A Comparative Analysis of European City Police Presence on Twitter

Master Thesis

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I acknowledge that I used ChatGPT version 3.5 to generate code templates for creating bar charts, line plots, distribution plots, radar charts, and area plots for data analysis in chapters 4, 5, and 6. I entered prompts such as "Provide me with Python code using Matplotlib to generate a line plot/bar chart," and I used the generated output as a template to create the corresponding visualizations. I edited the formatting details and data to tailor them to my specific needs.

Shasha Jiang, Lausanne, July 2023

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Abstract

This study comprehensively analyses 21 Twitter accounts from city police departments across 16 European cities. It examined various communication practices exhibited by city police Twitter accounts, including post frequency and timing, retweet tendencies, resource-sharing strategies, language use, and hashtag employment. The research also investigated city police-related tweets from citizens in April and May 2023, providing a comparative perspective on topic preferences between police departments and citizens. Although common characteristics emerged among police accounts, each city displayed specific focal topics. Generally, the areas of concern for both citizens and police overlapped, but they emphasized different events and perspectives.

Keywords: City police social media, city police Twitter, city police and citizen, European city police, city police Twitter topics, police-related Twitter topics

Résumé

Cette étude analyse en détail les 21 comptes Twitter des services de police municipale dans 16 villes européennes. Elle examine les différentes pratiques de communication des comptes Twitter des polices municipales, notamment la fréquence et le moment des publications, les tendances au retweet, les stratégies de partage des ressources, l'utilisation de la langue et l'emploi de hashtags. L'étude a également porté sur les tweets des citoyens relatifs à la police municipale en avril et mai 2023, offrant ainsi une perspective comparative sur les préférences des services de police et des citoyens en matière de sujets. Bien que des caractéristiques communes soient apparues parmi les comptes de la police, chaque ville a présenté des sujets spécifiques. En général, les domaines de préoccupation des citoyens et de la police se recoupent, mais ils mettent l'accent sur des événements et des points de vue différents.

Mots-clés: Médias sociaux de la police municipale, Twitter de la police municipale, police municipale et citoyens, police municipale européenne, sujets Twitter de la police municipale, sujets Twitter liés à la police

Contents

Chapter 1

Introduction

1.1 Motivation

With the digital age continuing to shape contemporary society, public institutions are rapidly changing how they engage with the public. Among these institutions, police organizations at different geographical and organizational levels in Europe have progressively adopted Twitter as a medium of public communication. This shift has significantly redefined traditional police-public interaction and engagement, affecting public accountability, police image management, and emergency response.

To gain a comprehensive understanding of city police Twitter accounts practices in different countries, this study delves into the Twitter activity and content of 16 selected European urban police accounts. The analysis focused on how these urban police departments use Twitter as a platform for public information dissemination and the types of messages they primarily focus on.

The growing use of social media by the public has amplified citizens' voices, allowing them to express their opinions on police-related topics freely. These include commentary on police actions, reports of illegal activity, and current news discussions. As such, identifying similarities and differences in how law enforcement agencies and citizens engage with these Twitter accounts provides valuable insight into the effectiveness of city police departments' communications and the public's key concerns.

1.2 Research Questions

Following primary questions guide this study:

- **RQ1:** : What characterizes the Twitter usage practices of European city police departments, and how do these practices differ among cities in various countries?
- **RQ2:** Are there identifiable patterns or differences in how city police departments and city residents tweet about police-related matters across different European cities?

1.3 Overview of the report

This report is structured into eight chapters. Chapter 2 reviews relevant literature. Chapter 3 presents the selected city police Twitter accounts under study. Chapter 4 discusses the two categories of collected tweetS data — account and search tweets — along with their pre-processing. Chapter 5 concentrates on the analysis of tweets made by city police, detailing their

account-level activity, retweets, replies, and the shared media and URLs within the tweets. Chapter 6 focuses on the language and hashtags used in both types of tweet data. Chapter 7 delves into the context of the tweets, examining the topics and sentiments contained within both categories of tweet data. Common topics that frequently surface in both account and search tweets are elaborated and compared in detail, with specific references to tweet content. Chapter 8 concludes the report with key takeaways, answers research questions and discusses on future work. The appendix provides additional tables and plots for more detailed information.

Chapter 2

Related Work

2.1 Social Media in Policing

Extensive research has been conducted on police utilization of social media platforms, particularly Twitter. Initial studies, such as those by [9] and [19], sought to understand the general dynamics of police Twitter usage, including what information is shared by police departments in the US (United States).

Other researchers have focused on processing and analyzing data related to general authorities. [20], for instance, analyzed Twitter as a communication channel for five government secretaries in Mexico, highlighting the development of an internal tool for tweets analysis. Similarly, [21] looked at visualization techniques for government-citizen interaction tweets in five Latin American countries.

Additional studies have examined the relationship between police action and public sentiment and engagement. [25] measured public attitudes toward police performance on Twitter, including arrest, detection, and crime. [32] similarly focused on negative social media reactions to instances of excessive force by police in the US. Meanwhile, [31] examined how Canadian police officers use Twitter for public relations, with a similar study conducted in Toronto by [26].

Research has also been conducted on specific aspects of police work on social media. [13] revealed how Canadian police use Twitter in missing people investigations, while [5] focused on police social media practices in solving crime.

There has also been a prevalence of studies investigating police practices on other social media platforms, such as Facebook. [37] analyzed police tweets and their associated comments from 43 municipal police agencies in the US to understand their interaction patterns. [10] explored social media usage by mid-sized city police in the US across different platforms, including Facebook and Twitter.

2.2 Twitter in European Policing

The use of Twitter in policing across various cities in the European space has also been a popular focus of study.

Some research primarily focuses on one country from various perspectives. For example, [8] analyzed how police officers use Twitter in both urban and rural areas of Sweden, examining both official police accounts and private police officer accounts.

Other studies, such as [35], attempt to understand the communication patterns of the Dutch police force on Twitter. Similarly, [23] identified patterns of Twitter usage by the German police

at different levels of governance. And [29] examined citizen engagement on Twitter with 11 large police departments in Germany.

Research in the UK has explored the use of social media, specifically Twitter, by police forces for public engagement [14], as well as communication by the London and Manchester Police during the 2011 England riots [11].

Cross-country analysis has also been conducted, with [2] studying the national police and gendarmerie accounts in Turkey, Italy, France, and Spain.

Chapter 3

About City Police accounts

3.1 Inclusion Criteria

The cities selected for this study include the capital cities of the EU (European Union)[1], as well as the UK (The United Kingdom) and Switzerland. The inclusion of the UK and Switzerland is based on historical and geographical reasons, as both countries are in Europe and have a long history of interactions with other European nations.

The UK is previous membership in the EU until 2020, [36] and [4] indicate that its policing practices have been influenced by EU policies and regulations. Studying the UK's policing system can provide insights into the impact of EU membership on policing. Although Switzerland is not an EU member, it is part of the Schengen Area, which eliminates passport control at mutual borders and has implications for policing and security [28].

To select the Twitter accounts for this study, the process began by browsing the official websites of the city police departments of capital cities. On its official website, we followed the corresponding links to the Twitter accounts. To ensure that the selected accounts are at the city or metropolitan level, accounts representing the entire national police force were excluded. However, the Bern police account is canton-level, as there was a referendum to merge Bern municipal police in 2007. It is important to note that the region served by each police account may also differ due to the size of the country and city represented. General accounts for city information or tourism accounts were also excluded, as the primary focus of this study was on police-related services.

Each selected account underwent individual validation with Twitter, evidenced by the blue Twitter Verified badge, to confirm its authenticity as an official account. However, during our data collection phase, Twitter discontinued this account property. Finally, a peer review was conducted to confirm that the chosen accounts were suitable for the study.

3.2 Selected Accounts

In total, as listed in Table 3.1 we have selected 21 accounts for 16 capital cities to do our research study. Four populated European cities, Berlin, London, Paris and Roma have multiple accounts.

Berlin:

1. Polizei Berlin Einsatz (@PolizeiBerlin_E) appears to be used for specific occasions or events, and it provides updates on police operations or incidents that are of particular public interest.

[1] https://european-union.europa.eu/

Table 3.1: City Police Twitter Accounts Information

City	Account Name	Handle
Amsterdam	Politie Eenheid Amsterdam	@POL_Amsterdam
Berlin-1	Polizei Berlin Einsatz	@PolizeiBerlin_E
Berlin-2	Polizei Berlin	@polizeiberlin
Bern	Kantonspolizei Bern	@PoliceBern [a]
Copenhagen	Københavns Politi	@KobenhavnPoliti
Helsinki	Helsingin poliisi	@HelsinkiPoliisi
Lisbon	Comando Metropolitano de Lisboa	@psplisboa @PSPCOMETLIS [b]
London-1	City of London Police	@CityPolice
London-2	Metropolitan Police	@metpoliceuk
London-3	Met Contact Centre	@MetCC
Madrid	Policía Municipal de Madrid	@policiademadrid
Oslo	OPS Politiet Oslo	@oslopolitiops
Paris-1	Police Municipale de Paris	@PMdeParis
Paris-2	Préfecture de Police	@prefpolice
Prague	Městská policie Praha	@MP_Praha
Riga	Rīgas pašvaldības policija	@RigasPP
Rome-1	Polizia Roma Capitale	@PLRomaCapitale
Rome-2	Questura Di Roma	@QuesturaDiRoma
Stockholm	Polisen Stockholm	@polisen_sthlm
Vienna	POLIZEI WIEN	@LPDWien
Warsaw	Policja Warszawa	@Policja_KSP

[a] https://www.bern.ch/en/topics/security/police
[b] During the data collecting period, Lisbon city police account changes its screen name from @PSPCOMETLIS to @psplisboa.

