




REVIEW ARTICLE



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# How do we study misogyny in the digital age? A systematic literature review using a computational linguistic approach

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Nowadays, despite centuries of striving for equality, women still face higher levels of discrimination compared to men in nearly every aspect of life. Recently, this systemic inequality has manifested in cyberspace through the proliferation of abusive content that is even more aggressive than what one would expect in the 21st century. Various research disciplines are now attempting to characterise this new manifestation of misogyny. The endeavour to comprehend this phenomenon has resulted in a significant increase in publications from several fields, including Social Sciences, Arts and Humanities, Psychology, and Computer Science. This paper presents a systematic review of multidisciplinary research on misogyny from the years 1990 to 2022, encompassing a total of 2830 articles retrieved from the Scopus database as of December 31, 2022. The literature is thoroughly analysed using three approaches: bibliometric analysis, topic detection, and qualitative analysis of the documents. The findings suggest that the analysis of online misogyny has been the primary driver behind the exponential growth in publications in this field. Additionally, the results of the topic analysis and topic interaction reveal a limited connection between the areas of knowledge that are necessary to fully grasp this complex phenomenon.

## Introduction

Nowadays, regardless of centuries of fighting for equality, women continue to face a disproportionate amount of discrimination compared to men across various contexts. Women and girls encounter prejudice, sexist attitudes, open discrimination, and violence throughout their lives, while the extent of these experiences varies by location, identity, and culture. Disgust, intolerance, or entrenched prejudice, serving to legitimise women's oppression, persist even in countries often alleged to be post-patriarchal, like the United States, Australia, and the United Kingdom (Manne, 2017). The all-pervasive form of hostility and aversion against women and girls is referred to as misogyny, a term derived from the Ancient Greek word

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“mīsoḡuniā”, which means hatred of women. According to Allen (2021), misogyny has a disputed definition. Some authors offer a definition of misogyny that, in some respects, overlaps with the concept of sexism. For example, Code (2000) defines misogyny as any of the following acts or feelings: sexual and physical violence against women, exclusion of women, promotion of patriarchy, belittlement, and marginalisation of women. In this approach, the promotion of patriarchy, broadly conceptualised as a system or systems producing and reproducing gendered and intersectional inequalities, is clearly the spread of a sexist mentality. Here, sexism is linked to the acceptance of sex-role stereotypes and can manifest at various levels: individual, organisational, institutional, and cultural (VandenBos, 2015). In the same line of reasoning, Jukes (1993) states that misogyny can be obvious and explicit at times, but it can also be subtle and insidious. However, the subtle expression of misogyny is more linked to sexist attitudes than to the expression of hate. Other authors, such as Manne (2017), set out a clear distinction between sexism and misogyny. In her book, “Down Girl: The Logic of Misogyny”, Kate Manne (2017) describes misogyny as the patriarchal order’s “law enforcement” branch, which rewards “good” women who adhere to social norms while punishing those who disobey. Sexism, on the other hand, is viewed as the “justificatory” branch, which rationalises and justifies male dominance through beliefs, theories, stereotypes, and cultural narratives that portray women as naturally inferior. This conceptual debate is due to two reasons. First, the fact that misogyny is strictly linked to the concepts of patriarchy and sexism, and second, the evidence that our societies are facing new ways of conveying misogynistic content in the form of open denigration of women.

Focusing on the link between concepts that describe women’s discrimination, it is evident that the powerful dynamics of a patriarchal society contribute to the development of a sexist culture, and this leads to the oppression of women both in their personal lives and within societal institutions (Millet, 1970). Additionally, hostile and benevolent sexism (Glick and Fiske, 1997) functions to preserve patriarchy and conventional gender norms. Benevolent sexism manifests through subjectively positive attitudes towards women in traditional roles, encompassing protective paternalism, idealisation, and a desire for intimacy. On the other hand, hostile sexism is expressed in a blatant and resentful way toward women who violate traditional roles and includes the negative equivalents of each dimension of benevolent sexism: dominant paternalism, derogatory beliefs, and heterosexual hostility. The aforementioned patriarchal culture legitimises openly misogynistic expressions, which represent the most extreme manifestation of aggression against women.

In this complex dynamic, studies from different disciplines tend to use different terminology when examining hostility towards women. Specifically, research in psychology is more inclined to use terms related to sexism, especially in distinguishing between hostile and benevolent sexism, and the notion of patriarchy is extensively examined in social science, particularly in sociological studies. The concept of misogyny is more commonly used in communication studies and computational science. The findings reported in the Supplementary Material provide evidence of the emphasis of different disciplines on different concepts.

Regarding the emergence of new ways of transmitting misogynistic content, the rise of interactive social media has been widely considered (Moloney and Love, 2018; Rubio Martin and Gordo López, 2021; Tranchese and Sugiura, 2021).

Misogyny on the internet is not a new phenomenon. Indeed, legislation pertaining to women’s online safety dates back to the Beijing Declaration in 1995. However, it was not until the events of Gamergate<sup>1</sup> (Massanari, 2020) in August 2014 that the

mainstream media and academic research took notice. In fact, in the gaming community, 2014 saw the emergence of the controversy and online movement known as “Gamergate”. It started out as a reaction to questions about ethics in video game journalism, but it soon turned into a harassment campaign directed at female journalists. The movement brought attention to misogyny, sexism, and the need for diversity in the gaming industry.

With the development of social networks, the historical aversion to women has become articulated through new modes of communication and social interaction. While digital spaces have amplified female voices, online platforms have notoriously facilitated the spread of misogynistic content: women’s systematic inequality and discrimination have been replicated in cyberspace in the form of abusive content much more aggressive than we would have expected in the 21st century (Bates, 2021). The online realm provides ample opportunities for misogyny to be linguistically expressed in various ways, ranging from subtle forms such as social exclusion and discrimination to more severe forms like sexual objectification and violent threats (Anzovino et al., 2018). Studies examining online misogynistic discourse have employed different terminology, such as “gender cyber hatred” (Jane, 2017), “cyber harassment” (Citron, 2014), “technological violence” (Ostini and Hopkins, 2015), “gender trolling” (Mantilla, 2013), “e-bile”, and “gender hate speech” (Jane, 2015). Other scholars (see, for instance, Ging and Siapera, 2018) chose to use a broader definition of misogyny which almost always results in some form of harm, either directly, in the form of psychological, professional, or physical harm, or indirectly, making the internet a less equal, less safe, or less inclusive space for women and girls.

Our study aims to investigate the current state of research on misogyny. For this purpose, we focus on the scientific literature on this subject during the period between 1990 and 2022. To the best of our knowledge, our study is the first systematic review on misogyny which combines three approaches: bibliometrics, topic detection, and qualitative analysis of the documents.

For the bibliometric research, we first analyse the existing literature extracted from the Scopus database within the misogyny research field by exploiting bibliometric tools. Bibliometric analysis provides a systematic, transparent, and replicable manner to investigate extant literature in a given field and discover the progress of disciplinary research from a macro perspective, supporting future research directions. Using bibliometric methods, we explore the main lines of research in the scientific literature on misogyny and offer a summary of the research activity in terms of the volume of work and evolution over time, as well as in terms of the social, intellectual and conceptual structures of this research area.

Although bibliometric tools provide a broad overview of current research, they cannot deliver detailed insights into studies in the literature based on semantic content analysis. In order to conduct an in-depth semantic analysis, it is necessary to supplement bibliometric methods with text-mining techniques (Hu et al., 2014). In accordance, our work employs topic analysis based on the Latent Dirichlet Allocation method (LDA; Blei et al., 2003) in order to identify the most prevalent latent themes in misogyny literature. LDA is gaining popularity among scholars in diverse fields (Alghamdi and Alfalqi, 2015). Two important findings emerge from a topic model: a list of topics (i.e., clusters of words that appear frequently together) and a list of documents that are strongly associated with each topic. As a result, this method offers a probabilistic quantification of relevance for both the identification of topics and the classification of documents, making it useful for locating interpretable topics with semantic meaning and assigning these topics to literature documents (Tontodimamma et al., 2021). According to Suominen and Toivanen (2016), the main innovation of topic modelling in

categorising scientific knowledge is that it essentially eliminates the need to fit knowledge that is brand-new to the world into definitions that are already well-established.

