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**Text analytic approaches for
analysing information sharing in
radicalised manosphere communities**

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Resumen

Esta tesis se encarga de analizar mediante técnicas analíticas de texto, los grupos de la manófera (grupos online con alto contenido misógino), en concreto, se encarga de analizar la información que comparten estos grupos radicalizados y como influye esta en sus discusiones así como la composición temática de estas.

De esta forma, en este trabajo se muestran que fuentes de información son las más compartidas y discutidas por los miembros de estas comunidades, demostrando que existe una importante retroalimentación dentro de las mismas.

Por otro lado, mediante técnicas de modelado de tópicos probabilísticos, se demuestra que los tópicos más hablados por estas comunidades son sobre las relaciones, las mujeres, la sociedad y otras comunidades de la manófera. Gracias a estas técnicas se ha podido ver la composición de los temas de las discusiones de cada fuente de información y mediante técnicas de clustering se han podido clasificar estas fuentes según los tópicos de estas discusiones.

Con todo ello, este trabajo proporciona una nueva visión de estas comunidades de la manófera radicalizadas a través de la información que comparten y la influencia de esta información.

Abstract

This thesis analyses, using text analytical techniques, the manosphere groups (online groups with high misogynist content), specifically, it analyses the information shared by these radicalised groups and how this influences their discussions as well as the thematic composition of these discussions.

In this way, this work shows which sources of information are the most shared and discussed by the members of these communities, demonstrating that there is important feedback within them.

On the other hand, using probabilistic topic modelling techniques, it has been shown that the topics most talked about by these communities are relationships, women, society and other manosphere communities. Thanks to these techniques it has been possible to see the composition of the topics of the discussions of each source of information and utilizing clustering techniques it has been possible to classify these sources according to the topics of these discussions.

As a result, this work provides a new insight into these radicalised manosphere communities through the information they share and the influence of this information.

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Chapter 1

Introduction

This work analyses the information shared by manosphere groups on online forums such as Reddit. Due to the growing number of users in these communities, understanding the information shared is expected to provide a better understanding of the behaviour of these communities as well as some of the reasons for the radicalisation of their users. Thus, this work will analyse the most shared and impactful sources of information as well as the topics and relationships between these sources.

1.1 Motivation

Manosphere groups are user groups found on the web (websites, forums, blogs, etc.) that promote masculinity, opposition to feminism and even misogyny. Within these manosphere groups are various movements or groups, such as MGTOW (Men Go Their Own Way) which is a movement of men who have decided not to need women in their lives, the incels who are a group of men who accuse women (mostly with high levels of misogyny) of not having relationships with them and other anti-feminist groups who are against feminism movement.

In addition to their highly aggressive and discriminatory content, new trends related to hate crimes and even acts of terrorism are emerging within the discourse of the manosphere communities, even having some similarities with jihadism [19]. Sadly, some of these trends have reached beyond the networks of these manosphere groups, as was the case with the Toronto terrorist attack in 2018 in which 10 people were killed by a 28-year-old man who claimed to be an incel [6].

A major concern is that over the years these groups have grown and transformed into the radicalised groups of today [36], with the number of users participating in these online groups growing exponentially in recent years [14] as it can be seen in figure 1.1.

On the other hand, this type of radicalisation not only ends up harming the people who suffer these hate crimes (generally women) but can also affect the health of the users of these communities themselves. As will be seen in more detail in the next section, there are some of these communities that not only feel great hatred and aggression but also have mental health problems, many feel lonely and in the most extreme cases, some can become depressed and even think about self-harming themselves and commit suicide. This can be seen in the work of Daly and Laskovtsov [9] where they analyse suicide posts from these communities, coming across such sensitive topics as the planning of their suicides, the effects that these could have or their failed attempts.

For all these reasons, there is a need to understand how these manosphere groups are radicalised and to provide a better understanding of these communities in order to be able to identify and mitigate these trends in the near future.

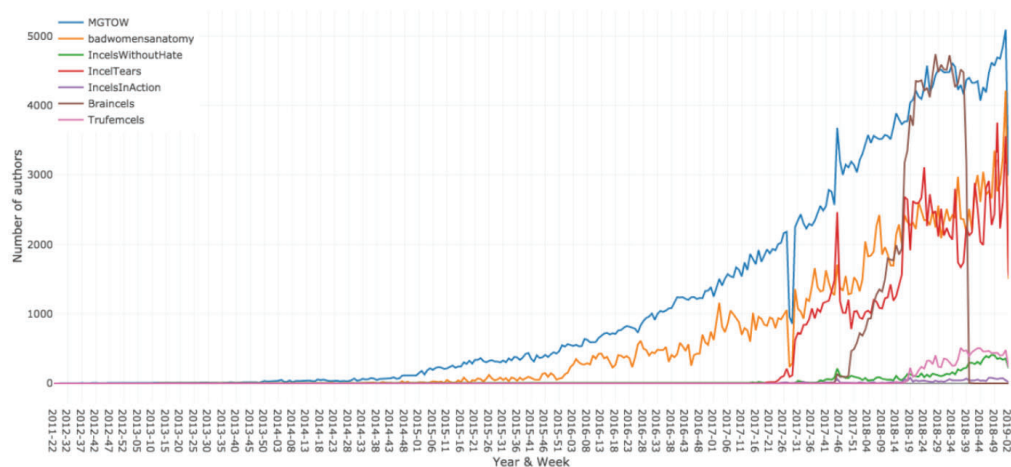


Figure 1.1: Growth of manosphere communities in recent years [14]

1.2 Manosphere groups culture

Before analysing these communities in-depth and establishing the research questions that this thesis will attempt to answer, it is important to understand the motivations and culture of these manosphere groups. Thus, this section will discuss the two main communities that will be investigated in this thesis, MGTOW and the Incels.

1.2.1 MGTOW

MGTOW is the acronym for "Men go their own way", as the name may indicate, this community is made up of a group of men who have decided that women have no role in their lives although some may have spontaneous relationships depending on how faithful they are to this philosophy.

This movement is believed to have started around the year 2000 mostly by divorced men, however, after the publication of their manifesto this movement has spread rapidly through the network with large communities such as Reddit threads, mgtow.com or YouTube channels with thousands of followers.

Thus, within the MGTOW community they have an ingrained culture that is based on modern man having to preserve and protect his own sovereignty above all else. Some communities even claim that the MGTOW movement can be traced back to great men in history who succeeded without women, such as Schopenhauer, Beethoven, Galileo and even Jesus Christ [4].

Furthermore, depending on how deeply rooted the members are in this community and at what level they follow the philosophy of this movement its members can be in 5 different levels [25]:

- **Level 0:** This is the first level in which there are all members who, even if they do not comply with the philosophy of the movement, are at least aware of the situation (women are trying to steal their money, the gender equality movement is a lie, etc.).
- **Level 1:** At this level, members reject and do not enter into long-term relationships such as stable relationships or marriage. However, they may have sexual encounters and non-stable relationships.
- **Level 2:** At this level, members reject all kinds of relationships, from long-term relationships to short-term relationships and even sexual encounters.

- **Level 3:** At the third level, members try to reduce the money they contribute to society in order to avoid giving financial support to other groups such as single mothers.
- **Level 4:** At the latter level, members disengage themselves completely from society. They are known as ghosts and are treated in this community as heroes.

In this way, in this community there can be found high levels of misogyny, where women are treated as parasites who try to harm men in order to take their money, their property and even their children.

1.2.2 Incels

The term incel is an abbreviation of the term involuntary celibacy. Thus, unlike the members of the MGTOW movement, incels have not decided to do without women but cannot have relations with any woman even if they want to. This includes not only sex and relationships, but also the wider field of feeling loved, valued and accepted. In this way, incels blame this lack of experiences and feelings on modern society and in particular on women [28].

To justify this hatred and their situation, there are several beliefs within this community. On the one hand, there are several biological theories following approaches such as Darwin's theory of evolution and even stating that incels are like this because the bone structure of their skull is not the socially desired one.

With this in mind, we come across some of the terms used by incels to classify people according to their attractiveness. With this in mind, we come across some of the terms used by incels to classify people according to their attractiveness. Firstly, there are the chads who are those men with a socially desirable face (according to their definition with a small nose, pronounced jaw, etc.) and sexually desirable. On the other hand, women are classified as Becky and Stacy. Stacy are those women according to the incels who flirt with Chad and only care about fashion and cosmetics. Becky women, on the other hand, are inferior to Stacy women and want to be noticed, yet reject most men [22].

Along these lines, incels also rate people according to their attractiveness from one to ten in what is known as the decile scale. The problem with this scale, as incels claim, is that low-scoring women will always aspire to men with higher scores than her, which leaves low-scoring men (including those who claim to be incels) with no chance of having a relationship. With this philosophy incels blame society and especially women for the fact that women do not want to be with them.

On the other hand, the Incels also have a deeply rooted philosophy of the red pill (figure 1.2) although it can be found in other communities. The red pill philosophy is an analogy to the Matrix movie and is based on the idea of whether or not to accept an uncomfortable truth, in this case about impossible relationships due to attractiveness. Thus, the different pills would be the following:

- **Blue Pill:** It means following the roles imposed by society such as the acceptance of movements like feminism.
- **Red Pill:** It means waking up and realising that men suffer social discrimination and not women.
- **Purple Pill:** It is a middle ground between the two previous pills, meaning that it accepts some of the uncomfortable truth but not others such as the decile scale scoring system. In the case of the MGTOW community, this pill would be level 0.

- **Black Pill:** This pill is the most pessimistic version of the red pill. Those who "take" this pill give up all hope and accept that they will always be alone and that their life has no solution because the world is unfair and will always be unfair.

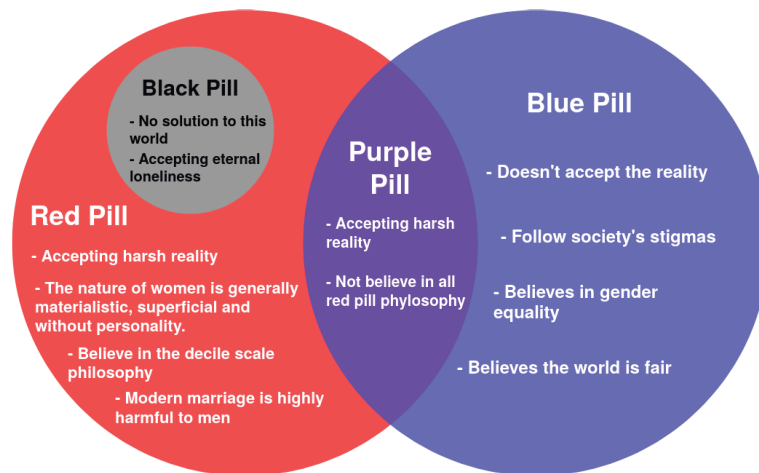


Figure 1.2: Red pill philosophy

Because of this whole culture, incels hate women for being, according to them, the cause of their problems. Thus, within their communities there is a high content of misogyny, they even dehumanise these women by using terms such as Femoids (female humanoid) to refer to them. Furthermore, as seen with the pill philosophy, the situation of incels goes beyond a systematic hatred of women and society, they also have mental health problems such as depression and a deep sense of loneliness.

Finally, within the incels you can find other sub-communities such as the incels-without-hate, which are incel communities that claim not to hate women (although some works show the opposite [14]) or the femcels, which are women who claim to be incels although they are not generally accepted by the community because, according to incels, they will always be able to get laid.

1.2.3 Other communities

Although MGTOW and incels are the most prominent and the main manosphere communities to be analysed in this thesis, there are also other communities that are important within the manosphere. Some of these communities are the following:

- **Men's Rights Activists (MRAs):** The MRA movement is a group whose aim is to defend men's rights because its members claim that they are discriminated against merely because they are men. In this way, the movement is concerned with social issues centred on family and relationships as well as political issues such as education and military service. This movement shares many similarities with the MGTOW group.
- **Pick-Up Artists (PUAs):** It is a community whose aim is seduction. Thus, the members of this group are men who try to learn the art of seduction in order to seduce or have sexual relations with women.

1.3 Our work

Due to the philosophies of these movements and the problems they have caused not only for society at large but also for themselves, there is a need to better understand the ways in which their members are radicalised in order to identify and mitigate them in time

With this in mind, this thesis will focus on analysing the sources of information that are shared by these manosphere groups in order to better understand where their ideas come from. In this way, the main objectives of this work will be the following:

- Find the sources of information shared by the incels and their influence on the discussions.
- Find the themes and relationships between these sources of information.

To achieve these objectives, data will be drawn from manosphere groups found on online forums such as Reddit. Specifically, the communities that will be analysed are MGTOW, Incels, Trufemcels, badwomenanatomy (group of men talking in a misogynistic way about women's bodies) and IncelTears (group of users dedicated to calling out incels).

Thus, it is hoped that this research will provide a better understanding of these manosphere communities and the information they handle so that techniques for identifying and mitigating this type of radicalisation can be addressed in the near future.

Finally, the structure to be followed in this thesis is as follows: Chapter 2 will highlight and discuss previous work that has addressed the analysis of these manosphere groups. Chapter 3 will discuss the research questions and the objectives that will be pursued to address those questions. Chapter 4 will describe the data used and their structure. Chapter 5 will contain the methodology and discussion of the two research questions. Finally, chapter 6 will discuss the conclusions that have been reached with this work as well as open fields for future research.

Chapter 2

Related work

The aim of this chapter is to locate previous work related to the topic of this project. In this way, this chapter will present the methodology used to locate these works, the state of the art, the gap in the state of the art that this thesis will attempt to fill and the techniques used in other works that will be applied in this work.

