



Feminism Discussion on Twitter after Death of Hugh Hefner

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Abstract

Hugh Hefner - owner of the Playboy magazine and mansion - died in September 2017. His death drew a lot of media attention, since his lifestyle, values, legacy and role in society were highly controversial. While some saw him as a feminist and pioneer of female liberation, others believe that he contributed to the objectification of women by selling them as products.

As a popular micro-blogging platform, Twitter provides a way to gain direct feedback from society and allows an estimation of the public response to events.

This project provides quantitative and qualitative analysis of the data collection streamed from Twitter in the 10 days after his death. After filtering, the set contained about 460K Tweets related to Hugh Hefner. Using sampling and annotation techniques to get stance labels, it was possible to estimate that the majority of tweets, as well as users in the set had negative stances towards Hefner. The analysis also includes popular topics discussed in relation to his lifestyle and death. The focus of this analysis lays on the opinion of feminist accounts and the main topics distinguishing Tweets supporting Hugh Hefner from those who criticize him.

Acknowledgements

Instead of thanking anyone but myself for manually annotating approximately 3000 tweets in various languages (#oof my mistake), I want to share something more fun:

When I was looking for readings and I came across Jon Ronson's book "So you've been publicly shamed" (which then someone recommended to me again, later) and felt that it was relevant to this research, so I borrowed it from the library and carried it around for any potential 'breaks' I might want to spend reading for 'fun'. While I still need to actually read it (and we all know that won't happen before April 4th #lmao), I opened it on one of the initial pages and my suspicions were confirmed:

"We've built Jon his very own infomorph", he wrote. "You can follow him on Twitter here: @jon_ronson."

'Oh, so it's some kind of spambot', I thought. 'OK. This will be fine. Luke Robert Mason must have thought I would like the spambot. When he finds out that I don't he'll remove it.'

So I tweeted him: 'Hi!! Will you take down your spam bot please?'

Ten minutes passed. Then he replied, 'We prefer the term infomorph.'

I frowned. 'But it's taken my identity', I wrote. 'The infomorph isn't taking your identity', he wrote back. 'It is repurposing social media data into an infomorphic aesthetic'.

I felt tightness in my chest.

'#woohoo damn, I'm in the mood for a tidy plate of onion grill with crusty bread. #foodie', @jon_ronson tweeted.

I was at war with a robot version of myself." - [Ronson, 2015: p. 2]

I am currently debating whether it would be correct or ridiculous to cite this properly and include the reference in my bibliography. Google, how do I cite my acknowledgements? I wouldn't want you to think I'm sloppy! #relatable

Furthermore, I think I annoyed some of my friends with my increased obsession of Twitter, feminism and - more exotically - Hugh Hefner (so #sorrynotsorry about that I guess, thanks for internalizing your frustration). Messenger (Facebook) has a new filter when you take pictures that makes you into a bunny and even that reminded me of THIS #triggered and all the questionable content I came across when examining some of the tweets. (#haha. Yes. What you think is probably right.)

Lastly, I somewhat regret not going through with naming a chapter 'Finding the master of #clout' #smh.

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Chapter 1

Introduction

The death of Playboy founder Hugh Hefner on September 27, 2017 [4] prompted a large media response, including Twitter, a popular micro-blogging social networking site. While a large part of the responses neutrally report Hefners death or related events, a significant number of tweets supports or attacks Hefner and his legacy, often with underlying feminist themes and arguments.

The controversy around Hefner stems from his significant influence on the sexual revolution of the 1960s, a very liberal mindset and a complicated relationship with feminism: While he normalized female sexuality, supported abortion rights and funded research on sexuality, others argue that his business promoted the objectification and mistreatment of women [22]. The large media response to his death can be attributed to Hefner's celebrity status resulting from the success of Playboy as magazine and brand and his association with Hollywood, as he collaborated with a variety of famous actors, actresses and musicians [3].

In this paper, I report the results of a quantitative and qualitative analysis of the data collected from Twitter in the days following his death. The initial collection contained ca. 460K Tweets that were streamed between September 29th and October 9th using the search term 'Hefner'.

A small sample of tweets, those with the largest amount of retweets in the set, was manually annotated with a stance towards Hefner. By propagating the stance to associated retweets and assigning stances to users based on their tweet's stances, almost 70% of tweets and 73% of users in the set could be tagged. Furthermore, the Twitter timelines and profile description of these users was collected to detect whether the profile was feminist or frequently tweets about feminism.

In this report I present the results of the quantitative and qualitative analysis based on the collected data on tweet level and user level: The results indicate that in the given collection, the majority of tweets were criticizing Hefner and Playboy, many of which had underlying feminist arguments. This trend was reflected in user stances, however there was a small set of users that were identified as feminist and tweeted in support of Hefner. The report includes case studies of two users in this set: Christina Sommers, a pro-sex feminist with a verified, active and well followed Twitter account and podcast, as well as Cooper Hefner, the son of Hugh Hefner and current owner of Playboy. On

tweet level, the most popular 'viral' tweets in the set could be found and central topics of the Twitter discussion were extracted to illustrate the discussion around the death of Hugh Hefner and popular arguments that users brought up in relation to feminism.

1.1 Overview

In this section, I will give a brief overview of the project goals, my contributions in terms of tasks that were performed in order to meet the goals, the approach, the motivation for this project and relevance of its results, as well as a short outline of each section in this report.

1.1.1 Project goals and tasks

This project aims to provide a full report on the discussions on Twitter after the death of Hugh Hefner.

These are the project goals with associated tasks:

- Detect if a tweet expresses a positive or negative stance towards Hefner (stance analysis)
 - Extend cut-off tweet text to full text where possible
 - Sampling relevant subset of tweets
 - Manual annotation of sub-set of tweets
 - Label propagation from annotated tweets to re-tweets
- Find the most viral (i.e. popular) tweets in the set
 - Sort tweets by in-Set re-tweets
 - Extract top 5 tweets overall and per stance
- Identify feminist accounts and find their stance towards Hefner
 - Identify user stances towards Hefner based on their tweet's stances
 - Download timelines and profile descriptions of users
 - Examine feminist descriptions to find frequent terms. Contextualisation of frequent terms with known feminist 'profiles' (by drawing on feminist literature)
 - Evaluate distribution of user labels for Hefner stance feminism
 - Understand the differences between feminist users who support Hefner and who disagree with him

- Extract the main topics discussed around his death
 - Extend tweets to include relevant text content of linked media (e.g. other Tweets or article headlines)
 - Extract main topics discussed in general and by stance
- Analyse influential feminist users in favour of Hefner (case study)
 - Identify interesting users to examine
 - Collect and examine available material to understand their background, attitude and motivations
- Look at language distribution of Tweets
- Put results in context of psychological models related to behaviour on social media and identity formation

1.1.2 Approach

Data collection and analysis methods, specifically sampling, stance annotation and label propagation techniques are based on [20], who present a quantification of the public response towards Islam on Twitter after a terrorist attack. The two projects can be compared methodologically, as they both examine tweets responding to a specific event in 'real life'. While [20] focuses on the distribution of stances in terms of tweet language and (geographical) user location, this project considers the stance of users based on their identity as feminist or involvement in the discussion around feminism. The strategy for the identification of feminist user profiles is based on existing research on Twitter feminism by [19][15]

The qualitative analysis provides a more detailed examination of the attitudes towards feminism and Hefner based on two case studies of influential users that had the rare combination of valuing feminism/identifying as feminist and a positive stance towards Hefner. Based on qualitative data like the content of Twitter profile and related media (e.g. podcasts, articles and background information), this analysis attempts explaining the interesting position of these users and what their motivations and underlying arguments could be.

I took a psychological-sociological approach to discussing and attempting to explain the results of the analysis in the context of Twitter as micro-blogging platform, known feminist movements and theories of human behaviour.

1.2 Project Motivation and Relevance

This interdisciplinary project combines the practicality, efficiency and opportunities brought by data science with background knowledge and qualitative methods from sociology and psychology. Because these disciplines are very human-focused and humans now spend a significant part of their lives on social media[14], it is important

to include this dimension in research and as [21] writes, "there is a serious need for more feminist analysis and intervention in the politics of () participation in these media channels. While there are studies like the one by [19] that recognize the importance of examining human behaviour and trends on platforms like Twitter, they are often restricted to methods that do not take full advantage of the available data and technologies to automatize certain tasks in the analysis. Similarly, [15] discusses the need of collaboration between social science or research in the humanities and computer science to bridge this gap and I would argue that this project is a good example of such a project.

Twitter is commonly used for the purpose of obtaining information, social reasons and relationship building [5], all of which reflect human behaviour that exists 'outside' of Twitter and the internet and is already part of research in psychology, for example. However, on Twitter, users learn to use specific rules and methods like 'conversational tagging' [13] and there is a significant lack of contextual knowledge that interacting users have about each other. A larger base of existing research that combines interdisciplinary skills and knowledge would help building a better understanding of how Twitter data can be analysed and interpreted in the most appropriate and efficient way.

This specific project focuses on Twitter users' reactions to the death of a celebrity that created a lot of controversy on different morals and social levels, so the results of this analysis are not trivial. Because of Playboy, Hefner is commonly associated with sexuality and pornography, which are central and recurring themes discussed in feminism,[26][9, p. 297] so the fairly 'Hefner-specific' topic has some implications on the wider discussion surrounding this issue. Furthermore, different feminist movements have concerned themselves with how different labels can or can't coexist [9], so this project will offer a snapshot of current trends in feminism and how it is expressed on Twitter.

From a methodological point of view, this research contributes to the re-evaluation of strategies to extract user information from Twitter data, how appropriate they are in this context and in what way findings can be interpreted.

1.3 Report outline

The rest of this report is organised as follows: **Chapter 2** gives an overview of relevant Twitter terminology, background information on Hugh Hefner, feminism and how they are related, as well as related research that the methods used in this project are based on. **Chapter 3** contains information on the data, how it was collected and processed. **Chapter 4** describes the methodology of the quantitative analysis, including sampling, manual annotation and label propagation. It also provides a brief overview of the quantitative analysis. **Chapter ??** reports results on a tweet and on a user level. The discussion puts the results in context with ideas of feminism. **Chapter 7** draws conclusions and potential future directions from the findings.

Chapter 2

Background

To better understand how Hugh Hefner fits into the discourse around feminism, it is worth noting that there is no such thing as one feminist opinion, because the movement has gone through several 'waves': Historically, but also dependent on cultural (and several other) factors, identifying as feminist can mean very different things [9][38]. After a brief overview of the Twitter terminology that will be used frequently, this section draws on existing research on feminism and Twitter to better explain the decisions made during data collection and analysis. This will also include ethical and practical implications of using Twitter data. The methods and underlying theories used in this project are explained by looking at related research with a similar approach, as well as some background information regarding the shape and collection of Twitter and other website data.

2.1 Useful Terminology

Although there will be definitions and clarifications throughout the paper, it is helpful to explain some of the more frequently used vocabulary upfront. I extended definitions from [19]:

- Tweet: A 'tweet', which Twitter calls 'status' is a microblog post that is usually no longer than 140 characters (exceptions in 2.4) and can contain URLs, hashtags and mention other users
- Retweet: A user can 'retweet' an existing tweet, which will then have the same content, but mention the original author
- Timeline: The history of tweets posted and retweeted by a user
- Hashtag: designated by the # symbol, a form of metadata [41] that can be used for search and emphasis and can replace a word in a sentence [13]
- Handle: The unique username of each Twitter user, which begins with the '@' symbol and can be used to direct a tweet to a specific user.

- URL: a web address that can be used to collect data from the linked web resource. URLs on Twitter and other social media are commonly shortened (one website can have many corresponding short URLs) [2].
- SNS: stands for Social Networking Site or Service, social media platform

2.2 How does Hugh Hefner fit into the discourse around feminism and what does it mean to be feminist?

In the Oxford dictionary feminism is defined as The advocacy of women's rights on the ground of the equality of the sexes, and the term feminist describes whoever supports this view [30]. To understand how Hugh Hefner is connected to feminism, it will be necessary to elaborate on this concept and to understand that there are different ways of seeing which are all feminist, allowing for diversity within disciplines and within the feminist movement itself [9, pp. 230-231].