2. Polizei Berlin (@polizeiberlin) is the main account for the Berlin police. The account is managed by multiple individuals or departments based on the tweet's topic.

We also found PolizeiBerlin.Int (@PolizeiBerlin_I), a police account intended for English-speaking and international audiences. We do not include it as an account to study, as it talked about the projects of Berlin police with international partners or translated tweets of the @PolizeiBerlin_E.

London:

1. City of London Police (@CityPolice) represents the police force for the 'Square Mile,' which is London's financial district and historic center. This account provides information in this unique jurisdiction, which differ from those of the broader Metropolitan Police Service.

2. Metropolitan Police (@metpoliceuk) represents the main police service for Greater London; it provides the most comprehensive view of policing activities and issues in London.

3. Met Contact Centre (@MetCC) is the contact center for the Metropolitan Police Service and is available for non-emergency inquiries 24/7/365. This account could be a valuable resource for getting responses to specific questions or concerns and for understanding the non-emergency issues that London residents face.

Due to the scope and nature of the study, two other London city police accounts are not included. They are more specialised. @MetPoliceEvents focuses primarily on protests and special

events, and @MPSViolentCrime specifically on violent crimes.

Pairs:

1. Police Municipale de Paris (@PMdeParis) from the Police Municipale de Paris, or Municipal Police of Paris, is a local police force. Typically, they handle local issues such as traffic, local ordinance enforcement, and neighborhood patrolling. They discuss city initiatives and events, government activities, and messages of solidarity.

2. Préfecture de Police (@prefpolice) is an official account of the prefecture of police. It provides policing services for Paris and the surrounding three "petite couronne" departments of Hauts-de-Seine (92), Seine-Saint-Denis (93), and Val-de-Marne (94). This organization handles major policing duties and discusses the range widely but primarily focuses on law enforcement activities and public safety issues.

The Préfecture de Police handles broader and more severe law enforcement matters in Paris and the surrounding departments. At the same time, the Police Municipale de Paris deals with local issues and community policing within Paris city.

Rome:

1. PoliziaRomaCapitale (@PLRomaCapitale) is the official police account of the municipal area of Rome.

2. QuesturaDiRoma (@QuesturaDiRoma) is the official account of metropolitan area of Rome.

Figure 4.1 showcases the active time period of the Twitter accounts. It reveals variations in the dates when city policies created their respective accounts. Amsterdam, London-1, London-2, Stockholm, and Riga established their accounts before 2010. These cities have been utilizing their Twitter accounts for over ten years, accumulating significant experience on the platform. Additionally, all of these city policies have more than five years of Twitter usage experience. In contrast, Paris-1 only recently created its Twitter account in 2022, indicating a comparatively shorter active time period.

3.3 Account Biography

In the account biographies of the official police accounts, they commonly mention the organization they belong to and the cities or regions they serve. This information helps users identify which police force is responsible for their specific area. For instance, Amsterdam's account serves the areas of Amsterdam, Amstelveen, Diemen, and Uithoorn, while Oslo's account covers the municipalities of Oslo, Asker, and Bærum. It is important to note that the coverage area may extend beyond the city itself, depending on the jurisdiction and responsibilities of each police department.

Additionally, Madrid's police account provides links to their official Facebook, Instagram, and YouTube profiles, indicating their presence on multiple social media platforms. Riga and Vienna accounts include links to their data protection policies or statements, highlighting their commitment to safeguarding user information and privacy. The Kopenhagen police account biography says that they use a specific hashtag, *#politidk*, for their tweets, which was explored further in the hashtag section 6.2.1. Helsinki police account showcases the use of three languages in its biography, which aligns with their most frequently used languages in tweets, as discussed

Table 3.2: City police Twitter Accounts Biographies

City	Report Crime Info in Biography	Emergencies Info in Biography
Amsterdam	"Report incidents by calling 0900-8844"	*"Call 112"*
Berlin-1	No	*"Number 110 should be called"*
Berlin-2	No	*"Number 110 should be called"*
Bern	Does not specify	*"Call the emergency number 117"*
Copenhagen	*Web report:* `https://t.co/oYQtDxt9sq`	*"Call 112"*
Helsinki	Does not specify	Does not specify
Lisbon	Does not specify	*"Should use 112"*
London-1	No	*"Should call 999"*
London-2	No	*"Always call 999"*
London-3	*"For non-emergency enquiries"*	*"Always dial 999"*
Madrid	Does not specify	Does not specify
Oslo	Does not specify	*"Call 112 or 02800 for other matters"*
Paris-1	Does not specify	*"Call 3975 and then press 3"*
Paris-2	Does not specify	*"Dial 17 or 112"*
Prague	No	Does not specify
Riga	No	*"Call 110 or use the RPP mobile application"*
Rome-1	No	*"Call 0667691"*
Rome-2	No	*"Call 112"*
Stockholm	For tips use 114 14 or `http://polisen.se`	*"Call 112"*
Vienna	No	"Call 133"
Warsaw	No	*"Call 112"*

in the language section 6.1. Berlin and Bern specifically mention that their social media and communications teams manage the accounts.

After tranlated in English, table 3.2 presents phrases related to crime reports and emergencies found within the biographies of the examined accounts. Here, 'No' signifies that the account explicitly states its non-applicability for crime reporting. It is worth noting that several accounts explicitly state that their Twitter accounts are not intended for reporting crimes. Instead, they encourage users to contact non-emergency numbers or visit their official websites for incident reporting or general inquiries. This applies to police accounts for Berlin-1, Berlin-2, London-1, London-2, Rome-1, Rome-2, Warsaw, Vienna, Stockholm, and Riga, as indicated in Table 3.2.

Some accounts mention their availability or monitoring hours, indicating they may not respond or monitor the account 24 hours a day. This emphasizes that Twitter should be independent of urgent matters and emergencies, and individuals should use the provided emergency contact numbers instead. The limitations of using Twitter to report crimes and emergencies are worth considering. As further articulated in [5], two-way asynchronous communication is critical, but it is important to acknowledge that police do not maintain a 24/7 presence on Twitter. Notably, the police accounts of Madrid, Prague, and Helsinki do not mention emergency contact numbers in their biographies, unlike other police accounts in Table 3.2.

Chapter 4

Collected Twitter Data

4.1 Data Collecting and pre-processing Approach

Our collection focused on two categories of tweets related to police Twitter accounts:

1. Account Tweets: These are tweets tweeted directly by 21 specific police accounts we had pre-selected.

2. Search Tweets: These tweets corresponded to a unique search query crafted for each of the 21 accounts. The query used was: *"name OR @handle"* This approach enabled us to gather tweets from the previous ten days that included the search keywords.

Our Twitter data collection began in April 2023. An account was created on the Twitter Developer platform to obtain Twitter data. Python library Tweepy was utilized for accessing the Twitter API. Subject to Twitter API's academic research limitations, we could only retrieve a maximum of 3200 recent tweets from each user. Additionally, the current search endpoint only returns tweets from the past ten days corresponding to a given search query.

To ensure the relevance of the data to our study, we excluded any tweets made by the account itself that appeared in the search tweets. We applied the following filtering criteria to filter further collected search tweets:

- The original tweets must contain the keywords.
- The text of any quoted tweet must also include the keywords.
- The text of retweets must contain the keywords and the retweets not originating from the 21 selected accounts.

All tweets underwent further pre-processing, including conversion to lowercase, removal of URLs, mentions, retweet symbols, emojis, and numbers. For the context analysis, all tweets were translated into English. During the analysis, the focus was on analyzing the tweets from city police accounts to gain insights into how they are utilizing Twitter as a public platform. Additionally, searching for tweets aimed at understanding the conversations and topics discussed by citizens regarding the city police.

4.2 Data Topology and Categories

4.2.1 Data Overview

The total count of account tweets amounted to 68,670 tweets, with an average of 3,270 tweets per account from the 21 different accounts. After applying inclusive criteria 4.1 on search tweets,

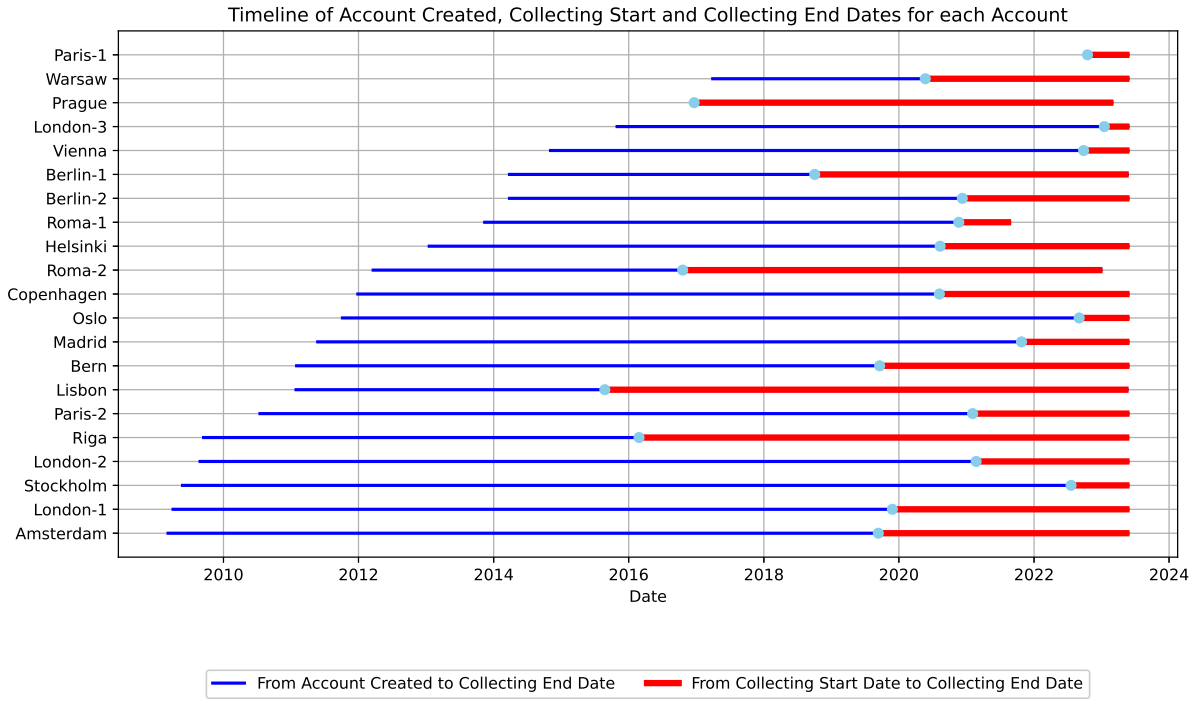

Figure 4.1: Accounts Timeline

we retained 365,932 tweets. Notably, the commencement dates for collecting account tweets varied due to the activity level of the police accounts. Nonetheless, due to the limitations of the Twitter API, search tweets were only available for April and May of 2023. Refer to table A.1 and A.2 in the appendix for detailed information about the collected data.