2.1 Methodology

The problem of hate speech has been growing exponentially over the years, including the problem that concerns us in this thesis, misogyny. Fortunately, research and the number of publications on hate speech has grown in the same way [35]. Due to this large number of publications, which is growing year by year, it seemed relevant to us not only to indicate the publications on the different topics into which this problem of hate speech towards women is divided but also how these publications have been found. In this way, the steps needed for obtaining the most relevant papers on this topic will be detailed in this chapter so a good study base is provided for finding the newest and best contributions against online misogyny.

In the first step of the information search, it was decided to use the Web of Science search engine and we looked for the topics misogyny and online, refined by the language (as we are looking for English papers). In this first search, we got 128 papers, where we can initially see a division between the different topics. On one hand, we have papers that research the problem of hate speech, especially on misogyny themes and more oriented on social investigations. On the other hand, we have papers that try to study online communities where misogyny is the main topic and their jargons. Finally, we also found a lot of papers related to machine learning that are more focused on obtaining good datasets and models to predict these kinds of comments. Due to these different topics that we obtained with the first query, we also searched other queries more focused on these main topics. This way, the final queries for Web of Science searcher were:

TOPIC: (misogyny) AND TOPIC: (online) Refined by: LANGUAGES: (ENGLISH)

TOPIC: (misogyny online) AND TOPIC: (communities) Refined by: LANGUAGES: (ENGLISH)

TOPIC: (misogyny online) AND TOPIC: (language) Refined by: LANGUAGES: (ENGLISH)

TOPIC: (misogyny detection) Refined by: LANGUAGES: (ENGLISH)

Secondly, we looked in Scopus searcher as before, for the papers with the topics “misogyny” and “online” and filtering by the language, getting only the English written papers. In this search, we obtained 136 documents, a few more than before. As before we got papers related to social investigations, online communities research and machine learning projects. This way, following a similar approach as with the Web of Science search engine, the final queries for the Scopus searcher engine were:

(TITLE-ABS-KEY (misogyny AND online) AND (LIMIT-TO (SUBJAREA , ‘COMP’)) AND (LIMIT-TO (LANGUAGE , ‘English’))

(TITLE-ABS-KEY (misogyny AND online) AND TITLE-ABS-KEY (communities))

(TITLE-ABS-KEY (misogyny AND online) AND TITLE-ABS-KEY (language))

TITLE-ABS-KEY (misogyny AND detection)

Finally, we looked at google scholar to see if some papers were missed. On this search we looked for “Misogyny online”, as there were thousands of results, we focused on those papers that were cited more times, that were not included on the previous searches and which title could fit in our research.

Once we had a considerable amount of papers preselected, all the abstracts were analysed manually to see if those papers fit in our research. Depending on whether the paper fits or not, it is saved or discarded, when there are some doubts about it, the introduction or all the paper if needed are read to make sure whether it fits or not.

Once all the papers that can be relevant to our work have been selected, is time for extracting the important data from them to know which methods are getting the best results and to know which approaches have not yet been taken. Also, this step can be used for finding new relevant papers on the citations of the previously selected papers.

To facilitate running a similar process in the future, we summarise our literature search protocol in these steps:

1. Determine search engines that are going to be used.
2. Search for ”misogyny online” and try to differentiate between the different topics related to the current research for making more specific searches.
3. Add the necessary filters to reduce the number of papers to read to those that are going to be more relevant.
4. Ignore those duplicated articles that appeared in more than a query or other search engines.

5. Search manually in Google Scholar to see if some relevant articles were missed.
6. Extract relevant data and remove papers that do not fill in your research or discover new ones following the citations of said papers.
7. Discuss those papers that fit better in your research features.

In this way, in the next section, all the papers that have been selected with this methodology (table 2.1) will be discussed.

Table 2.1: Selected papers

Paper	Category	Reference
Terrorism, radicalization and de-radicalization	Radicalism Roots	[12]
Misogyny & violent extremism: Implications for preventing violent extremism	Radicalism Roots	[23]
Elliot rodger: An analysis	Misogynistic Roots	[26]
Fragile masculinity: Men,gender, and online harassment	Misogynistic Roots	[33]
A Horror Tale of Male Entitlement: Jack the Ripper and “His” Shadow, the Incel Movement	Misogynistic Roots	[7]
Exploring misogyny across the manosphere in reddit	Manosphere Culture	[14]
Topic modeling the red pill	Manosphere Culture	[29]
From “Incel” to “Saint”: Analyzing the violent worldview behind the 2018 Toronto attack	Manosphere Culture	[3]
Reddit quarantined: Can changing platform affordances reduce hateful material online?	Manosphere Culture	[8]
Using platform signals for distinguishing discourses: The case of men’s rights and men’s liberation on Reddit	Hate Analysis	[27]
Online hatred of women in the Incels.me forum: Linguistic analysis and automatic detection	Hate Analysis	[21]
Neologising misogyny: Urban Dictionary’s folksonomies of sexual abuse	Hate Analysis	[17]
On the use of Jargon and Word Embeddings to Explore Subculture within the Reddit’s Manosphere	Terminology	[13]
Detecting misogyny in Spanish tweets. An approach based on linguistics features and word embeddings	Misogyny Identification	[16]
Detecting misogyny and xenophobia in Spanish tweets using language technologies	Misogyny Identification	[31]
Automated hate speech detection and the problem of offensive language	Bias in identification	[11]
Racial bias in hate speech and abusive language detection datasets	Bias in identification	[10]
A semantic graph-based approach for radicalisation detection on social media	Other Identification	[34]
How “alone” are lone-actors? exploring the ideological, signaling, and support networks of lone-actor terrorists	Other Identification	[20]
The age of lone wolf terrorism	Other Identification	[18]

2.2 State of the art

In this section, we will discuss the works that constitute the state of the art, as well as the structure in which these works have been classified and the techniques that will be used from other similar works.

2.2.1 Structure

The structure of the state of the art papers of this project can be seen in Figure 2.1.

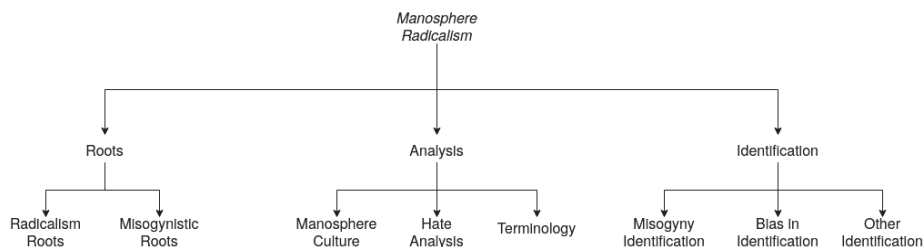


Figure 2.1: SOTA structure

In this way, the papers can be divided into 3 main categories:

- **Roots:** These are those papers that analyse the reasons for both general and misogynist radicalisation from a mostly sociological point of view.
- **Analysis:** Papers that attempt to analyse manosphere communities. In this way, there will be works that analyse the culture of these groups, the hatred inherent in these communities or the terminology and characteristics of these collectives.
- **Identification:** in this category are works that propose methods for the detection of misogyny, the problems of these methods (biases) and other methods of identification.

The category to which each paper belongs can be seen in table 2.1 in the previous section.

2.2.2 Discussion

The radicalisation of members of different groups is a problem in our society, ranging from manosphere groups to political or religious groups. According to Doosje et al. [12] this radicalisation is characterised by 3 phases. The first phase is called sensitivity and is the phase in which individuals start to be influenced by these ideas, which may be due to personal reasons (feelings of insignificance, uncertainty, etc.), the individual's circle (fraternal relative deprivation, friends belonging to such groups, etc.) or social circumstances. In the second phase, the individual joins the radical group, in this phase the individual tries to follow the norms of the group and starts to exercise its values, forging a strong relationship with the group and even breaking the relationships of his or her former close circle. Finally, phase 3 is the action phase. In this last phase, members of these radicalised groups use violence against other groups.

In the case of this research, the phase of joining the group and following their values, would be joining manosphere groups like incels and its members should follow the values of philosophies like the red pill and blame women for their misfortunes. Thus, the next phase would be violence against women. In this way, there is a direct correlation between

misogyny (phase 2) and violence against women (phase 3) as has been shown in previous works [23].

As mentioned above, during this radicalisation process, some triggers are also needed for individuals to decide to join such communities. These triggers are still quite similar to those of decades ago [7] and are based on the idea of not being able to meet the standards imposed by society. Thus, men who feel anxious about not fulfilling man gender roles and feel that they are less of a man are more likely to hate women [33]. This was the case with Elliot Rodger (misogynistic killer turned hero to some incels [1]), who exhibited a sense of failed masculinity and sexual frustration due to his failure with women. This failed masculinity feeling along with a combination of many personal traits (e.g. complexes about being biracial) and other life experiences (e.g. feeling inferior to his brothers) led him to murder 10 people [26].

Along these lines, in recent years the radicalisation of various groups through social networks has grown exponentially [14], reaching beyond the internet and provoking aggression and even terrorist acts [6]. Fortunately, research on this type of radicalisation has also grown exponentially [35], resulting in a wide variety of papers that attempt to study this phenomenon. In this way, the women-hating communities that constitute manosphere groups are not an exception for this growing radicalisation and their communities have also grown and evolved over the years. In the work of Manoel et al. [32], they have investigated the evolution of the manosphere across the web, in their work, they have seen how new communities such as incels and MGTOW have become more relevant than old communities such as Pick-Up artists. They have also seen how there has been a migration of members from these old communities to the new ones and how these new communities have become more aggressive than the older ones.

Each of these communities has its own characteristics, in a previous paper [14], it was studied the different cultures within the *manosphere* of Reddit and found that each of these communities has its peculiarities in terms of vocabulary and intentions. Also, the trend in the size of these communities as well as their hate speech was seen to be on the rise. As a result, Reddit decided to quarantine some of these communities, although this did not reduce the levels of hate speech in these communities and many of their users began to migrate to other, less restrictive platforms [8]. In some of these external communities, such as those based on the red pill philosophy, themes such as self-development, social change or the importance of historical male leaders have been seen to predominate, as well as the relationships of these themes and how members use them to support each other's arguments [29]. Also, in an extensive analysis of the *incels.me* forum [3], it can be seen how this forum has grown over time (especially after the Toronto attack) as well as its worldview and the relationship of this worldview to violence.

Furthermore, numerous studies have investigated the hatred within these communities as well as the terminology they use. First of all, incel groups formed by men are completely different from other men's groups such as the Men Lib movement, with incel groups having a more specific and aggressive terminology [27]. This idea is confirmed by other studies of incels-only forums such as *incels.me*, where there is 10 times more hate speech than on Twitter as seen in [21]. Also, in this work, it was found that the user profile of these communities is young people between 21 and 30 years of age with a psychological profile in which they present a tendency to isolation and negativity, as well as aggressive behaviour and incitement to violence.

Moreover, the language used in these communities is important to better understand their culture and way of thinking. In fact, on portals such as Urban Dictionary, there is a large percentage of misogyny that encourages the manosphere's hate speech, and there are clear indications that a discursive transfiguration is taking place with terms related to sex and gender causing more objective definitions of these terms such as feminism to be obscured by misogynistic definitions [17]. Also, as seen above, within the manosphere there

are distinct groups of incels with their particular characteristics. In [13], they analyse how the priority issues that are discussed change between different communities and propose an approach for understanding the new terminology that emerges within these types of communities.

In addition to these studies, a great deal of work has been done on the detection of this type of misogynistic behaviour. Most of these works are focused on processing the text from a misogynous dataset with natural language processing techniques for extracting some attributes that can be used as inputs in some machine learning models. For example, in [31] the authors propose three different approaches to classifying hate speech against women and immigrant in Spanish tweets. Similarly, in [16] the authors train different models for detecting misogyny in Spanish tweets but distinguishing between Spanish from Latino America and Spanish from Spain since the cultural differences are large enough to distinguish between these communities according to their authors. All these works and their results prove that the detection of hateful and misogynistic content is possible on social networks. However, in constructing such identification models, care must be taken to avoid biases. As shown in [11], machine learning algorithms often struggle to distinguish between offensive and hate speech. In worse cases, racist biases can also be found in the data used by these algorithms to detect hate speech and abusive language as shown in [10].

Other techniques have also been used for the identification of radicalisation, for example, in [34] the authors propose a semantic graph-based approach for radicalisation detection on social media. Furthermore, it has been shown that patterns related to social activity can help make terrorist attacks detectable [20]. In addition, studies have also shown that certain news stories published in the media can influence lone wolf terrorists [18].

Along these lines, understanding the activity related to information sharing in these radicalised groups may be key not only to better understand these communities but also to identify and mitigate this type of radicalisation in the future. In this way, despite this extensive research on the analysis of these manosphere communities and the detection of misogynist content, to the best of our knowledge, no research has been conducted on how these groups of the manosphere share the information as well as the discussion fostered by it. To this end, this thesis will contribute to the state of the art with an in-depth study of how this type of misogynist radicalisation is encouraged within forums such as Reddit through the information shared to try to learn more about this type of radicalisation and thus, try to mitigate its possible future effects.

2.2.3 Technical related work

Once the works that make up the state of the art have been specified, it is also important to explain which techniques from those works or new ones will be used for the technical section of this thesis.

First of all, when working with data in text format, it will be necessary to follow a procedure for the application of natural language processing techniques. The pipeline followed in identification works can be something simple like in [31] that only pass the text to lowercase or remove information that is not needed although in other works like [16] also other feature extraction techniques like POS Tagging are used.