While the idea of feminism existed beforehand, it only started to become a real movement in the late 19th century and is usually summarized in three or four waves that are motivated by different key goals. These waves mainly describe events in Western Europe and North America, but since the initial aim women's right to vote had a predominantly political nature, there are location-based differences [9]. From today's point of view, feminism has become a global topic that is discussed beyond country borders and has expanded to questions of identity and symbolism in addition to the more graspable political and socio-economic topics it was born from [19].

Thus, the discussion around Hefner is influenced by the way it is framed. One may consider Hefner in the historical context of American feminist movements, but also from a modern point of view that takes into consideration how Twitter and the internet change and expand the debate to include a worldwide audience with different cultural backgrounds and ages [25][18].

The first issue of the mens lifestyle magazine and brand Playboy that made Hefner famous appeared in December 1953, which coincides with the first wave of feminism, the period after World War II and a politically conservative, conformist and increasingly capitalist society with traditional values like monogamy. With Playboy, which offered a mix of nude and semi-nude photographs of women, articles by well-known writers and often featured celebrities, Hefner arguably drove the sexual revolution: Influenced by the Kinsey Reports on human male and female sexual behaviour that were published in 1948 and 1953, Hefner saw an opportunity in the sexual repression of the era, so he offered a sophisticated way to sexual liberation and openness. While gaining popularity, Playboy contributed to the normalization of the sexualized depiction of women in mainstream media [1][26]. During this period there was a transition into the second wave of feminism, which completely rejected male dominance and any behaviour that could support the patriarchy. Recognizing how internalized societal norms like traditional gender roles, normative sexuality and marriage might support the oppression of women, feminists criticized the objectification of women in magazines, prostitution, sex workers and sometimes heterosexuality and values of femininity as a whole. This

increasingly radical feminism came from a new left and influenced the gay liberation movement, but was ultimately too constrictive and judgemental to include all feminists and lead to a split [38].

The fact that women like Juliette Frett, a former playboy model, would identify as feminist makes more sense with an understanding of third wave feminism. As a reaction to the loss of solidarity amongst feminists through the exclusive nature of second-wave ideals, US feminism in the 1990s allowed women to choose what feminism means to them individually and aimed to reconcile sexual freedom with the ideal of gender equality:

"What does it mean that a gorgeous blonde posing in Playboy chooses to call herself a "feminist", when most readers of the magazine probably view feminists as anti-sex and anti-male? Perhaps by eroticizing feminism, she helps build support for political goals, such as reproductive freedom, policies to create work/life balance, and safe, affordable childcare." [38]

The recognition of how the feminist identity overlaps with several other identities, such as gender, race, sexuality and religion for each individual makes third-wave feminism inclusive, but also harder to define. In the context of this project, it will be interesting to detect some of these overlapping identities and how they might influence someone's stance on Hugh Hefner and Playboy. Regardless of his motives or whether Hefner himself can be considered feminist, 'sex-positive' feminists like Camille Paglia support him [9, pp. 264-265,291] and his libertarian and socially tolerant philosophy [22] create different levels on which individuals may support or criticize Hefner.

2.3 Feminism on Twitter and the implications of using Twitter as data source

Hefner died in 2017, which was also a year important for feminism online: According to the Merriam-Webster dictionary, 'Feminism' was the most searched word on the internet in 2017 and Twitter participated with trending hashtags like '#YesAllWomen' and '#metoo' [19], so it is likely that both the choice in social network and the year of data collection have contributed to the capture of a significant number of users who either identify as feminist or tweet about feminism.

Collecting data from Twitter comes with a range of advantages and disadvantages: Any research that attempts to understand human subjects in some way depends on the quality and amount of available data and besides ethical concerns, a lot of problems come from small sample sizes and bias that was introduced by the researcher during data collection. Using data collected from Twitter is less obtrusive, as it does not require any interaction between researcher and research subject and it existed beforehand, independently of the study [16]. Because of the immense amount of existing data on Twitter and since a large part of the collection and evaluation of tweets and Twitter users can be automated and does not rely on the active participation of human subjects, the effort and cost are minimal.

Since users publish tweets with the knowledge that they are publicly accessible to anyone with access to the internet, [19] consider the use of this data to be unproblematic. However, [27] suggests that results from Twitter analysis should be reported considering user privacy and the necessity for anonymisation on a case to case basis.

The argument by [19] is based on the fact that users are able to create an online persona that is, unless they want to be identified (e.g. in the case of celebrities), anonymous and can not easily be traced back to the person in real life. This also means that misbehaviour online is largely inconsequential and would only lead to user suspension or the deletion of profile or specific tweets in the worst case. Under the assumption that Twitter allows a higher degree of freedom of speech than 'reality', many users may state their opinions and thoughts more honestly and directly, which has a side-effect of enabling hate-speech and bullying. To find out about popular opinions and trends in society - at least a significant portion of it - the unfiltered character of tweets is an advantage. However, the anonymity also makes it much harder to understand where an opinion is coming from. For example the location field on a user's Twitter profile is optional and allows free text, which means that users can leave it empty, write something unrelated or use different terms to describe their location (e.g. colloquial names, capitalization and initials)[12][20]. The lack of standardization makes this information difficult to process and interpret, which creates a disadvantage if knowing a user's 'real' location is necessary to interpret the data. Similarly, Twitter does not ask users to set age or gender, so placing users demographically can be a challenge that requires some level of interpretation.

Perhaps because of the freedom allowed in the creation of this online persona, Twitter is an interesting platform to examine from a psychological-sociological standpoint. In the results and discussion section I will examine some ways in which users identify and label themselves on their profile and why the given online environment may motivate them to do so. As mentioned previously, feminism is not only related to a form of activism, but also implies a certain awareness of labels that are either imposed by society or oneself. Therefore, it will be interesting to examine the way feminists behave and describe themselves on Twitter, as well as whether there are any emerging trends and patterns.

Importantly, it is important to evaluate if and how the findings from this data may generalize to a wider population. Generally, [14] estimates that about 48% of the world's population had access to the internet in 2018 and the portion increases to 71% if we only consider 'young people' between the ages of fifteen to twenty-four. Especially in Least Developed Countries (LDCs), younger people form a larger part of the online population. In developed countries the range of internet users is much wider (so we can expect more older users). This could be interesting considering that users from the USA and Mexico may be especially involved in the discussion around Hugh Hefner because of geographical vicinity. [25] looked at the demographics of Twitter users in the US and found ..

Chapter 5 will include all findings related to the identity and demographics of users in this specific set of users and draw on this context information. The background knowledge on feminism and feminism on Twitter also informed some of the decisions

and keywords used in the analysis (Chapter 4).

2.4 Related work and common methods

The methodology for data collection and analysis of this project is similar to the one used in [20] and [?]. While the topics are mostly unrelated to feminism and a celebrity death, both are concerned with analysing user stances towards some event and successfully use the sampling, annotation and label propagation techniques I applied for this research (described more in detail in chapter 3 and 4). The data is comparable, as both papers report using large collections of tweets that were not initially annotated. Especially the first paper is similar in the sense that the tweets were collected directly after and in response to an event that drew a lot of attention on Twitter (and social media in general).

Stance classification is different from sentiment analysis, as it is highly dependent on content and context information, while sentiment analysis can easily be done by training a classifier to recognize structural patterns in tweets of any topic (e.g. the use of capitalisation, punctuation, emojis and vocabulary). While it would be possible to train a (supervised) classification model on a set of tweets to recognize stances of new tweets, as done by [10], this would be highly specific to the topic towards which stances are detected. The use of sarcasm and complicated references that can be specific to the user and their immediate network further complicates the case to the point where classification can even be difficult for a human annotator, who might need to draw on additional information about author and surrounding data before making a decision. In this case, any supervised method would require a set of tweets that is already annotated with a stance towards Hefner to train the model (which then would only serve to recognize stance towards Hefner). By instead using a network based approach, just annotating a small set of 'popular' tweets, allows propagating the stance to a larger set of re-tweets under the assumption that they contain the same text and the user must have agreed with the stance of the original tweet, which is a method used by [20] and [6].

The topic extraction method was chosen based on a study by [29], which examined topics of tweets about a celebrity suicide over time.

2.5 Practical notes on Twitter data collection

As mentioned in section 2.1, the standard length of tweets is a maximum of 140 characters. However on September 26, 2017 (coincidentally right before the data for this project was collected), Twitter introduced an experiment by which some users were allowed longer Tweets. This change had implications on the REST API endpoints, which now have a new request parameter called `tweet_mode` that defaults to the original length, but can be set to `extended`[39].

There are a few different types of tweets to be aware of: Retweets are marked by RT, have the same content as the original tweet and can be linked to the original author (through the Twitter handle, i.e. @userX, and the original tweets id in the JSON object). There is another way to utilize someone else's tweet that does not count as a retweet. As explained by [17], the JSON object of the new tweet does not contain information on the quoted tweet, but the shortened URL to it appears at the end of the tweet text, starting with <http://t.co/>. As [19] observed, tweets also often contain links to media from external social networks or news websites, which are included in a similar way. While URLs are often shortened on Twitter, the JSON object contains the corresponding expanded URL, which can be helpful if data needs to be pulled from the corresponding web resources.

Chapter 3

Data

3.1 Initial data collection

The base data used in this project was collected via the Twitter REST API, by streaming Tweets containing the term "Hefner" in the 10 days between the 29th September and 9th October 2017. The resulting collection contained 464K Tweets. Since Hugh Hefner died on the 27th of September, and his death was announced by Playboy's official Twitter account on the 28th of September, the collection does not contain all the early Tweets about his death. It does, however, contain them as retweets from when the streaming was started.

Using the search term "Hefner" to collect the initial set of tweets has the advantage of being language independent, so the collection contains tweets in a range of different languages - a large part in English and Spanish. It even contains some tweets in languages that do not use the roman alphabet, as either the text itself or hashtags included the search term. Most tweets in the set are on-topic, excluding single cases where someone had the same name 'Hugh Hefner' or the search term appeared in an unrelated URL.

As mentioned in chapter 2.4, each tweet in the collection is represented as JSON object, of which 24 descriptive attributes were collected, but not all of which had a value or contained reliable information, as some can be set by the user or are hidden because of the account's privacy settings. (Table 3.1)

3.2 Data processing and expansion

As ca. 500 of the tweets were missing some relevant attributes, these were initially removed. The remaining collection of 463K Tweets was then divided into 109.5K original Tweets and 354K retweets.

Retweets were identified (as they contain information on the original author and the marker 'RT' at the beginning of the tweet text) and I extracted the ID of the correspond-

Table 3.1: Tweet attributes

About the Tweet	ID of the tweet
	creation date
	tweet text content
	attached media/URLs
	hashtags (#) and mentions (@user)
	retweets counted at the time it was saved
	if retweet: original tweet ID and text
About the Author	ID of (re-)tweet author
	username and their screen name
	URL of their profile image
	<i>info about timezone, location, country, place, coordinates, source</i>
	number of followers, followees

Table 3.2: These is a description of the attributes that were collected about each tweet, although some of the associated values were often missing or not reliable (here in *italic*).

ing original tweet. Without duplicates this resulted in another 21.514 original tweets, 12.882 of which were not already in the collection. These were added to the set of original tweets, even though they do not contain information about their author. Using the Twitter REST API, some of this information could be retrieved via the tweet ID, but in many cases the tweet was deleted on Twitter, the account has been suspended or was unavailable for a different reason. It is possible that this problem can be attributed to the age of the tweets, since users may have decided to delete their profile since the data was collected. Furthermore, it could be specific to the nature of this research topic, as the available data suggests that it may provoke more rude, sexual and explicit content that is more likely to be perceived as offensive and be reported, which can lead to deletion of Tweet, user profile or user suspension [40].

The resulting set of 118.160 original tweets that either had retweets or were captured in the initial collection was then ranked by their number of retweets in the set. (This process is summarized in figure 3.1) Off-topic tweets were flagged during manual annotation (chapter 4.1.2) and removed in any subsequent steps, such that their retweets are also not included in the analysis.

