Platform-Specific Discourses on 5G Networks

Utilizing a multi-modal topic model on TikTok and X (Twitter)

Master Thesis

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Abstract

The latest generation in mobile networks, the fifth generation (5G), is not only a significant improvement compared to 4G, but is also a subject of considerable controversy. Social media is full of linking 5G to health risks, electromagnetic exposure, and unfounded links to COVID-19. On social media, conspiracy theories and misinformation thrive in echo chambers. This study examines the discourses surrounding 5G networks on two mainstream social media platforms: TikTok and X (formerly Twitter). By analyzing both visual and textual data, the research aims to uncover how the unique modes of communication of each platform influence the discussion of 5G-related information and misinformation. To analyse the discourses, the study employs a multi-modal topic modeling using BERTopic to analyze the data, offering insights into the role of platform characteristics in shaping public perceptions of 5G. Key findings reveal distinct and overlapping discourses about 5G on TikTok and X. TikTok content often combines humor with creativity, by its interactive and visual interface, while X's text-focused content tends to be more extreme and politically oriented. This research enhances the understanding of how social media platforms facilitate public discussions on controversial issues such as 5G technology.

Contents

1 | Introduction

This study will explore the discourses surrounding the mobile network 5G on two major social media platforms (TikTok and X). By examining both visual and textual data, the study aims to uncover how the platform characteristics shape the spread of 5G related information and misinformation. The research question addressed in this study is: *What are the discourses surrounding 5G networks on TikTok and X, and how does the platform specificity mediate these discourses?*

Over the past few years, mobile networks have evolved rapidly. A number of generations have already passed, such as 2G, 3G and 4G (Shahen Shah, 2022). The latest generation, the fifth generation (5G), has improved the users experience over the 4G network. 5G offers much higher speeds, greater capacity, and differs technologically. While 4G primarily operates on low-frequency bands, 5G utilizes a mix of low, mid, and high-frequency bands (Agiwal et al., 2016). Although this new generation in mobile technology has significantly improved the mobile network, there has been a lot of controversy. There are many allegations about health risks caused by the 5G technology, the electromagnetic exposure of 5G causing health implications, and links between 5G and COVID-19 (Chiaraviglio et al., 2019; Meese et al., 2020; Shahsavari et al., 2020). These concerns about 5G are primarily propagated through social media, as conspiracy beliefs and misinformation are most likely to spread on social media platforms (Goreis & Kothgassner, 2020).

It can be tough to ignore something that everyone else believes. Conspiracy theories spread because people trust what others say. What makes them unique is how they defend themselves. Even if there is proof against them, people twist it to support the conspiracy instead (Sunstein & Vermeule, 2009). Social media is designed to present content tailored to your preferences, thus restricting exposure to varied viewpoints and promoting individuals with similar believes. This process strengthens a shared narrative, called echo chambers (Cinelli et al., 2021). The terms echo chambers and filter bubbles are often used interchangeably. Pariser (2011) introduces filter bubbles as personalised "filters" based on ones preferences. The concept of filter bubbles is also highly debated, as some argue against the concept of filter bubbles (Bruns, 2019). In echo chambers and filter bubbles, users are exposed to content that aligns with a specific viewpoint. If someone only encounters misinformation within these bubbles, they're more inclined to adopt that viewpoint. Many platforms use content moderation to regulate the content shared on the platforms. This process removes content that doesn't fulfill the guidelines or blocks problematic users. This causes problematic users to migrate to other platforms where there is no regulation. Thus, regulation policies play an important role to what users see on social media platforms (Cinelli et al., 2022).

False conspiracy theories can cause serious risks. They weaken democratic discussions and in some cases cause violence (Sunstein & Vermeule, 2009). The spread of these theories can also be understood through the concept of moral panics, where members of society become worried about something they perceive as a significant threat to their values and way of life (Cohen, 2011). For instance, the belief that 5G was causing or accelerating the spread of COVID-19 led to conspiracy-driven actions such as the burning of 5G towers (Ahmed et al., 2020).

During the COVID-19 pandemic TikTok became one of the fastest growing social media platforms. TikTok is a Chinese-developed platform, where users can share short videos with a length ranging from 15 seconds up to 3 minutes. X is founded in 2006 and known for its communication with short messages (tweets). These tweets have a limit of 280 characters, and may include images. The two platforms have distinct modes of communication, where TikTok focuses on short videos and Twitter focuses on short text messages. This study investigates how these different modes of communication influence the content shared on each platform.

The remainder of this study is organized as follows. Section 2 explains about the concepts of Platform Specificity, Discourse and multi-modal Topic Modeling. Section 3 goes in detail about the TikTok and X dataset, and how they are pre-processed. The implementation of BERTopic in the discourse analysis is discussed in Section 4. This is followed by, Section 5, the results of the methods. The limitations of the study and conclusion of the results are discussed in Section 6. In Section 7 the final conclusion is given.

2 | Key concepts

Since the deployment of the latest mobile network 5G, there has been significant controversy and misinformation about its health risks and links to COVID-19, often propagated through social media. This study examines the discourses around 5G networks on two major social media platforms, TikTok and X, to understand how platform-specific features influence these discussions. In this section, some key concepts of the study are discussed. The study looks at discourses on multiple platforms, therefore we define platform specificity and discourse. Each platform has its own unique characteristics, known as platform specificity. This specificity affects what users posts and engage with, including their interactions and content related to 5G. Discourses extend beyond mere text; they serve as a means of interpreting and comprehending social interactions. This approach provides valuable insights into how 5G discourses are formed on TikTok and X. Further, this section explains what topic modeling is and how this can be used in discourse analysis.

2.1 | Platform Specificity

Platforms exist in many different shapes, ranging from physical platforms to virtual platforms, like social media (Gillespie, 2010). In this paper, platforms are social media platforms. They are build with sensitivity towards their technical infrastructure while considering the broader social and economic impacts they may have (Gerlitz & Helmond, 2013). Although social media is often seen as one concept, there are many differences between platforms. Each social media platform has its unique combination of styles, grammatical structures and operational logic, which define its specificity. Despite these differences, overlapping features exist, some features might even migrate between platforms (Gibbs et al., 2015).

Each platform is shaped by a different strategy, resulting in asymmetrical results. Therefore, it is important to acknowledge the platform specificity (Barreneche & Wilken, 2015). The architectural differences between social media influence both the ecosystem itself and the user experience (Hendry et al., 2021). Prior studies have demonstrated that these differences in platforms shape the nature of user-generated content, with individuals preferences towards specific platforms for particular types of content (Shephard et al., 2023). As proposed by Ibert et al. (2022), platforms can be studied as user-centered ecologies. Their approach refers to the complex interplay between online platforms and users, emphasizing how they integrate into everyday practices and interact within a socio-technical context. When conducting social media analysis, individuals often adopt the standpoint of the platform (Marres & Moats, 2015). Since each platform has its differences by architecture and therefore users have a preferred platform for each type of content, it is important to approach each platform for its own qualities and opportunities.

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Rogers (2017) proposes an approach called cross-platform analysis, where he pays attention to both the medium research and social research. Medium research covers the structures of the platform and social research covers the stories on the platforms. Rogers emphasizes the importance of cross-platform analysis, as distinct discourses might emerge on different platforms due to their unique characteristics.

2.2 | Discourse

Discourse can be referred to as a specific way of understanding the world, or a part of it (Jørgensen & Phillips, 2002). Discourses are methods of expressing socially important identities and related behaviours in society through social language and ways of behaving, interacting, and understanding (Gee, 2011). Discourse analysis aids in understanding how language and communication shape interactions in society (Albert & Salam, 2013; Bouvier, 2015). There are three main perspectives in discourse analysis: language use, cognition and interaction in social contexts (van Dijk, 1997). These perspectives can also be categorized as formal, functional and social (Ng, 2018). Applying discourse analysis to social media helps in understanding how interactions are structured on these platforms.

In order to believe a bus driver is actually a bus driver, you need more context than just words. The rise of electronic communication has introduced a new form of expression, where visual images alongside spoken or written language play a crucial role in discourse. Visuals are not self-explanatory; they consist of multiple layers that each require their own interpretation (Ćwikła & Lindell, 2023). Visual discourse is built through human interaction and shaped by other images or text. Traditional discourse analysis focuses on text; however, incorporating visual images introduces an additional interaction in the social context, making the discourse more believable (Ng, 2018). Therefore, this study analyzes discourses by combining textual (written language) and visual (images) data, with the aim of understanding how interactions and discussions about 5G are shaped across both platforms.