On the other hand, probabilistic topical models such as LDA [5] will also be used as they have been used in other works to extract new terms from manosphere communities [13].

Finally, with these models and with the idea of using them to classify documents, clustering techniques will be needed. For these clustering methods from distributions over topics, Badenes, García and Corcho propose 3 clustering methods [2]:

- **Trends-based Clustering:** This type of clustering is based on assigning a numerical value according to the trend of the topics that make up the document. In this way, the cluster will be composed of K numbers where K is the number of topics. Each number will depend on the percentage of the previous topic, 1 will be assigned if the previous topic had a higher percentage, 2 will be assigned if the percentage is lower and 0 will be assigned if it is the same percentage. For example, given the distribution $P = [0.13, 0.24, 0.24, 0.39]$, the cluster would be 2102.
- **Ranking-based Clustering:** This clustering is based on assigning each document to the cluster of the topic with the most weight in that document. For example, given the distribution $P = [0.13, 0.24, 0.24, 0.39]$, the cluster to which that document would be assigned would be cluster 4 since it is the topic cluster with the highest weight.
- **Cumulative Ranking-based Clustering:** This clustering technique is similar to the previous one. The idea is to have a threshold and take the topics with the highest weight until the threshold is exceeded. For example, given the distribution $P = [0.13, 0.26, 0.22, 0.39]$ and a threshold of 0.5, the cluster would be 42.

Chapter 3

Research Methodology

This chapter will aim to define the research questions to which this project will attempt to provide answers, as well as to detail the reason for these questions and provide a detailed explanation of how they will be answered. As stated in the introduction of this thesis, the main objective of this research will be to understand where the information that causes these groups to radicalise comes from. In this way and for obtaining a response for this main question, the research questions we propose are as follows:

- R1: What kind of websites manosphere communities share and how this information influences their discussions?
- R2: Which are the topics and keywords of the discussions around this information?

3.1 Research Question nº1: What kind of websites manosphere communities share and how this information influences their discussions?

The purpose of this question is to see what manosphere groups share that can provoke this kind of radicalisation. In this way, it is hoped to see which sources of information are shared as well as which generate the most debate.

3.1.1 Hypothesis

The use of data extracted from manosphere groups together with data mining techniques can provide information on the most shared and debated sources of information in manosphere communities such as incels or MGTOWs.

3.1.2 Objectives and evaluation

To do this, we will analyse the links they share via the Reddit forum. The main points that are going to be covered in this research question are the following:

- **Get the most used urls:** The idea is to see which are the most posted urls on the Reddit forum. Thus, the objective of this point is to see what kind of websites are frequented by these users.
- **Get the most posted urls:** The main objective of this point is to find which are the most used urls to open debates, in other words, which are the most used urls in the initial posts.

- **Get the most commented urls:** Also, although it is known which links are the most used and which are most often used to open debates, the aim of this last point is precisely to see which links generate the most debate among their users.

Once these steps have been followed, to assess that the results are correct, they will be accepted once it is proven that the information sources are indeed real and correct. To know when a link is correct, we will check that there are no repeated links and that they are all in the same format (e.g. eliminating protocols such as HTTP).

3.1.3 Assumptions and Limitations

The assumptions and limitations of this research question are as follows:

- It is assumed that the information sources shared are in the form of a web link. Images or videos are not considered.
- The data extracted is from manosphere communities that exist within the Reddit forum. Other communities outside this online photo are not considered.
- Data extracted is prior to 12 January 2019. Information sources from later dates have not been considered.

3.2 Research Question n^o2: Which are the topics and keywords of the discussions around this information?

Once the most commented links by manosphere groups are known, the next step is to find out what do they discuss in those links. This can provide a better understanding of the elements that encourage hate speech.

3.2.1 Hypothesis

The comments made by the manosphere groups on the shared information sources allow the extraction of key words and the application of probabilistic topic models. Furthermore, by means of these trained models it is possible to find the relationships between the information sources and to group them by categories with state-of-the-art techniques.

3.2.2 Objectives and evaluation

The main points to be covered in this research question are as follows:

- **Process the text:** The first step necessary to start drawing conclusions from the text is to process it. So at this point, the aim is to clean up the text by eliminating words such as stop words and applying other natural language processing techniques such as stemming.
- **Get the most common words:** The idea is to find the most frequent words used by manosphere groups with each source of information obtained from the research question above. This will hopefully provide a first analysis of the topics and types of links that are shared.

- **Topic modelling:** In this last point, topic modelling techniques such as LDA will be used to try to extract the subjects discussed in the different types of web pages. This will imply an analysis to understand in more depth the type of discussions that the manosphere communities have with the information sources obtained. Also, state-of-the-art techniques will be used to find the relationships between the sources of information from the extracted topics.

To ensure that these objectives are met, once the groupings are obtained according to the probabilistic topical models, a manual analysis will be performed to see if the results are interpretable and make sense, both the topical and their groupings. If this is not the case, further iterations will be carried out and different parameters will be tested until the results are as interpretable as possible.

3.2.3 Assumptions and Limitations

For the second research question, the following assumptions and limitations are assumed:

- Only comments in text format are considered for topical modelling. Images and videos are not considered.
- It is assumed that the links shared by the manosphere groups are thematically related.

Chapter 4

Materials: Dataset

In order to analyse the radicalisation of the different groups in the manosphere, the information posted and commented on by these users is needed. For this, the Reddit platform was chosen because of its growing communities of incels as well as the simplicity of its data collection through external APIs.

Thus, data extraction was carried out with the authors of a previous work which analysed the manosphere [14] and it was recollected through the API <https://pushshift.io/>. In this way, the data collected is from seven different communities spread across the following subreddits:

- *r/MGTOW*: Acronym for “men going their own way” in which its users want to live a life without women. A total of 168124 posts were extracted from this community between 04-06-2011 and 11-01-2019.
- *r/badwomensanatomy*: The users of this subreddit are focused on describing women’s body. A total of 13010 posts were extracted from this community between 02-01-2014 and 11-01-2019.
- *r/Braincels*: This was the main incel subreddit after Reddit closed r/incels in November 2017. A total of 96545 posts were extracted from this community between 21-10-2017 and 10-01-2018.
- *r/IncelsWithoutHate*: This subreddit includes users who consider themselves incels but are not in favour of incel violence. A total of 2309 posts were extracted from this community between 09-04-2017 and 11-01-2019.
- *r/Inceltears*: Subreddit where their users post content from other incels communities. A total of 15679 posts were extracted from this community between 19-05-2017 and 11-01-2019.
- *r/IncelsInAction*: The users of this subreddit are responsible for monitoring other incel communities in a similar way to the previous subreddit. A total of 330 posts were extracted from this community between 24-06-2017 and 10-01-2019.
- *r/Trufemcels*: This subreddit is made up of women who consider themselves incels. A total of 5081 posts were extracted from this community between 04-04-2018 and 11-01-2019.

Thus, the data to be extracted from these communities will be the posts published by their users and the comments on those posts as well as the metadata of those posts and comments. An example of such posts can be seen in the figure below (Figure 4.1) which shows a post and comment from the MGTOW community on a news item about monogamy and adultery.

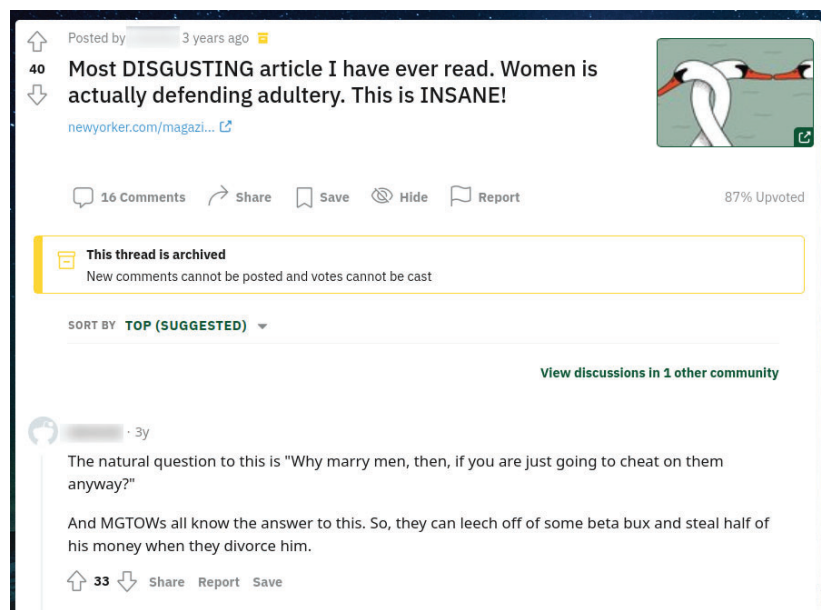


Figure 4.1: MGTOW post example

4.1 Obtained tables

This section describes the different tables obtained by the pushift.io API as well as their different attributes. In this way, the obtained tables are the following:

- **Links:** Links are those initial posts that start threads within a subreddit. The attributes that constitute this table are as follows:
 - *Id*: The link identifier.
 - *Subreddit_id*: Identifier of the subreddit to which the link belongs to.
 - *Title*: Title of the post.
 - *Self_text*: Text of the publication (if any).
 - *URL*: Indicates if there is any media or other url associated to the post.
 - *Author*: Author who published the post.
 - *Full_link*: Reddit link of the post.
- **Comments:** Contains the comments posted in the previous links. The attributes that constitute this table are as follows:
 - *Id*: The comment identifier.
 - *Link_id*: The link identifier in which the comment was posted.
 - *Body*: Text of the comment.
 - *Parent_id*: Identifier of the parent post.
 - *Author*: Author who published the comment.

4.2 New tables

In this section, we describe the different tables obtained from the data processing in order to better analyse the content of the data and be able to draw conclusions. For the creation, processing and management of these tables, a SQL manager has been created in Python, which can be seen in the following [Github repository](#). Thus, the new tables generated are as follows:

- **Unique_urls_from_comments:** Contains urls that are shared in comments. For the creation of this table, a parser has been created to extract the complete urls of all the comments collected from the manosphere communities. The attributes that constitute this table are as follows:
 - *id*: Identifier assigned to the url.
 - *url*: The url posted in the comments.
 - *n_occurrences*: The number of times the url appears in the comments.
- **Unique_urls_from_links:** Contains the url domains that are shared in links (for example: reddit.com). In a similar way of the previous table, a parser has been used to extract these domains of all the posts collected from the manosphere communities. The attributes that constitute this table are as follows:
 - *id*: Identifier assigned to the domain.
 - *url*: The domain posted in the main posts.
 - *n_occurrences*: The number of times the domain appears in the initial posts (links).
 - *n_comments*: The total number of comments the domain posted in the initial posts has.
 - *n_users*: The total number of users commenting the initial post with that domain.
- **Unique_paths_from_links:** Contains paths that are shared in links (for example: reddit.com/r/mgtow/comments). For the creation of this table we have used tools [15] [24] for the extraction of the elements from the paths of the previously extracted links. Thus, the attributes that constitute this table are as follows:
 - *id*: Identifier assigned to the path.
 - *url*: The path posted in the main posts.
 - *n_occurrences*: The number of times the path appears in the initial posts (links).
 - *n_comments*: The total number of comments the path posted in the initial posts has.
 - *n_users*: The total number of users commenting the initial post with that path.
- **Urls_links_ids:** Relationship table between the initial posts (links table) and the domains of the urls shared in the links (unique_urls_from_links table). In this way, this table relates the identifiers of the links with the identifiers of the domains that appear in those initial posts. The purpose of this table is to facilitate the extraction of data on comments made to certain links by reducing computational time of searching for posts where those links appear. The attributes that constitute this table are as follows:

- *url_from_links_id*: Domain identifier.
 - *link_id*: Initial post (link) identifier.
- **Paths_links_ids**: Relationship table between the initial posts (links table) and the paths of the urls shared in the links (unique_paths_from_links table). In this way, this table relates the identifiers of the links with the identifiers of the paths that appear in those initial posts. As before, the purpose of this table is to facilitate the extraction of data on comments made to certain links by reducing computational time of searching for posts where those links appear. The attributes that constitute this table are as follows:
 - *url_from_links_id*: Path identifier.
 - *link_id*: Initial post (link) identifier.
- **Comments_from_url**: This table contains all the comments assigned to each url. The reason for its creation is to reduce computational time when working with them. The attributes that constitute this table are as follows:
 - *u_id*: The url identifier.
 - *comments*: The comments that appear in the initial posts containing the url. These comments are merged into a single text.
- **Comments_from_paths**: This table contains all the comments assigned to each path. The reason for its creation is to reduce computational time when working with them. The attributes that constitute this table are as follows:
 - *u_id*: The path identifier.
 - *comments*: The comments that appear in the initial posts containing the path. These comments are merged into a single text.

Chapter 5

Methods

This chapter will discuss the different methodologies used to address the research questions proposed in the third chapter. In this way, we will see step by step how we have decided to tackle these questions and we will discuss the results obtained to finally get some conclusions that provide an answer to these research questions.

5.1 Shared Information

As has been seen in the state of the art, manosphere communities are growing day by day due to the radicalisation of Internet users, for that reason, this chapter will try to answer the following research question: *What kind of websites manosphere communities share and how this information influences their discussions?*

In this way, the objective will be to find the information that is shared and discussed that can encourage this type of radicalisation and hatred towards women.

