilities*, vol. 11, no. 2, pp. 243–263, 2016. Available: https://doi.org/10.1080/17450101.2014.977667
[29] J. M. Rickly, ""they all have a different vibe": A rhythmanalysis of climbing mobilities and the red river gorge as place," *Tourist Studies*, vol. 17, no. 3, pp. 223–244, 2017. Available: https://doi.org/10.1177/1468797617717637
[30] M. Ritter, "Generating rock climbing route descriptions with ml (gpt-2)," https://www.mattritter.me/?p=267, Oct. 2020, accessed: 2023-11-30.
[31] M. Ritter, "Understanding rock climbers with data (part 1)," https://www.mattritter.me/?p=209, Aug. 2020, accessed: 2023-12-06.
[32] M. Ritter, "Understanding rock climbers with data (part 2)," https://www.mattritter.me/?p=209, Aug. 2020, accessed: 2023-12-06.
[33] V. Robinson, "Everyday masculinities and extreme sport: Male identity and rock climbing," Berg, 2008, accessed: 2023-11-30.
[34] L. Roman, "Boulders handstands: Web apis natural language processing," https://medium.com/thoughtful-data-science/rocks-namaste-api-webscraping-natural-language-processing-5131c3889bbe, Sep. 2018, accessed: 2023-11-30.
[35] W. D. Shaw and P. Jakus, "Travel cost models of the demand for rock climbing," *Agricultural and Resource Economics Review*, vol. 25, no. 2, p. 133–142, 1996.