Figure 4.1 represents a timeline of the duration of collected account tweets in each city, based on three time points: the account creation date, the start of data collection date, and the end of data collection date. The blue line on the figure represents the duration from the account's creation date to the end of data collection date, indicating the entire timeline of the account's existence until we stopped data collection. On the other hand, the red line is a highlighted segment on the full timeline, indicating the data collecting phase.

Notably, the red highlighted segment of Paris-1 and Prague cover the full timeline . For Paris-1, the account was created on October 17, 2022, and had a total of only 228 tweets until June 1, 2023. This indicates a relatively short and less active timeline for the account. Similarly, for Prague, although the account was created in 2016, it had limited activity with only 365 tweets until the end of the data collection period.

4.2.2 Account Tweets Structure

To better understand the interactions and content of city police accounts, tweets are commonly categorized[24] into the following three types based on their content and context.

- Original Tweets: These are tweets that the user themselves creates.
- Retweets: These are the tweets shared by the user that were originally tweeted by another user. This type includes retweets with comments, where the user adds their words to the shared tweet and retweets without additional comments.

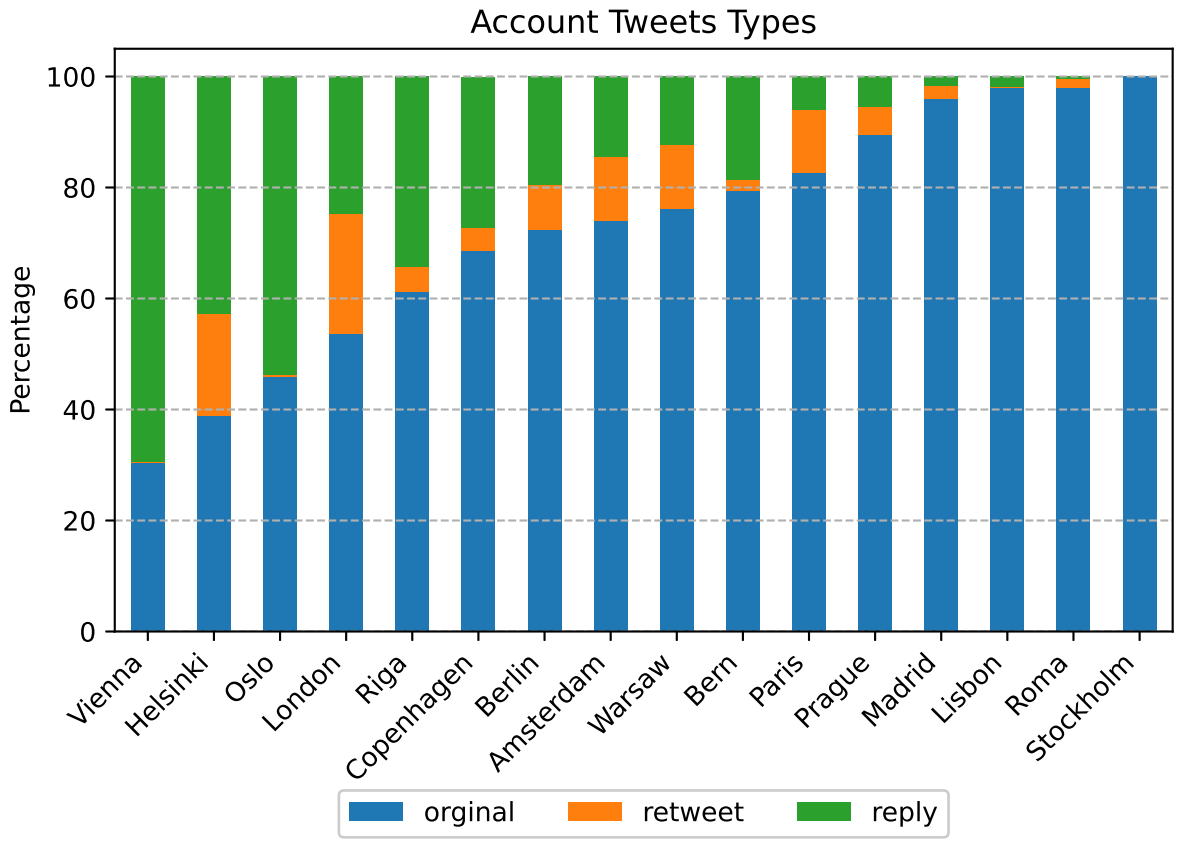

Figure 4.2: Three Categories of Account Tweets

- Reply Tweets: These are tweets that directly respond to another user. Reply tweets are meant to contribute to a conversation or respond to the addressed tweet.

Figure 4.2 is a stacked plot illustrating the proportion of different types of tweets in city police accounts. The y-axis represents the percentage of tweets for each tweet type. Each segment of the stacked area corresponds to one tweet type.

The figure 4.2 shows that Vienna and Oslo have the lowest proportion of original tweets, with more than 50% of their tweets categorized as replies. On the other hand, Stockholm does not have any retweets or replies. Regarding retweets, Helsinki and London have the highest retweets percentage, with Helsinki having 18.26% and London having 21.61%.

4.2.3 City Population

The population data of 16 selected cities are collected, as differences in the population might influence the communication strategy of city police, such as higher pressure for more populated cities to adopt social media platforms [30].

The population data is based on information obtained from country statistical websites or city council reports. The population is based on the range of areas the city police account serves; for instance, Copenhagen, Helsinki, and Stockholm are city-level; for Amsterdam, as the account biography stated, the population includes Amstelveen, Diemen, and Uithoorn. And for Bern, the population is at the canton level. In the appendix, detailed information on the city population can be found A.3.

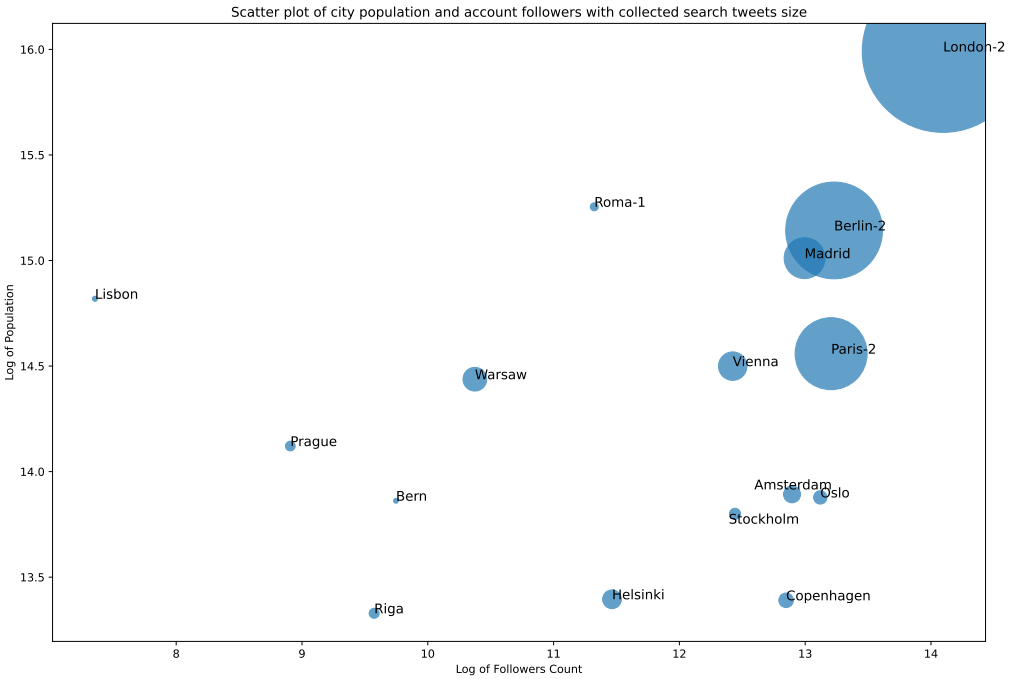

Figure 4.3: City Population and Account Followers with Collected Search Tweets Size

The scatter plot in Figure 4.3 displays the Twitter account followers on the x-axis and the city population on the y-axis. Both axis are displayed on a logarithmic scale. Each point on the scatter plot represents a city, and the size of the dot corresponds to the amount of collected search tweets for that city. For cities with multiple police accounts, only the account with the highest follower count is considered.

Figure 4.3 reveals that followers count and city population does not have a strong correlation, with Copenhagen having the high follower numbers but a relatively low population, with 58% of the follower population ratio. Similar to Oslo, with a 47% follower population ratio.