5.1.1 Methodology

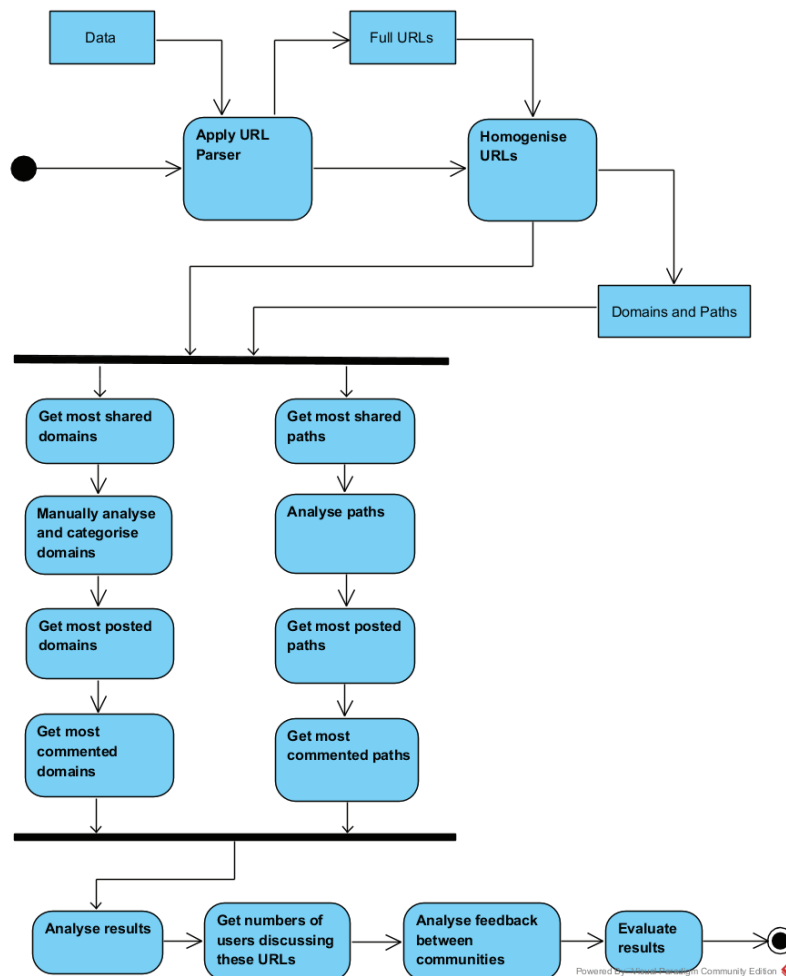
The methodology to solve the first research question will be based on extracting a series of statistics from the links extracted from the texts of the manosphere communities on Reddit. In this way, the first necessary step will be to create a parser that will extract these links from the texts.

Once all the complete links have been obtained, it will be time to process them to analyse their structure. With this analysis, we hope on the one hand to obtain the main domains (e.g. reddit.com) that are shared in order to try to group the different types of web pages that the members of the manosphere communities usually frequent. On the other hand, the links will be processed to obtain part of the paths (e.g. reddit.com/r/incel) that are shared to find the most specific information that is shared from these domains and that it may be the origin of the radicalisation of these communities.

In this way, this extraction of links will be applied first to the texts extracted from the comments of these communities to see what information is mostly shared in the publications. Secondly, this link extraction will be applied to the initial posts that start discussions to see which are most shared links with the intention of generating a debate.

Finally, to see the scope of these debates, the comments made on the initial posts will be analysed to see which of the domains and paths extracted are the ones that foster the most debate. This includes an analysis of the comments and the users related with those posts.

This methodology is summarised in the activity diagram shown in Figure 5.1.

Figure 5.1: Methodology followed in Research Question n⁹¹

5.1.2 Results and discussion

As mentioned in the methodology, the first step is to create a parser to extract the different types of links that are shared within a text. To do this, several elements that can make up a link have been taken into account:

- **Transfer protocol:** It can be either HTTP or HTTPS and may not even appear in the shared links.
- **World Wide Web:** ‘www’ usually appears at the beginning of the links, although it may not.
- **Domain:** The main name of the link being shared.
- **Top-Level-Domain (TLD):** A TLD is the last segment of a domain name - the part that comes after the full stop. (e.g. .com).
- **Country code second-level domain (‘ccSLD’):** Some countries or domains add a second level in the TLD (e.g. ‘co.uk’).
- **IP Address:** Some shared links may be directly an IP address.

- **Port:** In the case of shared IP addresses it is also important to note whether a port is specified.
- **Query:** All links can contain a query indicating a search, action or keywords on these links.

In addition, to be able to apply this parser, a small preprocessing of the text will have to be done to transform all the text to lowercase (since the links are not case sensitive) and to transform the short links to their original links (e.g. 'redd.it' to 'reddit.com').

Also, it is important to mention that one of the limitations of this parser is that if the spelling mistake of not adding a space after a full stop occurs, that mistake would be counted as a link. However, because the importance of these links lies in the number of times they are shared, it is not expected that these false links due to misspellings will have any impact on the outcome of this research.

Once we have developed the parser to extract the complete links, it will be necessary to decompose these links into different parts in order to extract both domains and paths. To do this we have used the Python url parser [15] that allows us to obtain the path of each domain and the tldextract library [24] that allows us to extract the domains, subdomains and TLDs.

After having the parser to extract all the URLs and obtain both domains and paths, the next step is to search for the most commented domains and paths. To do this, the parser will be applied to the chosen text, either all the comments of the manosphere threads or all the initial posts that start the thread discussions. This process has been an iterative process since, as these domains and paths have been obtained, it has been seen that some of them were the same links but in their short version.

This way, we will start to see which domains have been the most shared by the manosphere groups both in the comments and in the initial posts. This way, we will start to see which domains have been the most shared by these communities both in the comments and in the initial posts. Firstly, the domains most published in the comments can be seen in figures 5.2-5.5.

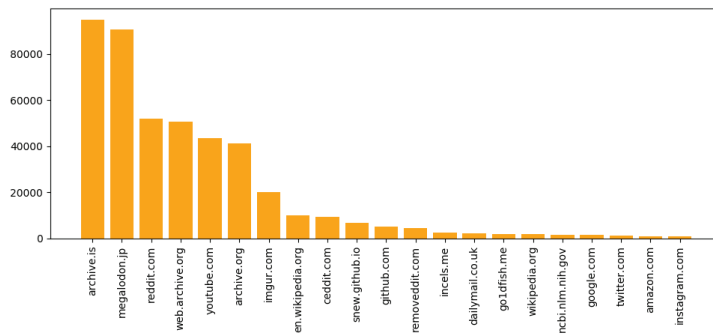


Figure 5.2: Domains shared in comments more than 1000 times

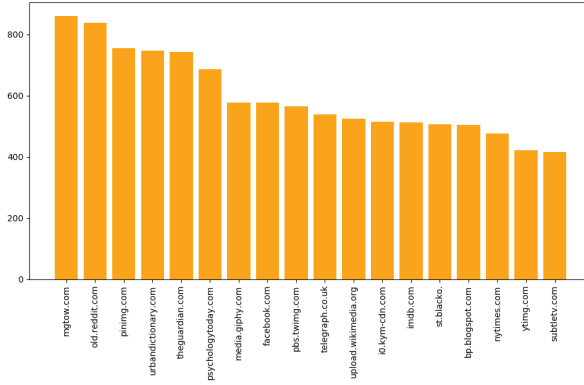


Figure 5.3: Domains shared in comments between 400 and 1000 times

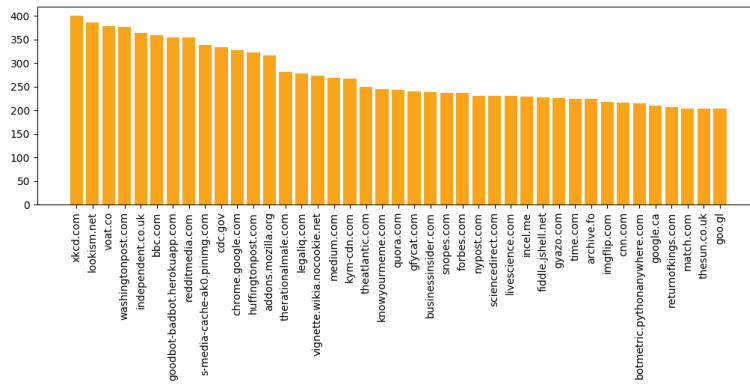


Figure 5.4: Domains shared in comments between 200 and 400 times

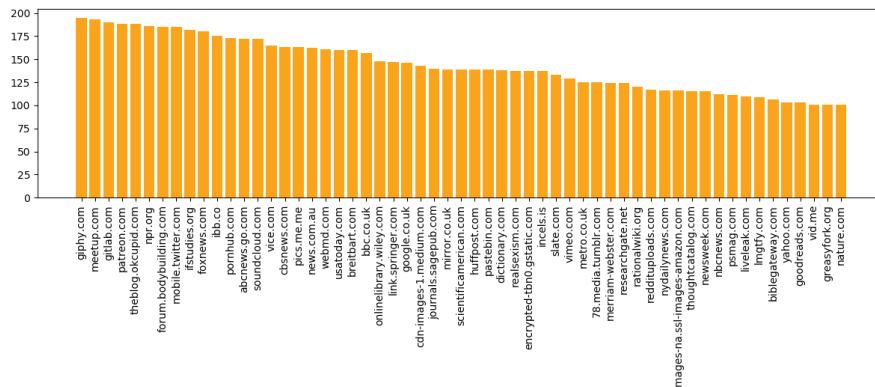


Figure 5.5: Domains shared in comments between 100 and 200 times

In a first analysis of the graphs obtained through the links shared in the comments by manosphere groups, it can be seen that the most shared domains are digital libraries that tend to be focused on sharing content that has been or can be deleted. However, other types of domains such as social networks or digital media are also found. Thus, in a first manual classification, the different domains that can be found can be classified into the following categories:

- **Digital libraries:** Web applications that store everything from images to HTML pages. Some examples are archive.is, megalodon.jp and archive.org.
- **Social networks:** Web applications with a high social component that allows information to be shared, either in text format or with images and videos. Some examples are youtube.com, twitter.com and even Reddit itself.
- **Other manosphere communities:** Some of the links shared are from other manosphere communities outside Reddit. Some examples are incels.me or mg-tow.com.
- **Media:** Media sites that share current news. Examples include dailymail.co.uk, nytimes.com or washingtonpost.com.
- **Encyclopaedias or educational interest:** Web applications that provide information. Some examples are wikipedia.org, ncbi.nlm.nih.gov or sciencedirect.com.
- **Code managers:** Online libraries and code managers. Examples include github.com and gitlab.com.
- **Dating services:** Social networks specifically for dating or meeting people with the same interests. Examples include march.com and meetup.com.
- **Other categories:** Other domains not classified in a category because they have been the only ones shared in that category include psychology sites (psychologytoday.com), pornography sites (pornhub.com) and online shopping sites (amazon.com).

Once we have seen which domains are usually commented on these manosphere communities, we are going to look for which of these domains are most common to start a debate. To do this, we will look for the domains that are most present in the initial posts. In this way, figure 5.6 shows the most relevant domains in the initial posts.

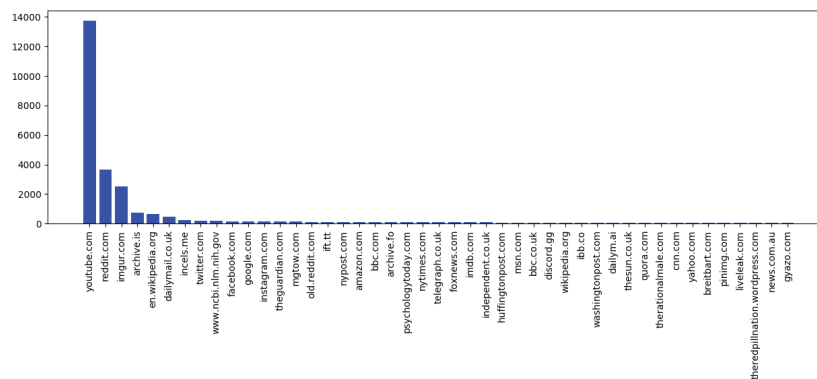


Figure 5.6: Domains shared in initial posts

As it can be seen, the most published paths in the initial posts are undoubtedly related to other incel communities, most of them also part of the Reddit community, which may indicate that there is a feedback of information between these communities.

Once the most published paths are known, to find out which links encourage the most discussion, we will look at which of these links published in the initial posts receive the most comments.

In this way, we will first analyse which are the domains that generate the most debate and discussion among the members of the communities in the manosphere. As it can be seen in Figures 5.9 and 5.10, the domains that generate the most debate are those belonging to the categories of social networks such as youtube and Reddit, other manosphere communities and digital media.