3.3 Sampling strategy: preparation for profile labelling

This project requires identifying Twitter users' stances towards Hefner (i.e. supporting, against or neutral) and 'feminist label' (i.e. whether a user identifies as feminist/talks about feminism a lot or not), so it is not sufficient to just look at one of their (re-)tweets. The approach used here is network-based and relies on manual annotation of tweets that can then be used to label retweets and classify users. To reduce the

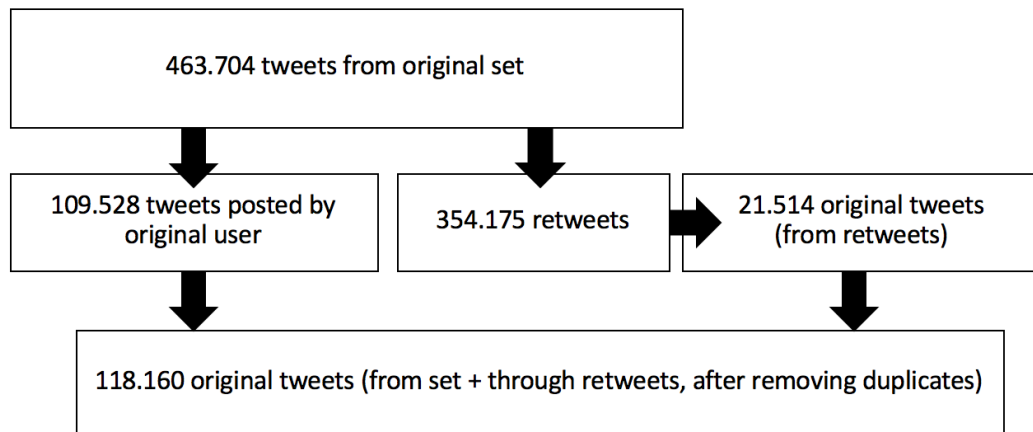


Figure 3.1: Processing initial set of tweets

number of tweets that have to be annotated manually and get the most influential set, I ranked the original tweets from most to least popular by counting how often they were retweeted in the set, such that annotating less than 4K of the most popular (original) tweets reaches almost 318K tweets after label propagation (without unrelated tweets), which is 69% of all tweets in the set. From this collection of annotated tweets, one or more stance labels can be propagated to about 262K users (73% of all users in the set). This is a consequence of the power-law like frequency distribution of retweets per tweet and tweets per user (figure 3.2), which can be compared to Zipf's law: Few tweets were retweeted many times/by many users and many tweets were retweeted few times/by a few users. In other words, given the large sample of tweets, the frequency of retweets of any original tweet is (approximately) inversely proportional to its rank in the frequency table.

3.4 Collection of user timelines and profile descriptions

To check for Twitter users that identify as feminist or talk about feminism, it was necessary to collect more data. As I initially planned on annotating only the top 500 tweets (as these reach ca. 84% of users IF unrelated tweets are included; the number is reduced as one of the top tweets was flagged as unrelated), the set of users for which I downloaded profile description and timeline was determined by sampling the users that tweeted or retweeted the top 500 tweets. The unique set consisted of 240K user ids that were used to download user data using the python package tweepy [37] and the Twitter REST API. The resulting collection of user timelines and profile descriptions covers 215.4K users, as approximately 10% of the ids resulted in errors (i.e. profile was unavailable). For the collection I adapted a script (by Abeer Aldayel) and collection of tweets in extended mode was taken into consideration. The data collection took several weeks and downloaded data had to be stored on server (as just the timelines occupy over 45G on hard drive).

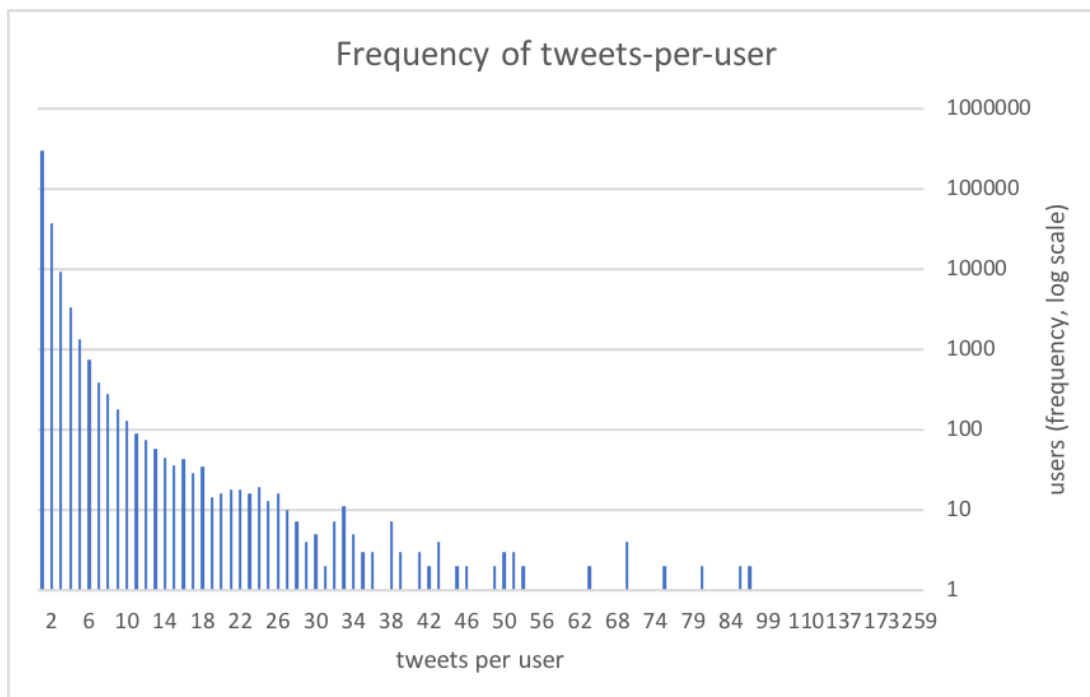


Figure 3.2: Frequency of tweets per user

Chapter 4

Methodology: Quantitative Analysis

The quantitative analysis looked at the data on two levels, both of which require annotation and categorisation: (1) Tweet level analysis: The first part analyses the tweets themselves and aims to quantify the response towards Hefner for each stance, to extract the dominant topics and features that distinguish tweets in favour from tweets against Hugh Hefner. (2) User level analysis: By using the now annotated tweets, each twitter user's stance towards Hefner (if any) is inferred. Users are also classified as feminist or 'talking about feminism' based on their profile description and Twitter timeline. The resulting four classes are then compared and relevant features are extracted, including popular hashtags and @-mentions. (if applicable, incl. network analysis)

4.1 Tweet level analysis

To reduce the amount of data for manual labelling, I extracted a subset of tweets whose label can then be propagated to a significant portion of the whole set (as explained in chapter 3.3).

4.1.1 Tweet content extension

Both for the manual stance annotation and for content analysis of tweets, it is helpful to include as much relevant (tweet) context as possible. Since the initial collection contained truncated tweets and URLs, the extended tweet text and some text from linked media was collected additionally.

To avoid extending the content of all tweets in the set, this was done for most of the tweets that were manually annotated (Hefner stance) and a slightly more inclusive set of original tweets for content analysis/topic extraction: Because a significant part of the tweets is in English and to simplify the pre-processing and text analysis, the initial set of original tweets (resulting from the original collection) was filtered to only include Tweets with language tags containing en. This subset was further reduced to only include tweets that have at least one re-tweet in the original collection, providing

a very low threshold for tweet popularity. (Note: For the manually annotated tweets in other languages, linked media was examined on a case to case basis during annotation, but the tweet text was extended beforehand.)

Using the tweepy library [37], the extended tweet text and any linked URLs of each tweet id in the subset were requested through the Twitter REST API. In cases where the request is denied (e.g. because the tweet has been deleted and is unavailable), the original truncated tweet text and URLs were used. To avoid pulling data from the same HTML file several times, I collected the expanded URLs, which can be matched if they lead to the same web resource.

Web scraping: Next, text from HTML files linked through the URLs was collected using the python package Beautiful Soup 4[36]. The difficulty of this task lies in collecting mostly relevant text from a variety of websites that are structured differently. When text is pulled from a HTML file, it is possible to specify which specific HTML tags the text should be extracted from. This is very practical if the location and tags of the desired information are known, but the given collection of URLs result in a mix of websites with very inconsistent structure, such that the text tagged as headline (`<h1>`) in a blog post may actually contain the author's name instead of the title.

Since a large part of the URLs could be identified as tweets that are tagged consistently (tweet text is tagged as `<p>` and has the CSS class 'tweet-text'), I collected these separately from other linked media. For all other URLs I decided to avoid collecting too much potentially irrelevant text with the cost of missing some relevant information and just pulled the primary headline (tagged `<h1>`). Some websites can only be scraped after requesting access for the given URL and specifying a user agent (this was done using 'Request' from the python package 'urllib2'[32]).

The scraped text was then filtered to remove frequently occurring error messages, which I compiled by checking a subset of the results manually, as well as text that was not in English (detected via the python package 'langdetect' [33]). The error messages used for filtering were "Access Denied", "This video is unavailable.", "Oops! That page can't be found.", "Not Found", "Forbidden", "Data Protection Choices", "Server Error", "Before we continue", "This video is no longer available because the YouTube account associated with this video has been closed." (as well as text containing the error codes "404" and "403", which was removed during collection).

Since very large chunks of text would have a bigger influence on the emerging topics in the analysis, I examined these manually to remove completely unrelated content, which can be the case when headlines list all topics in a magazine issue or the HTML tag was misused to contain body text.

Each successfully scraped URL text was then attached to all tweets that contain the given URL.

4.1.2 Manual annotation

A subset of popular (original) tweets was manually annotated with a stance towards Hugh Hefner that was either '1' (supporting), '-1' (against), '0' (neutral/unclear) similarly to the labels in [20]. Tweets that were unrelated to Hefner were flagged to exclude

Supportive (1)	neutral report about his life/death, split opinion, unclear message, neutral joke, linked media has no/split opinion, tweet mentions Hefner but is not directed at him, tweet asks others for opinions (i.e. 'was he an abuser or a hero?')
Against (-1)	negative feelings towards Hefner, his lifestyle or playboy, pity, hate or dislike, linking media with negative stance without refuting it/and agreeing with it
Neutral/Unclear (0)	agrees with his lifestyle/messages, admire him, give him credit for positive changes, remember him fondly, linking media with positive stance without refuting it/and agreeing with it

Figure 4.1: Tweet stance annotation guideline (not including unrelated Tweets, i.e. that are not about Hugh Hefner)

them from the analysis. I was the only annotator for this task, but in ambiguous cases the decision was made by taking second and third opinions into consideration. The annotation was done on the basis of the tweet text (extended if possible) and all available context data, i.e. linked media and user profile. If necessary, text was translated by cross checking translations from different online translators and looking up specific idioms separately. As the '0' stance is both applicable to neutral and unclear tweets, a lack of available data for evaluation lead to 'neutral' stance, which should be taken into consideration when evaluating the results. The specific guidelines used for annotation are illustrated in table 4.1.

4.1.3 Label propagation to retweets

This step is based on the assumption that a user retweets a tweet with a message they support, such that the stance of the original tweet reflects the stance of the retweet. Then the propagation consists of applying the label of each manually annotated tweet to each of its retweets.

Original tweets and retweets can be viewed as vertices $v-o$ and $v-r$ in a very sparse, directed graph $G=(v,e)$ that has outgoing edges (e) from original tweets to each of their retweets. Each vertex has an associated value, which corresponds to the tweet stance and can be propagated outwards, i.e. across edges from $v-o$ to $v-r$. The graph is not very complicated, as retweets of retweets look exactly like regular retweets, so the maximum degree of each vertex is one. Original tweets can only have outgoing edges and retweets can only have one incoming edge. Projecting the data onto a graph will become more interesting when stances need to be assigned to users (see chapter 4.2.1).