2.3 | Multi-modal topic modeling

According to Jacobs and Tschötschel (2019), topic modeling aligns with the perspective of discourse studies, which view the meaning of words as relational and contextual rather than inherent. They argue that topic modeling can aid discourse analysis in achieving its research goals by capturing this relational aspect of language and meaning. Previous studies have used topic modelling in discourse analysis. Törnberg and Törnberg (2016) combined topic modelling and critical discourse analysis to examine patterns of representation around the words Muslims and Islam on a Swedish Internet forum. Marjanen et al. (2020) used topic modeling to explore the discourse in historical newspapers.

Topic models are unsupervised machine learning techniques, aiming to find hidden semantics in a collection of documents and group them into topics (Churchill & Singh, 2022). They enable the analysis of large document sets without needing to read each one individually (González-Pizarro & Carenini, 2024). Many topic models, such as Latent Dirichlet Allocation (LDA) (Blei et al., 2003), use Bag-of-Words (BoW) representations

of the documents. These BoW representations overlook the order of words, relying solely on the frequency of each word in the document. As a result, the semantic relationships between words are ignored.

Neural topic models do not use BoW representations for creating the topics, but use contextualized representation for the documents (Abdelrazek et al., 2023). Grootendorst (2022) introduces BERTopic, which uses document embeddings and clusters these embeddings. By using word embeddings, the semantic relationships among words are preserved. The BERTopic model consist of three steps, which can be separated from one another: first, document embeddings are generated; second, these embeddings are clustered to form topics; and third, these topics are represented by a class-based TF-IDF representation. Since these steps can be isolated from each other, it is possible to customize the model. Besides having the ability to customize the model, BERTopic assumes that each document contains only one topic. Although Grootendorst describes this to be one of the weaknesses of the model, in social media analysis this could be a benefit. As social media posts often contain only one topic.

This study does not look at solely textual data, but aims to analyze discourses through both textual and visual data. The BERTopic model can be customized into a multi-modal topic model (Grootendorst, 2024). Document embeddings can be replaced with image and/or text embeddings, enabling the clustering algorithm to cluster based on images and text. Finally, the topic representations can be derived from textual data to integrate both visual and textual data.

3 | Data

Despite 5G's technological improvements, significant controversy and misinformation about its health risks and alleged links to COVID-19 have spread widely on social media. Social media platforms tailor content to users' preferences, reinforcing similar viewpoints and facilitating the spread of conspiracy theories. By examining the specific discourses on TikTok and X, this study aims to understand how platform-specific characteristics shape the spread of 5G-related information and misinformation. This section goes in detail about the datasets used for the study and how the datasets are processed.

To study the discourses surrounding 5G on TikTok and X, there are two datasets used containing posts, about 5G, from TikTok and X. The collection process for both datasets is based on the snowball sampling method (Baltar & Brunet, 2012). Initially, the terms "5G" and "5GDanger" were used to collect posts. From the collected posts, new relevant hashtags were used to collect more posts. Both datasets are collected using the Zeeschuimer tool (Peeters et al., 2024). Zeeschuimer is a browser extension designed to gather social media data. The collection process is manual.
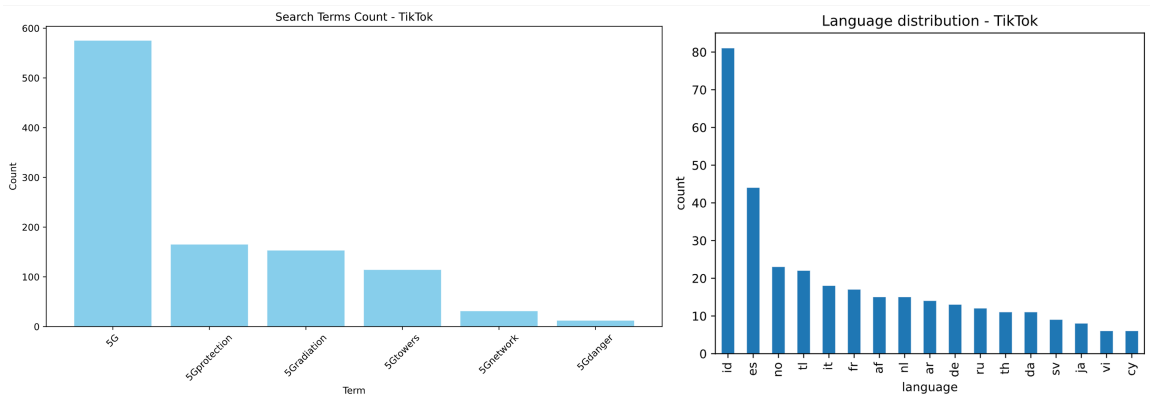
3.1 | TikTok dataset

Figure 3.1: This figure shows how often each search term occurs in the TikTok dataset (left figure) and the language distribution of the posts (right figure).

The TikTok dataset contains 1191 posts. 13 posts are duplicates, that leaves 1178 original posts. The search terms used to collect these posts include "5G", "5GDanger", "5Gradiation", "5Gtowers", "5Gnetwork" and "5Gprotection". The left side of Figure 3.1 illustrates the frequency of each term within the dataset. Each data point includes details such as the post caption, username, time, music, number of likes, comments, shares, and

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plays, potential warnings, and the thumbnail of the short video post. The posts span from December 7, 2019, to April 23, 2024, and are in various languages. Figure 3.1 shows the distribution of languages besides English and with at least 5 posts. This shows that besides English, most posts are in Indonesian (id), followed by Spanish (es) and third Norwegian (no).
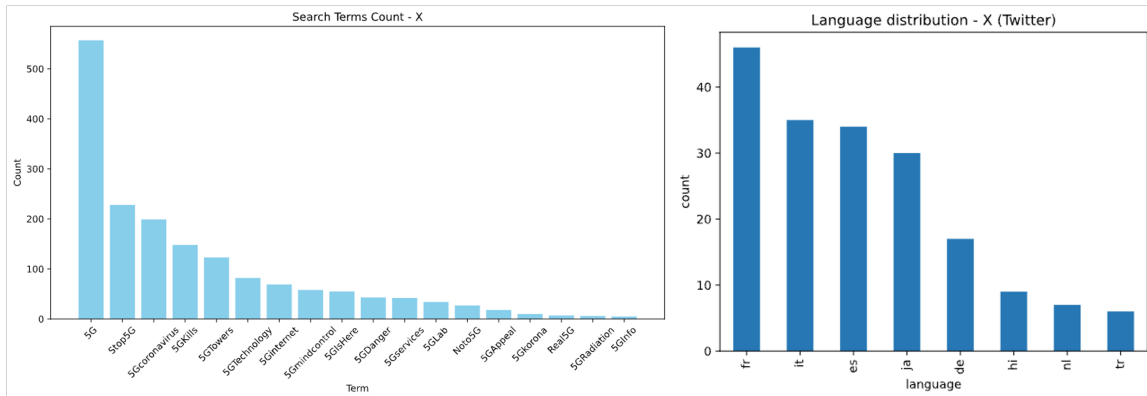
3.2 | X (Twitter) dataset

Figure 3.2: This figure shows how often each search term occurs in the X dataset (left figure) and the language distribution of the posts (right figure).

The X dataset contains 3300 posts, of which 1005 posts include an image. The search terms used to collect these posts include "5G", "5GDanger", "5GTechnology", "5GInfo", "Stop5G", "5GKills", "5Ginternet", "5GTowers", "5Gcoronavirus", "Noto5G", "5GRadiation", "5GLab", "5Gservices", "5GAppeal", "Real5G", "5Gkorona", "5GIsHere" and "5Gmindcontrol". The left side of Figure 3.2 illustrates the frequency of each term within the dataset. Each data point includes details such as the text of the posts, username, time, estimated language, number of retweets, reply's and likes, if the tweet is retweeted, if the tweet is an reply and the image that is included in the tweet. The posts span from January 10, 2018, to May 31, 2024, and are in various languages. Figure 3.2 shows the distribution of languages besides English and with at least 5 posts. This shows that besides English, most posts are in French (fr), followed by Italian (it) and third Spanish (es).