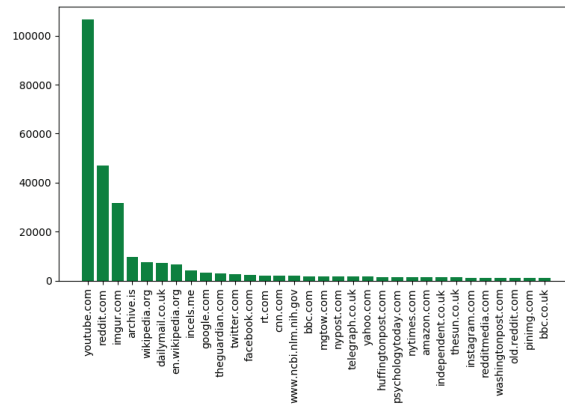


Figure 5.9: Most commented domains (more than 1000 comments)

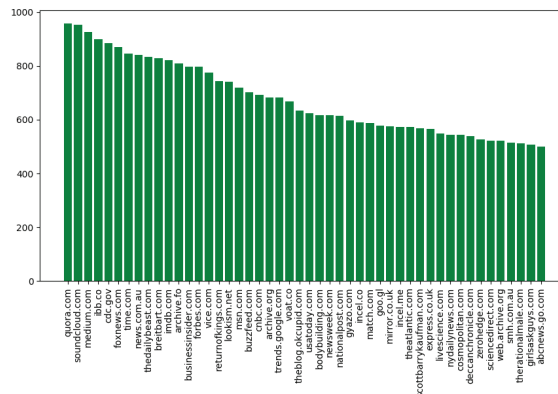


Figure 5.10: Domains which have between 500 and 1000 comments

Again, although this gives us a first idea of what type of information tends to generate the most debate, we will also analyse the paths to see which are the most commented on. Figure 5.11 shows how the paths that generate the most debate in these communities are other manosphere communities inside and outside Reddit like mgtow.com. In addition, in Figure 5.12, it can be seen the following most commented paths among which there are

also some media in which it can be seen what kind of news are the ones that generate more discussion such as studies that claim that women do not go for the nice guys and related to relationships and sex. Also on social networks, such as Reddit (without taking into account the other communities), it can be seen that the most commented topics have to do with women, sex, relationships and even legal advice.

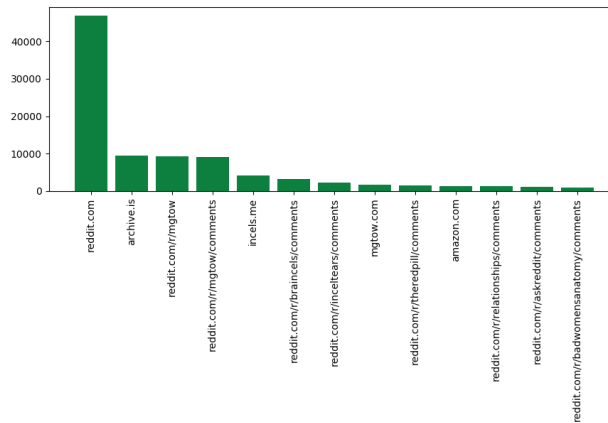


Figure 5.11: Most commented paths (more than 1000 comments)

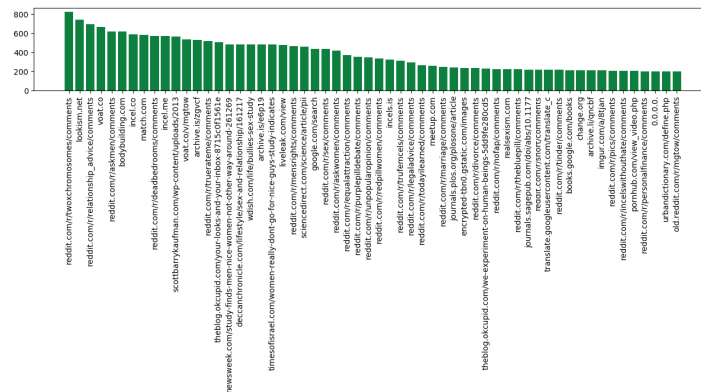


Figure 5.12: Paths which have between 200 and 1000 comments

To make sure that these links are indeed the most discussed, it is important to see how many users are participating in these discussions. This will allow us to have a new perspective on the level of participation in these discussions. For this purpose, we have analysed the total number of users commenting on these links. The result can be seen in figures 5.13 and 5.14 below.

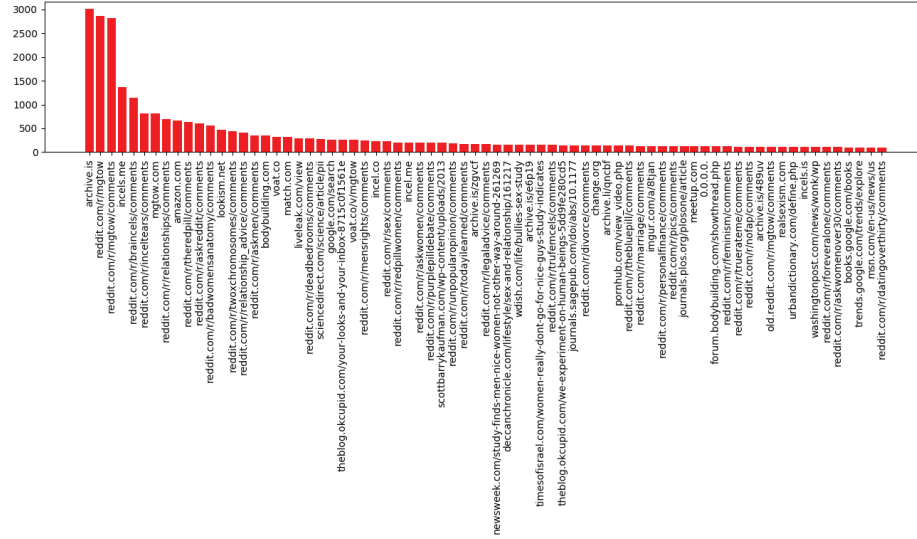


Figure 5.13: Paths posted in the initial posts with the most users

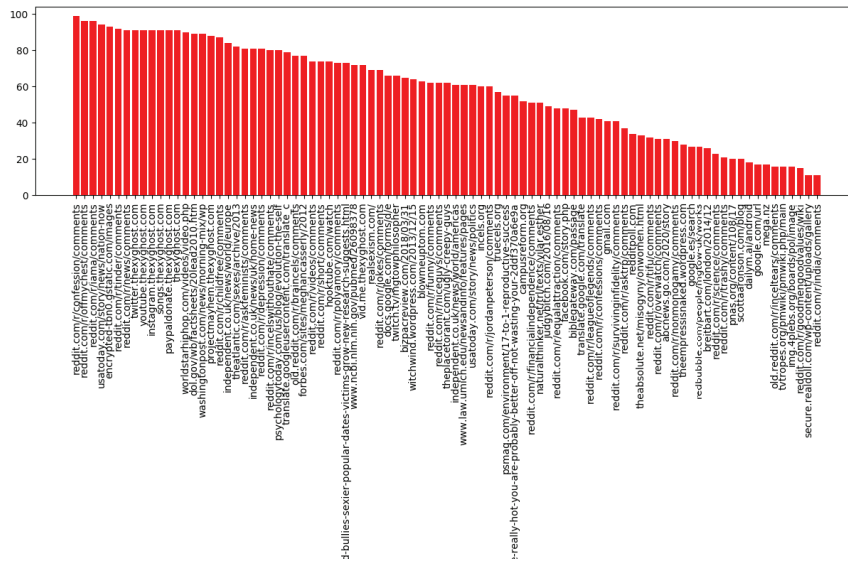


Figure 5.14: Paths posted in the initial posts between 10 and 100 users

As it can be seen, the results obtained are consistent with the most commented links. Thus, the links with the most users in their discussion are from other manosphere communities on Reddit, other Reddit topics related to women, sex and relationships, and some news related to these topics as well.

Finally, seeing that a large part of the links shared are to other communities in the manosphere, another important question arises about the information shared by manosphere groups: Which communities are the most shared in each community? Do they feed back to each other?

To answer this question, we will see how many links from these communities are shared in each community, including themselves, to see if there is a feedback of previously shared information. Thus, in table 5.1, the first row represents the communities being analysed in this thesis and the first column represents the manosphere communities (including those analysed in this thesis), with the remaining cells representing the number of posts from the main communities that contain links to other manosphere communities (including themselves). In a similar way, in table 5.2 it can be seen the number of total comments received by those posts containing those other communities.

Table 5.1: Times manosphere communities were posted (first column) in main manosphere communities (first row)

	MGTOW	Bad Women Anatomy	Incels Without Hate	Incel Tears	Incels In Action	Braincels (Incels)	Trufemcels
MGTOW	477	0	1	1	0	12	1
Bad Women Anatomy	4	12	0	0	0	1	0
Incels Without Hate	0	0	8	1	0	0	0
Incel Tears	5	0	2	17	0	18	4
Incels In Action	0	0	0	0	0	0	0
Braincels (Incels)	10	2	3	2	0	157	10
Trufemcels	1	0	0	0	0	7	14
The Red Pill	66	1	0	0	0	4	0
Incels.me	6	0	10	17	0	150	11
Mgtow.com	94	0	0	0	0	1	0

Table 5.2: Number of comments about manosphere communities which were posted (first column) in main manosphere communities (first row)

	MGTOW	Bad Women Anatomy	Incels Without Hate	Incel Tears	Incels In Action	Braincels (Incels)	Trufemcels
MGTOW	9228	0	16	0	0	58	7
Bad Women Anatomy	47	980	0	0	0	2	0
Incels Without Hate	0	0	206	196	0	0	0
Incel Tears	160	0	61	1325	0	723	114
Incels In Action	0	0	0	0	0	0	0
Braincels (Incels)	206	29	18	0	0	2705	178
Trufemcels	0	0	0	0	0	86	179
The Red Pill	1546	71	0	0	0	25	0
Incels.me	132	0	206	819	0	2638	173
Mgtow.com	1710	0	0	0	0	0	0

In this way, it can be seen that for the most part the manosphere communities feed back on themselves. It is also striking that the **MGTOW** community is the one that shares and discuss the most links from **The Red Pill** community. Finally, some communities also share and discuss links from their communities but outside Reddit (**braincels** share **incels.me** and **MGTOW** Reddit community share **MGTOW.com**).

5.1.3 Conclusion

Throughout the analysis of this research question, we have been able to see the different types of links shared by the manosphere communities on Reddit. These categories range from digital libraries to other manosphere communities. These manosphere communities links are the links, along with the links belonging to the digital media and social networking categories, that seem to initiate the most discussion and are the most commented on.

Furthermore, it has been seen that most of these links from other communities are shared by those communities themselves, indicating that each of these communities feeds back to itself (even to forums outside of Reddit). In addition, there is also a bit of feedback between these communities as for example, **MGTOW** discusses quite a bit about the red pill community.

Thus, concerning the question to which this chapter seeks to provide an answer: What kind of information do incels share and which ones are the most discussed? the most shared information comes from digital media news together with information from other incel communities and social networks, with the majority of this information having a focus on women, relationships and sex.

5.2 Discussed topics

As seen in the previous research question, different groups in the manosphere share a wide variety of information through online communities. For this reason, it is important to know not only what information is shared, but also what topics are discussed about these links.

With this in mind, the aim of this chapter will be to answer the following question: *Which are the topics and keywords of the discussions around this information?*

In this way, it is expected that the answer to this question will allow the elicitation and analysis of these topics as well as the discovery of the relationships between the different information links shared.

5.2.1 Methodology

In order to address the second research question, the methodology to be followed will be divided into two main parts. The first will consist of obtaining the keywords from the comments and the second will be to apply a topic modelling model.

To this end, to obtain the keywords, it will first be necessary to process the text in order to discard the most common words. Once the text has been processed, the word clouds of the comments of the links will be obtained to have a visualisation of the most common terms in each link as well as to see the similarities between some links.

Regarding the second point, to obtain the different topics discussed in the manosphere, topic modelling techniques will be used. For this, again, text processing will be carried out to eliminate words that do not interest us, such as stop words or words that are not nouns or adjectives. After keeping these words, lemmatisation techniques are applied to group the words by lexeme (e.g. female would be considered the same word as females). Once the text is clean, topic modelling techniques are applied to obtain a list of the topics of each link. Afterwards, we will analyse and compare the topics contained in each of the links to finally perform clustering of the links according to the topics to see how to group the links according to the topics. Of course, this procedure will not be linear and several iterations will be required to improve the results.

This methodology is summarised in the activity diagram shown in Figure 5.15 although all these processes are detailed in more detail in the following section, as well as the obtained results.

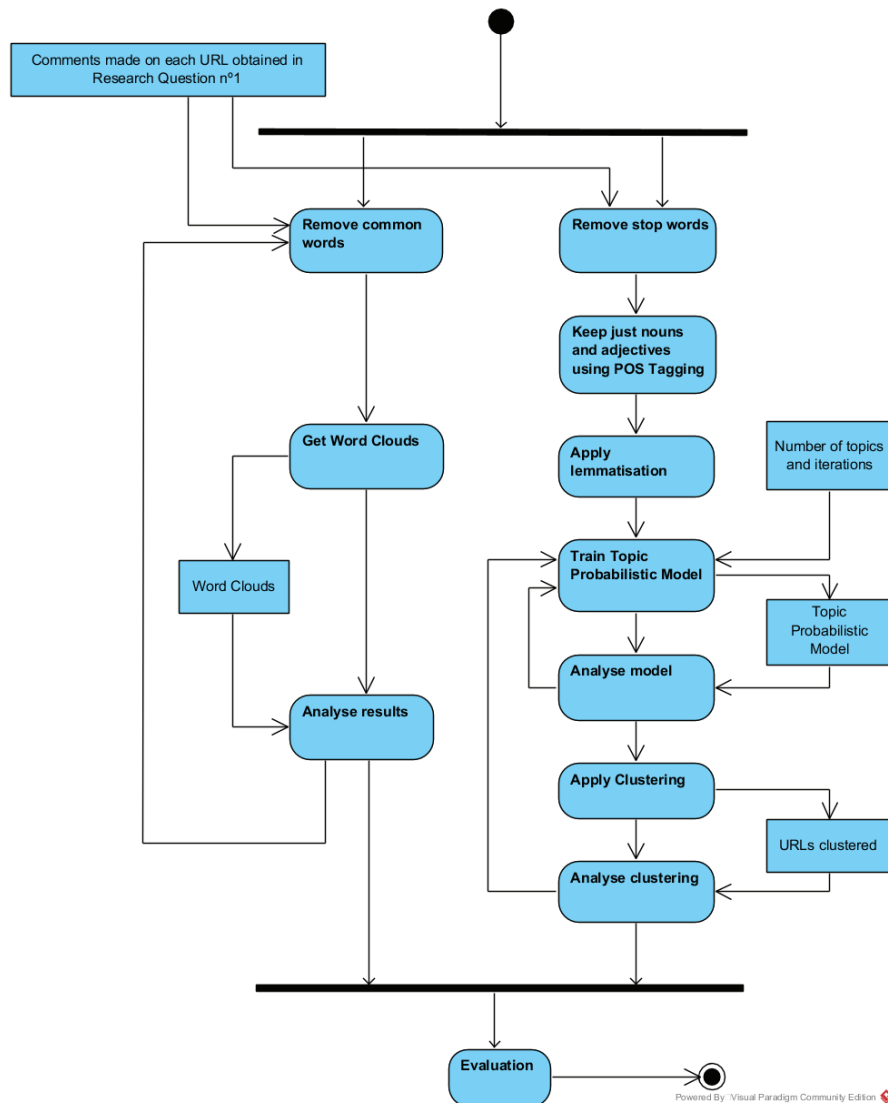


Figure 5.15: Methodology followed in Research Question n°2

5.2.2 Results and discussion

First of all, the aim will be to try to find out which keywords are commonly used by incels when publishing the links obtained in the previous research question.