But high-population cities tend to have more search tweets. London and Berlin have the highest counts of search tweets, with London-2 having 210,472 search tweets and Berlin-2 having 75,244. These higher counts are attributed to the common keywords used in the search queries for these cities, such as "Metropolitan Police" for London-2 and "Polizei Berlin" for Berlin-2.

City police departments often maintain multiple Twitter accounts for different districts or services, as seen in cities like London and Berlin. The diverse population of larger cities can also contribute to varied reasons for Twitter usage and preferences for social media platforms [22]. Furthermore, metropolitan areas tend to have greater language and cultural diversity [16]. These factors collectively influence the follower ratio and highlight the complexities associated with follower engagement in larger cities.

Chapter 5

Data Analysis: Account Data

In this chapter, our focus is solely on the analysis of account tweets. We examine various aspects of the tweets tweeted by the police city accounts, including the level of activity of 21 accounts separately, retweet ratio, mentioned, retweeted, and replied users, and recourse sharing with engagement level.

5.1 Level of Activity

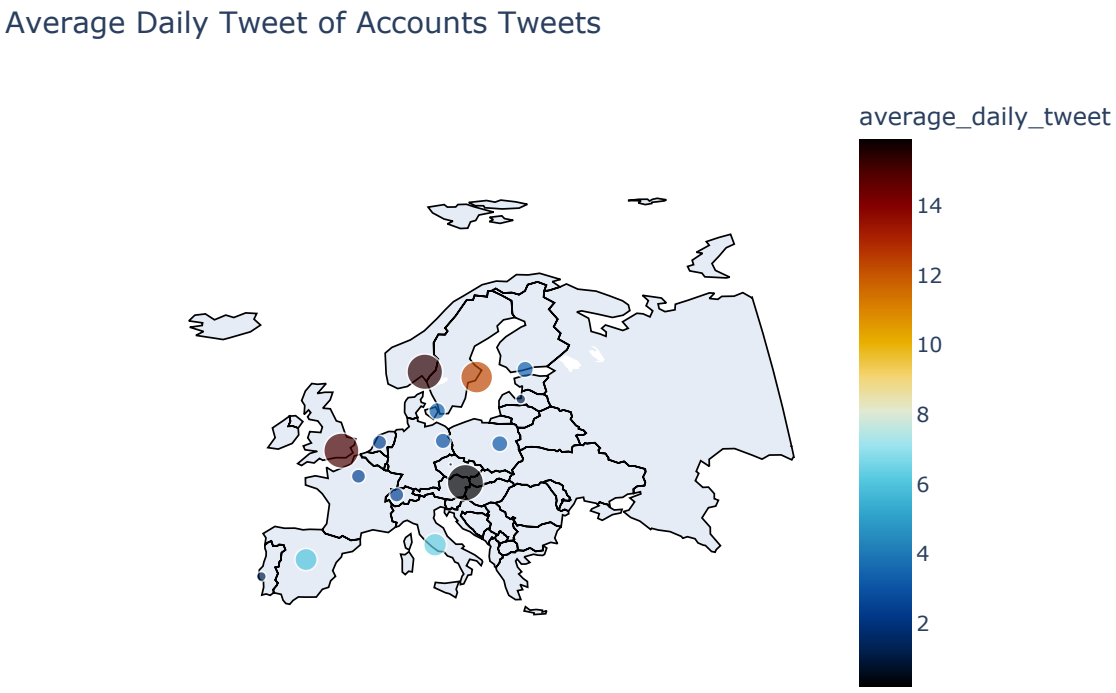

Figure 5.1: Average Daily Tweet of Account Tweets

In the figure 5.1, the size and color of the markers represent the average daily number of

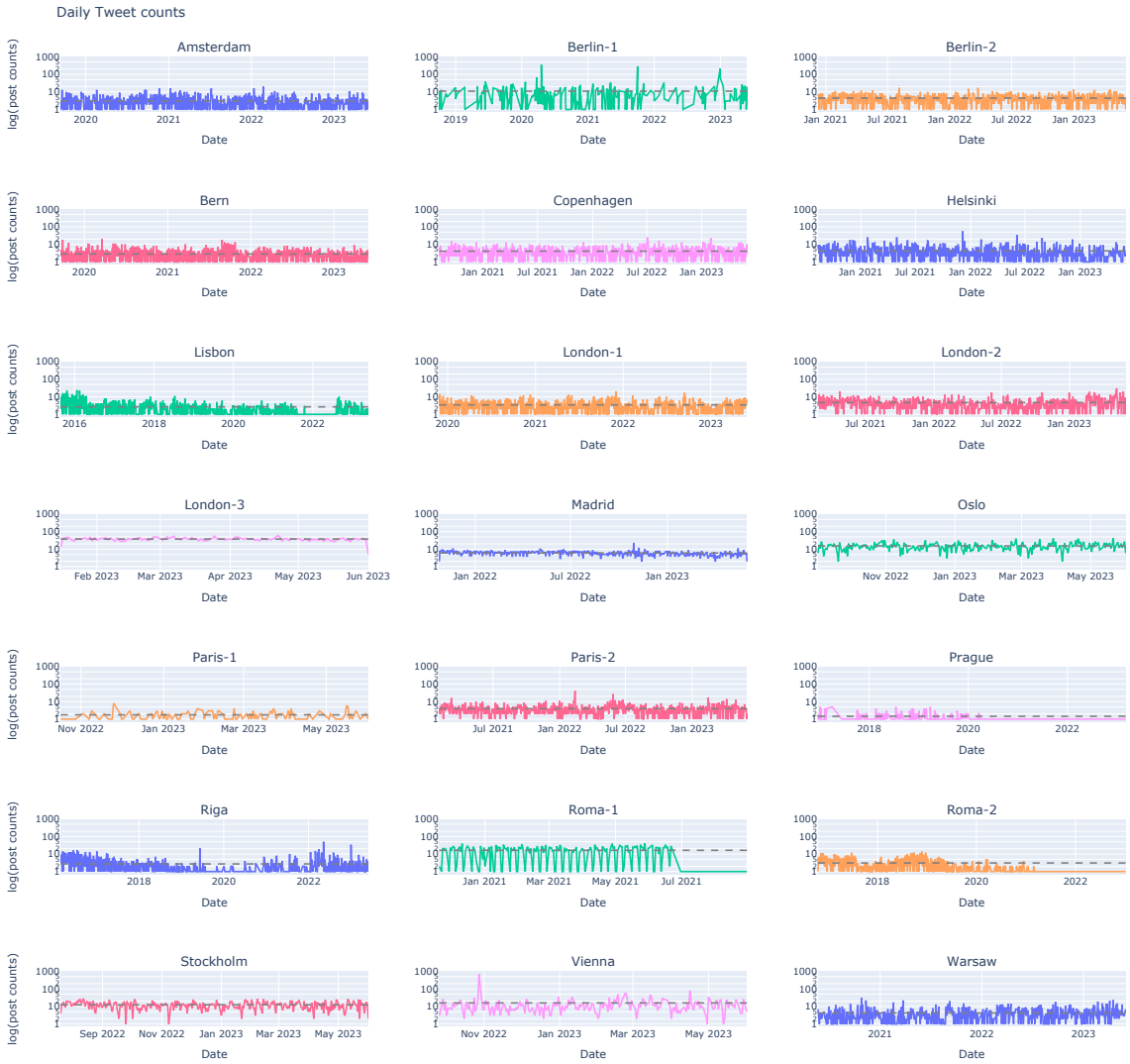

Figure 5.2: Average Daily Tweet of Account Tweets

tweets from each city's police account. The larger and darker the circle, the higher the average daily tweets, indicating higher Twitter account activity. Among the city police accounts, Vienna, Oslo, and London are the most active, with an average of approximately 15 daily tweets.

Figure 5.2 are 21 line charts showing each account's daily tweet counts. Figure B.1 with 2023 account's daily tweet counts can be found in appendix. We can see that Rome and Prague are not active anymore; they only have one tweet in 2023. Roma-2 (@QuesturaDiRoma) tweeted on January 2021 about the security issue at a thousand people event; and Prague (@MP_Praha) tweeted in March 2023 to inform the public about an incident and to display the promptness and effectiveness of the city police in handling emergencies. Interestingly, both city police are active on Facebook and Instagram with the same handle name.

Additionally, several city police accounts experienced sudden peaks in their daily tweet counts.

- On October 01. 2021 Berlin-1 used hashtag *#Polizei110* and tweeted 288 tweets, also under a social media marathon event. Meanwhile, the hashtag *#Polizei110* highlighted

the emergency hotline number 110.

- On April 18, 2020, the Berlin-1 police account tweeted 356 tweets, with an average daily tweet count of 10.9. On this day, Berlin-1 used the hashtag *#flattenthecrime*, to live-tweet about their daily work, focusing on enforcing COVID-19 rules. This hashtag documents various other operations carried out by the police during the day, not just those related to enforcing COVID-19 rules.

- On December 06, 2021, Helsinki tweeted 56 tweets with *#IndependenceDay*, above its average tweet count of 4.2.

- October 29, 2022, Madrid tweeted 23 tweets with hashtag *#SIMULACRO4VIENTOS* related to simulation exercises conducted by the Madrid Police. These simulations are typically carried out to prepare and evaluate the emergency services' response to a potential incident, such as a terrorist attack.

- February 12, 2022, Paris-2 tweeted 41 tweets, mainly with *#Manifestation*, about a series of events surrounding a large-scale protest happening in Paris.

- On May 10, 2022, Riga made 50 tweets and replied to respond to the public about a detain of a person who was carrying the flag of an "aggressor"(mentioned by tweets) country - Russia.