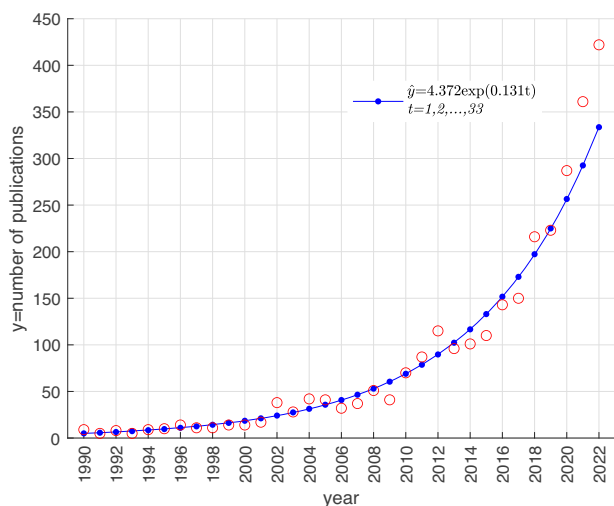
Finally, we complement the study with a qualitative analysis aimed to discover the sociological perspective of the literature on online misogyny, on the one hand, and the computational aspects, on the other hand.

### Bibliometric analyses

**Bibliographic dataset.** For the analysis, we use a bibliometric dataset covering the period 1990–2022, retrieved from the Scopus database on 31 December 2022. Since we focus on the broad spectrum of scientific research on misogyny, the bibliographic dataset was extracted by looking for publications containing terms related to the generic query “misogyn\*” in the content of the title, abstract, and keywords. All types of publications were included in the search, and 2830 documents were retrieved. The top publication fields include Social Sciences, Arts and Humanities, Psychology, and Computer Science.

Information about document distribution by research field is given in the Supplementary Material, along with the document distribution by source and the ranking of the most productive countries and authors.

**Research activity.** The evolution over time of the number of published documents shows remarkable growth (see Fig. 1). We found out that the number of published documents has increased dramatically over time. Since 1992, it has been possible to distinguish two distinct phases. A gradual increase in publications occurred during the first phase, which lasted from 1990 to 2010. The second phase, from 2010 to 2022, has a higher growth rate, indicating increased interest. This finding aligns with the three-stage development theory (Price, 1963) of productivity on a particular subject. Small increments in the scientific literature are documented during the precursor period when some scholars begin publishing research on a new topic. The number of papers increases exponentially in the second phase as the topic expands and draws a growing number of scientists, as many facets of the subject remain unexplored. Finally, in the third phase, the curve aspect shifts from exponential to logistic, testifying to a stabilisation in production and a consolidation of the body of knowledge.



**Fig. 1** Number of publications on misogyny per year: observed and expected temporal evolution according to exponential growth.

To verify the rapid increase, we fit an exponential growth curve to the data. The yearly rate of change in this model is 13.1%, demonstrating how research on misogyny might be cast in the second phase of development: although more research is being released, there is still space for improvement in many areas.

It is noteworthy to highlight that, as shown in the Supplementary Material, the research on misogyny from 1990 to 2002 follows a similar trend as sexism and has a slightly higher yearly growth rate compared to patriarchy. However, when considering only the five years prior to 2022, a more noticeable rise in the volume of published research on misogyny becomes evident, with a twofold increase in the number of published documents.

**Social Structure of research on misogyny: collaboration network.** To capture the essential characteristics of the misogyny research field, with a specific emphasis on collaborative efforts among different authors, we construct the authors’ collaboration network. We used the Bibliometrix R package, for performing network analysis and visualisation (Aria and Cuccurullo, 2017). Within the collaboration network, researchers act as nodes, and the connections between them (edges) represent co-authorships on articles. The node size is indicative of the authors’ productivity, measured in terms of the number of manuscripts authored or co-authored. The edges are weighted according to the frequency of co-authorship. Figure 2 visually illustrates the collaboration network among authors, highlighting the most significant cliques, each distinguished by different colours. The term “clique” is commonly employed to identify highly interconnected groups of elements, such as nodes or vertices, within a network. In our context, a “clique” signifies a group of authors who closely and frequently collaborate with one another compared to their counterparts, thereby creating a densely interconnected structure within the network. The most central scholars, with the highest number of connections, are Elisabetta Fersini, Paolo Rosso, Bilal Ghanem and Viviana Patti, who are also among the most proficient authors in the field of research on misogyny, as shown in the Supplementary Material. The noteworthy aspect is that the densest subgraphs link authors whose research falls under the computer science category.

**Intellectual Structure of research on misogyny: citation analysis.** The top five documents with the highest number of citations are: “Gamergate and The Fappening: How Reddit’s algorithm, governance, and culture support toxic technocultures” (Massanari, 2017), “Down girl: The logic of misogyny” (Manne, 2017), “Attitudinal antecedents of rape myth acceptance: A theoretical and empirical re-examination” (Lonsway and Fitzgerald, 1995), “Post-postfeminism?: new feminist visibilities in post-feminist times” (Gill, 2016) and “Beauty and Misogyny Harmful Cultural Practices in the West” (Jeffreys, 2005). These works investigate misogyny from various angles.

Manne’s book explores the logic of misogyny, which “primarily targets women because they are women in a man’s world” (Manne, 2017, p. 64). Manne argues that misogyny still exists in alleged post-patriarchal cultures and has taken different forms since legal equality, requiring women to be moral “givers” and validating a sense of entitlement among privileged men. Misogyny often takes the form of taking from women what they supposedly owe men and preventing women from competing for positions of power and authority traditionally held by men. In addition, Manne examines various examples of rape culture, including online harassment.

Considering attitudes toward sexual violence, Lonsway and Fitzgerald investigate the relationship between misogyny and rape

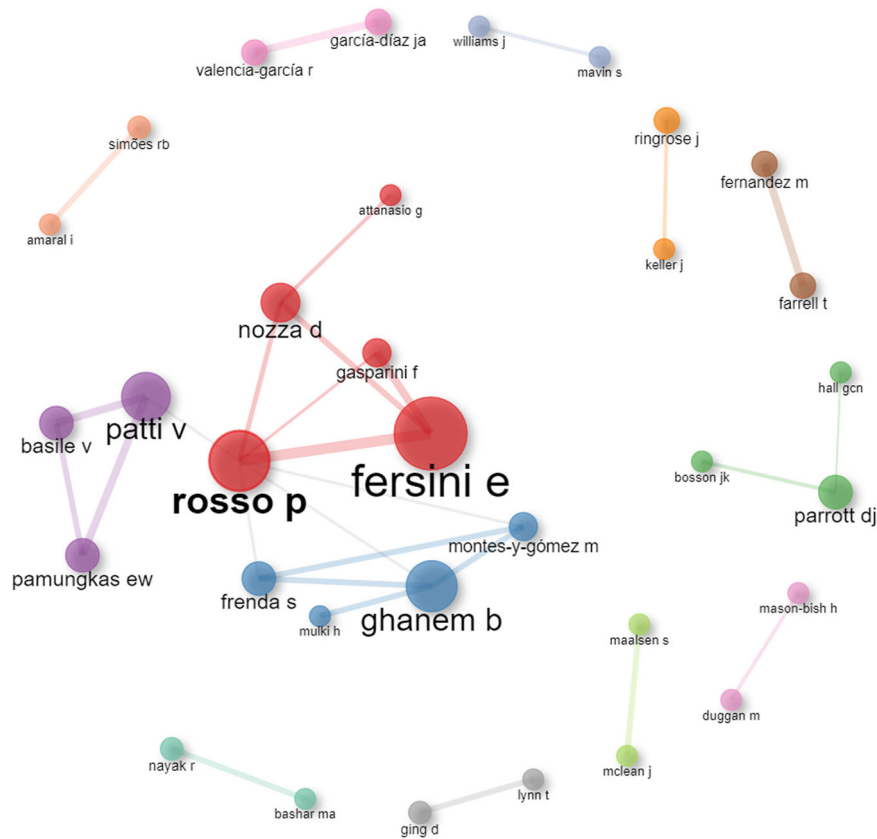


Fig. 2 Authors' collaboration network.

myth acceptance. Here, rape myths can be defined as “attitudes and beliefs that are generally false but are widely and persistently held, and that serve to deny and justify male sexual aggression against women” (Lonsway and Fitzgerald, 1994, pag. 134).

From a feminist perspective, Jeffreys argues that some Western beauty practices (e.g., makeup, high-heeled shoes, breast implants) should be included in the United Nations' definition of harmful traditional/cultural practices due to the damaging effects they have on women's health, the creation of sexual difference, and the enforcement of female deference. Gill's article contends that it is crucial to examine how the media portrays feminism and to delve into the complexities of a cultural moment that seems to be characterised by a range of feminist ideologies (both contemporary and traditional), as well as a resurgence of anti-feminist attitudes and prevalent misogyny.