4.1.4 Content analysis: Finding key topics

One of the main goals of this research was to extract the topics of the discussion around Hefners death overall and depending on the stance.

The topic extraction itself was done with the python package 'wordcloud' [28], after removing all characters that were not letters (Latin alphabet) or numbers and using the python 'nltk'[31] library to remove all stop-words typically used in English. Im-

portantly, all versions of 'Hefner' and 'Hugh Hefner' were also removed first, as they would obviously appear with high frequency (as 'Hefner' was defined as searchterm to collect the tweets). Word cloud is based on word frequency and co-occurrence and since it gave satisfying results for this analysis, it was not necessary to apply more complicated methods, such as clustering the tweets and defining topics per cluster.

This analysis was applied to the full set of tweets sampled and extended as explained section 4.1.1 and also separately for the subsets of tweets labelled as supporting and against Hefner. This results in a stance-independent overview of topics discussed in relation to the death of Hugh Hefner, but also the specific topics that were used to by each stance.

Since hashtags are often a central part of the message and are used for "marking experiential topics, enacting interpersonal relationships, and organizing text"[?], they can be valuable for discovering a tweet's topic. The hashtags were extracted from the original tweet itself, as well as linked media (which may contain hashtags, if it is a quote of another tweet) and then ranked based on the frequency of their occurrence in tweets and retweets to find the most popular ones. The analysis was done for all tweets in the set, just counting hashtags from original tweets, as well as counting occurrences from both original and retweets (such that hashtags from popular tweets are ranked higher). Furthermore, hashtags were counted and ranked according to their occurrence in tweets and retweets of each stance (pro Hefner and against Hefner).

Note (1): The same analysis was repeated with lower-cased tweets to check if spelling differences would make a difference and show further topics, but this did not make a big difference, so the results are not reported. Note (2): Since tweets with attached stances did not contain many hashtags, this analysis was not carried any further. The most frequently occurring hashtags were examined qualitatively and in context with the extracted topics.

4.1.5 Finding most popular tweets

As described in chapters 3.2 and 3.3, the original tweets were extracted from the initial collection and ranked according to their number of retweets in the set when sampling the subset for annotation. The top 5 tweets with most retweets overall and per stance are reported in chapter 4.1.

Each tweet in the collection also contains a time and date tag (GMT) for when a tweet was first posted. By just extracting the date and ignoring the exact time of day, the tweets were sorted into date-categories. For each date, I extracted the tweets that had most retweets from that date (as well as calculating the number of tweets and users engaged per date).

4.2 User level analysis

A large part of this project aims to understand the users that tweeted positively or negatively about Hefner and how feminist users were represented in these groups. This

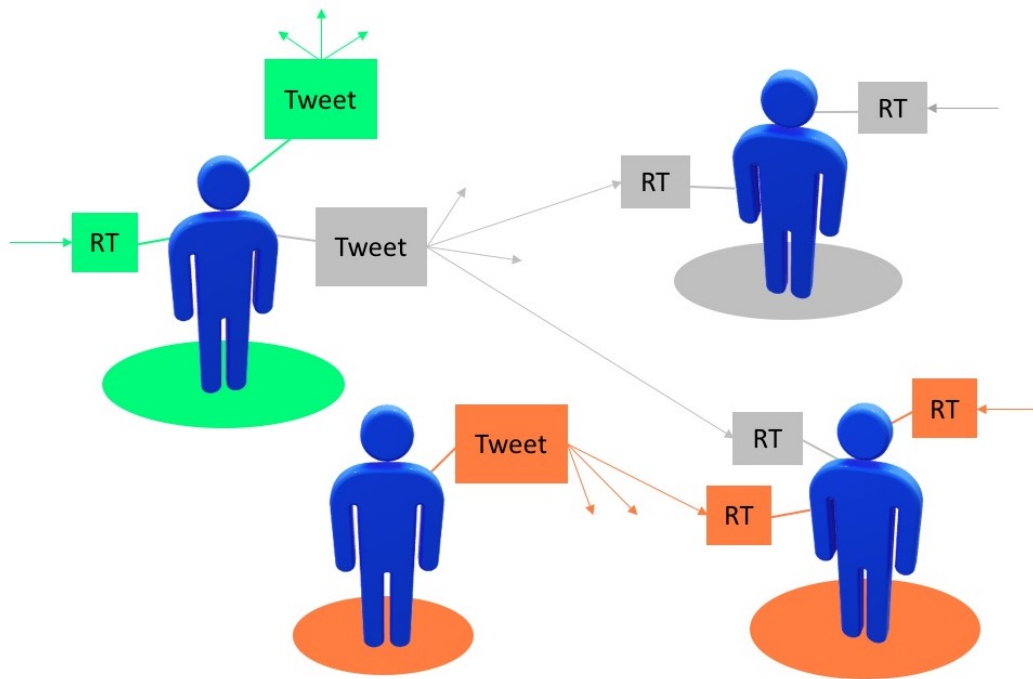


Figure 4.2: Network based approach to applying tweet stances to users and user stance detection. Note: Edges between users and tweets/retweets are not directed, because users are represented as 'collectors' of vertices, rather than vertices themselves.

section explains how users were classified in terms of feminism and stance towards Hefner and which steps were taken to analyse this data and extract user information.

4.2.1 Detecting user stances towards Hefner

As continuation of the label propagation from tweets to retweets, a user's stance can be determined based on the stances of the tweets they posted or retweeted.

Picking up on the interpretation of label propagation as a network based approach (section 4.1.3), figure 4.2 illustrates how users can be added to the tweet-retweet graph. For label propagation, users can be treated as vertices that have incoming edges from each of their tweets and retweets (to avoid mixing up the hierarchy), but perhaps it would be more appropriate to treat them as a collection of tweet/retweet vertices.

The user-tweet-retweet network can then be examined under different aspects, such as productivity (how many vertices do users 'contain') and popularity (how many incoming edges do their vertices have). Similarly to [10], the network could be analysed to find neighbourhoods and strongly connected users, especially after users are classified in terms of feminism and stance towards Hefner. This analysis is outside of this project's scope, but would be an interesting direction for further research.

Since each user can be associated with one or more tweets and retweets of different

stances, their own stance needs to be determined by a rule. For this project, I did this step twice with different rules:

- Low confidence: A user has a positive stance, if **at least one** of their tweets/retweets has a positive stance **and none** of their tweets/retweets has a negative stance (and vice versa for negative stance).
- High confidence: A user has a positive stance, if **at least two** of their tweets/retweets have a positive stance **and none** of their tweets/retweets has a negative stance (and vice versa for negative stance).

Users that did not fill the criteria above, for example if a user posted tweets with conflicting stances or none of their tweets had a positive/negative stance label, were also counted. Since a user could land in this group for different reasons and could theoretically have a positive or negative stance, these users did not play a significant role in the analysis.

Applying these rules to user stance classification is done under the assumption that users agree with the tweets they post or retweet, so if they don't contradict themselves, their tweet's stance(s) reflect their own beliefs. While it would be preferable to use the 'High confidence' rule, as it provides more evidence for a user's stance and is less susceptible to errors made during annotation, the 'Low confidence' rule is applied to provide a baseline and in case the first rule does not capture enough users.

The results (in chapter 6.2.1) include the number of users labelled with each stance for both rules.

4.2.2 Detecting feminist users

As described in chapter 3.4, the profile description and all tweets on the timeline of approximately 215K users were downloaded to provide more information on how 'feminist' a user is. Before searching the data for keywords, timelines and descriptions were lower-cased and filtered to remove most punctuation, URLs and timestamps (where applicable). This did not include '@' to allow the detection of user mentions by their Twitter handle, underscores, as these may be part of Twitter handles and '#' to allow the detection of hashtags. User descriptions were treated in a similar way.

This data was then searched for a set of keywords, each of which was counted (differentiating between whether it occurred in description or timeline). This distinction was made, because the profile description is more explicitly 'about' the user, so the occurrence of a keyword has a higher value in this case. It is also less likely, simply based on the length of profile descriptions (a few words) compared to the complete collection of the user's tweets.

To understand what keywords may be popular for an account that identifies as feminist or talks about feminist issues a lot, I drew on findings from [15] and a newspaper article by [7], which provided some additional relevant terms. The final selection contained three words that were stemmed to capture the translation in many languages that use the latin alphabet (especially English and Spanish, as these were popular amongst tweets in the set), as well as word variations (e.g. noun and adjective).

- 'femini': To capture 'feminist', 'feminists', 'feminism', 'feminista', 'feminismo' ... (but not 'female')
- 'womani': To capture 'womanist', 'womanism' (but not 'woman'). Womanist is a word preferred by many black feminists, as there was a popular opinion that feminism mainly refers to 'white feminism', which black women may not identify with [7]
- 'misog': To capture some 'weaker' profiles that may not talk about feminism explicitly, but use the word misogyny, which [15] included as popular feminist keyword (Captures 'misogyny', 'misogynist', 'misogino'...)

Chapter 6.2.2 discusses the choice of these keywords based on some observations.

Since many users tweeted using some of these keywords and thus fell into the feminist category very easily, there was a second step of user classification with the following rules:

- **Feminist or talks about feminism frequently ('strong')**: Feminism keyword was found in profile description or the timeline contains over five occurrences of 'femini' and or 'womani'.
- **Sometimes talks about feminism ('weak')**: The timeline contains less than five occurrences of 'femini' or 'womani', but mentions one of the three keywords at least once.
- **Probably not feminist ('not')**: Neither timeline, nor profile description contain any of the feminist keywords.

The user descriptions were manually checked to detect cases where a user explicitly refutes being feminist or calls themselves a misogynist (which the automatic labelling did not initially check for). These cases were recorded and reported for future use and improvement of methods.

4.2.3 Combining user groups and detecting common features

To find out, how many users that identify as or talk about feminism support or attack Hefner, the 'high confidence' labels for user stances towards Hefner were combined with the three 'feminism' categories stated above.

Three groups of users (with 'high confidence' stance of pro-Hefner, con-Hefner and 'strong' feminism label) were then examined in terms of:

- Twitter handles (i.e. user 'mentions' when a tweet is directed towards another Twitter user, answers them or retweets their tweet) are extracted from the timelines. They can be detected, as they start with the '@' symbol.
- Hashtags (i.e. topic markers denoted by '#') were extracted from timelines.

For each timeline, each handle and hashtag was only counted once to avoid giving more weight to users that tweet more than others or use this metadata disproportion-

ately. Then, for each set of users the most frequently occurring handles and hashtags were extracted and compared. The frequencies of each handle/hashtag should therefore denote the number of users who used it at least once. The goal is to find features that define the users belonging to each group.

Additionally, frequent identity labels used in feminist user descriptions are reported with their frequency, ranked and discussed.

Chapter 5

Methodology: Qualitative Analysis

5.1 Tweet level

The qualitative analysis on tweet level primarily served to interpret topics emerging from tweets and was done by drawing on the media connected to tweets and contextual information from newspaper articles and academic literature.

5.2 User level

Firstly, the most frequent labels found on feminist user profile descriptions were taken from the quantitative analysis, defined and explained by drawing on research in feminism related to online identity formation.

Since both the expectation and the reality were that feminist Twitter users generally did not support Hefner, I conducted a higher-level analysis of two users that stood out from the small set of users that were feminist and supported Hefner. The choice of users for this case study was therefore informed by the quantitative analysis, as well as a check of the perceived importance and influence of users. Another criterion was that a deeper examination of their profile confirmed both labels they were assigned.

For each case study, I drew on the user's recent and older tweets, the profile description and related media. This includes background information and related newspaper articles, as well as other media that included a podcast in one case. The analysis of both case studies was structured as follows:

- A summary of the user's "main background", i.e. whether they are primarily feminist or connected to Hugh Hefner, which I called the 'primary label'.
- Relevant background on the user: e.g. their occupation and known demographic factors, as well as other details that would help understanding their position.
- Evidence supporting their 'secondary label', which was their support of Hugh Hefner and or Playboy, if the primary label was feminist and their identification

as feminist, if the primary label was supporting Hefner.