- On October 28, 2022, the Vienna police account had a remarkable increase in its daily tweet count, totaling 700 tweets. This number is significantly higher than the it's average daily tweet count of 15.9. The reason for this surge in activity was a Twitter marathon organized by the Vienna police, using the hashtag *#24hWien*. The purpose of the marathon was to provide citizens with a comprehensive and real-time glimpse into the daily operations and activities of the Vienna police.

Moving forward, city police departments with multiple accounts will be consolidated for subsequent analysis. Figure 5.3 depicts a heatmap illustrating the distribution of police account tweets throughout the week. The color intensity within each cell represents the proportion of tweets, with darker shades of blue indicating a higher percentage and lighter shades for lower percentage.

Observing the heatmap, it is evident that each city has its own tweeting preferences. Berlin, for instance, exhibits a higher percentage of tweets on Saturdays (19.4%) and Fridays (18.6%) compared to other weekdays. Vienna and Lisbon demonstrate a significant proportion of their tweets on Fridays, with 30% and 22.8%, respectively. Prague and Riga tend to tweet more on Tuesdays. Conversely, London, Madrid, Oslo, and Paris maintain a relatively consistent tweeting frequency throughout the week.

5.2 Retweets and Reply

We can see how the accounts interact with other users from retweets and reply tweets. To focus specifically on the account's public communication and interactions with a broader audience, we exclude reply tweets when considering the retweet ratio because reply tweets are typically directed toward specific users.

From figure 5.4, we can see that the retweet ratio varies among the police city accounts. Helsinki has the highest retweets ratio, with 32.03% retweets out of non-reply tweets. London follows with the second-highest ratio, where 28.76% of the non-reply tweets are retweets across

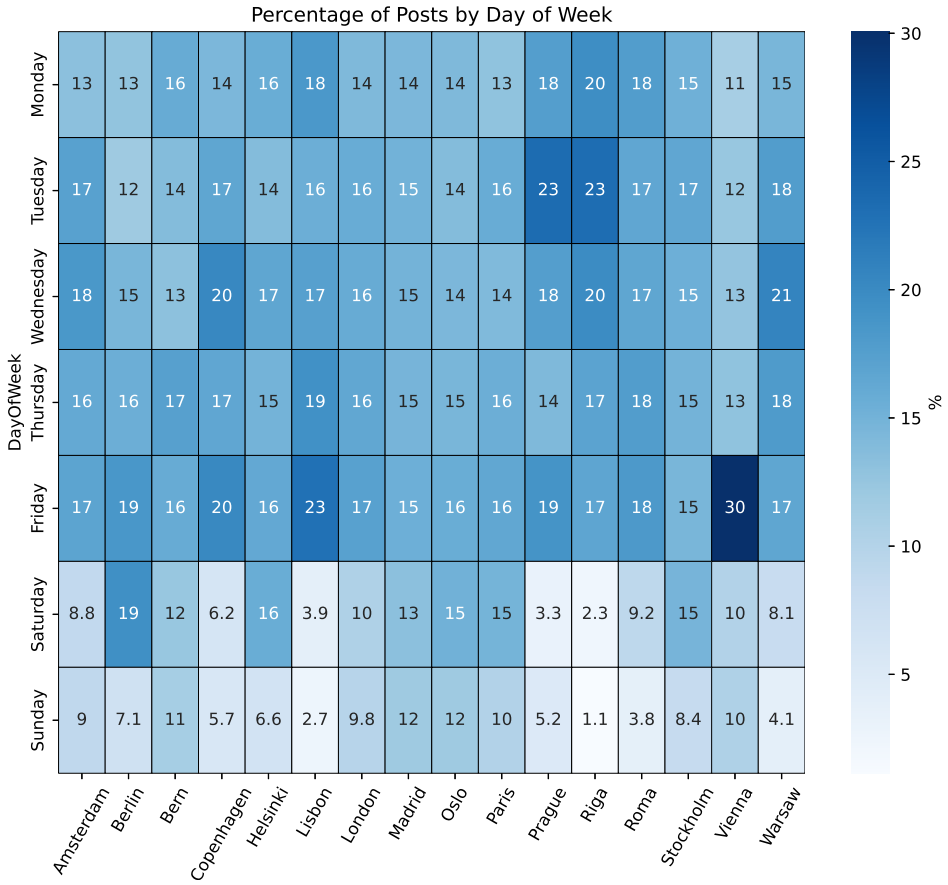

Figure 5.3: Heatmap of Percentage of tweets on Day of Week

all three accounts. Other police city accounts exhibit relatively lower retweet ratios, with Oslo, Vienna, and Lisbon having less than 1% retweets. Stockholm, on the other hand, does not have any retweets in the collected account tweets.

Detailed information the appendix table A.5 reveals that only Copenhagen, Berlin, and Helsinki have commented on slightly more than 11% of retweets. Notably, Rome retweeted the most from its own account, with 49% of the retweets originating from its own tweets. Oslo and Copenhagen rank second and third in retweeting their own tweets, respectively, with 15.38% and 11.49% of retweets from their own accounts. The remaining accounts exhibit less than 5% retweets coming from their own tweets.

Frequently Retweeted and Mentioned Accounts

We further examined the three most frequently mentioned and retweeted accounts by each police city account. It is worth noticing although we are presenting the top three accounts, the frequency differs a lot. Upon analysis, we observed a substantial overlap between the mentioned accounts and retweeted accounts. Additionally, it is interesting to note that Oslo and Rome include their own official account among the top three mentioned and retweeted accounts, as shown in the appendix table A.6.

The top three accounts that are frequently mentioned or retweeted by the police city accounts

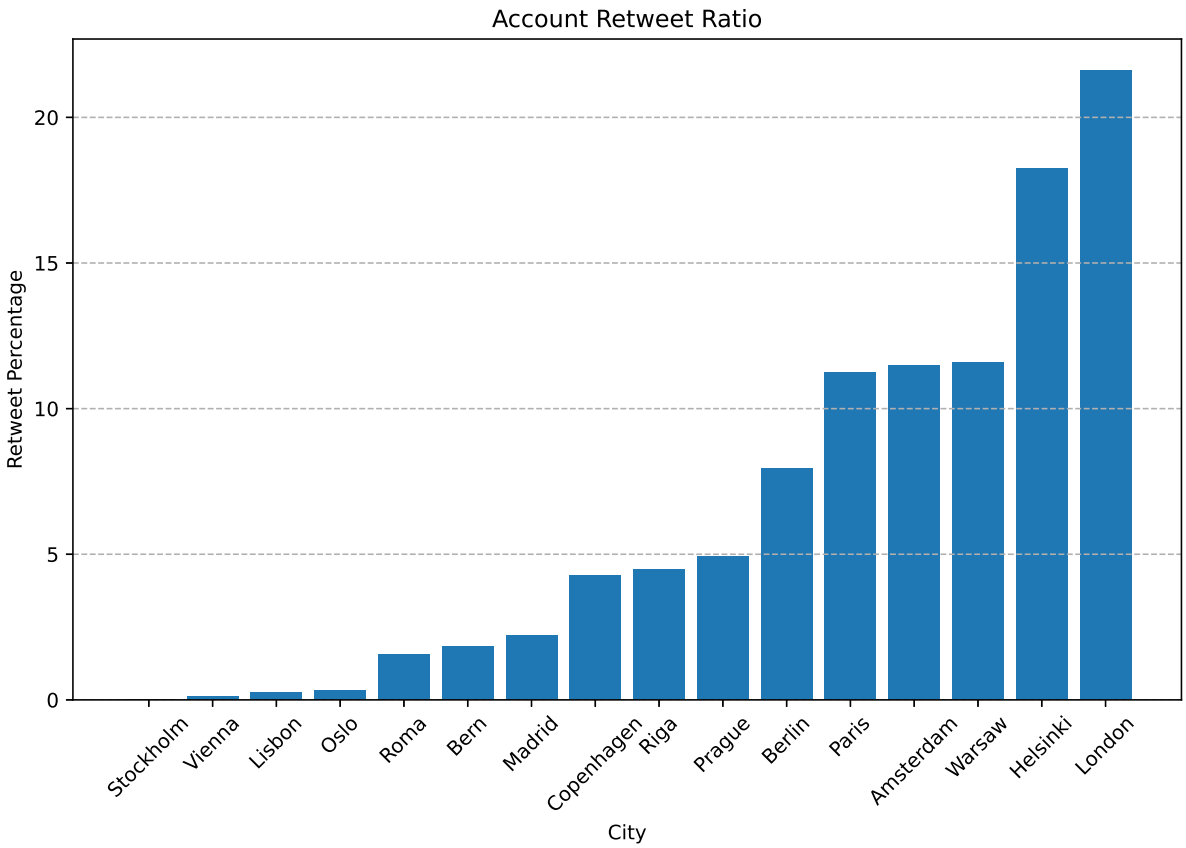

Figure 5.4: Account Retweets Ratio

are primarily official accounts of:

- Government or City Administration: such as @AmsterdamNL: The official Twitter channel of the municipality of Amsterdam, and @MADRID: The official profile of the Madrid City Council. @GStABerlin: Official Twitter account of the Berlin Public Prosecutors.
- Police and Law Enforcement Agencies for other regions or purposes: like @SuomenPoliisi: The official Twitter account of the Finnish Police. @MetPoliceEvents: for updates on protests and special events in London.
- Fire and Emergency Services: like @BrandweerAA: Official account of Amsterdam-Amstelland Fire Brigade. And @HasiciPraha: Official Twitter account of Prague firefighters.
- Traffic and Transport Services: for example @VTSost: Official channel from the Norwegian Public Roads Administration, Eastern Traffic Management Centre. And @DPasterstein: Personal account of the head of traffic control operations in Helsinki.