To achieve this purpose, for each link detected in the previous chapter, all the comments of the initial posts containing those links have been collected and saved as a unique document.

Once these documents have been obtained, the next step is to remove the most common words from these documents to ensure that the extraction of these keywords is as clean as possible. In this way, the words that have been eliminated are those known as stop words, which are words that are used very frequently in a language. Thus, some of these stop words are English articles and conjunctions. In addition, as this has been an iterative process, words related to the web such as com, www, https, etc. have been eliminated, as well as links present in the text.

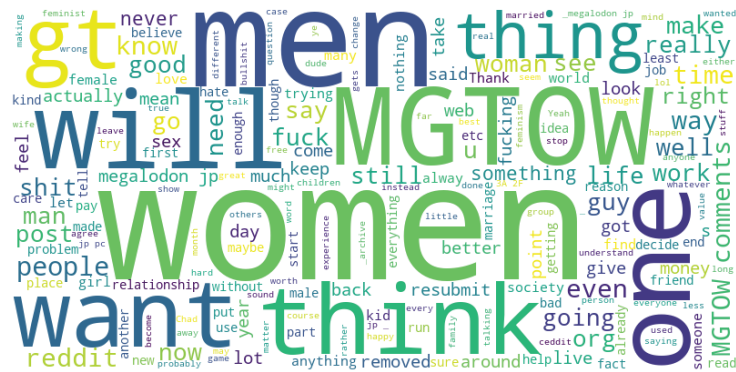


Figure 5.19: Word cloud from comments made on MGTOW community



Figure 5.20: Word cloud from comments made on a Reddit thread about confessions

One of the most prominent features of these images is that women are an important part of the incels' discussion of these links as this keyword is highlighted in most of the extracted word clouds. Thus, at first glance, many sites seem to have similar comments about women but with slight variations from one site to another. For example, in news reports from independent.co.uk, there seems to have been talking of relationships, dating and attractiveness as suggested by incels' terms such as chad and normie. Similar results can be seen on the meetup page, although words such as advice, friendship and girlfriend stand out in comments about this website. On the other hand, comments on the psychology pages seem to be more aggressive with prominent terms such as asshole and fuck being displayed. Finally, as seen in the previous research question, incel communities and social networks (in particular other Reddit threads), are much discussed by manosphere groups. Thus, as it can be seen in image 5.19, on the Men go their own way (MGTOW) community, most terms are related to this community and terms such as women and men stand out. Lastly, in the Reddit thread on confessions, the incels' comments are related to law, marriage, adultery and even death.

The rest of the word clouds extracted from the comments made on the links extracted in the first research question by the manosphere groups can be found in the following [GitHub repository](#).

With this keyword extraction, we can get an idea of the topics that can be found in the comments of these communities. However, to extract these topics and to see the relationship of the links due to these topics, a deeper analysis is needed.

For this purpose, probabilistic topic models can help us to find these topics as well as the relationships between the different links. In this way, probabilistic topic models are

statistical methods that will analyse the words to find the topics embedded within the documents as well as their relationships. One of the best known probabilistic topic models is Latent Dirichlet Allocation (LDA) [5].

LDA is an unsupervised model which is based on the idea that there are a number of topics and that documents are made up of a percentage of these topics. In turn, these topics are based on the probabilities of certain words appearing in those documents.

Thus, the implementation used in this project is the one implemented in the gensim library [37]. For its use, we will need to indicate the corpus used, the number of topics, a dictionary with the vocabulary and the number of iterations.

With this in mind, firstly, it will be necessary to prepare the corpus and establish what the documents will be. In this case, each document in the corpus will be all the comments made on initial posts containing a given URL. In this way, each URL will be a document containing everything that has been discussed about it. As the domains contained too general documents (e.g. within reddit.com there are many different communities), it has been decided to perform the analysis on the paths specified in the previous research question.

Once the corpus has been extracted, it needs to be processed to improve the efficiency and results of the probabilistic topic model. In this case, the following natural language processing techniques have been applied:

- **Removing urls:** As we are interested in the word distributions used, all links will be removed.
- **Remove non-alphanumeric characters:** In a similar way as above, all non-alphanumeric characters (such as punctuation marks) will be removed.
- **Tokenization:** Text is separated into smaller units (unigrams) to facilitate some natural language processing techniques such as POS tagging.
- **Removing stop words:** Words that are very common in a language (in this case English) are eliminated as they do not provide meaningful information.
- **Keeping just nouns and adjectives:** POS Tagging is applied to store those words that are nouns or adjectives as they provide more representative information than other words such as prepositions.
- **Lemmatization:** Lemmatization extracts the lemma from the words thus allowing different forms of the same word (using another gender or number) to be considered as the same word.

After extracting and processing the corpus, a dictionary of the vocabulary used in the corpus will be obtained. This dictionary will also be used to discard those words that are very frequent (75%) in case they have not been discarded in the process of eliminating the stop words.

Before applying LDA on the processed corpus, we only need to establish the number of topics and the iterations to be performed. Knowing the number of topics contained in our documents can be a complex and subjective task, in our case we will look at two things. Firstly, as seen in the previous research question, web pages can be divided into 8 categories according to their topics. On the other hand, in a previous paper by Farrel, Araque, Fernandez and Alani [13], they claim that there are 10 common themes in these manosphere communities. Therefore, the application of LDA will be carried out iteratively with a number of topics close to 8 and 10 and with a different number of iterations until the results are interpretable. Thus, the obtained topics can be seen in figures 5.21 - 5.24. Other extracted topics with a different number of topics and iterations can be found in the following [GitHub repository](#).

```

0 0.007*art" + 0.006*fetish" + 0.005*anatomy" + 0.005*book" + 0.005*amazon" + 0.005*women" + 0.005*real" + 0.004*get" + 0.004*agency" + 0.004*bad"
1 0.006*sex" + 0.004*something" + 0.004*girl" + 0.004*right" + 0.004*relationship" + 0.004*child" + 0.003*lot" + 0.003*male" + 0.003*money" + 0.003*fuck"
2 0.014*incels" + 0.011*incel" + 0.008*attractive" + 0.007*sex" + 0.007*girl" + 0.006*personality" + 0.006*chad" + 0.005*look" + 0.005*women" + 0.005*bad"
3 0.005*something" + 0.004*money" + 0.004*lot" + 0.004*sex" + 0.004*right" + 0.003*anything" + 0.003*nothing" + 0.003*fuck" + 0.003*world" + 0.003*society"
4 0.014*islam" + 0.006*islamic" + 0.006*christianity" + 0.004*religion" + 0.004*law" + 0.004*violent" + 0.004*war" + 0.003*uk" + 0.003*government" + 0.003*country"
5 0.019*issue" + 0.006*feminist" + 0.006*patriarchy" + 0.005*feminism" + 0.003*equality" + 0.003*movement" + 0.003*privilege" + 0.003*pdf" + 0.002*shelter" + 0.002*misogynist"
6 0.013*web" + 0.012*simple" + 0.012*pc" + 0.011*decide" + 0.009*nlm" + 0.009*nlh" + 0.009*ncbi" + 0.009*gov" + 0.008*article" + 0.007*get"
7 0.006*youtube" + 0.006*php" + 0.005*channel" + 0.004*romeo" + 0.004*urbandictionary" + 0.003*cuninterrogation" + 0.002*define" + 0.002*squad" + 0.002*worldstarhiphop" + 0.002*opponent"

```

Figure 5.21: LDA topics with 8 topics and 1000 iterations

```

0 0.009*sex" + 0.005*girl" + 0.005*something" + 0.004*lot" + 0.004*bad" + 0.003*relationship" + 0.003*male" + 0.003*trp" + 0.003*friend" + 0.003*body"
1 0.009*book" + 0.008*feminist" + 0.008*male" + 0.007*feminism" + 0.007*amazon" + 0.006*issue" + 0.006*job" + 0.004*teacher" + 0.004*patriarchy" + 0.004*incel"
2 0.009*article" + 0.008*feminist" + 0.007*decide" + 0.007*pc" + 0.007*simple" + 0.006*male" + 0.006*web" + 0.005*get" + 0.004*study" + 0.004*gov"
3 0.016*incels" + 0.012*incel" + 0.008*girl" + 0.006*sex" + 0.005*relationship" + 0.005*look" + 0.004*lot" + 0.004*attractive" + 0.004*personality" + 0.004*person"
4 0.009*message" + 0.008*site" + 0.007*truth" + 0.006*jews" + 0.005*society" + 0.005*article" + 0.005*okcupid" + 0.003*dating" + 0.003*blackpill" + 0.003*online"
5 0.007*site" + 0.007*content" + 0.005*hate" + 0.004*channel" + 0.004*youtube" + 0.004*feminist" + 0.003*forum" + 0.003*subreddit" + 0.003*new"
6 0.013*web" + 0.010*snaphillbot" + 0.007*pc" + 0.006*petition" + 0.005*decide" + 0.005*simple" + 0.005*fill" + 0.005*st" + 0.005*info" + 0.005*compose"
7 0.013*attractive" + 0.010*women" + 0.008*personality" + 0.007*sex" + 0.007*chad" + 0.006*asshole" + 0.006*partner" + 0.006*nice" + 0.006*fuck" + 0.005*ugly"
8 0.005*money" + 0.004*something" + 0.004*right" + 0.004*child" + 0.004*lot" + 0.004*sex" + 0.004*relationship" + 0.004*fuck" + 0.003*society" + 0.003*anything"

```

Figure 5.22: LDA topics with 9 topics and 1000 iterations

```

0 0.006*book" + 0.006*women" + 0.006*amazon" + 0.005*get" + 0.005*real" + 0.004*relationship" + 0.004*agency" + 0.004*simple" + 0.004*web" + 0.004*everything"
1 0.008*feminist" + 0.007*male" + 0.005*right" + 0.005*message" + 0.005*women" + 0.005*child" + 0.005*feminism" + 0.004*society" + 0.004*article" + 0.004*sex"
2 0.005*money" + 0.004*something" + 0.004*lot" + 0.004*right" + 0.004*child" + 0.003*sex" + 0.003*society" + 0.003*snaphillbot" + 0.003*fuck" + 0.003*world"
3 0.003*brand" + 0.003*php" + 0.003*iana" + 0.002*askfeminists" + 0.002*ama" + 0.001*product" + 0.001*gdp" + 0.001*premium" + 0.001*insinct" + 0.001*ribbon"
4 0.008*murder" + 0.008*hurricane" + 0.006*psy" + 0.004*meditation" + 0.003*probation" + 0.003*google" + 0.003*hl" + 0.003*creepy" + 0.002*search" + 0.002*manslaughter"
5 0.013*attractive" + 0.009*women" + 0.008*personality" + 0.007*sex" + 0.006*chad" + 0.006*asshole" + 0.005*nice" + 0.005*fuck" + 0.005*partner" + 0.005*girl"
6 0.008*sex" + 0.008*incels" + 0.006*girl" + 0.005*relationship" + 0.005*something" + 0.005*incel" + 0.004*lot" + 0.004*bad" + 0.004*right" + 0.004*person"
7 0.013*incels" + 0.011*incel" + 0.009*personality" + 0.008*girl" + 0.008*white" + 0.007*look" + 0.005*average" + 0.005*probability" + 0.005*attractive" + 0.005*least"
8 0.014*organ" + 0.008*petition" + 0.006*breast" + 0.005*sex" + 0.003*lip" + 0.003*immigration" + 0.003*utm" + 0.002*canadian" + 0.002*zone" + 0.002*eu"
9 0.008*trp" + 0.006*pill" + 0.004*red" + 0.004*lot" + 0.004*something" + 0.003*male" + 0.003*society" + 0.003*puu" + 0.003*relationship" + 0.003*fact"