3.3 | Data preparation

To prepare the dataset for topic modeling with BERTopic, several preprocessing steps were undertaken. First, all duplicate posts were removed from the dataset. Then, all posts from X without an image were excluded (this step only applies to the X dataset, as TikTok posts always include an image). URLs were removed from the body (the textual part) of the posts, as they do not contribute meaningful information, allowing for a focus on the actual text content. Besides URLs, emojis are also removed from the body of the posts. Emojis can add noise to the data or cause unnecessary complexity to the data. As illustrated in Figure 3.1 and Figure 3.2, the textual content of the posts is in various languages. To analyze all posts together, all non-English text was translated into English.

4 | Methods

To analyse the discourses surrounding 5G networks on TikTok and X and understand how the platform specificity influences these discourses, it is essential to first identify the discourses on each platform. This section introduces a method for analyzing large sets of social media data, containing images and text, which would be time-consuming to process manually. As mentioned in section 2, topic modeling can be used to analyze these discourses. Given that this study focuses on visual and textual social media data, a multi-modal topic model is required.

4.1 | BERTopic

This study utilizes the neural topic model BERTopic as a quantitative tool for the qualitative analysis of discourses. BERTopic generates topics based on embeddings, preserving the semantic relationships among words. The model assumes that there is one topic per document, making it an excellent model for social media data. The model initially creates document embeddings, then reduces their dimensions to cluster similar documents, and finally represents the topics. BERTopic isolates all steps from each other, allowing the model to be fully customized to your preferences. Figure 4.1 shows a graphical representation of components used for BERTopic to analyse the discourses around 5G on TikTok and X[1].
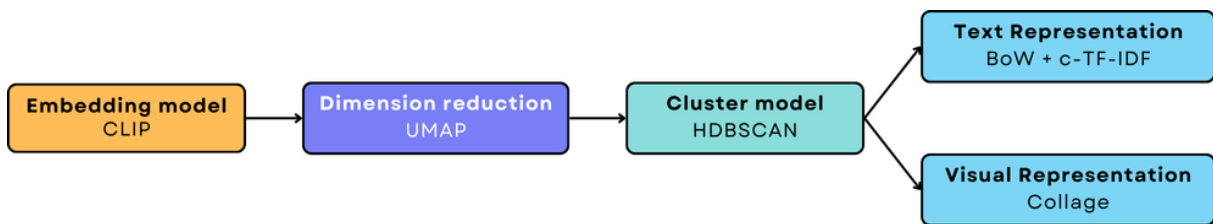
Figure 4.1: This figure shows a graphical representation of the components of BERTopic.

Embedding model As the study involves multiple modalities (visual and textual), the `MultiModalBackend` was selected for the embedding model. This backend supports the generation of embeddings for words, documents, and images. It requires a Sentence-Transformers model that can embed both images and text. The selected model is clip-ViT-B-32 from the CLIP framework, which maps text and images into a shared vector space (Radford et al., 2021). This results in an embedding model

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[1]Code available: https://github.com/EgginkM/ADS_thesis_multimodal_5G

capable of handling both text and images, while keeping the semantic relationships among words.

Dimension Reduction The default dimension reduction model for BERTopic is Uniform Manifold Approximation and Projection (UMAP) (McInnes et al., 2020). UMAP is an algorithm designed to map high-dimensional data into a lower-dimensional space.

Clustering model The default clustering model for BERTopic is Hierarchical Density-Based Spatial Clustering of Applications with Noise (HDBSCAN) (Pei et al., 2013). This is a clustering algorithm that is excellent in identifying clusters of varying shapes and densities and handling noise effectively.

Text representation BERTopic uses a Bag-of-Words (BoW) representation weighted with a class based Term Frequency-Inverse Document Frequency (c-TF-IDF) (Grootendorst, 2022). This technique builds on TF-IDF by combining all documents within each class into a single document. It calculates the term frequency for each word within a class, normalizes it, and then multiplies it by the inverse document frequency, which is based on the average number of words per class and the word's frequency across all classes. The outcome is a list of terms that are most significant in each topic. Since documents contain many stopwords, such as "the", "and", or "is", which hold little meaning for representing topics, the parameter `reduce_frequent_words` is set to true. This removes words, such as "the", that are frequently used.

Visual representation To represent the images, the class `VisualRepresentation` is used. This class extracts images to represent the topics in a collage of images. The N most representative images are presented in a collage.

These components are employed to train BERTopic on both datasets. The next step is fine-tuning the model by selecting the optimal number of topics. This is done by adjusting the minimum topic size: increasing it results in fewer topics, while decreasing it results in more topics. The selection process involves conducting a manual review of the topics. The topics are manually reviewed to ensure they are distinct and meaningful, serving as a qualitative step to confirm the topics make sense. The optimal number of topics for each model is chosen through this manual evaluation of interpretability. Table 4.1 shows the selected number for the minimum topic size for each model.

Table 4.1: This table shows the customized minimum topic size for each model.

	Minimum topic size
TikTok	8
X	12

Once the optimal number of topics was determined, each dataset produced a set of topics represented by the most representative words and images. These topics, generated by BERTopic, provided an overview of the themes and narratives in the datasets. The next step involved an analysis of the discourses on TikTok and X.

4.2 | Discourse analysis

The topics generated by BERTopic were analysed to identify themes and narratives surrounding 5G networks on each platform. This required selecting relevant topics based on their visual and textual representation. The focus was on selecting the topics related to 5G networks. These representative topics were then further analyzed qualitatively to understand the discourses. As Jacobs and Tschötschel (2019) mention, a topic is not automatically a discourse. A topic becomes a discourse when it can be interpreted as a stable pattern of language use that consistently appears. This involved manually examining the representative posts associated with each relevant topic, aiming to interpret the nuances and contexts of discussions surrounding 5G networks. This combination of quantitative and qualitative analysis results in an robust understanding of the discourses on 5G networks on both TikTok and X. The quantitative analysis provided a structured overview of the main topics, while the qualitative analysis added depth by interpreting the context around the discourses.

With the discourses on both platforms analyzed, the second part of the research question can be addressed: How does the platform specificity mediate the discourses? This involves a comparative analysis of the relevant topics generated from TikTok and X. By examining both platforms, the study aims to identify similarities and differences in the discourses, providing a nuanced understanding of how platform characteristics influence the nature of the conversation.

The relevant topics from TikTok and X were compared to pinpoint common topics and themes shared between the two platforms. These common topics were examined for their similarities and differences in presentation on each platform. Key aspects of this analysis included examining the use of visuals, the language employed, and the context of the discussions. In addition to comparing common topics, the unique discourses on both platforms were highlighted. These unique discourses provide insights into the distinctive ways users on TikTok and X interact and discuss 5G networks. By highlighting both common and unique topics, the study provides a comprehensive view of how platform specificity mediates the discussions about 5G networks. This results in valuable insights into the broader dynamics of social media discourses and the impact of platform-specific features on shaping public perception and conversation around 5G networks.

5 | Results

Social media platforms amplify conspiracy theories and misinformation, reinforcing users' existing beliefs and potentially inciting violence. The release of the latest generation of mobile networks, 5G, has been a topic of controversy and misinformation. Social media platforms are places where users are exposed to content that aligns with their preferences, strengthening echo chambers. Due to the differences in modes of communication, TikTok and X deal differently with these narratives. This study examines how TikTok and X spread information and misinformation about 5G, using a multi-modal BERTopic tool to analyze visual and textual data. The goal is to understand how these platforms shape public perceptions of 5G. This section presents the relevant topics identified through BERTopic for both the TikTok and X dataset, the section after will discuss these results and identify the discourses surrounding 5G on TikTok and X, and their similarities and differences.

5.1 | TikTok Topics

The analysis of discussions about 5G on TikTok is based on 1178 posts, with their caption and thumbnail. These posts, translated into English, span from December 2019 to April 2024. Following several preprocessing steps, BERTopic was applied to the dataset with a minimum topic size of 8. The minimum topic size is selected through a manual review of the topics. A larger minimum topic size resulted in less topics, these topics contained more noise and a less clear theme across each topic. Therefore the minimum size of 8 is chosen. This resulted in 24 topics, with 249 outliers. Table 5.1 presents each topic, their size and a manually assigned name. This section discusses a manual selection of the most relevant topics, see the bold items in Table 5.1. The remaining topics can be found in Appendix A.

The largest topic included 151 posts, while the smallest included 9 posts (as the minimum topic size is 8). There are 5 topics with a total of 256 posts promoting 5G and 11 topics with a total of 494 posts against 5G.