It is noticeable that the Stockholm police account does not have any retweets or mentions. This is because the Stockholm account primarily focuses on sharing links to current news about their activities from their official website rather than engaging in interactions or amplifying content from other users or accounts. This observation is consistent with the information provided in the URL section 5.3.1, where all tweets from the Stockholm police account contain links.

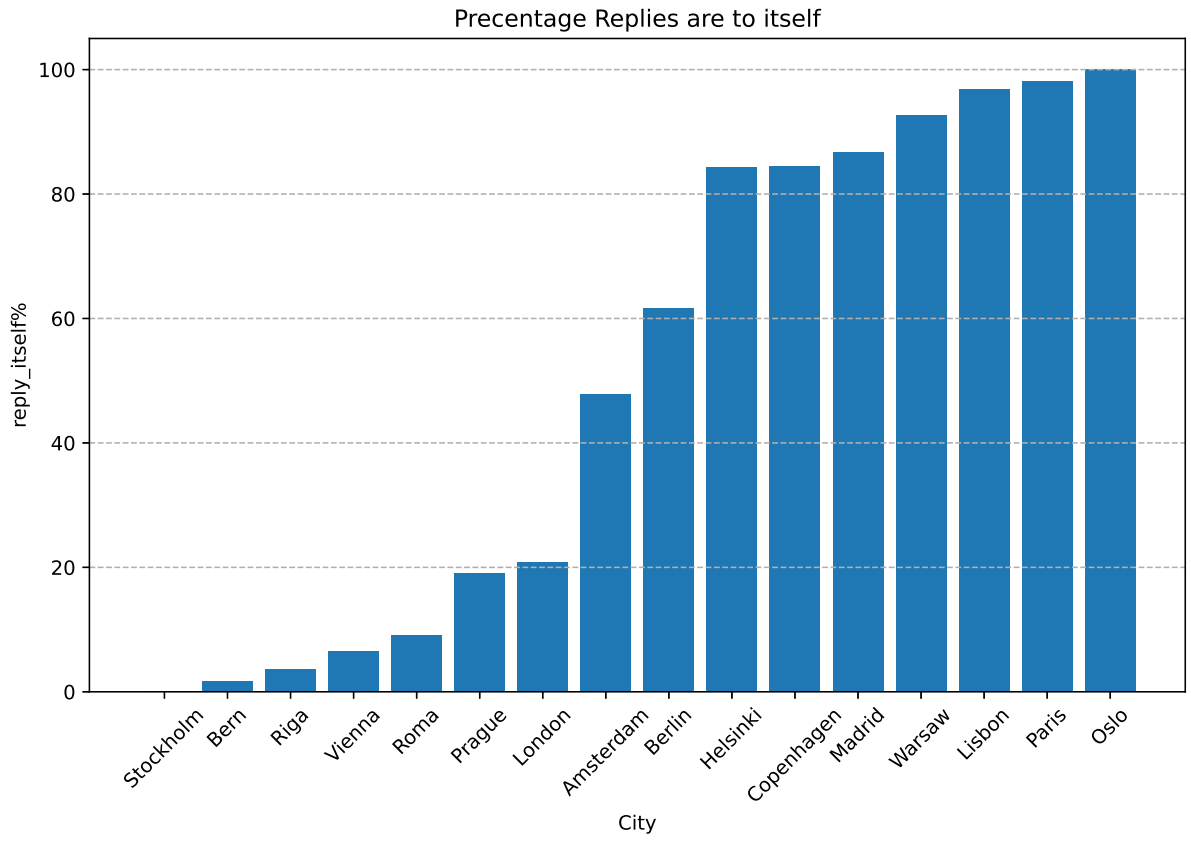

Figure 5.5: Account Replies to itself

Replied Accounts

The city police accounts, according to our data, primarily respond to their own tweets. This is particularly evident in the cases of cities like Oslo, Paris, Lisbon, and Warsaw. Among these, Oslo stands out, with 100% of its reply tweets being self-replies. Similarly, Paris, Lisbon, and Warsaw's self-replies make up over 90% of their replies.

From the table A.6 in the appendix, it is also notable that there are only a few responses to random users in Lisbon and Madrid. Figure 5.5 visually represents the proportion of self-replies of all replies, further emphasizing this trend.

Interestingly, not only does Oslo have a high percentage of self-replies, but it also has a high volume of reply posts, totaling 2252. These self-replies from the Oslo account are often used to provide follow-up information related to incidents mentioned in the original posts.

5.3 Resource Sharing in Original Tweets

Resource-sharing tweets refer to tweets that include URLs or media[21]. Analyzing the resource sharing (URLs, Media) in original tweets allows us to gain insights into how police city accounts utilize different types of media and external resources to communicate with their audience. By examining the presence and frequency of resource sharing, we have an insight into accounts' content sharing strategy and engagement patterns [1].

On Twitter, three types of media can be shared: photos, videos, and animated gifs. However, in the account tweets we collected, we did not find any tweets with animated gifs.

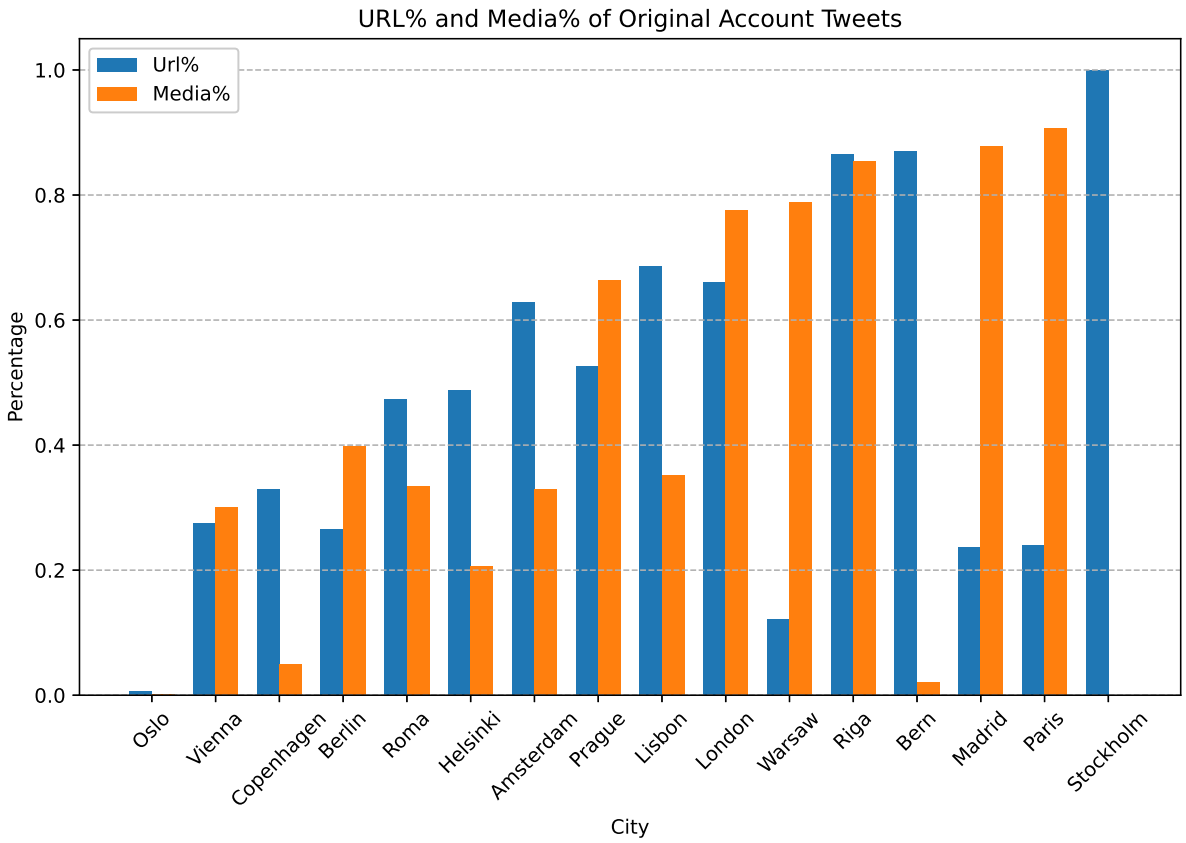

Figure 5.6: Percentage of Original Accounts Tweets have Url and Media

Figure 5.7 displays the percentage of original account tweets that include shared resources. We can see that all accounts utilized resource sharing, with ten accounts having more than 80% tweets containing resources.

Figure 5.6 presents the percentage of original tweets containing URLs and media , showing variations among cities. Stockholm tweets every tweet with a URL, while Paris and Madrid have the highest percentages of tweets with media, at 90.7% and 87.8%, respectively.

Furthermore, figure 5.8 illustrates the proportion of each resource type being shared. The size of each circle represents the proportion, and the actual numbers are indicated on the plot. We can see that photos are more commonly shared than videos. Some accounts, like Vienna and Riga, tend to use URLs when sharing photos. On the other hand, Oslo does not frequently share multiple resources simultaneously. In contrast, London shared an equal mix of different types of resources. Overall, the results indicate that the most commonly used media types are links and photos [7].