```

Figure 5.23: LDA topics with 10 topics and 1000 iterations

```

0 0.019*islam" + 0.007*christianity" + 0.007*islamic" + 0.005*pdf" + 0.004*religion" + 0.004*romeo" + 0.004*urbandictionary" + 0.004*php" + 0.004*west" + 0.003*anti"
1 0.006*sex" + 0.005*snaphillbot" + 0.005*women" + 0.005*feminist" + 0.005*child" + 0.005*male" + 0.004*web" + 0.004*right" + 0.004*money" + 0.003*job"
2 0.009*message" + 0.007*site" + 0.007*truth" + 0.006*jews" + 0.005*society" + 0.005*article" + 0.004*okcupid" + 0.004*blackpill" + 0.004*right" + 0.004*black"
3 0.004*book" + 0.004*feminist" + 0.003*child" + 0.003*new" + 0.003*right" + 0.003*male" + 0.003*something" + 0.003*site" + 0.003*hate" + 0.003*society"
4 0.010*youtube" + 0.009*channel" + 0.008*content" + 0.006*video" + 0.003*ad" + 0.002*platform" + 0.002*google" + 0.002*btchute" + 0.002*bretbart" + 0.002*advertiser"
5 0.004*meetup" + 0.004*askwomenover30" + 0.004*spiritual" + 0.003*karma" + 0.002*hobby" + 0.002*email" + 0.002*united" + 0.002*spirituality" + 0.002*meditation" + 0.002*kingdom"
6 0.005*cs" + 0.002*plebe" + 0.001*financialindependence" + 0.001*handful" + 0.001*atlantid" + 0.001*preups" + 0.001*lavish" + 0.001*phenotype" + 0.001*niss" + 0.001*layoff"
7 0.014*attractive" + 0.010*women" + 0.009*personality" + 0.007*sex" + 0.007*chad" + 0.007*asshole" + 0.006*nice" + 0.006*fuck" + 0.006*partner" + 0.006*ugly"
8 0.005*sex" + 0.004*something" + 0.004*lot" + 0.004*right" + 0.004*sex" + 0.003*child" + 0.003*fuck" + 0.003*society" + 0.003*relationship" + 0.003*anything"
9 0.012*simple" + 0.011*pc" + 0.011*decide" + 0.010*nlm" + 0.010*nlh" + 0.010*ncbi" + 0.010*gov" + 0.009*article" + 0.009*study"
10 0.009*incels" + 0.008*sex" + 0.007*girl" + 0.007*incel" + 0.005*something" + 0.005*relationship" + 0.005*lot" + 0.004*bad" + 0.004*person" + 0.004*anything"

```

Figure 5.24: LDA topics with 11 topics and 1000 iterations

In this way, it can be seen that in general expected topics related to incels, relationships or sex are obtained. However, there are also other interesting topics such as religion (Jews, Islam and Christianity are mentioned), money, society and even children.

However, the most interesting thing that these probabilistic topic models like LDA can provide is to see by which topics each document is composed and the relationships between these documents according to the topics.

To see what topics each document contains, it has been decided to make a matrix representing the percentage of each topic contained in each document. These matrices have been extracted with 9 and 10 topics LDA models as they are considered to be the least noisy and the most interpretable. The matrices obtained can be seen in figures 5.25 and 5.26. On the other hand, in the following [GitHub repository](#) you can see the rest of the matrices obtained with other number of topics and iterations.

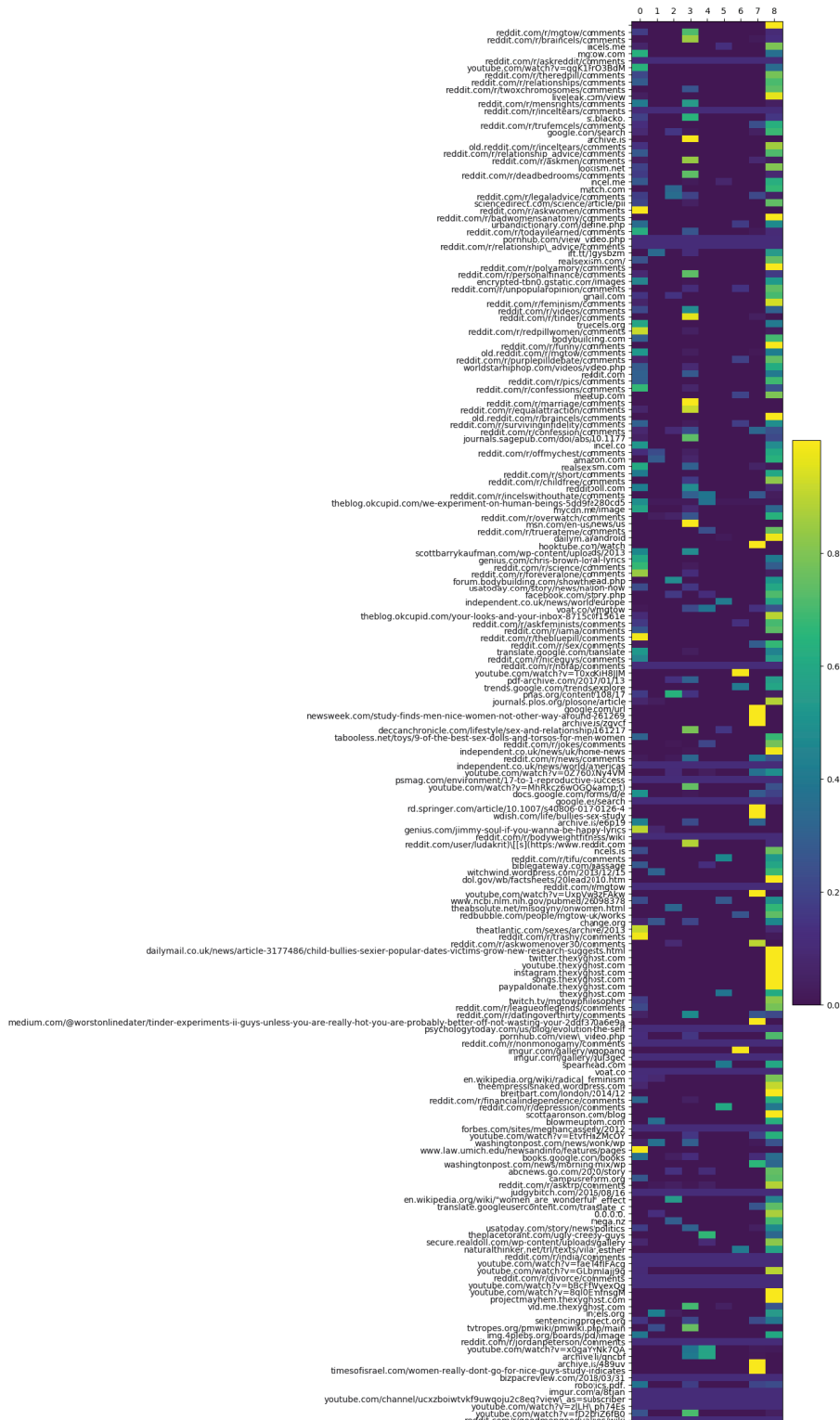


Figure 5.25: Topics assigned by LDA model with 9 topics and 1000 iterations

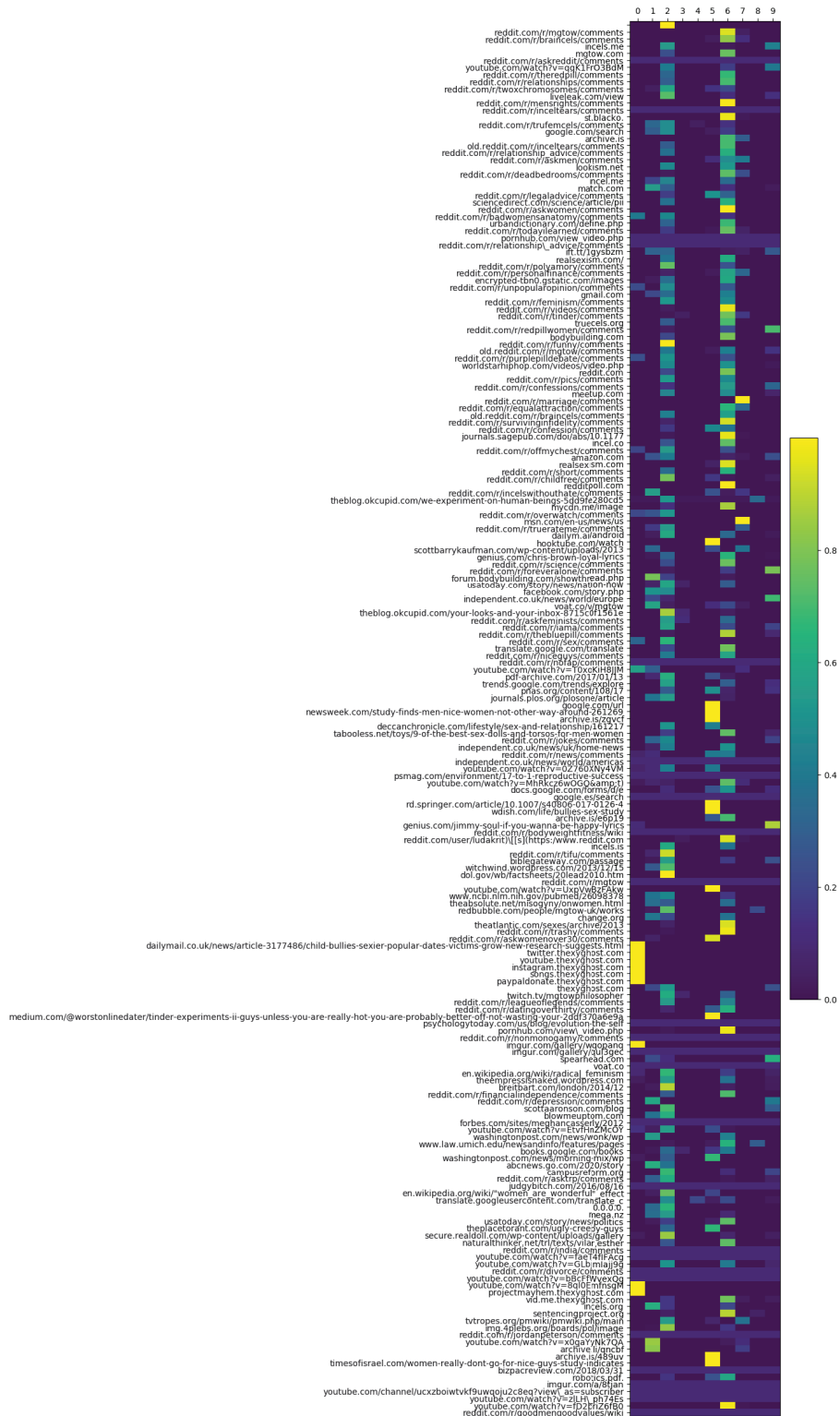


Figure 5.26: Topics assigned by LDA model with 10 topics and 1000 iterations

In these matrices it can be seen that in both cases the most predominant themes are related to money, society, incels, sex and relationships. In addition, it can also be seen how the links from Reddit and other communities tend to be more related to the topics of incels, sex and relationships while those related to information sources such as the media or even some links from youtube and other blogs are more related to society and money.

Although these matrices give an idea of the relationships between some links, clustering methods will be used in order to be able to group all the links in a more accurate and efficient way. For these topical distribution clustering methods, the methods proposed by Badens, García and Corcho [2] explained in section 2.2.3 will be taken into account.

Knowing these techniques, it has been decided to use Cumulative Ranking-based Clustering with a threshold of 0.9 for link clustering. This is because Trends-based Clustering due to the relatively high number of topics and few documents can lead to too many insignificant clusters. On the contrary, Ranking-based Clustering would create clusters that are too general and not very informative as we have seen in the previous matrices. Thus, Cumulative Ranking-based Clustering will allow us to create more specific clusters that could not be identified at first sight.

The most relevant clusters obtained for both LDA models (9 topics and 10 topics) can be seen in tables 5.3 and 5.4. Clustering with a different number of topics and iterations as well as applying other techniques such as Ranking-based Clustering can be seen in the following [GitHub repository](#).