Table 5.1: This table shows the topics identified through BERTopic on TikTok, with their id, number of posts per topic and manually assigned name. The model used a minimum topic size of 8.

Topic ID	Figure	Count	Topic Name	Perception of 5G
0	**5.1**	**151**	**Mobile phone unboxing**	**Promote**
1	**5.2**	**110**	**5G towers conspiracy**	**Against**
2	**5.3**	**99**	**5G protection orgonite**	**Against**
3	A.1	71	Health dangers of Radiation	Against
4	A.2	67	5G radiation health - COVID-19	Against
5	A.3	39	5G network antennas	Against
6	A.4	37	Shungite	Against
7	A.5	36	Grand Theft Auto (GTA)	-
8	A.6	33	Mobile 5G Internet speed	Promote
9	**5.4**	**31**	**5G speed in Indonesia**	**Promote**
10	A.7	30	Random myths	-
11	A.8	25	5G internet speed	Promote
12	A.9	25	Spiritual	-
13	A.10	17	Random trends	-
14	A.11	16	Memes	-
15	A.12	16	EMF protection Waveblock	Against
16	**5.5**	**16**	**Viral 5G trends**	**Promote**
17	A.13	16	Random woman	-
18	A.14	16	EMF protection pendant	Against
19	**5.6**	**15**	**EMF meter**	**Against**
20	A.15	13	Theories of new world order	Against
21	**5.7**	**11**	**Techwear**	**Against**
22	A.16	10	Ariana Grande	-
23	A.17	9	Volkswagen Golf	-

Mobile phone unboxing

The largest topic is about unboxing of mobile phones that support 5G. This topic is represented through terms such as "Samsung", "unboxing" and "iPhone", and through images of people holding phones. Figure 5.1 shows these representations. The captions of the related posts are about reviews of new released phones that support 5G, one of these captions is:

> "in Love with new Samsung Galaxy A55 5G #samsung #samsunggalaxy #galaxya555g #spec #features #priceinnepal #obssessed #gadgets #gadgetsinnepal #tech"

This post talks about how the user is in love with the new Samsung phone that supports 5G, other posts in this topic mention the release of phones that support 5G such as IPhone 15 or Motorola Moto G Stylus 5G.

Figure 5.1: This figure shows the key words and images of topic 0: Mobile phone unboxing

5G towers conspiracy

The second largest topic on TikTok is about conspiracies around 5G towers. Key terms used in this topic are "conspiracy", "5G towers" and "government", the topic is visually represented by vague images. The images differ from each other, but do look similar.

> We can't escape #5g #5gtowers #celltowers #radiation #tower #conspiracytiktok #conspiracytok #conspiracy coming to life. #cantescapefate

This post mentions how 5G radiation from cell towers cannot be escaped and links this to conspiracy. Other posts mention mention the dangers of 5G towers and link this to the government. Posts in this topic are not only represented by vague images as shown in Figure 5.2, but they often show images of cell towers.

Figure 5.2: This figure shows the key words and images of topic 1: 5G towers conspiracy

5G protection orgonite

Another significant topic about 5G contains posts about how to protect yourself against 5G radiation. Main keywords in this topic are: "orgon energy", "manifestation" and "crystaltok" (expression on tiktok for posts about crystals). The topic is visually represented by images of orgonite pyramids, as shown in Figure 5.3. The caption of one of the most representative post contains the following:

"These Orgones protect you against EMF radiation, 5G radiation & negativity. It creates an energetic field by combining certain elements. (copper, ceramic magnets, batteries, specific crystals & other metals) It creates a vortex of energy that converts all negative energy into positive energy. It also influences better plant growth, better mood & mainly protects you against harmful radiations that affect our health."

This post emphasises on how Orgones protect against EMF and 5G radiation. The posts also explains how it protects and tells about other benefits. Other posts in the topic mention orgonite pyramids to protect yourself against negative energy, such as EMF radiation.

Figure 5.3: This figure shows the key words and images of topic 2: 5G protection orgonite

Topic 6 and 18 show similarities to this topic. Topic 6 contains post that argue how shungite(pyramids) protect against 5G radiation and topic 18 mention orgonite pendants that should protect against radiation.

5G speed in Indonesia
Another topic about 5G on TikTok relates to 5G in Indonesia, the key words and images are shown in Figure 5.4. Main terms used in this topic are "mbps", "median", "indonesia" and "internet", these terms are accompanied by images of internet speeds or cellular towers. One of the captions contains the following text:

"The 5G internet network continues to expand to Southeast Asia. In fact, 5G internet speed in one of the Southeast Asian countries will be the fastest in semester I/2023. Based on the Speedtest report, Malaysia will be the country with the fastest 5G internet connection in the world in semester I/2023. The median 5G download speed in the neighboring country was recorded at 512.1 megabytes per second (Mbps). #DataIndonesiaID #5g #5gtowers #jaringan5g #5gindonesia #datavisualization #data"

This post mentions the expansion of 5G in Asia and how fast some countries will be. Other posts talk about when 5G will be released in Indonesia or reviews of 5G in Indonesia.

Figure 5.4: This figure shows the key words and images of topic 9: 5G speed in Indonesia

Viral 5G Trends

Another significant topic is a collection of posts with viral trends on TikTok, the representations are shown in Figure 5.5. This topics key terms are "bunnies", "2g" and "funnyvideo", key images contain a group of people each representing one generation of mobile networks. These posts contain captions such as:

"Don't miss the end of the network friends #funnyvideo #fyp #trend #5g #4g#3g#2g"

This topic contains different posts doing the same trend, making it a viral TikTok trend related to 5G.

Figure 5.5: This figure shows the key words and images of topic 16: Viral 5G trends

EMF meter

Figure 5.6 shows the representation of topic 19, which contains posts about Electromagnetic Field (EMF) meters. This topic is represented by terms such as "Telmex" (Mexican telecom company), "meter" and "emf safe", the visual representation contains images of several radiation meters. One of the most representative posts contains the following caption:

"Thinking about making this a series of exploring around, finding "5G" towers, map out location and reading what frequencies it's putting out GREEN = GOOD ORANGE/YELLOW = QUESTIONABLE RED = DANGER radiation frequency will alter cells in our body (too much high RF longterm will damage blood cells, led to *recnac* then eventually *htead* *words backwards until then, stay aware #outhere #radiation #5G #tower #wifi #acoustimeter #themoreyouknow #stayaware"

This post mentions that the user wants to start finding 5G towers and measuring the frequencies of the radiation, the image of this posts contains a picture of an EMF meter that shows a red light (indicating danger according to the text). Other posts in this topic mention the danger of EMF radiation.

Figure 5.6: This figure shows the key words and images of topic 19: EMF meter

Techwear

Figure 5.7 shows the representation of topic 21, about techwear. This topic is represented by term such as: "techwear, "silver" and "emfprotectivegarments". The topic is visually represented by images of black clothing with silver linings, as seen in Figure 5.7. The captions of the posts explain about the benefits of Techwear and how it protects against EMF radiation, like this caption:

"Real Techwear doesn't make you choose between safety and style. #fyp #silveraffect #silver #emf #emfradiation #5g #5gradiation #techwear #wifisignals #sustainablefashion #madewithsilver #emf-protectivegarments #healthiswealth #losangeles #newyork #siliconvalley #nyc #california #technology #ootd #techgear #techenthusiast #madeintheusa #techwearfashion"

This topic mentions you can be stylish and protect yourself against 5G radiation with Techwear. Other posts mention similar things, such as shielding yourself with Techwear.
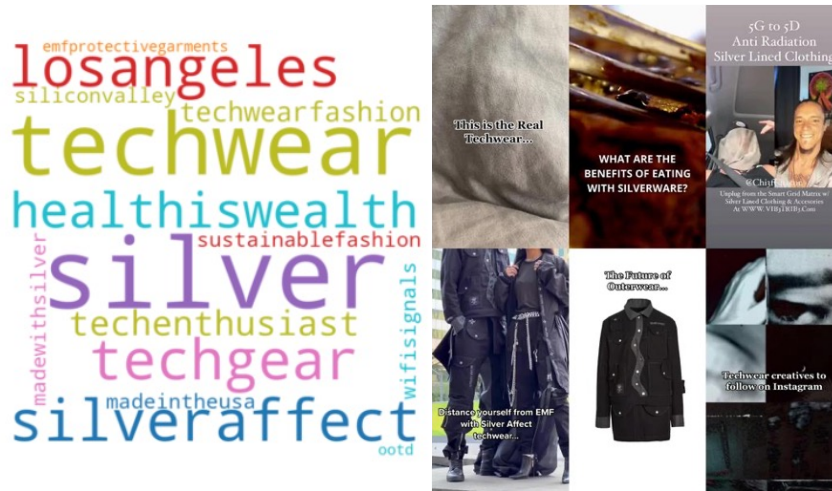
Figure 5.7: This figure shows the key words and images of topic 21: Techwear

5.2 | X (Twitter) Topics

Table 5.2: This table shows the topics identified through BERTopic on X, with their id, number of posts per topic and manually assigned name. The model used a minimum topic size of 12.