5.3.1 Urls Links

Most city police accounts typically limit the URLs they tweet to one or two of their official city authorities' websites. All city police account tweeted links to their official city police websites to share updated news. Stockholm, in particular, tweets every tweet containing only news shared from its police official website [1]. Some accounts, like London, Vienna, Oslo, and Madrid, also share information from the official websites of other organizations, including state-level police or

[1] https://polisen.se/aktuellt/

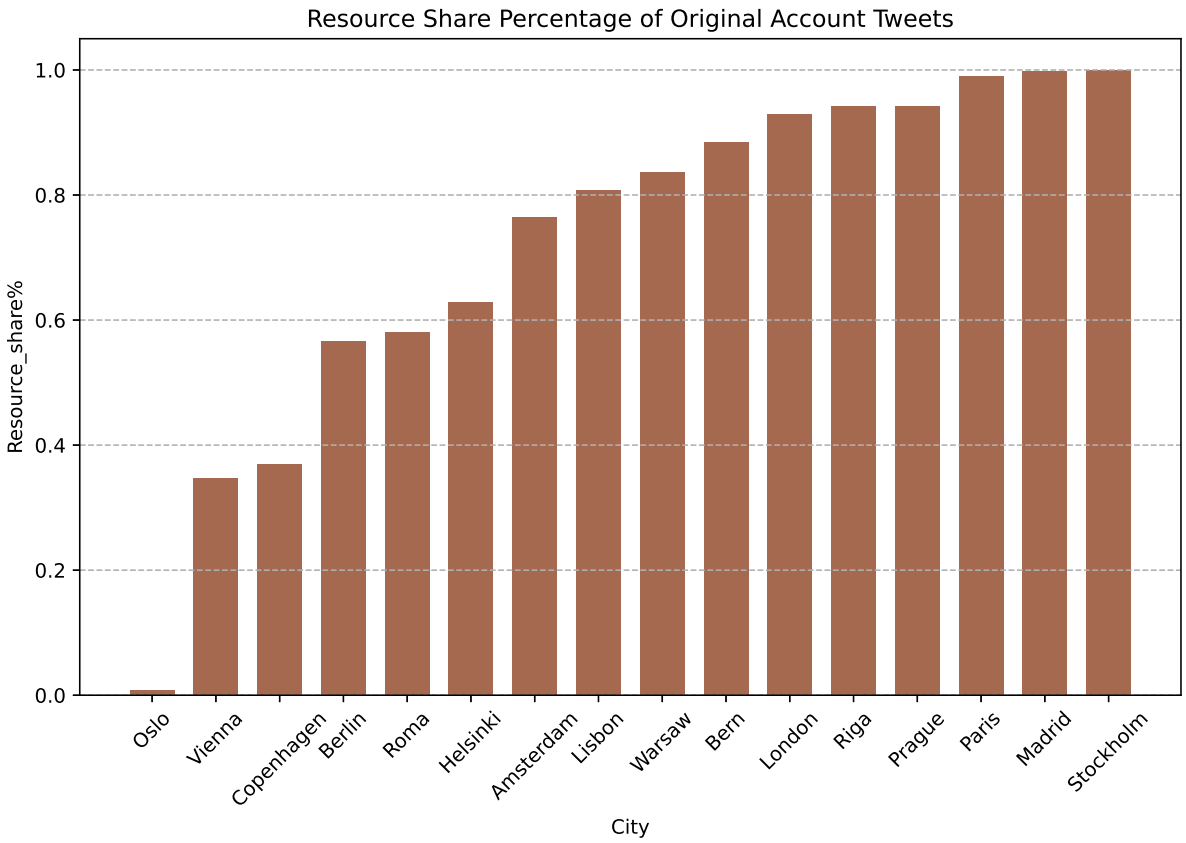

Figure 5.7: Percentage of Original Accounts Tweets have Resource Sharing

city council websites. Warsaw accounts, on the other hand, share links to different city district police websites. Madrid frequently uses links related to city tourism.

Oslo's account has only a few tweets containing URLs, but these links cover a diverse range of topics, from police news to public city events such as marathons. Berlin and Prague shared a certain number of links related to COVID.

The police accounts of Copenhagen, Vienna, Berlin, and Paris include many links to their own or other city-related twitter accounts. Additionally, several city police accounts share their tweets made on other social media platforms on their twitter. Lisbon used to share its official police website until 2020, after which they frequently tweeted Facebook share links. Copenhagen, Riga, Prague, and Rome continuously share tweets on their respective Facebook city police accounts. Warsaw, Berlin, Riga, and Prague also share video links from their official YouTube accounts. Paris, in particular, tweets links to their official accounts on multiple platforms: Facebook, YouTube, Instagram, and TikTok.

5.3.2 Engagement level

The engagement level of a tweet is characterized by the cumulative count of both likes and retweets. Figure 5.9 illustrates the distribution of likes and retweets among different types of resource sharing. Furthermore, figure B.2 in the appendix provides a closer look at the counts of retweets and likes for each city police account. While it is generally accepted that tweets featuring media content tend to garner higher engagement [6], we found no such correlation in the tweets from these accounts