Table 5.3: Clustering with 9 topics

Cluster	Manually assigned topics	Links
8	Incel communities	reddit.com/r/mgtow/comments urbandictionary.com/define.php reddit.com/r/personalfinance/comments old.reddit.com/r/mgtow/comments reddit.com/r/survivinginfidelity/comments reddit.com/r/news/comments reddit.com/r/mgtow twitter.thexyghost.com youtube.thexyghost.com instagram.thexyghost.com songs.thexyghost.com paypal donate.thexyghost.com thexyghost.com reddit.com/r/financialindependence/comments blowmeuptom.com projectmayhem.thexyghost.com vid.me.thexyghost.com
308	Other incel communities	reddit.com/r/braincels/comments reddit.com/r/incel tears/comments reddit.com/r/trufemcels/comments incel.me reddit.com/r/incelswithouthate/comments reddit.com/r/goodmengoodvalues/wiki
850	MGTOW and misogyny	mgtow.com theabsolute.net/misogyny/onwomen.html

08	Red pill	reddit.com/r/askreddit/comments reddit.com/r/theredpill/comments reddit.com/r/redpillwomen/comments reddit.com/r/offmychest/comments reddit.com/r/science/comments reddit.com/r/trashy/comments
012345678	Spam (highly posted urls without comments)	youtube.com/watch?v=qqK1FrO3BdM st.blacko. reddit.com/r/relationship_advice/comments ift.tt/1gysbzm youtube.com/watch?v=T0xoKiH8JJM youtube.com/watch?v=0Z760XNy4VM youtube.com/watch?v=MhRkcz6wOGQ&t) rd.springer.com/article/10.1007/s40806-017-0126-4 reddit.com/user/ludakrit youtube.com/watch?v=UxpVwBzFAkw pornhub.com/view_video.php imgur.com/gallery/wqopanq spearhead.com en.wikipedia.org/wiki/radical_feminism youtube.com/watch?v=EtvfHnZMcOY en.wikipedia.org/wiki/”women_are_wonderful”_effect youtube.com/watch?v=faeT4fIFAcg youtube.com/watch?v=GLbjmIajj9g youtube.com/watch?v=bBcFfWvexQg youtube.com/watch?v=8qI0EmfnsGM youtube.com/watch?v=x0gaYyNk7QA robotics.pdf. youtube.com/channel/ucxzboiwtvkf9uwqoju2c8eq youtube.com/watch?v=zlLH_ph74Es youtube.com/watch?v=fD2briZ6fB0 youtube.com/channel/ucj2qanqkgvlcoluglb3-b5a

80	Relationships	reddit.com/r/relationships/comments reddit.com/r/twoxchromosomes/comments reddit.com/r/mensrights/comments reddit.com/r/relationship_advice/comments reddit.com/r/askmen/comments reddit.com/r/deadbedrooms/comments reddit.com/r/polyamory/comments reddit.com/r/unpopularopinion/comments reddit.com/r/videos/comments reddit.com/r/funny/comments reddit.com/r/confessions/comments reddit.com/r/childfree/comments reddit.com/r/askfeminists/comments reddit.com/r/thebluepill/comments reddit.com/r/nofap/comments reddit.com/r/jokes/comments reddit.com/r/tifu/comments reddit.com/r/leagueoflegends/comments reddit.com/r/datingoverthirty/comments breitbart.com/london/2014/12 reddit.com/r/asktrp/comments reddit.com/r/divorce/comments reddit.com/r/jordanpeterson/comments
83	Live videos and polls	liveleak.com/view redditpoll.com
870	Google services	google.com/search translate.google.com/translate
3	Attraction	old.reddit.com/r/inceltears/comments reddit.com/r/equalattraction/comments reddit.com/r/truerateme/comments
82	Legal advice and news	reddit.com/r/legaladvice/comments usatoday.com/story/news/nation-now redbubble.com/people/mgtow-uk/works usatoday.com/story/news/politics
0	Women and sex	reddit.com/r/badwomensanatomy/comments reddit.com/r/sex/comments reddit.com/r/askwomenover30/comments books.google.com/books
803	Pics and depression	reddit.com/r/askwomen/comments reddit.com reddit.com/r/pics/comments facebook.com/story.php reddit.com/r/depression/comments
806	Learning	reddit.com/r/todayilearned/comments reddit.com/r/iama/comments
038	Porn and bodies	pornhub.com/view_video.php bodybuilding.com forum.bodybuilding.com/showthread.php

083	Loneliness and relations	reddit.com/r/purplepilldebate/comments meetup.com reddit.com/r/overwatch/comments reddit.com/r/foreveralone/comments reddit.com/r/niceguys/comments
86	Marriage	reddit.com/r/marriage/comments pnas.org/content/108/17 change.org reddit.com/r/india/comments
85	Social networks and the bible	hooktube.com/watch voat.co/v/mgtow biblegateway.com/passage twitch.tv/mgtowphilosopher voat.co
7	News about relationships	scottbarrykaufman.com/wp-content/uploads/2013 newsweek.com/study-finds-men-nice-women-not-other-way-around-261269 archive.is/zgvcf deccanchronicle.com/lifestyle/sex-and-relationship/161217 wdish.com/life/bullies-sex-study archive.is/e6p19 www.ncbi.nlm.nih.gov/pubmed/26098378 psychologytoday.com/us/blog/evolution-the-self timesofisrael.com/women-really-dont-go-for-nice-guys-study-indicates bizpacreview.com/2018/03/31

Table 5.4: Clustering with 10 topics

Cluster	Manually assigned topics	urls
2	MGTOW	reddit.com/r/mgtow/comments old.reddit.com/r/mgtow/comments reddit.com/r/mgtow
67	Incels communities	reddit.com/r/braincels/comments reddit.com/r/trufemcels/comments old.reddit.com/r/inceltears/comments old.reddit.com/r/braincels/comment
675	External incel communities	incels.me lookism.net
296	Incels culture and communities	mgtow.com reddit.com/r/theredpill/comments reddit.com/r/mensrights/comments reddit.com/r/asktrp/comments
62	Reddit threads about relationships	reddit.com/r/askreddit/comments reddit.com/r/relationships/comments reddit.com/r/twoxchromosomes/comments reddit.com/r/relationship_advice/comments reddit.com/r/askmen/comments reddit.com/r/deadbedrooms/comments reddit.com/r/askwomen/comments reddit.com/r/todayilearned/comments reddit.com/r/polyamory/comments reddit.com/r/tinder/comments reddit.com/r/redpillwomen/comments reddit.com/r/funny/comments reddit.com reddit.com/r/pics/comments reddit.com/r/survivinginfidelity/comments reddit.com/r/confession/comments incel.co reddit.com/r/offmychest/comments reddit.com/r/childfree/comments reddit.com/r/overwatch/comments reddit.com/r/foreveralone/comments reddit.com/r/niceguys/comments reddit.com/r/nofap/comments reddit.com/r/trashy/comments reddit.com/r/askwomenover30/comments reddit.com/r/nonmonogamy/comments reddit.com/r/depression/comments reddit.com/r/india/comments

0123456789	Spam (highly posted urls without comments)	youtube.com/watch?v=qqK1FrO3BdMst.blacko . reddit.com/r/relationship_advice/comments/ift.tt/1gysbzm youtube.com/watch?v=T0xoKiH8JJM youtube.com/watch?v=0Z760XNy4VM youtube.com/watch?v=MhRkcz6wOGQ rd.springer.com/article/10.1007/s40806-017-0126-4 reddit.com/user/ludakrit youtube.com/watch?v=UxpVwBzFAkw pornhub.com/view_video.php imgur.com/gallery/wqopanq spearhead.com en.wikipedia.org/wiki/radical_feminism youtube.com/watch?v=EtvfHnZMcOY en.wikipedia.org/wiki/”women_are_wonderful”_effect youtube.com/watch?v=faeT4fIFAcg youtube.com/watch?v=GLbjmIajj9g youtube.com/watch?v=bBcFfWvexQg youtube.com/watch?v=8qI0EmfngM youtube.com/watch?v=x0gaYyNk7QA robotics.pdf . youtube.com/channel/ucxzboiwtvkf9uwqoju2c8eq youtube.com/watch?v=zLH_ph74Es youtube.com/watch?v=fD2briZ6fB0 youtube.com/channel/ucj2qanqkgvlcoluglb3-b5a
6	Incels without hate	reddit.com/r/inceltears/comments reddit.com/r/badwomensanatomy/comments reddit.com/r/incelswithouthate/comments reddit.com/r/goodmengoodvalues/wiki
562	Scientific articles	sciencedirect.com/science/article/pii journals.sagepub.com/doi/abs/10.1177
627	Porn	pornhub.com/view_video.php
206	Terminology	urbandictionary.com/define.php
26	Traditional relations	reddit.com/r/personalfinance/comments reddit.com/r/videos/comments reddit.com/r/confessions/comments reddit.com/r/tifu/comments reddit.com/r/datingoverthirty/comments reddit.com/r/jordanpeterson/comments
621	Feminism, news, science and unpopular opinion	reddit.com/r/unpopularopinion/comments reddit.com/r/feminism/comments reddit.com/r/science/comments reddit.com/r/news/comments
962	Body	bodybuilding.com forum.bodybuilding.com/showthread.php
692	Meetings	meetup.com reddit.com/r/sex/comments
629	Marriage and jokes	reddit.com/r/marriage/comments reddit.com/r/jokes/comments

7	Attraction	reddit.com/r/equalattraction/comments reddit.com/r/truerateme/comments
5	News about relationships	scottbarrykaufman.com/wp-content/uploads/2013 newsweek.com/study-finds-men-nice-women-not- other-way-around-261269 archive.is/zgvcf deccanchronicle.com/lifestyle/sex-and-relationship/ 161217 wdish.com/life/bullies-sex-study archive.is/e6p19 www.ncbi.nlm.nih.gov/pubmed/26098378 psychologytoday.com/us/blog/evolution-the-self timesofisrael.com/women-really-dont-go-for-nice- guys-study-indicates bizpacreview.com/2018/03/31
263	League of Legends	reddit.com/r/iama/comments reddit.com/r/leagueoflegends/comments
269	Accepting social ideals and divorce	reddit.com/r/thebluepill/comments pnas.org/content/108/17 reddit.com/r/divorce/comments
0	The XY Ghost (External incel community)	twitter.thexyghost.com youtube.thexyghost.com instagram.thexyghost.com songs.thexyghost.com paypalldonate.thexyghost.com thexyghost.com imgur.com/gallery/ql3gec projectmayhem.thexyghost.com vid.me.thexyghost.com

As it can be seen in the tables above, there are a wide variety of themes that relate to the type of information shared by manosphere groups. First, there are the communities of incels (which are even distinguished between Reddit and external ones in the 10-topic LDA model). Secondly, there are also links focused on part of the incel culture such as pills (accepting the roles imposed by society or seeing the "truth". Then, there are also a variety of links about relationships, talking about fidelity, polyamory and loneliness among others. Similarly, there are also some more traditional relationship clusters. There are also news clusters also related to relationships as well as scientific and psychology articles, all seeming to talk about relationships. Finally, there are also (although in a minority) leisure topics such as the video game League of Legends.

5.2.3 Conclusion

Throughout this research question, we have been able to see the keywords of manosphere groups discussions when sharing information as well as the topics being discussed. Furthermore, probabilistic topic models (in particular LDA) have allowed us to see not only the topics with which the manosphere group discussions are composed but also the relationships between them.

In this way, we were able to see that in general the keywords of the discussions were about women, relationships and sex while others were particularly dependent on the link, and we were able to find interesting findings such as that on psychology websites there is

more aggressive vocabulary. This idea of general topics has been confirmed and completed through the analysis of topic distribution. In this analysis, we found topics related to incels, society and even money. In addition, LDA showed that the vast majority of links are composed of the basic themes of incels, relationships and society. Finally, these models have also allowed us to see how the different links are related to more specific topics such as scientific articles, traditional relationships, the body or marriage at the same time as demonstrating that document clusters can be realised through probabilistic topic models with state-of-the-art techniques.

Furthermore, as future work, it remains to use these results to discuss them with sociologists in order to have a more in-depth analysis of the reason for these topics and relationships within the manosphere communities.

Chapter 6

Conclusions and Future Work

Throughout this thesis, it has been investigated the information shared in radicalised manosphere groups such as incels or MGTOW communities by applying text mining and natural language processing techniques to try to find answers to two research questions. In this way, this project has aimed to provide a better understanding of these communities and how they radicalise through the information they share.

On the one hand, the first question proposed in this work was what kind of websites manosphere communities share and how this information influence their discussions? To answer this question, text mining techniques such as the application of parsers have been applied and the most shared and commented links in these communities have been analysed. As a result, first, it was discovered that manosphere groups share links of different types, such as digital bookstores, social networks, news media, etc. Later, it was found that the most shared links are from social networks, news (about relationships and women) and manosphere communities. In turn, we discovered that the most commented links in these social networks are Reddit threads about relationships, although the most commented links are undoubtedly about manosphere communities. Finally, in a more exhaustive analysis, it was found that although there is a small amount of feedback between these communities (e.g. MGTOW with The Red Pill), most of the groups feedback to themselves, some of them even feedback to their communities outside Reddit forum (e.g. r/braincels with incels.me).

On the other hand, once the most shared and discussed information has been obtained, we have given an answer to the second research question Which are the topics and keywords of the discussions around this information? To answer this question, natural language processing techniques such as lemmatisation or POS Tagging have been applied to clean up the text. After these processes, on the one hand, the keywords have been extracted employing word clouds and the topics with probabilistic models to finally find the relationships between the links by using state of the art clustering techniques. As a result, it has been observed that in general, the keywords were about women, relationships and sex while, for example, in psychology pages, a more aggressive vocabulary was used. In addition, topic analysis using LDA confirmed that some of the most prominent topics commented on in these links were about incels, society and even money, with the majority of comments on the links being composed of the topics of incels, relationships and society. Finally, it has been shown that using state-of-the-art probabilistic clustering techniques, it is possible to cluster the documents (formed by the link comments) to see the different categories of links shared by these manosphere groups obtaining categories such as traditional relationships and scientific articles.

In conclusion, this work has provided a new insight into these manosphere groups, uncovering the sources of information most discussed and the strong feedback that occurs

in these groups. On the other hand, it has also shown the topics that exist within the comments on this information as well as demonstrating that it is possible to categorise this information through these topics.

Finally, some lines of future research that have been left out of the framework investigated in this thesis are proposed:

- **Sociological analysis:** It is hoped that this work can help future researchers to better understand the motives and causes of radicalisation of manosphere group members. For this, it would be necessary to carry out a more in-depth analysis of the results obtained by sociological professionals to understand the roots of this radicalisation and to analyse the impact of the information shared by these communities.
- **Analysis of multimedia content:** One of the limitations of this work is that it has focused only on the text format. A future line of research could try to analyse the information shared through images or videos.
- **Analysis with more external coverage:** As we have seen, some communities feed back to themselves with links from their external communities to Reddit. Thus, a possible future line of research would be to collect data from these communities such as incels.me and MGTOW.com to perform an analysis similar to the one seen in this work.

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