Topic ID	Figure	Count	Topic Name	Perception of 5G
0	**5.8**	**206**	**Dangers against 5G**	**Against**
1	**5.9**	**98**	**5G in Pakistan and India**	**Promote**
2	**5.10**	**91**	**5G technology revolution**	**Promote**
3	B.1	74	Internet of Things (IoT)	Promote
4	B.2	63	5G kills	Against
5	**5.11**	**48**	**Cell tower radiation health risks**	**Against**
6	B.3	43	Electromagnetic smog WiFi	Against
7	B.4	42	Electromagnetic pollution	Against
8	**5.12**	**36**	**5G EMF protection orgonite**	**Against**
9	B.5	22	Sakurazaka46 (Japanese girl band)	-
10	B.6	21	5G summit	Promote
11	**5.13**	**21**	**5G internet speed**	**Promote**
12	B.7	16	EMF radiation	Against
13	B.8	13	Motorola smartphones	Promote
14	B.9	13	Lewis Hamilton Vodafone commercial	Promote

The analysis of discussions about 5G on X is based on 1,005 tweets that included images. These posts, translated into English, span from January 2018 to May 2024. Following several preprocessing steps, BERTopic was applied to the dataset with a minimum topic size of 12. This resulted in 15 topics, with 196 outliers. Table 5.2 presents each topic, their size and a manually assigned name. This section discusses a manual selection of the most relevant topics, see the bold items in Table 5.2. The remaining topics can be found in Appendix B.

The largest topic included 206 posts, while the smallest included 13 posts (as the minimum topic size is 12). There are 7 topics with a total of 331 posts promoting 5G and 7 topics with a total of 454 posts against 5G.

Dangers against 5G

One of the most prominent topics on X revolves around the dangers associated with 5G, the topic representation is shown in Figure 5.8. The most representative term in this topic is NWO, which stands for New World Order. This term is commonly used in conspiracy theories that suggest an elite group is attempting to establish a totalitarian wold government. Other significant terms in this topic include references to COVID-19, the dangers of 5G and the claim that 5G kills. Most posts on this topic feature a meme[1] captioned by numerous hashtags. One of the posts, featuring the woman shown in Figure 5.8, has the following caption:

> "#COVID19 #arrestbillgates #crimesagainsthumanity #arresthillary #arrestbillgates2020 #ArrestFauci #Agenda21 #Agenda2030 #NWO #Stop5G #5GCoronavirus #5GDangers #5GKILLS #coronavirus #covid_19 #MAGA2020 #MAGA2020LandslideVictory #Trump #SaveOurChildren"

The caption of the meme combines NWO, COVID-19 linked to 5G, and the dangers of 5G, including claims that 5G kills. This user also mixes in political elements, calling for the arrest of Bill Gates and invoking "MAGA" (Make America Great Again), a slogan frequently used by Donald Trump.

Figure 5.8: This figure shows the key words and images of topic 0: Dangers against 5G

Topic 4, 5G kills, shows similar patterns as the topic mentioned above. In topic 4 users discuss how 5G kills, and causes danger. Users use the phrase 5G mind control and 5G kills, and mention the dangers of electromagnetic fields (EMF). These messages are accompanied by memes about 5G radiation or antennas.

5G in Pakistan and India

The second most prominent topic concerns 5G in Pakistan and India, as represented in Figure 5.9. This topic includes posts about the launch of 5G in both countries and mentions Narendra Modi, the Prime Minister of India, who appears in many images within

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[1]Image that is typically humorous in nature, copied and spread rapidly by internet users

this topic. Other representative therms in this topic are: "5G services", "digital india" or "Jio" India's largest telephone company. The most representative caption for this topic is:

> "PM Shri Narendra Modi is driving the 5G revolution. 5G labs are now set up across 32 States/UTs, fueling innovation in compact networks and use case devices like drones, AR/VR and startups. #DigitalIndia #5GServices"

This post emphasises on how the prime minister of India drives the revolution of 5G in India. Other posts talk about how 5G is being released in India and Pakistan, making the service available in the countries.

Figure 5.9: This figure shows the key words and images of topic 1: 5G in Pakistan and India

5G technology revolution

Another significant topic focuses on the revolution of 5G technology, as illustrated in Figure 5.10. This topic includes posts about the emergence of 5G technology in the market and its advancements. The topic is represented by terms such as "5G technology", "advancements" and "huawei", a Chinese multi-national 5G vendor. The most representative post in this topic is:

> "The fifth generation of wireless technology, 5G, is set to transform the way we communicate and revolutionize our world. With speeds up to 100 times faster than 4G, 5G is the ultimate game-changer. #TechTermTuesday #5GisHere"

This posts talks about how 5G is revolutionizing the world, other posts mention how the higher frequencies of 5G enable higher capacity and new innovations or how 5G can benefit organisations.

Figure 5.10: This figure shows the key words and images of topic 2: 5G revolution

This topic emphasises on the advancements of 5G and how it is revolutionizing the world. Topic 10, 5G summit, is contains posts talking about the summit where 5G is introduced. Users in this post mention the new opportunities brought by 5G, and what a great accomplishment 5G is to the mobile ecosystem.

Cell tower radiation health risks

Figure 5.11 shows the representation of topic 5, which focuses on health risks associated with cell tower radiation. This topic is illustrated by images of cell towers and is represented by term such as "tinnitus", "amp", "stop4glte", "trees" and "celltowerradiaton". 4G LTE is an advanced version of 3G, but not yet 4G. The topic emphasizes the potential dangers of 5G frequency exposure, linking it to tinnitus. One of the most representative captions for this topic is:

> "@ElektraAngel We never had #tinnitus until Jan 2019 when a #4G mast was upgraded to #4GLTE. Now with #4G/#5G, it's 24/7 #tinnitus torture. #Microwaves are good for electronic gadgets but terrible for human beings & the #environment. #Stop5G #Stop4GLTE #MicrowaveHearing"

This post mentions how the upgrade of a 4G mast to 5G causes tinnitus and that the microwaves are causing harm on humans and the environment. Other posts mention how the cell tower radiation causes sickness, some refer to the radiation as being toxic and poisoning.

Figure 5.11: This figure shows the key words and images of topic 5: Cell tower radiation health risks

Protection against 5G EMF with orgonite

Another relevant topic about 5G on X is topic 8: 5G EMF protection orgonite. This topics main terms are about 5G risks, orgonite, emf protection and sensitivity. The visual representation of the topic contains images with orgonite pyramids, some believe that orgonites have energy clearing properties and protect against EMF radiation. The most representative posts is:

> "The Rainbow Small #Giza Pyramid is designed to #protect a small home from #harmful #EMF Fields. #Stop5G #5G #5Grisks #5gDangers #5GRisks #Skynet #StoptheBias #emfprotection #emfsensitivity #Orgone #orgonite #EMF #protection"

Posts in this topic discuss how one can protect themselves against 5G/EMF radiation with orgonite pyramids. The posts mention that EMF radiation is harmful and different types of orgonite can protect against the radiations.

Figure 5.12: This figure shows the key words and images of topic 8: 5G EMF protection orgonite

5G internet speed

Figure 5.13 shows the representation of topic 11, about 5G internet speeds. This topic is visually represented by images showing the results of internet speed tests, with related

terms such as test, speed and 5G internet. A representative posts contains the following caption:

> "In better news today, @verizon lit up #5G at my work-at-home set up in NW DC. Check out a blazing 1376 mbps (inside my house on @SamsungMobile S10 5G w/@Qualcomm chip). [Note: The 1847 mbps test is from 14th & Constitution downtown from yesterday. Compare to 4GLTE!] #5Gishere"

This post talks about how fast 5G internet is, other posts mention how they are amazed by how fast 5G internet is.