- A deeper exploration of their 'justification' for being feminist and also supporting Hefner.
- Do they criticize other types of feminism and if so, in what way and why?
- How influential and involved do they seem to be on Twitter?

Chapter 6

Results and Discussion

This chapter is split into three sections: The first two examine tweets and users, report both quantitative and qualitative results, as they are highly related to each other (However, the method underlying each result is either evident or stated explicitly). While the last section discusses this project overall, some observations and methods were discussed in section one and two in relation to specific results to clarify how they are connected.

6.1 Results: Tweets

Initial note: The tweets were ranked by number of retweets in the collection, so it is possible that outside of this study there exist tweets about Hugh Hefner that are more popular and have been retweeted more.

6.1.1 On tweet data, data collection and initial observations

As visible in figure 6.1, the largest number of tweets in the collection was posted on the 30th of September, however the short period over which tweets were collected does not allow a significant time analysis. Likely explanations for the lack of tweets on the 29th are that tweets from part of this date are missing and collection only started later. Since many of the tweets also referenced articles and other media that could only be published after Hefner's death on the 26th, it makes sense that the reactions on Twitter are a bit delayed. (The Appendix also includes graphs that illustrate how many users were involved in the discussion on each day, but there are no surprising results, as most users first appear on the 30th. See figure 3 and 4)

The main languages of tweets are shown in figure 6.2. Most of the tweets are in English (80%), followed by Spanish, Portuguese and French. This information was used to justify reducing the topic extraction to tweets in English, as it simplified the process of removing stop-words and characters that do not belong to the Latin alphabet.

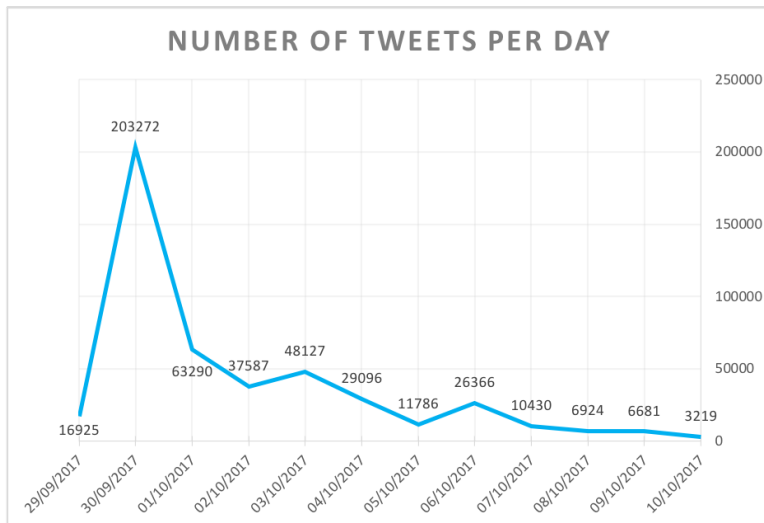


Figure 6.1

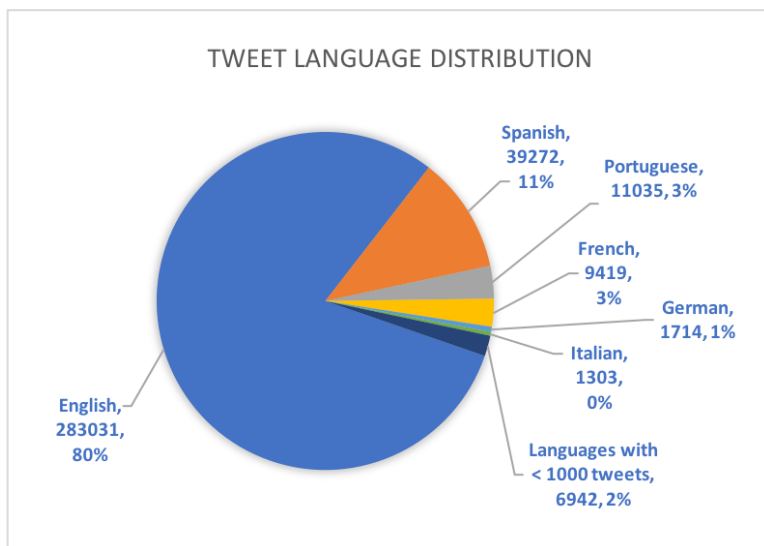


Figure 6.2

Tweet text	Contextual information	Retweets (in set)	Stance
"the disgusting truth about hugh hefner: a rant thread"	(Suspended user) humorous account that posts many 'threads'/stories/opinions. The thread is a list of arguments against Hefner and Playboy.	39091	-1
"this dude found a way to disrespect women even in his death"	Refers to an article with the headline "Hugh Hefner To Be Buried Next To Marilyn Monroe, Whose Nude Photos Were Used To Launch Playboy Without Her Consent"	22009	-1
"She done sucked old wrinkled d*** for nothing 🤔🤔🤔" (censored)	(Suspended user) Refers to the tweet: "Hugh Hefner's 30-year-old-wife Crystal Harris 'will inherit nothing' after death"	17231	-1
"tribute to the original playboy - art dealer x Hugh Hefner prod . Playboicarti"	A tribute to Hugh Hefner by the American rapper known as 'Playboicarti' (attached music video)	13976	1
Unrelated tweet		12198	N/A
"well done king"	(Suspended user)	8808	1

Figure 6.3: The top 5 Hefner-related tweets ranked by retweets in set (plus a highly ranked tweet that was not related to Hefner)

The five most popular 'viral' tweets in the set are reported in figure 6.3.

As explained in the methods, the tweets were extended by adding text scraped from URLs, which either linked external media or other tweets (quotes). The result shows that in some cases this step is essential to understand the message of a tweet and is thus very important for topic extraction and manual annotation. This becomes evident in tweets with text, such as: "Bro I would be sick". While it indicates a sentiment (and therefore would be sufficient for sentiment analysis), its subject remains unclear without the additional text scraped through the URL: "Hugh Hefner's 30-year-old wife Crystal Harris 'will inherit nothing' after death".

6.1.2 Tweet annotation

While the approach chosen for stance detection via manual annotation of an initial set of tweets is time intensive and depends on the marker, some observations made during annotation show why it is hard to replace with automated (or even unsupervised) methods. Even for a human marker it can be extremely hard to understand a message out of context, especially if the author was making a joke, using sarcasm or references only known to the author's audience. One such example is "In honor of the late feminist icon Hugh Hefner, I'll be grabbing my new daughter-in-law Jared by the p***y first thing in the morning! #MAGA" (tweet was censored for display). Without contextual information, the conclusion may be that the author supports Hugh Hefner, Trump (#MAGA means "Make America Great Again" and is Trump's campaign slogan [6]) and considers Hefner to have been feminist. Fortunately, the author's profile description clarifies that this is a "satire/parody account", but in other cases the conclusion largely depends on the marker and their susceptibility to sarcasm.

This reinforces the importance of multiple markers to avoid human error in the inter-

pretation and to calculate an inter-annotator agreement score that would help estimating the validity of the annotation. While the lack of multiple annotators in this project was compensated by a careful examination of contextual information, multiple annotators in some difficult cases and avoiding positive/negative (significant) stance labels for divergent opinions, a second annotation should to be considered, if further research will be based on this data.

The distribution of tweets per stance after manual annotation and after label propagation is shown in figure 6.4 and the following chart. In the initial annotation, the majority of tweets was labelled neutral, followed by ones with a negative stance (-1) towards Hefner. After propagating the label to retweets, the majority has a negative stance, while the proportion of tweets with positive stance (1) does not change by much. The switch in label with the highest proportion of tweets indicates that at least some of the Tweets with negative stance towards Hefner must have many retweets and many of the neutral tweets are likely to be less popular or influential.

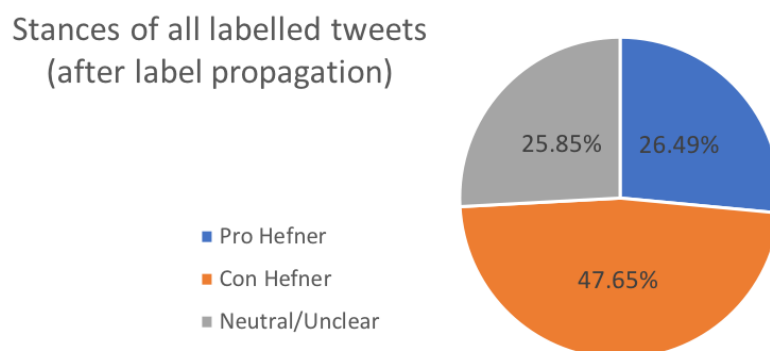
6.1.3 Results: Label propagation to retweets

Popular Neutral Tweets It seems like the majority of the most popular neutral(/unclear) tweets was created for entertainment and consists of jokes about Hefner, without contributing to the discussion or offering a clear stance. The jokes comment on his age and lifestyle and partly offer commentary on external media or other peoples' reactions to Hefner's death and less on Hefner himself. One user, for example, uses 'brutal' to describe a humorous article about Hefner, which could be interpreted as both criticism and/or amusement. In contrast, the most retweeted neutral tweet offers a clear split opinion of Hefner that almost discusses reasons to like or dislike Hefner: It was posted by Cora Harrington, a book and blog author, who writes about lingerie fashion [11]. In the tweet she acknowledges that Hefner employed a black woman to design the 'bunny' costume, but only after writing "There's a lot that can (and should) be said about Hugh Hefner, but", clarifying that her stance is not fully positive. This tweet brings up a central positive argument of Hefner's proponents, which argues that he employed women and did not discriminate people on the basis of race. A large portion of the neutral tweets in the rest of the annotated set report the news of his death or announce a documentary about Hugh Hefner.

Popular Negative Tweets The most popular negative tweet was also the most viral tweet overall and was posted by a suspended account, so the original could not be viewed online. Because the retweets contain the original author's handle, I was able to find information on the user and the tweet, either indirectly through other Twitter users or blog posts that saved screenshots of the tweet. The user created a 'tread', which is a series of tweets that quote each other in order to create a longer, connected post without being restricted to Twitter's character limit for a status. The tweet "the disgusting truth about hugh hefner, a rant thread" is the beginning of this thread, which lists a range of arguments against Hugh Hefner. The user is not verified, but regularly posts humorous tweets and treads that are followed by a large fan-base. Other popular tweets with a negative stance criticize that Hefner decided to be buried next to Marilyn

Tweet stances	Before label propagation -> manually annotated (% of total tagged)	After propagation to retweets (% of total tagged)
Pro Hefner	1001 (~26.4%)	84215 (~26.5%)
Con Hefner	1146 (~30.3%)	151489 (~47.7%)
Neutral/Unclear	1641 (~43.3%)	82184 (~25.9%)
Total tagged	3788	317888
Total overall	118160 (original)	463704 (all tweets in set)
% tagged	~3.2%	~68.6%

Figure 6.4: Frequency of tweet stances towards Hefner. (Label propagation did not include tweets flagged as unrelated.)



Monroe, whose nude photographs were published in the first issue of Playboy. The underlying argument is that Hefner used her for profit without consent or remorse and then continued to disrespect her after death. Further popular negative tweets show disgust towards Hefner, either in a joking manner, or with an angry tone, describing him as abusive and manipulative, explicitly refuting messages with positive stance towards Hefner. The more lighthearted tweets often celebrate his death or make fun of events that confirm the negative opinion.

Popular Positive Tweets The most popular Tweet with a positive stance was posted by the American rapper known as 'Playboi Carti', who created a "tribute to the original playboy - art dealer" in form of a music video, paying his respects. The set contained various other, less well known rappers with similar messages, as well as other artists, celebrities and ex-'Playboy bunnies' that express their love and admiration together with tributes or memories (e.g. pictures, videos and quotes). This reflects Hefner's good relationship with the music scene and Hollywood, especially Jazz, R&B and Hip-Hop/Rap artists that he featured in the Playboy magazine and variety shows []. His support of black culture and civil rights is reflected in many tweets like those by black rappers that highly valued his support and seem to be embedded in a well connected

network of artists and fans of 'black culture' on Twitter, which could be observed during annotation, but is also supported by a study by [8] that confirms a "sizable Black presence on Twitter", which may explain the popularity of these tweets. Other popular positive tweets express this stance by praising him (e.g. calling him "king" or "Civil rights supporter, philanthropist, publisher, innovator and entrepreneur"), encouraging girls to "dress as a bunny for Halloween in memory of Hugh Hefner" or posting something Hefner said as inspirational quote.