Massanari's research centres on online misogyny and is based on a long-term participant-observation and ethnographic study of Reddit's culture and community. The research specifically focuses on the #Gamergate and The Fapping cases. The Fapping involved the illegal distribution of nude photos of celebrities via anonymous image-board 4chan and Reddit, while #Gamergate was ostensibly about ethics in gaming journalism but became a campaign of harassment against female and minority game developers, journalists, and critics. The study highlights how Reddit's design, algorithm, and platform politics implicitly support toxic technocultures, providing a fertile ground for anti-feminist and misogynistic movements to flourish. Online misogyny is also discussed in the papers with the highest number of local citations (i.e., citations from other documents within our bibliographic dataset): “#MasculinitySoFragile: Culture, structure, and networked misogyny” (Banet-Weiser and Miltner, 2016), “Back to the kitchen, cunt: Speaking the unspeakable about online

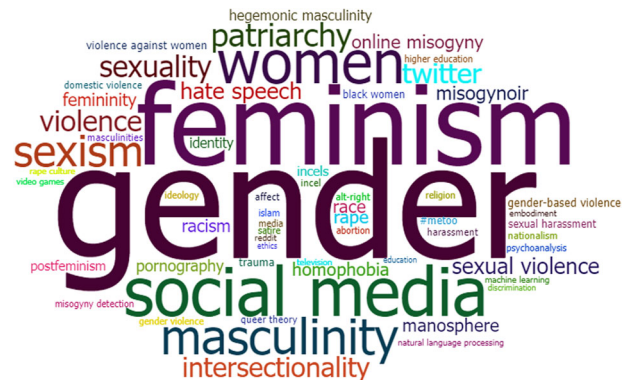


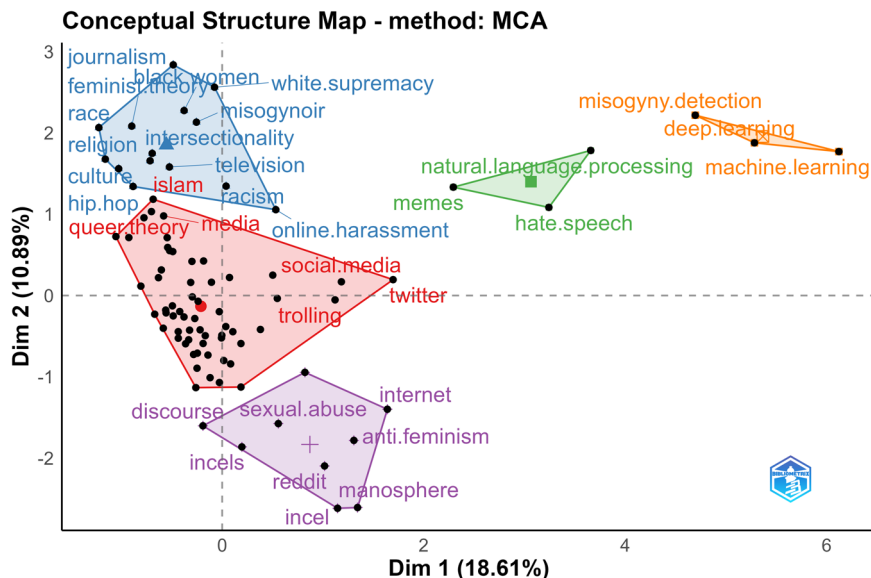
Fig. 3 Most used keywords.

misogyny” (Jane, 2014), and “Drinking male tears: language, the Manosphere, and networked harassment” (Marwick and Caplan, 2018).

**Conceptual Structure of research on misogyny.** To understand the conceptual structure of the research on misogyny, we initially performed an exploratory analysis of the textual content of the keywords chosen by the authors.

Figure 3 shows the most used keywords, after removing the term “misogyny”. Besides the extensive terms gender, feminism and sexism, we find keywords related to the phenomenon of violence against women, to the emerging theme of the Manosphere and to the classical theme of patriarchy and hegemonic masculinity. It is also worth noting the presence of several keywords strictly linked to the online diffusion of misogynistic content.





**Fig. 4** Conceptual map of research on misogyny.

To deepen the analysis, a conceptual structure map (see Fig. 4) of the literature on misogyny was created using the Bibliometrix R package (Aria and Cuccurullo, 2017), which enables performing multiple correspondence analysis (MCA, Greenacre and Blasius, 2006) and hierarchical clustering. MCA, in particular, allows the generation of a low-dimensional Euclidean representation of the original data matrix by performing a homogeneity analysis of the “documents by keywords” indicator matrix, which is constructed by taking into account a dummy variable for each keyword. The words are plotted on a two-dimensional plane, where closer words have a more consistent distribution across the documents.

The two dimensions of the maps that emerged from the MCA can be interpreted as follows. The first dimension separates keywords emphasising the problem of misogyny in general and on social media platforms (on the right) from those related to the methodological aspects of the automatic detection of misogynistic language (on the left). The second dimension separates keywords emphasising the problem of misogyny from a general point of view (on the upper) from those related to the Manosphere and Incels (*involuntary celibates*) and their presence on the Reddit platform (on the bottom). Figure 4 also displays the results obtained through a hierarchical cluster analysis carried out adopting the method of average linkage on the factorial coordinates obtained through MCA. Five clusters emerge from the conceptual structure map. The orange cluster refers to publications related to the automatic detection of misogynistic content through machine learning and deep learning techniques. The green cluster displays the connection between misogyny and hate speech and the exploitation of Natural Language Processing (NLP) methodologies to investigate these phenomena. The blue cluster refers to the intersectionality of research on misogyny. The red cluster is strictly linked to studies of the presence of misogynistic content on social media. Finally, the purple cluster is related to publications dealing with the topics of the Manosphere and the Incel phenomenon.

**Research themes in misogyny literature**

A topic modelling approach is exploited to investigate the textual content of title, abstract and authors’ keywords to give extra insight into multiple latent themes emerging from the literature on misogyny. To reveal the themes, research interests and trends

of studies in the existing misogyny literature, we rely on the LDA model.

**Topic analysis: LDA model.** LDA is an unsupervised machine-learning-based algorithm allowing to discovery of latent (unobserved) “topics” in large unstructured text datasets (Blei et al., 2003). Previous research applied LDA to bibliometrics as an efficient tool for understanding a field’s rich underlying topical structure (see, among others, Suominen and Toivanen, 2016, Tontodimamma et al., 2021). The idea behind LDA is that documents contain multiple topics, and each topic is represented as a probability distribution over terms in a fixed vocabulary, with different topics represented by different probabilities of words in the vocabulary. LDA generative process specifies a joint distribution of hidden and observed variables. The algorithm aims to estimate the posterior distribution of the hidden variables given the observed data, but exact inference is intractable, requiring approximate inference algorithms like sampling-based and variational algorithms (Blei et al., 2003; Steyvers and Griffiths, 2006). To employ LDA, the user needs to specify the number of latent topics in the corpus and two hyperparameters that control how documents and words contribute to topics. A detailed explanation of the LDA algorithm can be found in the studies by Blei (2012) and Steyvers and Griffiths (2006).

In our analysis, we use LDA to model a corpus with each document consisting of the publication title, abstract, and keywords. LDA analysis was performed through the Fitlda Matlab routine, available in the Text Analytics Toolbox (MATLAB, 2022).

**Topic interpretation.** The themes generated by LDA are hidden variables that require proper interpretation, typically done by examining the top keywords associated with each topic (Steyvers and Griffiths, 2006). To this end, Figs. 5 and 6 show the most important words for each topic, with importance determined by normalising the posterior word probabilities for each topic by the geometric mean of the posterior probabilities for the word across all topics. The topics are ranked based on their estimated likelihood of being observed in the entire dataset. Section 2 of the Supplementary Material contains the list of the most significant terms and their relevance measurements. The twelve selected

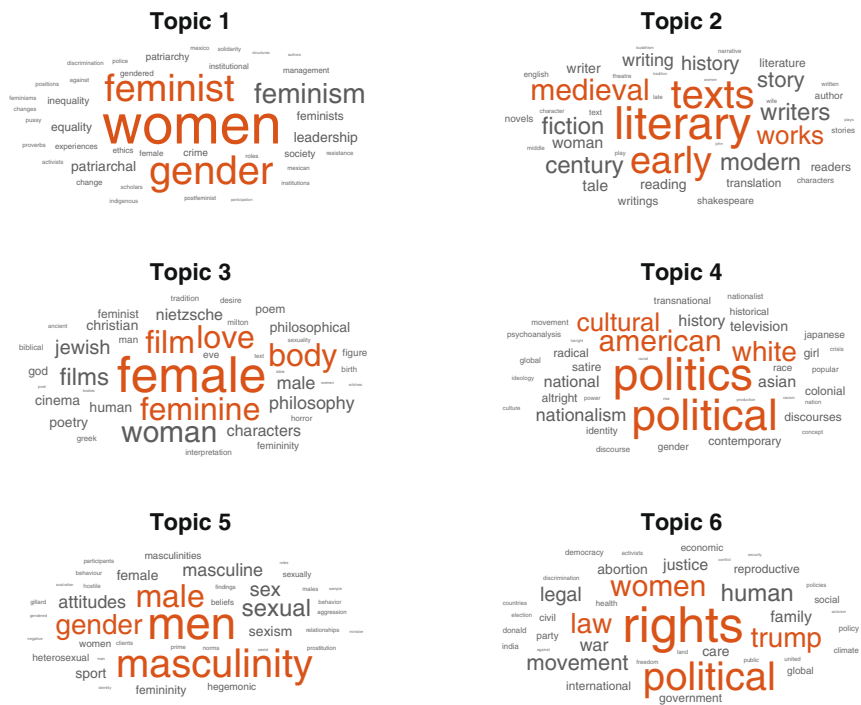


Fig. 5 Word clouds for topics 1-6.