Figure 5.13: This figure shows the key words and images of topic 11: 5G internet speed

6 | Discussion

The rise of the latest generation in mobile networks, the fifth generation, has shown great advancements. Besides its advancements, 5G is also a topic of conversation on social media platforms. This study explored the discourses surrounding 5G networks on TikTok and X to see how information and misinformation is spread on social media, and to understand how platform-specific characteristics influence these discussions. By utilizing a multi-modal topic modeling approach with BERTopic, various topics and narratives related to 5G are identified. This section will discuss the meaning of those topics and narratives, and shape them into discourses. Further this section will address the differences and similarities in discourses across the two platforms. Finally the limitations of the study are discussed and future research idea's are proposed.

6.1 | 5G Discourses on TikTok

The most prominent discussions about 5G on TikTok feature users expressing concerns about its potential health impacts. This aligns with the findings of Ahmed et al. (2020), who observed similar negative sentiments on Twitter regarding 5G-related health risks. These worries are likely rooted in fear and mistrust of technological advancements and global institutions. These concerns often arise with the introduction of new technology and can be interpreted through the concept of moral panics (Cohen, 2011).

As noted by Chiaraviglio et al. (2019), assertions about the health risks of 5G radiation often stem from the belief that the deployment of 5G is driven solely by the economic interest of industries and governments, leading to skepticism about the true motives behind its rollout. People tend to distrust institutions they belief prioritize profit over public health, this distrust is amplified by moral panics. This skepticism is intertwined with a general anxiety about new and unfamiliar technologies. This distrust is evident in the results, where users frequently connect 5G towers with the New World Order (NWO) and a controlling government.

The distrust in the government expressed by these users leads to the weakening of democratic discussions. When a significant proportion of the population believes in misinformation, it becomes challenging to engage in rational discourse about the benefits of new technologies. Users claim that 5G towers radiate harmful frequencies, causing COVID-19 or other diseases. Chiaraviglio et al. (2019) studied the technical aspects of 5G deployment, and argued that the potential health impacts of these technologies are within safe limits. This suggests that claims of health risks from 5G radiation are based on misinformation, a key feature of moral panics where fear often outweighs evidence.

Despite numerous scientific studies demonstrating that 5G technologies are safe when used within regulatory guidelines, some TikTok users attempt to prove otherwise. On TikTok, there is a recurring pattern of posts featuring EMF meters showing high frequencies. Citizen science that "proofs" high frequencies supports pre-existing fears and beliefs about health implications caused by high EMF frequencies. Users share their data without rigorous scientific validation or examination of underlying assumptions.

The distrust in the government and technology, combined with believes in misinformation about 5G, cultivates a general fear among the public. People often seek hope and solutions when they feel fear or powerlessness - in this case, feeling powerless against perceived health risks from 5G radiation. On TikTok, numerous discussions revolve around ways to protect oneself from 5G radiation, including the use of energy-cleansing stones and radiation-blocking stickers or clothing. It seems as the fear manifests in consumer goods, protecting oneself against the perceived threats, a common response characteristic of moral panics. These products include energy cleansing orgonite pyramids, shungite stones that neutralize radiation, "WaveBlock" stickers to block radiation from devices and radiation blocking clothing lined with silver, called "TechWear".

These discourses present various consumer goods designed to protect against 5G radiation. While the products are distinct, they share similarities in their use of language. Posts about Orgonite stones primarily use the hashtag #5Gprotection, whereas other products typically use the hashtags #5Gradiation and #EMFprotection. The terms they use overlap and vary slightly, with a switch between 5G and EMF, as well as between protection and radiation. The overlapping use of hashtags and similar goal of the consumer goods, builds upon how people react to the fear of health implications caused by 5G radiation. They offer a sense of control and security, addressing the psychological need for protection against perceived threats. However, these measures are often based on unfounded claims and do not have scientific backing.

Another significant topic of discussion are the advancements that the 5G technology brings. The 5G technology promises much higher speeds and greater capacity, 5G operates on higher frequency bands, providing users with much improved internet speeds. This leap in performance has amazed users, prompting them to share their excitement and experiences with the new technology. The incredible speeds of 5G have led many users to create TikTok posts showcasing their internet speed tests, sharing their experience of the high speeds or talking about their excitement on the higher speeds. This aligns with the findings of Dashtipour et al. (2021), where he argues that many users express excitement and positive sentiment about the high speeds and improved performance of 5G networks.

The excitement about 5G internet speeds was so great, that users have turned the advancement into a trend[2]. A unique trend emerged where individuals represented different generations of mobile networks — each person representing 2G, 3G, 4G, and the newest, 5G (see Figure 5.5). This trend humorously contrasted the limitations of older networks with the speed of 5G, underscoring the monumental shift in technology.

Beyond the technological advancements of the 5G network, it also led to many consumer products. The rollout of 5G compatible smartphones has been a great topic of

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[2]A popular type of content on social media within a short period of time.

conversation on TikTok. Users on TikTok quickly started unboxing the latest generation smartphones, showcasing the devices' advanced features and possibilities unlocked by the 5G technology. Their excitement about the possibilities of 5G and the latest technology is reflected in the trending content of unboxing videos. These unboxing videos and reviews foster a sense of community as users bond over their shared anticipation and exploration of new technology.

The technology innovation leads to excitement, which leads to new consumer products. There are many organisations that capitalize on the deployment of 5G, this is reinforced by users talking enthusiastically about new phones, like Samsung, and fast internet speeds provided by T-Mobile.

6.2 | 5G Discourses on X (Twitter)

Many users on X demonstrate a profound distrust in both new technology and the government, expressing strong beliefs that 5G technology is lethal and that the government is corrupt. This rise of these concerns and distrust aligns with the concepts of moral panics. This distrust manifests in claims that 5G kills, although specific reasons for these claims are rarely provided. Instead, users suggest that 5G is part of a government scheme to control citizens' minds, aligning with NWO conspiracy theories. These users often link the rollout of 5G technology to the spread of the coronavirus, despite the lack of scientific evidence to support such connections. This mistrust of technology is often accompanied by animosity towards influential figures associated with technological advancements, such as Bill Gates, and hostility towards medical experts like Anthony Fauci. This animosity is expressed on X through trending hashtags such as #ArrestFauci or #ArrestBillGates.

The Bill and Melinda Gates Foundation funded Event201, a pandemic outbreak exercise, only months before the COVID-19 outbreak. As Tuters and Willaert (2022) argues, the funding of the event months before the COVID-19 outbreak seems, for conspiracy theorists, as evidence for Gates NWO agenda. Although it could also be pure coincidence that these two events occurred right after each other, but it is a way for conspiracy theorists to establish links.

One group on X expresses their fear of 5G's innovative technology by asserting that 5G technology is lethal and linked to the coronavirus. Another group claims that radiation from 5G cellular towers causes tinnitus. These users believe that the higher EMF frequencies used by 5G networks cause diseases such as tinnitus, despite scientific evidence to the contrary (Chiaraviglio et al., 2019).

Within this moral panic of health concerns about 5G, the panic intensifies as users seek alternative solutions to alleviate their fears. One such solution that users discuss on X is the use of orgonite stones. These stones are believed by some to possess the ability to transform negative energy, such as that from EMF radiation, into positive energy. This belief is often shared and amplified within these online communities, providing a sense of hope and empowerment to those who are fearful of the potential dangers of EMF radiation. The praise and promotion of orgonite stones within these echo chambers serve as a means for individuals to reclaim a sense of control and well-being, countering the narrative of EMF radiation's dangers with one of protection and positivity.

Another prominent discussion on X about 5G is about the revolutionary features 5G brings. As mentioned before the 5G technology brings higher speeds and greater capacity as it operates on higher frequency bands. Users begin their excitement by talking about how "5G is here" and sharing their excitement about the Qualcomm 5G summit hosted by their CEO, Cristiano Amon. As to be believed by X users, this event embarked the beginning of a new technology revolution in our world. Users extend their excitement by sharing their experiences of the fast internet speeds. This optimism highlights the dual nature of public perception towards 5G—while some see it as a threat, others view it as a leap forward towards a more connected and advanced society.