Figure 1 in the Appendix shows the most popular tweets for each attitude. As it was not possible to load tweets from suspended accounts, only their text content is displayed.

6.1.4 Topics discussed around the death of Hugh Hefner

Figure 6.5 and figure 6.6 show some topics emerging from the collection, comparing the themes in tweets with positive and negative stance towards Hefner. As this part of the analysis was independent of tweet popularity, the size of keywords represents how many different original tweets were posted about the same topic and not how popular the tweets with this topic were themselves.

By looking at the tweets associated with the emerging keywords, it was possible to extract the main topics discussed by each stance. While some of the topics are overarching and are discussed on both sides, the keywords indicate a certain focus around specific arguments and media that were discussed about Hefner and his death on Twitter.

Topics of Pro-Hefner Tweets

- Playboy and the Playboy Mansion: Users made comments on what will happen to the Playboy mansion and thank him for Playboy, the magazines and Playboy bunnies.
- Remembering him fondly and with admiration: Hefner was frequently called a legend, great and tweets often stated that his legacy will live forever/always. Many users thank him for Playboy and his support (often rappers and other celebrities)
- Tributes and RIP (Rest in Peace) wishes
- Tweets about the article "Camille Paglia on Hugh Hefner's Legacy, Trump's Masculinity and Feminism's Sex Phobia", which I analysed in more detail in one of the case studies (chapter 6.2.3).
- About Hefner's wife Crystal Hefner: A few different articles and tweets are connected to her. In an interview, she talked about living with and being married to Hugh Hefner in a positive light. Many tweets also discussed what and how much she will inherit. The pro-Hefner tweets either complimented Hefner for 'playing her' or argue that she signed a prenuptial agreement/will inherit enough (defending Hefner).

Topics of Con-Hefner Tweets

- A lot of tweets praised the New York Times columnist Ross Douthat (@Douthat-NYT on Twitter) for writing a harsh obituary named "Speaking Ill of Hugh Hefner", recommending and re-posting the article.
- News reported that Hefner was going to be buried next to Marilyn Monroe, which he was criticized for in many tweets. Users linked articles and other external media to show why Hefner was bad and did wrong (i.e. taking advantage of sensitive material without her consent, calling him creepy for wanting to be buried next to her without ever meeting etc).
- Another popular topic was John Nolte's article "Playboy's Hugh Hefner liberated us straight into hell", which was published on "Breitbart", a far-right News Network. The article criticizes Hefner's leftist ideals and 'the costs that come with it'. While this article may be the political counterpart to the NYT article, both attack Hefner, but for different reasons.
- Many users reacted with disgust to the announced biographical film ('biopic') about Hugh Hefner, expressing their hate for Hefner, the casted actor (Jared Leto) and the director (Brett Ratner) and often commenting on the choice in actor: "An abuser to play an abuser", "Trash to play trash" etc. (Leto had been involved in scandals related to pedophilia.)
- Most of the remaining keywords, some of which sound positive (e.g. sexual revolution and hero) appear in tweets with a negative stance, because a lot of criticism was directed at Hefner indirectly, by refuting positive labels that his supporters attribute to him.

The topic analysis also included the extraction of hashtags from all tweets and ranking them according to their popularity in the set, since hashtags can carry significant content information (see chapter 4.1.4 for further reference). A table with the twenty most frequently occurring hashtags in this set and per stance is included in the Appendix (2). While this is not the case overall, many of the most popular tweets that were tagged with a stance do not seem to contain many hashtags. The most popular hashtag overall was #RIPHughHefner (5683) and related hashtags like #HughHefner, #RIPHef and #Playboy. Looking at the top 20 stance-specific hashtags, the main themes for pro-Hefner are RIP and acting/actor/movie. The con-Hefner hashtags are rarer, but show more variety: Hashtags like #PedoGate and #Pizzagate refer to theories of Hefner being involved in pedophilia, psalm37 and #catholic represent criticism he received from the church and #PigsOfLiberalism may come from a more right-wing perspective (similar to the Breitbart article mentioned above).

Three of the hashtags are related to celebrities: #MarilynMonroe comes up again, as well as #BillCosby and #GloriaSteinem. The last two bring up new topics that were discussed in relation to Hugh Hefner:

- Gloria Steinem plays a very important role in the feminism debate around Hugh Hefner, as she was a feminist journalist who infiltrated the New York Playboy Club, undercover, in the 1960s. Her negative reports of the abuse that Playboy 'bunnies' experienced in these clubs was published as "A bunny's tale"[24]. Her opinion is debated in feminism, as shown by the first case study (chapter 6.2.3).

User stances	Assignment rule: Min 1 (% of total tagged)	Assignment rule: Min 2 (% of total tagged)
Pro Hefner	67829 (~25.9%)	3613 (~1.4%)
Con Hefner	126344 (~48.2%)	15053 (~5.7%)
Confused/neutral	67827	243334
Total tagged	262000 (~73% of users)	
Total users from tweets	358927	

Figure 6.7: User stances towards Hefner with 'low confidence' rule (Min 1.) and 'high confidence' rule (Min 2.) as explained in chapter 4.2.1. The stance 'Confused/neutral' summarizes users that did not fall into the Pro Hefner/Con Hefner category and can be treated as 'rest' with unclear stance.

- Bill Cosby was mentioned in relation to Hugh Hefner, as the actor had been accused of attacking women in the Playboy mansion. [35]

6.2 Results: Users

6.2.1 User stances towards Hefner

The results of classifying users as pro- or con-Hefner by applying the 'low confidence' and 'high confidence' assignment rules are reported in figure 6.7. It is evident that a much smaller portion of users could be assigned a label with the more difficult criteria, however, further results show that there are enough users for each category to be compared for each feminism label. It is preferable to use the higher confidence classification in this case especially, since tweets were annotated only by one person, so the resulting set is more likely to reflect user stances accurately.

A higher percentage of users could be classified with a negative stance towards Hefner, i.e. at least two of their tweets are con-Hefner and none support him.

I also checked, which users contributed to the most tweets in the set, i.e. were the most 'productive'. Since many of these users were not verified on Twitter, I am not going to report the full list of usernames to avoid breaching their privacy. Interestingly, a lot of users retweeted the same tweet various times, which might indicate that they are using a bot. If these double tweets are counted, one of the most productive users is @Barbi_Twins, which is the account of two 'ex-Playboy celebs' (as they describe themselves in the profile description) with 198 tweets/retweets in the set. The account is pro-Hefner, similarly to many of those that were ranked highly for productivity, if double retweets are counted. This makes sense, since the same stance would have been propagated to each retweet of the same tweet. This implies that very popular tweets may have been retweeted by the same user various times, instead of by different users.

Taking this into consideration, user productivity was also checked for by only counting retweets of the same tweet once, which returned different users, most of which did not have a clear stance towards Hefner. Again, this makes sense, as they would have retweeted a large set of different tweets that were annotated separately, so the likelihood of conflicting stances is much higher. The top profiles that resulted from this analysis were from users outside of the US (mostly South America and Europe) and were either radio, newspaper and celebrity news accounts, as well as one pornography account.

6.2.2 Feminist users and their stance towards Hefner

After checking timelines and user descriptions for the keywords specified in chapter 4.2.2, these were the initial groups with the following 'feminism-labels':

- 1271 users self identified as feminist or womanist in the profile description (after manual filtering)
- 32744 users tweeted about feminism 'a lot', i.e. 'femini' and or 'womani' appeared over 5 times on their timeline
- 91434 users tweeted about feminism or related topics at least sometimes, i.e. any keyword appeared, but the number of occurrences of 'femini' and 'womani' was five or less.
- 79082 users did not use any of the keywords in their tweets

The groups of users resulting from combining these 'feminism-labels' (slightly redefined by combining the first two) with the Hefner labels (applying the high confidence rule) are reported in figure 6.8 and visualised in figure 6.9. Just by number of profiles that could be assigned to each group, the largest group of users has a negative stance towards Hefner and sometimes tweets about feminism, but not much. This is not surprising, considering that there are more con- than pro-Hefner accounts and more 'somewhat' feminist accounts than either of the other extremes. This is why these numbers need to be viewed in context.

The group with no feminist indicator is the hardest to interpret, as there is no reverse implication of an 'anti-feminist' stance and a user may have different reasons for not tweeting about feminism, even if they actually do identify as feminist. The most interesting, is the 'strong' feminist category, which still needs to be interpreted carefully, but is most likely to contain users who actually stand for their label (especially the ones included through their description, who were checked manually). Under 3% of all users in this group could be categorised as supportive towards Hefner with high confidence, almost 16% had a negative stance. The case studies look at this 'minority group'.

There were a few notable observations resulting from the examination of user profile descriptions that were labelled as feminist:

- The assumption underlying label propagation is that a user agrees with the stance of a tweet that they retweet. However, some users explicitly refute this. Exam-

Feminist vs. pro/con Hefner <i>(only including profiles of which timeline and description could be downloaded)</i>	Pro-Hefner	Con-Hefner	Stance independent <i>(pro/con/neutral)</i>
'strong' feminist tl &/ description <i>(Descriptions were checked for misclassification + timeline if >5 feminism or womanism mentions)</i>	62 0.2% of strong fem. 2.7% of Pro-Hefner	5171 15.7% of strong fem. 41.8% of Con-Hefner	32895
talks about feminism/ womanism/ misogyny <i>(timeline or description, includes category above)</i>	881 0.7% of fem. 39% of Pro-Hefner	10995 9% of fem. 88.9% of Con-Hefner	121563
No feminist indicator <i>(does NOT imply anti-feminist! Excludes categories above)</i>	1377 1.9% of not fem. 61% of Pro-Hefner	1374 1.9% of not fem. 11.1% of Con-Hefner	71513
Any fem/non-fem indicator	2258	12369	193076

Figure 6.8: Counts of users of each class resulting from combination of feminism and Hefner stance classification.

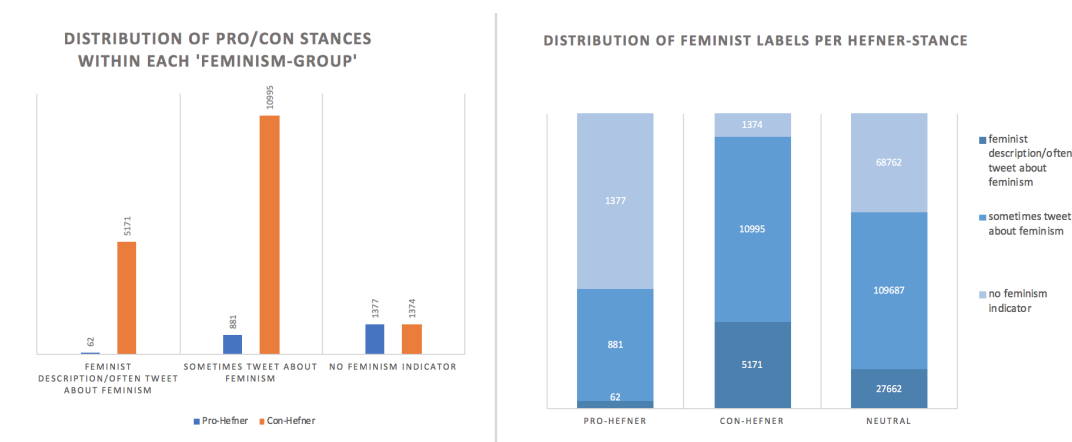


Figure 6.9: Visualisation of the table in figure 6.8

ples are: "feminist. retweets do not imply endorsement." and "(...) rts are not equal to endorsement." While this was not a frequent observation, the similar wording could imply that this is a topic that is frequently brought up, at least amongst specific groups of users.