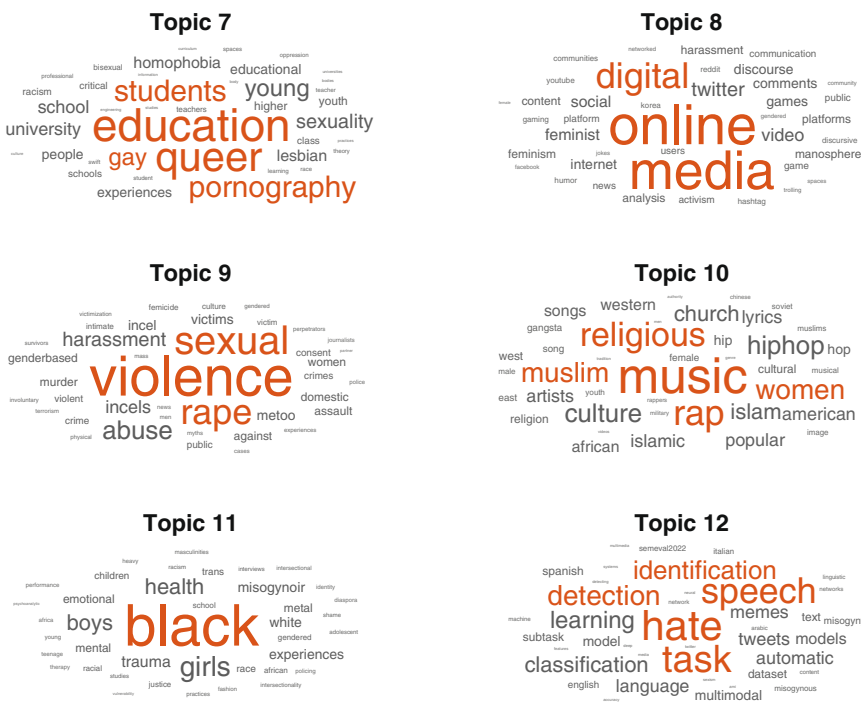


Fig. 6 Word clouds for topics 7-12.

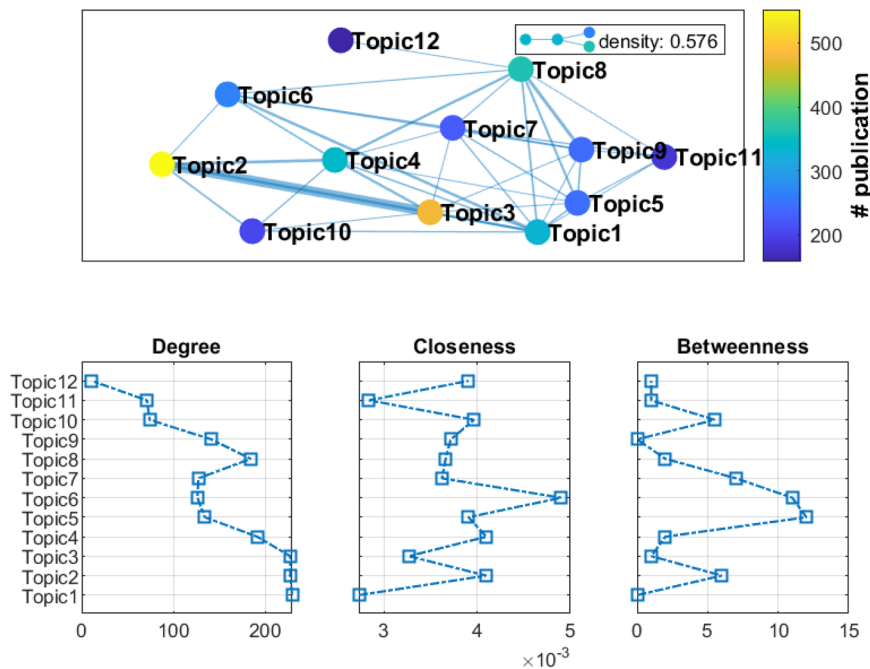
topics address crucial areas of research on misogyny and can be summarised as follows.

Topic 1 revolves around a comprehensive discussion on the feminist perspective of the misogyny phenomenon and addresses the root causes of misogyny and gender-based discrimination. The primary focus is on patriarchal male gender privilege and its role in perpetuating misogyny. This topic covers a range of issues related to gender inequality, such as the leadership gap between men and women, women’s rights, and the intersection of misogyny with other forms of oppression.

Topic 2 focuses on how misogyny is expressed in literary works from the early and medieval periods to the modern era. Overall, this topic highlights the role of novels, prose, tales, and fiction in shaping societal attitudes and beliefs about gender and how this has influenced the treatment of women throughout history.

Along similar lines, Topic 3 centres on the study of misogyny in relation to the representation of women in films and on how it influences the portrayal of women on visual media.

Topic 4 is focused on the study of misogyny within the realm of politics and examines how misogyny can be perpetuated within



**Fig. 7** Topic co-occurrence network for the publications on misogyny and nodes' centrality measures.

political systems and movements. In particular, the inclusion of terms like “American”, “white”, and “alright” suggests that research included in this topic might focus on the ways in which misogyny is manifested in American politics, particularly within white nationalist and alternative-right movements.

Topic 5 is centred on the study of masculinity and how it relates to misogyny. In particular, the word “hegemonic” suggests that this topic may focus on how dominant forms of masculinity reinforce misogyny and gender-based discrimination.

Topic 6 pertains to the research on women’s rights, including reproductive rights, family law, and access to healthcare, particularly within legal and political systems and on how these systems can either promote or hinder gender equality.

The latent theme of Topic 7 seems to refer to a broad subject area that encompasses issues related to education, sexuality, and sexual identity. Additionally, the related terms suggest a focus on the ways in which sexuality is addressed within educational institutions, including schools and universities.

Topic 8 is a subject area that focuses on the study of digital misogyny, which refers to the ways in which sexism and gender-based discrimination are perpetuated through online and digital media platforms.

The set of words linked to Topic 9 clearly indicates studies focusing on the subject of sexual violence and harassment.

Research included in Topic 10 is related to the investigation of misogyny in the context of music and religion.

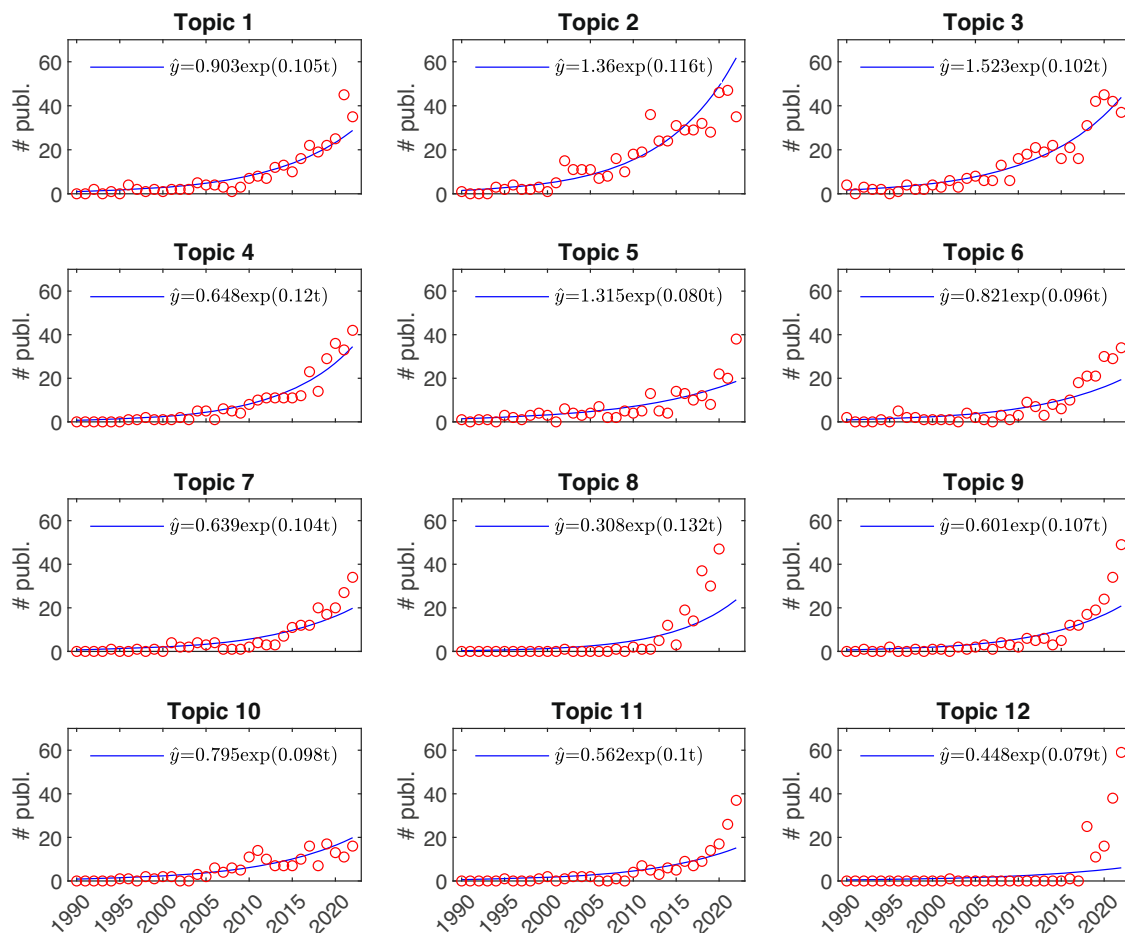
Topic 11 appears to be focused on the intersection of misogyny and racism, particularly as it relates to the misogynoir phenomenon.