The deployment of 5G technology has not occurred simultaneously across the globe. While some parts of the world begin rolling out 5G in 2019, countries like Pakistan and India only embarked on their 5G journey in 2022. This delay, however, has not lessened the imaginary revolutionary potential of 5G in these regions. It seems like X users in India credit Prime Minister Narendra Modi for driving the 5G revolution, emphasizing its importance for economic growth and technological advancement. However, these images are mainly created by government organisations: MyGov, a citizen engagement platform launched by the government and the ruling political party, Bharatiya Janata Party, of Modi. These posts praise Modi for driving the technological revolution, while also highlighting how Jio, one of India's largest telecom providers, has launched 5G networks across India. As this excitement is mainly promoted by government institutions, it is questionable if this is the viewpoint of India's X users, or that it is a promotional campaign from Modi himself. Kumar (2023) argues that Indian media frequently serves as an amplifier for Bharatiya Janata Party's nationalist agenda.

6.3 | 5G Discourses on TikTok vs. X

The comparative analysis of 5G discourses on TikTok and X reveals both shared and distinct themes in how information and misinformation about 5G is shared and perceived on these platforms. Both platforms broadly discuss health implications and technological advancements related to 5G. TikTok, with its inherently visual nature, enables users to create engaging videos that combine text, images, and sound, making it effective for demonstrating perceived effects of 5G radiation, showcasing product unboxings, and participating in viral trends. Conversely, X focuses on text-heavy tweets, where users share concise messages often accompanied by images or memes, facilitating rapid information dissemination and making misinformation spread easily.

The two distinct discussions, on health implications and technological advancements, are structured similarly. They start with an event, the deployment of 5G, which triggers an emotion, either anxiety or enthusiasm. These emotions, result in different consumer products designed to address these feelings. Both discourses contain citizen science that proves the better (5G internet speeds) or worse (EMF radiation). This citizen science enhances the anxiety or enthusiasm. These emotions lead to people seeking to capitalize on the public's reaction to 5G, by developing new 5G compatible phones or ways to protect oneself against harmful 5G radiation. New 5G compatible phones are promoted by telecommunication companies, other technology companies, and users that share their experiences with these phones. These companies incorporate the latest technology in-

novations into their consumer products. For the protective products, they address the anxiety surrounding 5G innovation. However, the market for these products may also provide a source of funding for conspiracy theorists.

Both platforms reflect a discourse on health implications of 5G, driven by general mistrust of technology and government institutions. This distrust is transformed into hope by suggesting protective measures against harmful radiation. TikTok users post more visually engaging content, such as showcasing EMF meters that measure the high frequencies, while X relays more on text and hashtags, leading to more extreme discourses. TikTok users typically state that 5G is dangerous, while X users are more extreme, claiming that 5G is deadly.

The platforms also show a similar discourse about the deployment of 5G, with users expressing excitement about the latest advancements. TikTok's content tends to be more interactive and visually rich, while X focuses more on textual discussions and updates. TikTok users transform their excitement into content where they humorously contrast the limitations of older networks or where they show the great technological advancements of 5G compatible mobile phones. On X users show more excitement around the release and updates around 5G technology, such as the 5G summit or the delayed deployment in India (which might be more promotional campaign than excitement on the deployment). However, it's important to note that TikTok is banned in India, which explains why the discourse on 5G deployment in India is not visible on TikTok.

The main distinction is that X features more politically oriented discussions, linking 5G to broader conspiracy theories and expressing hostility towards influential figures, like Anthony Fauci or Bill Gates, or the role of the Prime Minister Modi in the promotion of the 5G deployment in India. TikTok's content incorporates more humor and creativity, appealing to a younger audience. TikTok has a unique way of turning the excitement about 5G internet speeds into a trend, humorously contrasting the older networks. Its format of short videos makes it well-suited for unboxing videos, where tech enthusiasts share their excitement.

6.4 | Limitations and Future Research

This study has several limitations that should be acknowledged. Firstly, this study aims to enumerate, characterize, and describe the various discourses surrounding 5G, including conspiracy theories and other types of misinformation. While it does not measure the quantity or engagement with misinformation, examining these aspects could be an interesting avenue for future research.

Secondly, both models resulted in approximately 20-25% of the posts being classified as outliers. This high proportion of outliers might be due to the inherently noisy nature of social media data. Social media platforms often contain diverse and unstructured content, which can affect the accuracy and reliability of the models.

Important to note of the datasets used from both platforms, the study uses a relatively small dataset of around one thousand posts. This sample size provides valuable insights on the discourses around 5G on TikTok and X, but it may not be large enough to represent

the broader social media population accurately. The limited number of posts analyzed may restrict the generalizability of the findings, the results should be interpreted with consideration.

Additionally, the process of selecting the optimal number of topics in topic modeling is inherently interpretive and subjective. The number of topics chosen might not represent the true structure of the data, as there is no quantitative measure to definitively determine the optimal number of topics. This subjectivity, combined with the overall interpretive nature of the study, can lead to potential bias in the analysis. Different researchers might have various perspectives and interpretations, which can influence the study's outcomes and lead to variability in the results and conclusions.

Furthermore, the approach to cross-platform analysis suggested by Rogers (2017) is overlooked in this study. Rogers advocates for treating each platform according to its unique characteristics. However, in this study, both TikTok and X are analyzed uniformly, neglecting platform-specific features and potentially losing significant context that could influence the interpretation of the data. For instance, TikTok is primarily a platform for sharing short videos, yet this study only examined the thumbnails and captions of those videos. This approach misses out on the visual and dynamic content of the videos, which could provide additional insights. Although, as topic models are traditionally designed for text, it might be difficult to extend these methods to videos. A proposed method to give the TikTok posts more context beyond analyzing the thumbnails and captions, would be to transcribe the spoken words in the videos. By combining the transcribed text with either thumbnails or key frames, a more comprehensive interpretation of the data can be achieved. However, this approach has complications, as many TikTok videos contain only music or people speaking over music.

In addition to neglecting the visual and dynamic content of TikTok by analyzing both platforms uniformly, the study also overlooks important textual information on X. X is a platform where users share short text messages, optionally accompanied by media. Due to the nature of the selected topic modeling algorithm, all posts without an image were neglected. This approach disregards a significant proportion of posts that might add valuable context to the analysis, potentially skewing the results and missing important textual information.

These limitations suggest areas where future research could improve upon this study, such as incorporating more robust methods to handle noisy data, using more objective criteria for topic selection, and analyzing the full video content on TikTok for a richer context.

7 | Conclusion

The latest advancements of mobile networks has not only lead a evolution in technology, but has been a main topic of controversy. Social media is a place where many conspiracy theories are developed and misinformation is spread. Many concerns about the 5G technology and its health risks are spread on social media. Every social media platform is different by their design and user interaction, this affects the nature of the content shared on the platform. This study aimed to understand how the platform-specifics of TikTok and X shape the public perception of 5G, by answering the following research question: What are the discourses surrounding 5G networks on TikTok and X, and how does the platform specificity mediate these discourses? This question is answered by utilizing a multi-modal BERTopic topic model on both visual and textual data. The multi-modal approach, by analyzing text and images, demonstrates how 5G is discussed on TikTok and X, and how these discussions overlap and differ for each platform. This includes insights from a platform like TikTok, where the main focus is on videos.

The analysis revealed several discourses on health implications caused by 5G and the technological advancements of 5G. While the main discourses are similar, they are expressed through various sub-discourses. The study reveals that users on both platforms express anxiety and enthusiasm about the deployment of 5G. The anxiety stems from a moral panic about the technological advancements. Users on both platforms suggest that 5G is part of a broader government scheme aligned with an NWO agenda or assert strong connections between COVID-19 and 5G radiation. This moral panic intensifies on both platforms as users seek to regain a sense of control and security by using protective products against 5G radiation. Besides the fear, users also express enthusiasm about the deployment of 5G on both platforms. Users express their excitement about the fast internet speeds and the technological innovations driven by the deployment of 5G.

The analysis indicated that TikTok and X have distinct yet overlapping narratives about 5G. Content on TikTok is more engaging and visually rich, and incorporates humor and creativity, making it appealing to a younger audience. In contrast, X's discussions are more textually focused and contain more political discussions, linking 5G to broader conspiracy theories and reflecting hostility towards influential figures, such as Bill Gates and Anthony Fauci.