- 25 users were falsely classified as feminist through their profile description, because they used the feminist keywords to explicitly state that these did not apply. Examples of this are "feminism is cancer", "non-feminist", "feminism is hate", "antifeministas"/"anti-feminist" and someone who self-identified as "misogynist". While the keywords mostly worked well otherwise, I discovered that 'womani' also captured the terms: 'womanintech', 'womanizer', 'womanifest' and 'womaniac'.
- One user wrote "feminist. biology matters. men cannot become women. (...)". This represents the more radical and 'exclusive' second wave of feminism (as explained in chapter 2.2) that refutes the idea of gender diversity and trans-people. Hefner's liberal views support gender diversity and freedom of expression, especially in relation to expression of sexuality, which could be observed in some tweets (e.g. a transsexual model remembers his support).
- Other identity labels that appeared in many profile descriptions were denoting gender identity and sexuality, general references to religion ('atheist', 'religious') and lifestyle choices ('vegan', 'traveler' etc.), but also some other labels that come up in the general discussion around Hefner and feminism, such as 'intersectional', 'conservative', 'inclusive' and 'marxist'. Relevant labels that appeared relatively more for users that had a negative stance towards Hefner include 'feminista'/'feminismo' (Spanish), 'intersectional', 'queer', 'lgbt', 'she/her' and 'bisexual'. For pro-Hefner users, some interesting labels and keywords are '#resist'/'#theresistance', 'lover', '#blm'/'#blacklivesmatter', 'liberal' and '#pro-choice'.

Overall, the additional labels that feminist accounts use for self-identification are not significantly different between those of different stances towards Hefner. However, it is interesting to observe that themes like 'pro choice' (refers to right for abortion) and 'black lives matter' would come up for users that support Hefner, since he did play a role in the American movements towards allowing abortion, and racial equality. The term 'intersectionality' refers to "the complex, cumulative way in which the effects of multiple forms of discrimination (such as racism, sexism, and classism) combine, overlap, or intersect especially in the experiences of marginalized individuals or groups" [23]. Especially in feminism, there seems to be a certain struggle to reunite some labels with each other, for example black women or trans-people feeling excluded by the certain definitions of feminism. Hugh Hefner proves to be an interesting person to look at in terms of feminism and people's sense of how much he belongs to this group or how much he accomplished in favour of feminism.

6.2.3 Two case studies of feminist users with a positive stance towards Hefner (Qualitative analysis)

This combination of labels, feminist and supporting Hefner, is (at least in this analysis) less popular than the others: Most supporters of Hefner were not detected to be feminist and the feminist users generally have a negative stance towards Hefner.

The two users chosen as case studies come from different angles: The first account is explicitly feminist and tweeted about Hefner. The other one is highly related to Playboy and Hefner and often tweets about/in support of feminism. Both users provide an interesting definition of feminism and how it can be 'reunited' with Hefner's lifestyle and the Playboy philosophy.

Christine Sommers describes herself as "Resident scholar, AEI. Former philosophy professor. Author of *War Against Boys*. Host of YouTube's *The Factual Feminist* co-host of weekly podcast @Femsplainers". The purpose of her account seems to be the discussion of feminism, especially the 'right' type of feminism. As visible in the tweets in figure figure 6.11, Sommers occupies a very 'third wave' position in feminism and her tweets often reflect this by criticizing feminist movements like '#MeToo', which are meant to empower women. In this case, she argues that it can negatively affect innocent men and draws attention to the possibility of the women being "just as capable of cruelty malice as men", which reinforces her absolute belief in gender equality. Sommers was classified as pro-Hefner, because her tweet (figure 6.10) links an interview with pro-sex feminist Camille Paglia [Pyun], who argues that Hefner was not a misogynist. She supports free expression of sexuality for men and women and argues that mens magazines do not distort, but offer a honest view on sexuality and types of pleasure should be appreciated. In one of her podcasts, she talks to sex workers and discusses the role of pornography and whether it is conducive to violence. Her profile in general implies that she takes on the role of educator on Twitter, observing trends and topics and trying to lead feminism into fairer gender equality. Based on her following on Twitter, as well as the number of feminist accounts that interact with her through retweets and mentions, she can be considered a central figure on feminist Twitter that regularly engages in discussion around current feminist topics.

Interestingly, she retweeted a tweet by Cooper Hefner, Hugh Hefner's son and current director in chief of Playboy (as described on his Twitter profile), who was also classified as pro-Hefner and feminist through the quantitative analysis.

Cooper Hefner became Chief creative officer of Playboy in 2016 and was responsible for re-introducing nude models to the magazine, after they had been removed as an attempt to change the role of the Playboy magazine in the presence of increasingly available pornography online.[3] In his tweets and statements it becomes clear that he had a good relationship with his father and is proud of what he achieved with Playboy. In one of his tweets that was contained in the data for this project, he praises an article in *The Economist*, which shows Hefner in a 'realistic' light, but generally positively. His second tweet is a retweet of the German Playboy account on Twitter. Interestingly, the majority of his recent tweets seem to be themed around women and



The image shows a screenshot of a tweet from Christina Sommers (@CHSommers) and a reply. The tweet is dated 7:16 AM on October 5, 2017. It features a link to an article titled "Camille Paglia on Hugh Hefner's Legacy, Trump's Masculinity and Feminism..." from hollywoodreporter.com. The article's text states: "The pro-sex feminist, cultural critic and author tells THR why Hef's art of seduction is needed today and how Gloria Steinem is not a role model for young women." The tweet includes a photo of Hugh Hefner and a circular profile picture of Camille Paglia. The tweet has 31 retweets and 95 likes. A reply from an unnamed user, dated 8:26 AM on October 5, 2017, reads: "People are seduced by the Playboy brand of 'sophistication' when its devilish details birth a promiscuous void between man and woman."

Christina Sommers  [@CHSommers](#) [Follow](#)

Camille Paglia on Hugh Hefner, sex-phobic feminism, & more.



Camille Paglia on Hugh Hefner's Legacy, Trump's Masculinity and Feminism'...
The pro-sex feminist, cultural critic and author tells THR why Hef's art of seduction is needed today and how Gloria Steinem is not a role model for young women.
[hollywoodreporter.com](#)

7:16 AM - 5 Oct 2017

31 Retweets 95 Likes

7 31 95

Replying to [@CHSommers](#)

People are seduced by the Playboy brand of "sophistication" when its devilish details birth a promiscuous void between man and woman.

8:26 AM - 5 Oct 2017

Figure 6.10: Christina Sommers' tweet with pro-Hefner article and one of the tweet's comments criticizing this stance.

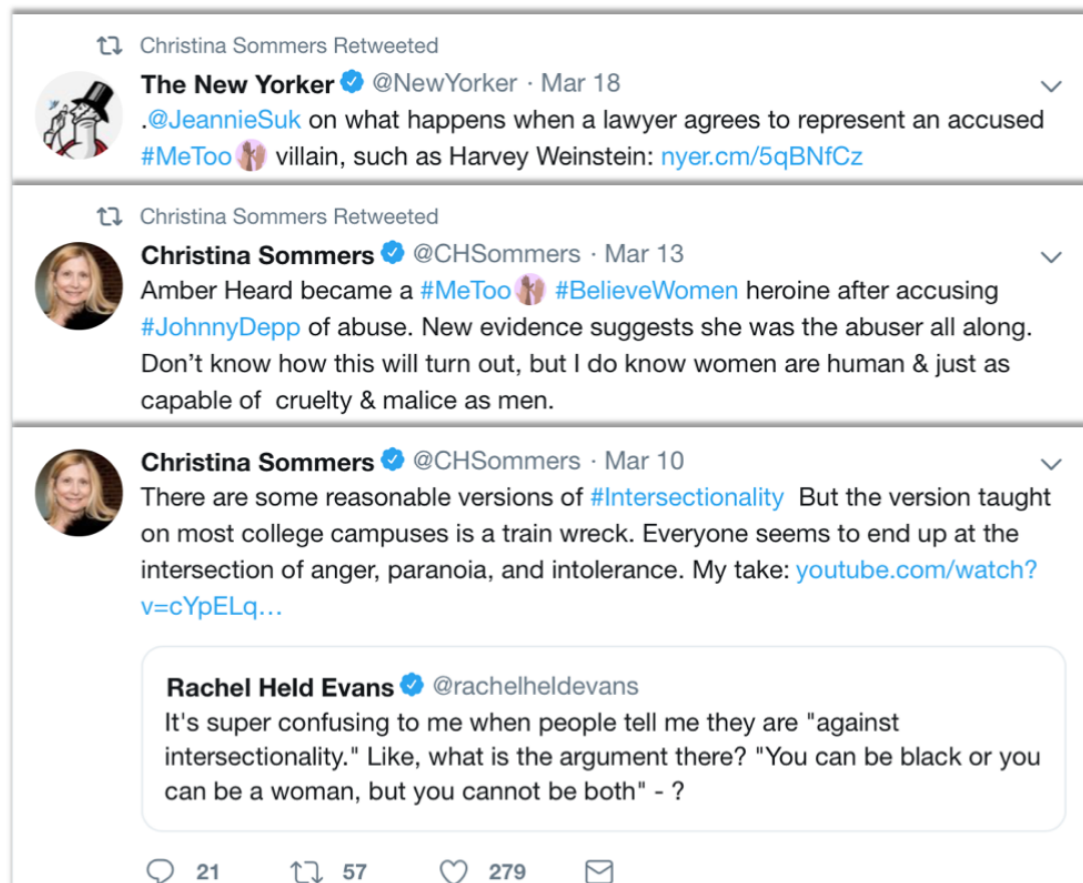


Figure 6.11: Christina Sommers' (criticism) on popular themes in online feminism like the #MeToo movement and #Intersectionality.



Figure 6.12: Cooper Hefner on Playboy, women and feminism.

feminism. He congratulates women on International Women's day and writes that "our Bunny ears represent a playful approach to liberation". He criticizes common negative public reactions to women that show their sexuality. He also comments on whether 'bunnies' have a place in feminism and the '#MeToo' movement, writing: "I was under the impression feminism was about free choice and consent". Given his stance, it is unsurprising that he mentioned Christina Sommers in a tweet and it seems like both share a similar view on the issue. (View figure 6.12 to see some of his tweets.)

Cooper Hefner has access to a large network of people from very different backgrounds through Playboy and Playboy's online presence. He fully supports Playboy's tagline "Thoughtfully Rebellious Since 1953" (Playboy's profile description on Twitter) and it seems like he is implementing the 'thoughtful' part by visibly and publicly supporting women and feminism. Perhaps, because Playboy was mainly targeted at men, it is interesting to observe that many of his tweets are very popular, which implies that he has an influence and fans that support his views.

6.2.4 Discussion

The discussion of these findings can be split into two parts:

- Firstly, it is important to consider the implications of these findings and whether they retain or even gain a meaning outside of their online context.
- Secondly, I will discuss the validity of these results and methods by drawing on issues and observations discovered during the project.

As partly already discussed in conjunction with the results, the tweets in this study offer a variety of different opinions on Hefner and topics around Playboy and feminism. Perhaps because a lot of the Twitter users fit into a different demographic than the one that was originally targeted by Playboy, the users that were involved in the discussion

around Hefner's death were largely critical of his actions and his legacy. Even though 'modern' feminism is supposed to be inclusive and open to all different opinions of what a 'feminist should look like', it still seems like a lot of users are not comfortable with supporting sex-work and open exhibition of female sexuality. Christina Sommers and Cooper Hefner offer an interesting perspective on feminism and how it may impact the future of Playboy to accommodate feminist views and to convince the audience of its value.

I discussed the validity of the methods applied in terms of label propagation and the observations that some users do not seem to retweet tweets of their own stance. This, as well as the relatively small set of remaining users that were both labeled for stance and feminism, may be detrimental to the meaningfulness of results. However, single examples seem to confirm that the users were classified correctly.