Finally, Topic 12 deals with the identification and classification of online misogyny.

**Topic interactions.** By modelling each document as a mixture of several topics and each topic as a combination of words, the LDA technique assigns topics to documents. In our analysis, we awarded the top three document-topic probabilities to each document in this study as long as the probabilities are greater than 0.2. We developed a topic relationship network by considering the topic co-occurrence matrix. The topic network is

depicted in Fig. 7, along with node centrality measures. The nodes are coloured according to their degree, and the edges are weighted depending on co-occurrences. The stronger the link, the thicker the line. Edges with weights less than the average number of co-occurrences have been omitted. The investigation of the linkages reveals relationships between research fronts, emphasising the multidisciplinary character of research on misogyny. The highest degrees are associated with the first three topics, which encompass broader themes dealing with the feminist perspectives of patriarchal society (Topic 1) and the representation of women in literary works (Topic 2) and cinema (Topic 3). Moreover, the latter two topics show the strongest interconnection. Lower degrees are associated with more specialistic research fronts related to the presence of misogyny in music and religion, the misogynoir phenomenon, and the recent field of misogyny detection in computational sciences. In particular, the theme of automatic identification of misogynistic content (Topic 12) is only linked to the research dealing with digital misogyny (Topic 8). A high betweenness, measuring the extent to which the node is part of paths that connect an arbitrary pair of nodes in the network, is associated with Topics 5 and 6, dealing with the study of masculinity and how it relates to misogyny and to research on women rights, respectively. These findings suggest that those research areas are more effective and accessible in the network and form the densest bridges with other nodes.

**Topic temporal evolution.** The temporal evolution of the scientific productivity for each topic can be captured through Fig. 8. The temporal trend of most topics agrees with exponential growth. However, looking at Topic 2, related to studies of misogyny in literary works, we notice how the number of publications in the last period falls below the number expected according to the exponential law. Conversely, the number of published documents for Topics 8 and 12 shows a sudden rise starting from 2018. This trend testifies to the increasing interest in the study of online misogyny and the related techniques for automatic detection and identification. A relatively more contained rise in the size of publications is recorded for Topics 10 related to the investigation of misogyny in the context of music and religions.



**Fig. 8** Number of publications on misogyny for each topic: observed and expected distributions according to exponential growth.

The appearance and development of new fields of interest and innovative ideas in the research activity on misogyny are confirmed by the heatmaps provided in the Supplementary Material, which show the number of documents, by years, assigned to the identified topics.

### Sociological research on online misogyny

To improve our comprehension of the ongoing research on the online dissemination of misogynistic content, we utilised a more specific selection query in our search of the original set of documents, which targeted terms associated with the online environment. We limited our search to articles published in journals categorised under the Social Science subject area. After analysing 277 articles, we identified 187 that were suitable for our study.

Among these documents, four articles provide a review of the literature on online misogyny from different perspectives. Moloney and Love (2018) review the way online misogyny is conceptualised in the social scientific literature within feminist media studies. The authors identify four different terms that are used to describe different types of online misogyny: online sexual harassment, gendertrolling, e-bile, and disciplinary rhetoric. They also examine the sociological perspective and introduce the concept of “virtual manhood acts” (VMAs), which is situated within the broader context of critical gender theory. VMAs are examples of technologically facilitated misogyny that occur in online social spaces: textual and visual cues are exploited to signal a masculine self, enforce traditional gender norms, oppress women, and restrict men to predefined gender roles. Bosch and

Gil-Juarez (2021) conducted both a systematic review of 33 articles found in Web of Science and a traditional review of academic, institutional, and feminist-activist publications. Their findings show that the majority of aggressors in online gender-based violence are cis-hetero-patriarchal men, who are mostly known to the victims and are often partners or ex-partners. The types of violence range from sexual insults and threats to sexual and high-tech violence. Rubio Martin and Gordo López (2021) provide an overview of the most recent academic literature within the feminist technosocial literature, specifically related to sexual and gender-based violence in digital environments. In addition to discussing the contemporary antecedents of this perspective and presenting current positions and the most representative studies on topics related to online misogyny, the authors demonstrate the potential of the feminist technosocial approach for analysing digital environments and their designs. The main conclusion drawn is that both the values of a misogynistic culture and the possibilities for its reproduction and dissemination are embedded in the design and architecture of digital platforms. The article also highlights the increasing relevance of hybrid realities that result from the synergies between the physical and digital realms, as they enable amplified discourses and actions of online misogyny. Faith (2022) investigates how gender, technology, and development are interconnected by analysing various works from different fields, including feminist technology studies, gender and development, feminist criminology, and ICT for development. The study also draws data from sources such as civil society, news reports, and international organisations, like the UN, to examine online violence. The author argues for a critical research approach



to better understand the complex and opaque power dynamics that shape the digital economy and how it affects gender and development goals.

The articles on online misogyny, which were found in the Social Science category, underwent a manual annotation process to extract various pieces of information. Regarding the different methodologies and techniques used to investigate online misogyny, our findings indicate that discourse analysis and content analysis are the primary methodologies employed in social science literature. Several studies utilise in-depth interviews and surveys to examine the individuals targeted by and responsible for online misogyny. Additionally, digital ethnography, corpus linguistics, and network analysis are also employed. The most analysed social media platforms include Twitter, Reddit and Facebook. Further details on the methodological approaches and the social networks are provided in the Supplementary Material. The subsequent sections delve into details regarding target victims, misogynistic groups, and potential measures to counteract online misogyny.

**Targets of online misogyny.** Scholars studying online misogyny have identified various target groups that are particularly vulnerable to misogynistic content. These groups include female politicians, journalists, celebrities, influencers, musicians, gamers and developers, YouTubers, university students, and women who have been sexually assaulted. By focusing on specific target groups, research helps in achieving a more nuanced understanding of the ways in which online misogyny manifests and the specific harms that it causes.

Studies on online misogyny directed towards female politicians have concentrated on analysing the experiences of women from various countries, examining the types of misogynistic content directed towards them and the platforms on which it is disseminated. Silva-Paredes and Ibarra Herrera (2022), using a corpus-based critical discourse analysis, explore abuse received by a Chilean right-wing female politician. Phipps and Montgomery (2022) conducted an investigation into the portrayal of Nancy Pelosi as the monstrous feminine in the deeply misogynistic attack advertisements of Donald Trump's 2020 presidential re-election campaign. In light of the prevalent misogynistic and anti-feminist depictions of Senator Hillary Clinton across all types of media, Ritchie (2013) examines how online media continues to have the power to create harmful representations of female politicians and the consequences for the political campaigns of women and for the democratic process as a whole. Focusing on Canadian politicians, Wagner (2022) discusses how online harassment is a gendered phenomenon. The study, drawing upon interviews with 101 people from diverse genders, racial/ethnic identities, sexual orientations, and partisan affiliations, shows that women are more aware of online harassment than men and how it succeeds in making women feel they are in a hostile political environment. Saluja and Thilaka (2021), analysing the Twitter discourse referring to three well-known female politicians in India, reveal similar findings, emphasising how female politicians are subjected to a different and distinct pattern of reception compared to their male counterparts. Instances of misogynistic or sexist hate speech and abusive language against female politicians in Japan are investigated in Fuchs and Schäfer (2021).