Both platforms reflect discourses on health implications caused by 5G and on the technological advancements of 5G. The main discourses are similar, but told through different sub-discourses. These differences in content presentation suggest that platform design significantly influence how information and misinformation are spread. In conclusion, this research contributes to the understanding of how social media platforms mediate public discussions on controversial topics like 5G.

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A | Appendix A: TikTok Topics

This appendix presents the topics, identified through BERTopic for TikTok, that are not discussed in the results section. See the bold items in Table A.1.

Table A.1: This table shows the topics identified through BERTopic on TikTok, with their id, number of posts per topic and manually assigned name. The model used a minimum topic size of 8.

Topic ID	Figure	Count	Topic Name	Perception of 5G
0	5.1	151	Mobile phone unboxing	Promote
1	5.2	110	5G towers conspiracy	Against
2	5.3	99	5G protection orgonite	Against
3	**A.1**	**71**	**Health dangers of Radiation**	**Against**
4	**A.2**	**67**	**5G radiation health - COVID-19**	**Against**
5	**A.3**	**39**	**5G network antennas**	**Against**
6	**A.4**	**37**	**Shungite**	**Against**
7	**A.5**	**36**	**Grand Theft Auto (GTA)**	**-**
8	**A.6**	**33**	**Mobile 5G Internet speed**	**Promote**
9	5.4	31	5G speed in Indonesia	Promote
10	**A.7**	**30**	**Random myths**	**-**
11	**A.8**	**25**	**5G internet speed**	**Promote**
12	**A.9**	**25**	**Spiritual**	**-**
13	**A.10**	**17**	**Random trends**	**-**
14	**A.11**	**16**	**Memes**	**-**
15	**A.12**	**16**	**EMF protection Waveblock**	**Against**
16	5.5	16	Viral 5G trends	Promote
17	**A.13**	**16**	**Random woman**	**-**
18	**A.14**	**16**	**EMF protection pendant**	**Against**
19	5.6	15	EMF meter	Against
20	**A.15**	**13**	**Theories of new world order**	**Against**
21	5.7	11	Techwear	Against
22	**A.16**	**10**	**Ariana Grande**	**-**
23	**A.17**	**9**	**Volkswagen Golf**	**-**

Health dangers of radiation

Figure A.1: This figure shows the key words and images of topic 3: Health dangers of radiation

5G radiation health - covid

Figure A.2: This figure shows the key words and images of topic 4: 5G radiation health - covid

5G network antennas

Figure A.3: This figure shows the key words and images of topic 5: 5G network antennas

Shungite

Figure A.4: This figure shows the key words and images of topic 6: Shungite

Grand Theft Auto (GTA)

Figure A.5: This figure shows the key words and images of topic 7: Grand Theft Auto (GTA)
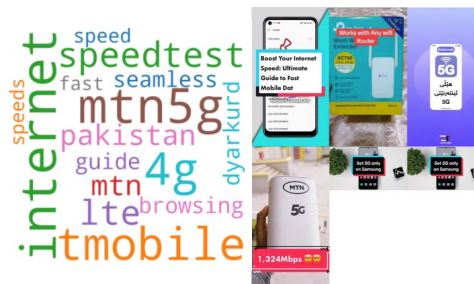
Mobile 5G Internet speed

Figure A.6: This figure shows the key words and images of topic 8: Mobile 5G Internet speed

Random myths

Figure A.7: This figure shows the key words and images of topic 10: Random myths

5G internet speed

Figure A.8: This figure shows the key words and images of topic 11: 5G internet speed

Spiritual

Figure A.9: This figure shows the key words and images of topic 12: Spiritual

Random trends

Figure A.10: This figure shows the key words and images of topic 13: Random trends
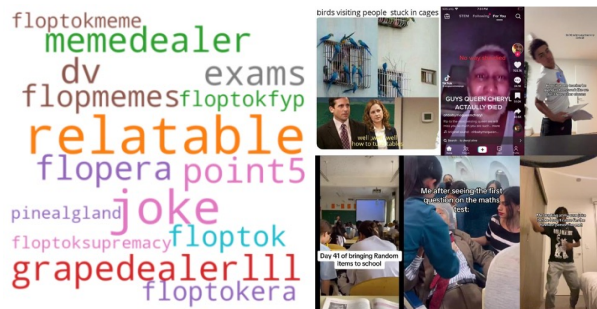
Meme's

Figure A.11: This figure shows the key words and images of topic 14: Meme's

EMF protection Waveblock

Figure A.12: This figure shows the key words and images of topic 15: EMF protection Waveblock

Random woman

Figure A.13: This figure shows the key words and images of topic 17: Random woman

EMF protection pendant

Figure A.14: This figure shows the key words and images of topic 18: EMF protection pendant

Theories of new world order

Figure A.15: This figure shows the key words and images of topic 20: Theories of new world order

Ariana Grande

Figure A.16: This figure shows the key words and images of topic 22: Ariana Grande

Volkswagen Golf

Figure A.17: This figure shows the key words and images of topic 23: Volkswagen Golf

B | Appendix B: X Topics

This appendix presents the topics, identified through BERTopic for X, that are not discussed in the results section. See the bold items in Table B.1.

Table B.1: This table shows the topics identified through BERTopic on X, with their id, number of posts per topic and manually assigned name. The model used a minimum topic size of 12.

Topic ID	Figure	Count	Topic Name	Perception of 5G
0	5.8	206	Dangers against 5G	Against
1	5.9	98	5G in Pakistan and India	Promote
2	5.10	91	5G technology revolution	Promote
3	**B.1**	**74**	**Internet of Things (IoT)**	**Promote**
4	**B.2**	**63**	**5G kills**	**Against**
5	5.11	48	Cell tower radiation health risks	Against
6	**B.3**	**43**	**Electromagnetic smog WiFi**	**Against**
7	**B.4**	**42**	**Electromagnetic pollution**	**Against**
8	5.12	36	5G EMF protection orgonite	Against
9	**B.5**	**22**	**Sakurazaka46 (Japanese girl band)**	**-**
10	**B.6**	**21**	**5G summit**	**Promote**
11	5.13	21	5G internet speed	Promote
12	**B.7**	**16**	**EMF radiation**	**Against**
13	**B.8**	**13**	**Motorola smartphones**	**Promote**
14	**B.9**	**13**	**Lewis Hamilton Vodafone commercial**	**Promote**

Internet of Things (IoT)

Figure B.1: This figure shows the key words and images of topic 3: Internet of Things (IoT)

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5G kills

Figure B.2: This figure shows the key words and images of topic 4: 5G kills

Electromagnetic smog WiFi

Figure B.3: This figure shows the key words and images of topic 6: Electromagnetic smog caused by WiFi

Electromagnetic pollution

Figure B.4: This figure shows the key words and images of topic 7: Electromagnetic pollution

sakurazaka46 (Japanese girl band)

Figure B.5: This figure shows the key words and images of topic 9: sakurazaka46 (Japanese girl band)
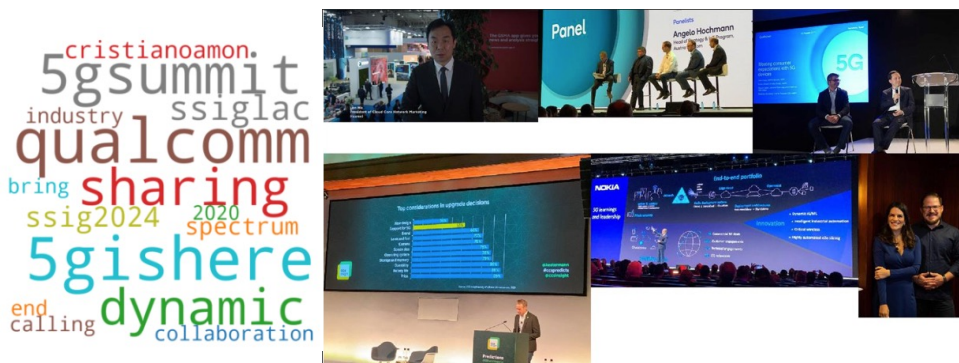
5G summit

Figure B.6: This figure shows the key words and images of topic 10: 5G summit

EMF radiation

Figure B.7: This figure shows the key words and images of topic 12: EMF radiation

Motorola smarthphones

Figure B.8: This figure shows the key words and images of topic 12: Motorola smartphones

Lewis Hamilton Vodafone commercial

Figure B.9: This figure shows the key words and images of topic 14: Lewis Hamilton Vodafone commercial