As previously mentioned, [10] show a slightly different approach to stance classification, which could be used in conjunction with label propagation to label a larger amount of initial tweets. Their model classifies tweet stances towards the Brexit referendum, so the type of tweet is likely different from the one in this project. The analysis showed a large variation in topics and opinions that emerged from tweets, but not necessarily specific to a stance. There were some general trends like the use of '#RIP' in some form for tweets of a positive stance towards Hefner. It would be

Chapter 7

Conclusions and Future Work

7.0.1 Conclusions

This project provides an overview of topics discussed around the death of Hugh Hefner on Twitter and analyses the stances of users involved in this discussion. Users mainly tweeted attacking Hefner and the Playboy philosophy, supporting their arguments with his exploit of Marilyn Monroe's nudes to start Playboy and refuting Hefner as 'feminist'. Profiles were labelled as feminist according to keywords found on the profiles and results show that the majority of feminist users did not agree with Hefner.

7.0.2 Future work

This project does not fully explore the data that was downloaded from user profiles and there is room for further analysis. For example, it would be interesting to analyse the network of users labelled as feminist and to find subgroups with similar views of feminism.

If this data is used for further research, it would be useful to get a second and third opinion on the labels applied to the tweets during manual annotation, for example using crowd sourcing. An inter-annotator agreement score would provide a higher level of certainty that the stances have been allocated correctly. Considering that some users explicitly state that retweets do not equal endorsement of the tweet's message, this observation should be kept in mind in projects using label propagation. A more in-depth analysis of this concern may clarify, whether this is a problem and a common 'trend' amongst Twitter users.

Given the role of micro-blogging platforms in opinion building and expression of identities like feminism and the various associated labels found from feminist user profiles, this may be an interesting path of research in relation to other types of identities. As the qualitative analysis shows, the interpretation of the feminism label itself varies across Twitter users, so it would be interesting to further investigate how these specific 'types' of feminist can be detected automatically and by making use of the collected data. Generally, the method and specific keywords used to detect feminist profiles could be improved based on the findings from this research.

While Hugh Hefner may not be a relevant topic for future study, it seems like Hefner's son is attempting to keep Playboy relevant, even supporting the philosophy from a feminist standpoint. It may be interesting to follow up on the development of this philosophy and how Playboy is attempting to co-exist with widely accessible online pornography and increased awareness and push for gender equality.

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Appendices





Neutral / Unclear	Negative about Hefner	Positive about Hefner
<p>Corra Harrington @ingene_addict There's a lot that can (and should) be said about Hugh Hefner, but the fact that he hired a black woman to design this is still incredible.</p> <p>Did you know, Zaida Wynn Walker, the designer of the iconic Playboy Bunny costume, was a black woman?</p> <p>11:00 AM - 28 Sep 2017 7,774 Retweets 15,494 Likes</p> <p>Hugh Hefner lived so long that his first wife's name was Mildred and his last wife's name was Crystal.</p> <p>3:15 AM - 28 Sep 2017 88,075 Retweets 395,756 Likes</p> <p>Mike Ginn @shugmikginn These Hugh Hefner obituaries are brutal</p> <p>This ancient primate may be responsible for genital herpes</p> <p>By Ben Quatman October 2 at 2:50 PM</p>  <p>8:07 AM - 6 Oct 2017 5,779 Retweets 25,456 Likes</p> <p><i>Suspended account:</i> Hugh Hefner's legacy will live forever (URL)</p> <p><i>Suspended account:</i> Life is short? Nigga he was 91 lmao (URL)</p>	<p><i>Suspended account:</i> the disgusting truth about hugh hefner, a rant thread (URL)</p> <p>this dude found a way to disrespect women even in his death</p> <p>L.A.ist @L.A.ist Hugh Hefner To Be Buried Next To Marilyn Monroe, Whose Nude Photos Were Used To Launch Playboy Without Her Consent</p> <p>3:15 PM - 28 Sep 2017 36,379 Retweets 91,260 Likes</p> <p><i>Suspended account:</i> She done sucked the old wrinkled for nothing (URL)</p> <p>christ... you can't even be alone in death without a man coming over and going "so, is this seat taken?" while sitting down in it</p> <p>billboard @billboard Hugh Hefner to be buried next to Marilyn Monroe</p> <p>10:25 AM - 28 Sep 2017 24,540 Retweets 83,034 Likes</p> <p>Things Hugh Hefner was:</p> <ul style="list-style-type: none"> • abusive • a predator • manipulative • into beastality • scum <p>Things Hugh Hefner was NOT:</p> <ul style="list-style-type: none"> • "iconic" • legendary <p>9:18 AM - 29 Sep 2017 from Florida, USA 4,681 Retweets 15,767 Likes</p>	<p>tribute to the original playboy - art dealer x Hugh Hefner prod . playboicarti</p>  <p>1:27 PM - 2 Oct 2017 17,859 Retweets 37,126 Likes</p> <p><i>Suspended account:</i> Suspended account: well done king (URL)</p> <p><i>Suspended account:</i> Every girl must dress as a bunny for Halloween in memory of Hugh Hefner</p> <p>A tribute to the late Hugh Hefner. Before he peacefully passed away, these were the final words he said...</p>  <p>8:37 PM - 29 Sep 2017</p> <p>Max's tribute to Hugh Hefner - Civil rights supporter , philanthropist , publisher , innovator and entrepreneur. #RIPHughHefner</p>  <p>6:03 PM - 28 Sep 2017 4,754 Retweets 136 Likes</p>

Figure 1: Most retweeted tweets for each attitude (in the collection). Tweets were anonymised and censored where appropriate.

Top 20: Overall, category independent

With retweets:

(#RIPHughHefner', 5683), (#HughHefner', 2952), (#RIPHef', 2411), (#Playboy', 1360), (#RIP', 1067), (#StopSlutShaming', 936), (#Hefner', 901), (#SoundCloud', 820), (#TuesdayThoughts', 744), (#np', 741), (#playboy', 535), (#RIPHefner', 526), (#ThursdayThoughts', 471), (#trndnl', 411), (#hughhefner', 354), (#hefner', 328), (#Venezuela', 316), (#news', 295), (#News', 294), (#JaredLeto', 224)

Just occurrence in original tweets (base rate):

(#HughHefner', 1366), (#Playboy', 809), (#SoundCloud', 591), (#Hefner', 532), (#np', 507), (#trndnl', 363), (#playboy', 338), (#Venezuela', 301), (#RIPHef', 293), (#news', 285), (#News', 245), (#hughhefner', 235), (#hefner', 219), (#RIPHefner', 206), (#RIP', 173), (#VIDEO', 173), (#Hugh', 164), (#celebrity', 151), (#RIPHughHefner', 143), (#JaredLeto', 141)

Pro: top 20

RIPHughHefner 5421
 RIP 670
 HughHefner 300
 dream 197
 actress 193
 actor 193
 actorslife 193
 grateful 193
 film 193
 joyce 193
 movie 193
 NewYork 193
 RIPHefner 178
 RIPHef 166
 playboy 127
 Playboy 96
 MAGA 63
 BMM 61
 Boudoir 57
 homecoming2k17 54

Con: top 20

HughHefner 116
 Hefner 70
 OpDeathEaters 41
 PedoGate 40
 PizzaGate 40
 HughHeffner 36
 Playboy 25
 hefner 25
 psalm37 25
 Apologetics 21
 GloriaSteinem 19
 hughhefner 17
 deadpimp 17
 Trump 13
 sexism 13
 PigsOfLiberalism 12
 MarilynMonroe 9
 catholic 9
 BillCosby 9
 PlayBoyMansion 9

Figure 2: Hashtags and frequency of their occurrence according to given criteria.

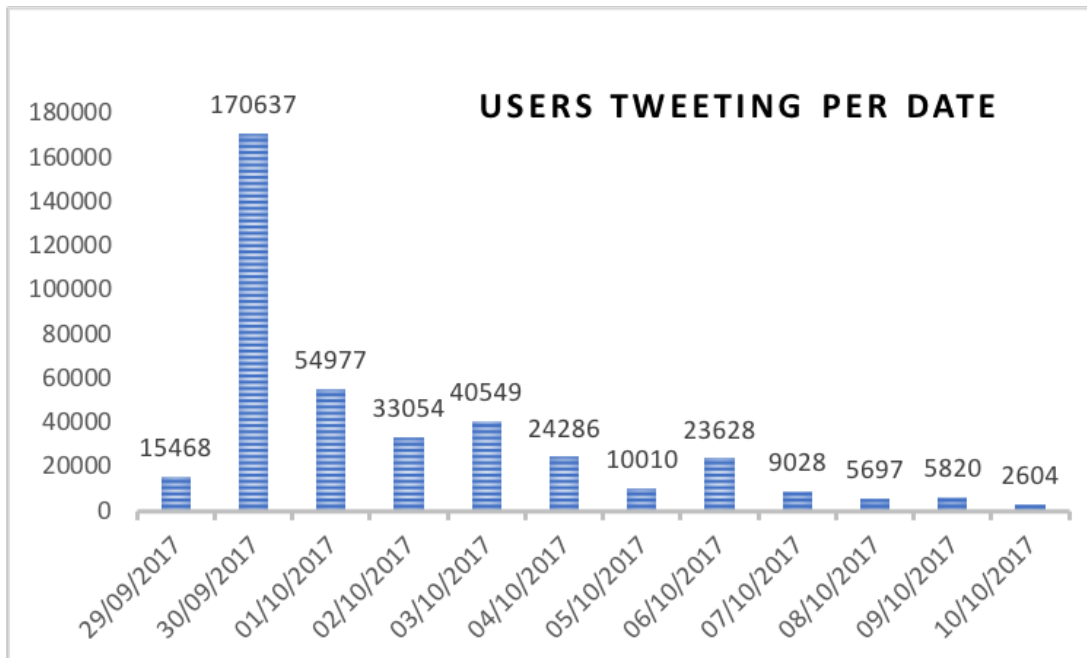


Figure 3: Unique set of users from tweets in collection, per day of collection.

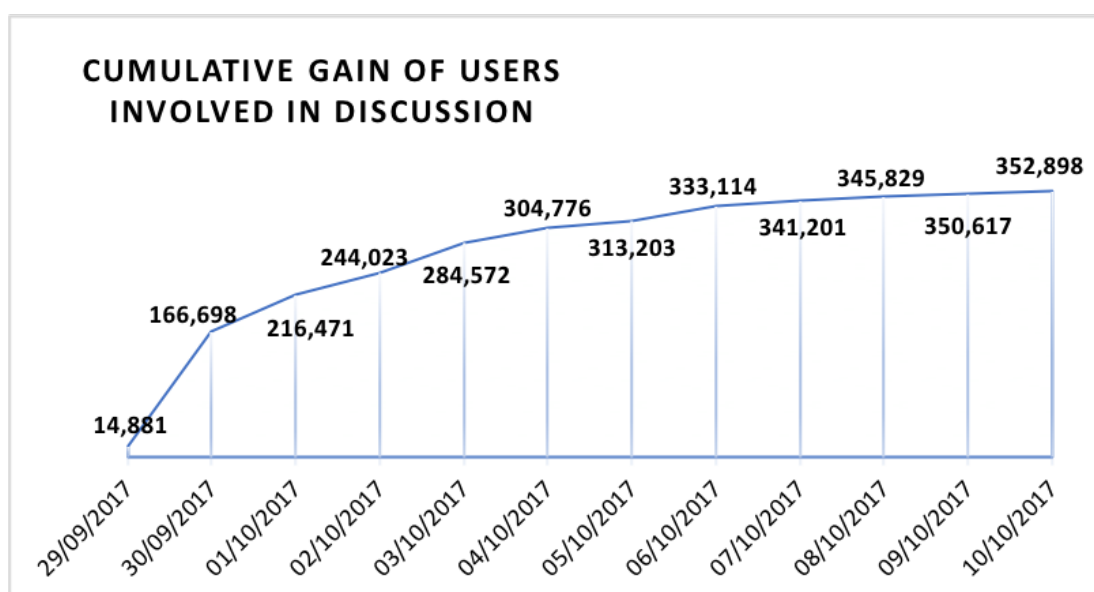


Figure 4: Cumulative gain of new users per day.