The research conducted by Chen et al. (2020) through in-depth interviews with 75 female journalists from Germany, India, Taiwan, the United Kingdom, and the USA revealed that those journalists frequently encounter online gendered harassment. The harassment, which includes sexist comments that criticise, attack, marginalise, stereotype, or threaten them based on their gender or

sexuality, has led to some female journalists being subjected to misogynistic attacks and even threats of sexual violence. The study suggests that this kind of harassment limits their level of interaction with their audience without being attacked or sexually undermined.

By examining the findings of the qualitative in-depth interview of 48 female journalists, similar findings are reported by Koirala (2020), whose study, based on the qualitative in-depth interview of 48 female journalists in Nepal, highlights how some of them tolerate harassment by being 'strong like a man', while many avoid social media platforms to keep free of such abusive behaviour. Along the same lines, Rego (2018) analyses Twitter conversations with Indian journalists and argues that social media platforms constitute convenient havens of harassment against assertive women.

Ghaffari (2022), analysing user-generated comments on the Instagram profile of a female American celebrity, shows how women are required to suppress their feelings and limit their authentic online presentation to maintain the outward countenance that matches the stereotypical gender roles in audiences' state of mind. The research conducted by Döring and Mohseni (2019) supports these findings, focusing on video producers on YouTube. Their study found that female video producers are more likely to receive negative comments compared to male producers, but only if they display their sexuality or address feminist topics. However, if they conform to traditional gender role expectations, they do not experience this kind of negative feedback.

The emergence of female gamers in video game communities has led to a rise in misogynistic attacks against those who challenge the traditional hypermasculine culture of gaming. The 2014 #gamergate incident is a prime example of this, where a group of gamers opposed "Social Justice Warriors" who highlighted discrimination and exclusion in the gaming industry. Female gamers were subject to death threats, rape threats, and doxing, where their private information was shared online (Tomkinson and Harper, 2015). The video gaming community has a long history of gender-based attacks on women, which serve to create a toxic environment for them when making and playing video games. According to Jenson and De Castell (2021), who approach the subject from a feminist perspective, video games have been predominantly masculine and gendered spaces. Repeated displays of aggression, referred to as "shock and awe", perpetuate and legitimise gendered hostility. These displays also help to preserve exclusionary media practices designed to maintain the status quo.

**The Manosphere.** Numerous articles on online misogyny examine the Manosphere, a collection of websites and social media groups that endorse misogynistic beliefs. These networks are not uniform but consist of multiple misogynistic groups with differing perspectives and degrees of violence, which are associated with far-right, homophobic, and racist ideologies (Dickel and Evolvi, 2022). Despite their variations, all these groups portray feminism as innately discriminatory and threatening to men (Farci and Righetti, 2019). The Manosphere adheres to the beliefs of a 'gynocentric order' and the Red Pill ideology, a metaphor derived from the movie *The Matrix*, in which the protagonist's eyes are opened to reality upon taking the "red pill". Although these groups may have distinct beliefs, many members use the term *misandry*, referring to the hate against men, which has ideological and community-building functions. It reinforces a misogynistic belief system that portrays feminism as a movement that hates men and boys (Marwick and Caplan, 2018). The use of *misandry* caters to both extremist misogynistic subcultures and

moderate men's rights groups. It enables these groups to adopt the language of identity politics, positioning men as the silenced victims of reverse discrimination in all aspects of political, economic, and social life and solidifying their sense of entitlement (Farci and Righetti, 2019).

Men's rights activists employ a personal action frame to construct a plausible but fictional narrative of men's oppression (Carian, 2022). The movement against feminism revolves around advocating for men's rights while denying that gendered violence exists (Garcia-Mingo et al., 2022). The Manosphere engages in a crucial ideological effort that normalises, trivialises, and legitimises sexual violence against women in various forms (Garcia-Mingo et al. 2022). Some of the primary themes of this ideology are: criticising and verbally abusing women, downplaying or not taking seriously accusations or reports of rape, depicting #MeToo as a feminist plot, portraying men as victims, and advocating for the restoration of patriarchal values (Dickel and Evolvi, 2022). Hopton and Langer (2022), analysing Twitter content to understand how the Manosphere constructs masculinity and femininity, identify three discursive strategies: co-opting discourses of oppression, naming power, and disavowal by disaggregation. These strategies are used to position men as victims, portray women as monstrous others, and re-establish gendered power hierarchies through continuous references to rape in their discourse.

One of the main groups in the Manosphere, the Incels, believes in a hetero-patriarchal racial hierarchy and justifies their lack of sexual activity through ideas rooted in biological determinism and victimisation by women and feminism (Lindsay, 2022). Scotto di Carlo's analysis of Incels (Scotto di Carlo, 2023) reveals a conflation of apparently sarcastic metaphors, dark humour, and misogyny to describe women, as well as unique self-representations of forum participants that do not conform to typical 'us vs them' identity pattern (van Dijk, 1998): instead of highlighting the positive qualities of their in-group, the Incels describe themselves in a derogatory manner, leading to a spiral of self-pity and self-contempt that can foster a sense of brotherhood within the community. These findings stem from a content-discourse analysis of posts from threads specifically discussing women on an incel forum and from the study of nominations and predications of self-representations used in the 'Introductions' thread of the same forum. Halpin (2022), drawing on a qualitative analysis of comments made on a popular Incel discussion board, demonstrates how the group uses its perceived subordinate status to justify their misogyny and legitimise its degradation of women. Conducting an ethnographic content analysis of incel-identified subreddits and using femmephobia as a lens, Menzie (2022) examines how Incels employ heteropatriarchal conceptions of femininity to devalue women and to describe the social conditions that force them to remain celibate. The study focuses on the symbolic actors constructed by Incels, namely Stacy, who represents the most attractive women, Becky, who represents women of ordinary or moderate attractiveness, and Chad, who represents dominant alpha males. Five themes emerge from the analysis. First, Incels use these symbolic gendered actors to describe a sex deficit most men suffer, implying their own undesirability. Second, Incels' femmephobia towards hyper-feminine women for not fitting heteropatriarchal requirements is evident in "Stacy". Third, "Becky" shows a more flexible femmephobia towards women of different appearances who uphold "unrealistic standards" and date men more attractive than themselves or rely on feminism to cope with not attracting the same men as Stacy. Through "Chad", the fourth topic examines the idea of masculinity, incorporating feelings of jealousy and recognition of victimisation under societal conditions that allow women to exploit men financially or emotionally. Finally, the

analysis reveals how Incels prioritise partner display as a symbol of wealth. Along the same lines, Koller and Heritage (2020) analysed a textual corpus created from threads posted and commented on by Incels. The study examined keywords, word frequencies, and concordance lines to explore the representation of gendered social actors. The findings suggest that Incels position different groups of men in a hierarchy in which conventionally attractive men occupy the top position. Female social actors are not placed in a similar hierarchy. Furthermore, an additional appraisal analysis of the most frequently occurring male and female social actors reveals that men are judged as unable to function, while women are viewed as immoral, dishonest, and capable of causing harm to men.

Chang (2022), analysing the discourses circulating on a Reddit forum for self-proclaimed Incels, explores the perceptions created by the term "femoid", a derogatory term generated by Incels to refer to women, constructing them as an abject "monstrous-feminine", serving a dehumanising function and thus justifying the violence enacted upon them. Tranchese and Sugiura (2021) focus on the similarities between the language used in pornography and that of Incels, arguing that both are different manifestations of the same misogyny. Their study involves a linguistic analysis that compares a collection of posts from an Incel subreddit community with a reference collection of posts from 688 subreddits covering other subjects. From a different perspective, Byerly (2020) investigated news media language in the coverage of Incel behaviour associated with sexual aggression. The study employs qualitative textual analysis on a sample of 70 articles obtained using keyword combinations 'incels and violence', 'incels and social media', and 'incels and sexism' from 29 distinct news sources across 6 countries throughout the years 2018 and 2019. Research findings indicate that news stories emphasise the role of social media in helping Incels find each other and form online communities. Additionally, specific social media sites served as locations to amplify misogynistic attitudes and to boast about their murders. Speckhard et al. (2021) conducted a study that involved gathering information on Incels' social and personal lives, adherence to incel ideology, opinions on incel-related violence, support for violent actions, and beliefs regarding the classification of Incels as violent extremists. The data was collected through a Google Forms survey that was distributed to active adult members of a prominent Incel forum. The final sample under analysis comprises 272 respondents who self-identify as Incels. The findings demonstrate that while most of them do not advocate violence and are non-violent, those who strongly hold misogynistic beliefs are more likely to endorse violent actions. Participation in Incel online forums, which validate their viewpoints, could also lead to an increase in their misogyny. O'Donnell and Shor (2022) investigated how misogynistic Incels discuss mass violence committed by their peers. Through qualitative content analysis of comments related to the 2018 Toronto van attack, in which self-declared Incel Alek Minassian drove a van into pedestrians, killing 10 and injuring 16, they found that a large majority of self-proclaimed Incels expressed support for such violence, as well as violence in general. Incels believed that mass violence was a means to achieve four main goals: gaining more attention, seeking revenge, reinforcing traditional masculinity, and bringing about political change.

MGTOW (Men Going Their Own Way), a separatist group within the Manosphere, also promotes a misogynistic agenda. Unlike Men's Rights Activists and Incels, MGTOWs focus on individualistic and self-empowering actions, encouraging men to lead a self-sufficient life away from women. Jones et al. (2020), using content and thematic analyses of a corpus of tweets from three of the most active MGTOW users on Twitter, have linked the MGTOW ideology with toxic masculinity, showing that the

online harassment it generates is deeply misogynistic and upholds heterosexual and hegemonic masculinity. The authors note that, although misogyny and violence produced by MGTOW are not extreme, the group's appeals to rational thinking make them appear to be common sense. Wright et al. (2020) delve deeper into the structural underpinnings and nature of MGTOW debate within their discussion forums, including leadership, moderation, in-group dynamics, and the discursive form of debates, and how this contributes to the propagation of misogyny and different calls to action. The authors conducted a content analysis of comments in the official MGTOW website's forum and a digital ethnographic approach. Their findings showed that discussions primarily revolve around women and the MGTOW community. When discussing women, users did so in an openly misogynistic way. When discussing MGTOW, conversations sought to define and rationalise it as an ideology, both for individuals and the collective. The authors also note that the communicative form was mainly communitarian, with strong group bonding, ties, and engagement.

**Countering online misogyny.** Strategies and tactics used by women to cope with and address gender violence online are diverse and sometimes activated simultaneously. Some of these strategies prioritise self-care and protection, while others focus on resistance and challenging such violence. From a self-care perspective, it is crucial to adopt mitigation measures that reduce harm and minimise risks, such as assessing online identities, adopting pseudonyms or collective identities, using masks, strengthening accounts, creating distance, silencing or erasing sensitive content (Bosch and Gil-Juarez, 2021). In the research by Chen et al. (2020), it is shown how female journalists have developed multiple strategies for coping with abuse, including modifying their social media postings, altering their reporting subjects, and utilising technological tools to prevent offensive comments on their public pages.

Merely prioritising self-care is insufficient; an active approach should be taken to resist and transform the current state of online misogyny. This involves engaging in actions that challenge the status quo and strive for meaningful change, with the ultimate goal of repoliticising the internet and social media with, for, and from a feminist perspective (Bosch and Gil-Juarez, 2021). From this standpoint, social media platforms can give space to the promotion of gender-based harassment but can also serve as crucial spaces for feminist education and activism and for the formation of a feminist counter-public that directly contests a misogynistic culture (Sills et al. 2016). In this perspective, Kurasawa et al. (2021) discuss a new form of feminist activism called evidentiary activism, which uses evidence of gender-based online violence (GBOV). Evidentiary activism engages with existing formal evidentiary cultures by advocating for legislative and regulatory reforms to address GBOV, promoting platform-based technological solutions, and challenging conventional notions of user privacy and anonymity. In addition, it involves contributing to and embracing informal evidentiary cultures, which use evidence as a tool for cultural and political mobilisation against GBOV. Strategies used include publicising instances of GBOV, highlighting the moral implications of such violence, and fostering feminist digital citizenship. As an example of online feminist activism, Kim (2017) explored the role of the 2015 hashtag #iamafeminist in promoting feminist identification and activism against misogyny in South Korea. The hashtag persisted for three months by addressing current gender issues and promoting activism both online and offline. The article by Shesterina and Fedosova (2021) examines the methods used by female bloggers to promote feminist ideas on Instagram. The authors found that while many posts are logically argued, female

bloggers often use emotional manipulation and persuasion techniques to promote their ideas. The study identifies both the main topics in support of feminism, such as domestic violence and gender stereotypes, victim blaming, and the most common attitudes that female bloggers challenge in their posts (e.g., "gender roles are determined by nature", "a woman must obey a man", "female intelligence is worse than male", "all women are hysterical"). The authors also describe the lexical means and rhetorical techniques commonly used in female blogs, such as metaphors, allusions, appeals, and rhetorical questions. The language used is generally colloquial, making texts easier to read, but it also includes harsh criticism and increased emotionality compared to traditional journalistic texts.

However, according to Jane (2016), taking matters into one's own hands when faced with online harassment may have limited effectiveness and is not a sufficient solution to the problem of gendered cyber-hate. This approach shifts the responsibility from the perpetrators to the targets and the private sphere rather than addressing the broader social issue. The author suggests that a combination of feminist activism efforts, including a revised approach to collectivism, is needed to enact the necessary legislative and corporate changes to combat gendered online hate. The study by Davis and Santillana (2019) examines the potential and limitations of digital media activism in raising awareness about gender-based harassment using the case study of Las Morras, a Mexico City-based feminist media group. The study demonstrates the paradoxical role of networked digital media as an activist tool. While it rapidly circulated a critique of misogyny, it also attracted negative attention, leading to the group's eventual demise due to doxing, trolling, and personal threats directed at its members.

Megalians, a cyberfeminist community in South Korea, utilised the technique of "mirroring" to combat online misogyny (Jeong and Lee, 2018, Moon et al., 2022, Yang and Lee, 2022). This practice involved mimicking the language of misogynistic online communities and reversing the roles of perpetrators and victims. Megalians also used parodies to subvert the humour and power dynamic that men often used to make fun of women. By appropriating and using the language of misogynists, they aimed to strip men of their ability to use misogynistic speech for their own entertainment. This approach also exposed the absurdity and ridiculousness of the misogynistic rhetoric. However, the success of mirroring is not clear-cut. In fact, while Megalians' voices were heard in society, the strong message and crude language proved divisive and polarising (Kim, 2021).

An alternative strategy for addressing misogyny is to use social re-norming and appeal to the empathy of those engaging in harassing behaviour. The goal of re-norming is to challenge cultural attitudes and beliefs that tolerate or encourage violence against women and to promote new standards of behaviour that prioritise respect, equality, and safety for all individuals. One example of this approach is the experiment conducted by Whiley et al. (2023) on Twitter. Their experiment aimed to inform misogynistic offenders that their sexist language was disapproved of by the majority of people. However, this intervention did not result in a reduction in the number or frequency of sexist Tweets or users, nor did it affect the tone or emotional intensity of subsequent tweets. In contrast, research has demonstrated the efficacy of creative humour, such as that used by the IncelTears subreddit to ridicule Incels, in promoting (dis)affiliative and informative functions (Dyner, 2020).

### **Computational science research on online misogyny**

In this section, we focus on documents on misogyny classified by Scopus in the "Computer Science" subject area. A total of 196



documents were found; 30 documents were excluded as they were off-topic. Two surveys were identified in the retrieved documents, which centre on the automated detection of online misogyny. In one survey, Shushkevich and Cardiff (2019) present an examination of techniques for identifying misogyny in social media through automation. Meanwhile, Sultana et al. (2021) conducted a systematic literature review of prior research to reveal different aspects of misogyny and sexist humour and to create a codebook for annotation purposes.

**Automatic detection of misogyny.** Manual classification of the retrieved articles reveals a wealth of valuable information regarding the automatic detection of misogyny. This includes details about the social networks that are being analysed, the primary techniques employed, and the availability of datasets.

In line with research in the social science area (see Section 4), Twitter (with 95 publications) and Reddit (with 46 publications) continue to be the most commonly used sources, even in the area of computational science. The number of studies dealing with Facebook and Instagram is very limited. Researchers frequently prioritise the study of Twitter (now rebranded X) and Reddit above other social media platforms due to their historically liberal provision of Application Programming Interface (API) access. Furthermore, Reddit, which has been described as 'a community of communities' (Massanari, 2017, p. 331), has a diverse array of subreddits that cater to different interests, some of which foster misogynistic beliefs. However, the new pricing plans for using the Twitter API, introduced in March 2023, are expected to significantly affect research. A survey conducted by the Coalition for Independent Technology Research<sup>2</sup> outlines the potential consequences of discontinuing free and affordable API access. These drawbacks include the disruption of research on the dissemination of harmful content. A similar survey on the impact of Reddit's recent API changes<sup>3</sup> emphasises how researchers are concerned about interruptions in their research resulting from API modifications. It is worth noting that only one study (Semenzin and Bainotti, 2020) reports the results of research on Telegram, which, in fact, has become a widely used platform for the dissemination of abusive and misogynistic content due to its high degree of anonymity and limited content-moderation policies (Guhl and Davey, 2020).

The automatic detection of misogyny typically utilises various techniques, with pre-trained deep-learning models and multi-modal models being the most commonly employed. Other techniques include machine learning algorithms such as SVM, Naïve Bayes, or Random Forest. Additionally, some documents rely on convolutional neural network models. More details on the published documents employing the different techniques are provided in the Supplementary Material.

Four articles employ the use of lexicons for automatic detection of misogyny. Attanasio and Pastor (2020) propose misogyny lexicons for automatic misogyny identification in order to improve sentence embedding similarity. Hurtlex (Bassignana et al. 2018), which is a lexicon of offensive, aggressive, and hateful words in more than 50 languages, is exploited for misogyny identification in the studies by Chiril et al. (2022) and Pamungkas et al. (2018). Kwarteng et al. (2022) created a specific lexicon around misogynoir.

**Taxonomies and guidelines.** When releasing annotated datasets, a crucial aspect is to clearly outline the guidelines for categorising misogynistic language. Four articles in the retrieved documents address this issue (Anzovino et al., 2018, Guest et al., 2021, Sultana et al., 2021, Zeinert et al., 2021).

Sultana et al. (2021) proposed eleven categories to classify misogynistic remarks: Discredit (slurring over women with no other larger intention), Stereotyping (description of women's physical appeal and/or comparisons to narrow standards), Sexual harassment (to physically assert power over women), Threats of violence (intent to physically assert power over women or to intimidate and silence women through threats of violence), Dominance (to preserve male control, protect male interest and exclude women from the conversation), Derailing (to justify abuse, reject male responsibility, and attempt to disrupt the conversation in order to refocus it), Victim blaming (blaming the victims for the problems they are facing), Mixed bias (gender bias might be mixed with other kinds of biases like religious or racial), Sexual objectification (evoke sexual imagery), and Damning (contains prayers to hurt women). Regarding the expression of misogyny using humour, this research proposes eight categories of jokes: Devaluation of personal characteristics, Women's place in the private sphere, Violence against women, Feminist backlash, Sexual objectification, Excluding and/or objectifying humour, Transphobic Jokes and Cruel or Humiliation. All the categories proposed in Anzovino et al. (2018) are included in Sultana et al. (2021). The same occurs with categories proposed by Zeinert et al. (2021), except for the interesting concept of neosexism. Neosexism is a concept defined in Francine Tougas et al. (1999), and presents as the belief that women have already achieved equality and that discrimination of women does not exist. Neosexism was the most common form of misogyny present in the dataset of Zeinert et al. (2021). Guest et al. (2021) define four categories of misogynistic content: misogynistic pejoratives, descriptions of misogynistic treatment, acts of misogynistic derogation and gendered personal attacks against women.

**Evaluation campaigns.** A number of the documents on misogyny that fall within the Computer Science subject area were produced in connection with various evaluation campaigns. These campaigns include EVALITA (Evaluation of NLP and Speech Tools for Italian), IberLEF (Iberian Languages Evaluation Forum), SemEval (International Workshop on Semantic Evaluation), and FIRE (Forum for Information Retrieval Evaluation). The EVALITA campaign includes the Automatic Misogyny Identification (AMI) task (Fersini et al. 2018). The IberLEF annual campaign features the EXIST task, which is sEXism Identification in Social neTworks (Rodriguez-Sanchez et al. 2021). SemEval has a task called MAMI, which is Multimedia Automatic Misogyny Identification (Fersini et al., 2022). Lastly, FIRE includes the Arabic Misogyny Identification (ArMI) task (Mulki and Ghanem, 2022).

Thanks to these evaluation campaigns, datasets for automatic misogyny detection in multiple languages are now available. Specifically, the AMI task made available two datasets, in English and Italian, downloaded from Twitter. The EXIST task provided datasets of tweets in both English and Spanish. The dataset released for the MAMI challenge comprises memes that were downloaded from popular social media platforms such as Twitter and Reddit, as well as from websites dedicated to meme creation and sharing. Lastly, the ArMI task provided a dataset of tweets written in Modern Standard Arabic (MSA) and various Arabic dialects.

## Conclusion

The bibliometric analysis reveals that research on misogyny has witnessed exponential growth from 2010 to 2022. This growth can be attributed to various areas of research, but one prominent factor contributing to this trend is the increased attention given to the online dissemination of hate towards women. Several findings support this initial conclusion.



Firstly, the analysis indicates that the most productive authors in the field of misogyny research come from the area of computer science. This suggests that experts in this field have been actively investigating and publishing on the topic, further driving the growth of research in this area.

Moreover, examining the topics covered in the analysed documents provides additional evidence for the influence of online misogyny. Topic 8, which is related to digital misogyny, and Topic 12, which focuses on the automatic identification of misogyny in social media, have experienced significantly higher growth compared to the broader field of misogyny research (as depicted in Fig. 8). This finding indicates that the study of misogyny in online platforms and the development of methods to detect misogyny in social media have gained considerable attention within the research community.

The major role that online misogyny plays in the development of the area supports the idea that the research seeks to delineate the contours of a new face of misogyny, the latest manifestation of hate towards women which is expressed more crudely and more openly on social networks because they facilitate anonymity and a greater distance from the victims.

Another conclusion drawn from the analysis of the conceptual structure of misogyny research (Fig. 4) and the interactions between topics (Fig. 7) is that the research focused on the automatic detection of misogyny in online platforms (Topic 12) exhibits weak connections with other conceptual areas that address different aspects of the phenomenon. This area of research only demonstrates some conceptual relation to the broader study of online misogyny (Topic 8). This presents a significant challenge, considering that qualitative analysis of sociological research emphasises the growing relevance of hybrid realities resulting from the synergies between the physical and digital realms, not just in violence against women but also in specific domains such as politics. Moreover, the lack of relationship between Topic 12, which focuses on the automatic detection of misogyny, and Topic 9, which explores violence against women and the concept of Manosphere (primarily a digital phenomenon), is particularly noteworthy. This suggests that research in the computational science domain may not be adequately addressing the most extreme manifestations of online misogyny. Furthermore, it also indicates that the tools offered by computational linguistics are underutilised in social science-led research.

In general, the absence of stronger connections between certain topics that attract the attention of various disciplines could be seen as a sign of the practical challenges encountered in interdisciplinary research. For instance, Topic 6, which focuses on the study of women's rights within legal and political systems, exhibits very weak relationships with Topics 8 and 12, despite qualitative sociological research emphasising the need to consider the new dynamics emerging in virtual spaces. Another illustration can be found in the qualitative review of computational science literature. It becomes apparent that this research area relies on the definition of taxonomies that would benefit from clarification through collaboration with social science research. For instance, the inclusion of stereotypes against women as part of the types of misogyny raises the question of whether the concept of misogyny should be reserved for the most extreme forms of hatred or should encompass the wide range of sexist attitudes and gender symbolic constructions derived from a patriarchal culture.

The main conclusion drawn from this work is that research across different disciplines is addressing a new facet of misogyny, a revitalised version of outdated beliefs about women's inferiority that circulate in novel forms within the online realm. Understanding the characteristics and functions of this new expression of misogyny poses a challenge that necessitates an interdisciplinary approach, leveraging the strengths of different areas of knowledge to effectively address it.

The above-mentioned lack of collaboration between different areas prevents the establishment of connections that would enrich the analysis of the way misogyny is disseminated today in both the virtual and real world. For example, social science knowledge in combination with computational discourse analysis or NLP technologies could be used to study the connections and similarities between agents disseminating misogyny online and mainstream social actors such as political parties or religious organisations. In the same way, the similarity between misogynist discourses and those of left-leaning feminists in open battle against other fractions of the feminist movement could also be monitored and would allow for a more complex view of the phenomenon. For both approaches, it is necessary that social science knowledge strongly rooted in the study of social relations be combined with the new methodologies that computer science offers for the analysis of discourse produced naturally in digital or real communicative exchanges, such as in parliaments, rallies or interviews.

### Data availability

Data sharing is not applicable to this research, as no data were generated. The analysed data were retrieved from the commercial Web of Science (WOS) and Scopus databases, following the search procedure detailed in the Supplementary Material.

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### Notes

- <https://www.theguardian.com/technology/2015/jan/11/gamergate-a-brief-history-of-a-computer-age-war>, <https://time.com/3510381/gamergate-faq/>
- <https://independenttechresearch.org/letter-tweets-new-api-plans-will-devastate-public-interest-research/>
- <https://independenttechresearch.org/reddit-survey-results/>

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## Author contributions

LF and BC contributed to the study conception and design, with LF leading the study supervision. LF, BC, and AS contributed to the writing of the manuscript. LF, EI, and AT developed the dataset and conducted the statistical analysis. All authors read and approved the final manuscript.

## Competing interests

The authors declare no competing interests.

## Ethics approval

Ethical approval was not required as the study did not involve human participants.

## Informed consent

Informed consent was not required as the study did not involve human participants.

## Additional information

**Supplementary information** The online version contains supplementary material available at <https://doi.org/10.1057/s41599-024-02978-7>.

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