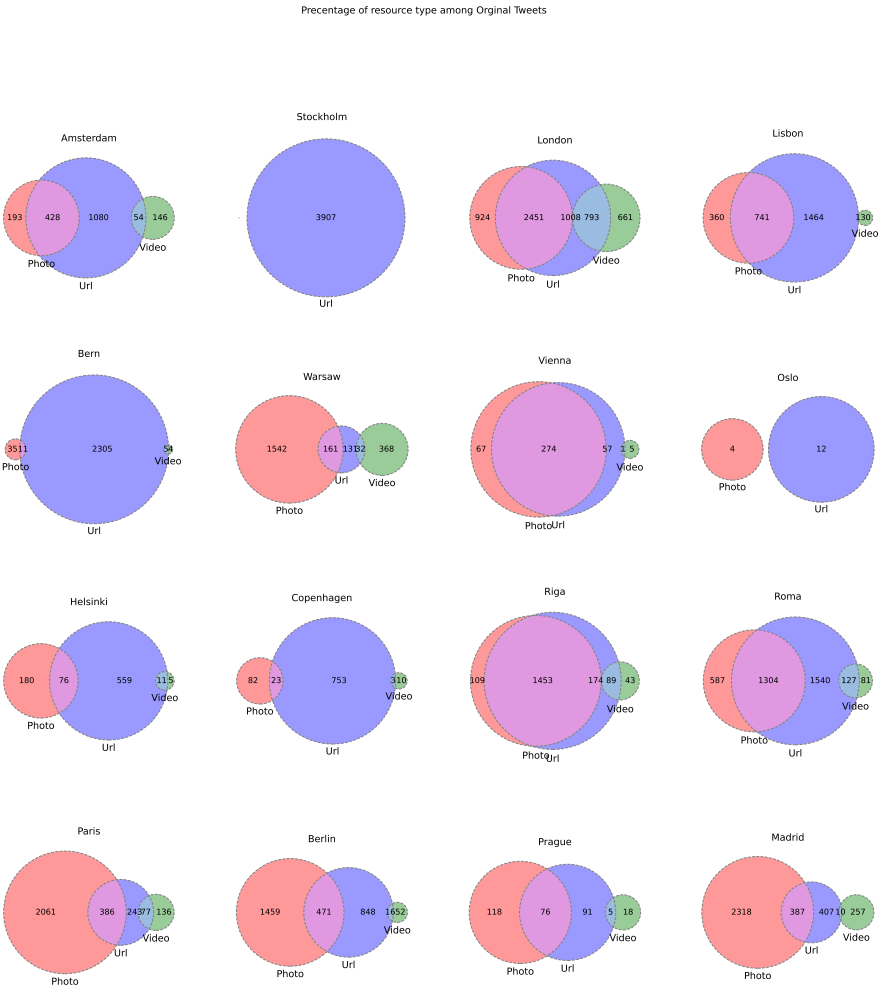

Figure 5.8: Proportion of Resource Types among Resource-sharing Tweets

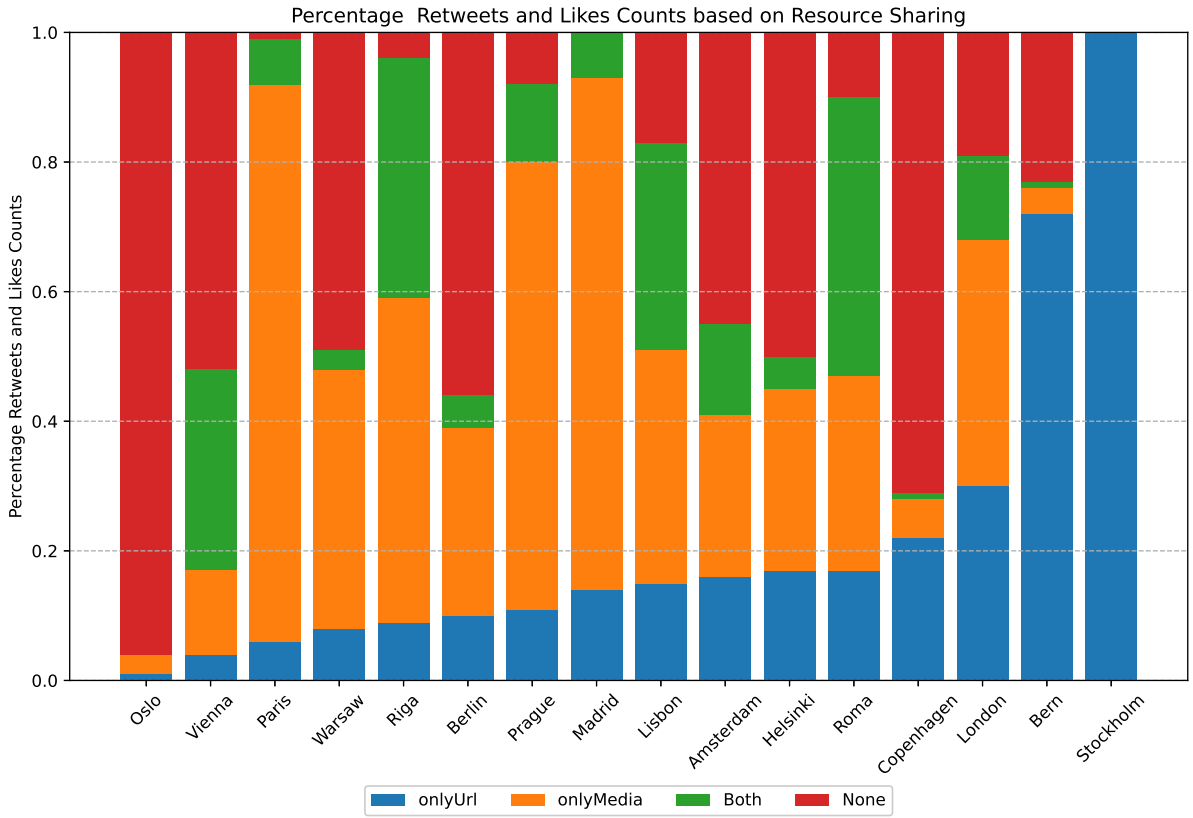

Figure 5.9: Percentage of Retweets and Likes Counts for Resource Sharing Types

Chapter 6

Data Analysis: Account and Search

6.1 Used Language

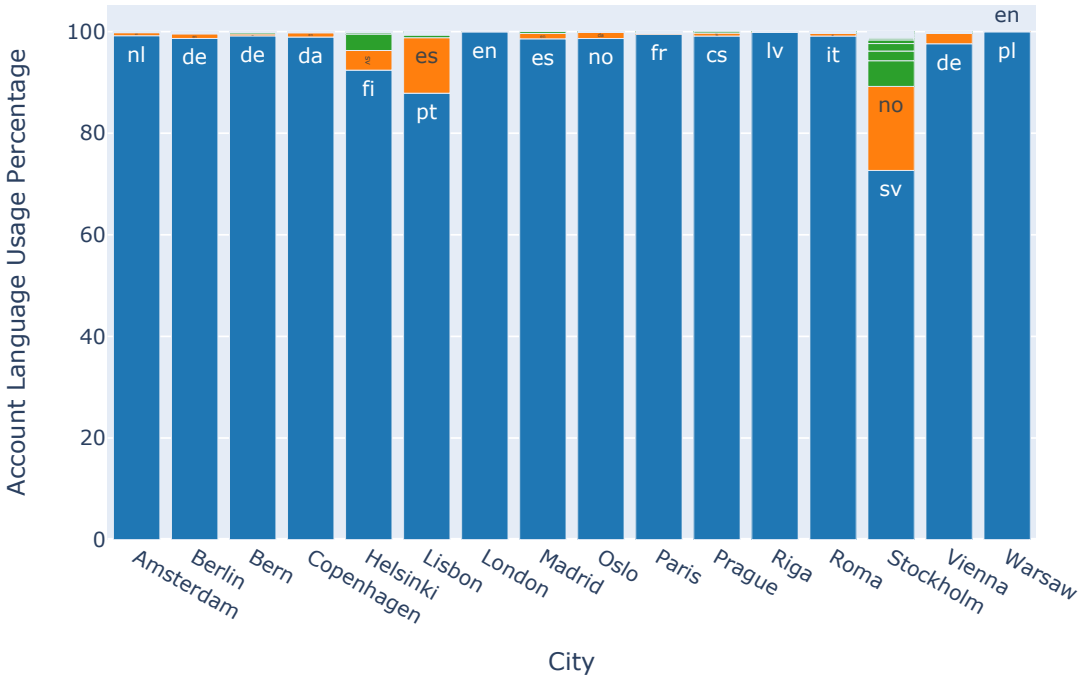

Figure 6.1: Language Usage in Account Tweets

We classify the language of the tweets based on the language labels provided in the data retrieved from the Twitter API[1]. Non-natural languages are excluded from our analysis, including those labeled as special[2]: und, qam, qct, qht, qme, qst, in, art, and zxx.

The language usage in account tweets and search tweets is depicted in figure 6.1 and fig-

[1]https://developer.twitter.com/en/docs/twitter-for-websites/supported-languages
[2]https://www.exportdata.io/blog/advanced-twitter-search-operators/

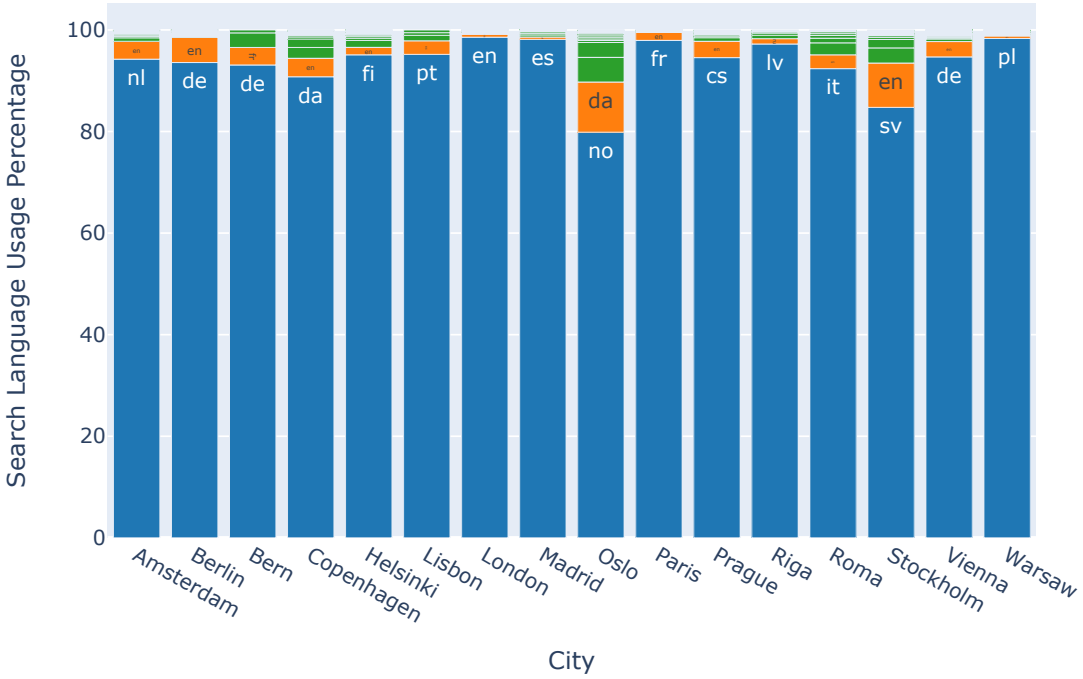

Figure 6.2: Language Usage in Search Tweets

ure 6.2, where the height of each segment represents the percentage of language usage in the corresponding city.

For both types of data tweets, it is evident that the dominant language in each city is their local language. Regarding Account tweets, as shown in figure 6.1, Lisbon has 87.87% Portuguese tweets and 10.93% Spanish tweets. The top three languages of Stockholm and Oslo are Scandinavian languages with:

- Stockholm: 72.67% Swedish, 16.54% Norwegian and 5.06% Danish
- Oslo: 98.64% Norwegian, 0.24% Danish, 0.07% Swedish

Other cities have more than 90% of their tweets in their respective local languages. Detail information can be found in the appendix table A.4.

Upon closer examination of the first non-local language, it is typically English or the language of neighboring countries. In addition to the Scandinavian cities and Lisbon mentioned earlier, the police account of Prague utilizes 0.58% Polish as the second most used language in its account tweets.

In search tweets, Madrid and Riga have 0.46% Portuguese and 1.05% Russian as their second most used languages, respectively.

6.1.1 Tweets in English

By using English on social media platforms, police departments in capital cities can effectively communicate with a diverse and broader audience, including tourists, ex-pats, and individuals

who may not speak the local language. Therefore, analyzing the English content tweeted by police accounts plays a role in understanding their communication efforts. For London, as English is its national language, we do not consider it when inspecting the content of English tweets of each city.

Account Tweets in English

Table 6.1: Topics of English Account Tweets

Category	Description
Community Engagement & Communication	Retweeting English Sources, Reply with English-speaking Twitter Users, Video sharing link from Facebook, Weekly roundups of news
Public Safety, Security & Emergency Response	Announce happening of security incidents, Updates on Emergencies and Serious Incidents, Announcing security measures, Updates on Security Threats, Emergency Preparedness
Legal & Regulatory Announcements	Announce Regulation: COVID-19 regulations, Traffic Regulation, Announcing security measures
International Relations, Crime & Cooperation	International cooperation, International Crime and investigation, Refugee from Ukraine
Event Management & Special Occasions	Football match, International Public event, Public safety during special Events, Diplomacy events
Crime Investigation, Prevention & Witness Outreach	Seek for Witness, Crime Prevention and Investigation
Public Information, Guidance & Tourist Support	Tips for tourists, Information on emergency services, Announcement for Immigrants, Guidance and information of police service
Inter-Agency Communication	Communication with Other Agencies
Infrastructure & Facilities Management	City Facilities installation

As shown in table 6.1, topics of English tweets were categorized into several broader types based on their nature and purpose.

Different cities have different purposes for tweeting in English. Here is a summary of the English tweets from each city and their respective focuses:

- Bern, Riga, Lisbon, Prague: They have relatively few English tweets. Bern mainly interacts with English-speaking users, while Prague offers tips for tourists. Riga primarily communicates with other agencies, and Lisbon shares video content from Facebook and tweets about football matches.

- Paris, Rome: Their English tweets is to offer a mix of tourist tips, football updates, international cooperation news, security measures, and more.

- Amsterdam, Berlin: These cities' English tweets focus on announcing security incidents, such as terrorist attacks and local regulations, including updates related to COVID-19. They also actively engage with English-speaking audiences, indicates an intention to reach an international demographic.

- Copenhagen: They tweeted in English to provide information on international public events like *#WorldPride* and football matches with the hashtag *#ManCity*.

- Helsinki: Their English tweets cover a wide range of topics, including emergency preparedness, joint exercises with the Finnish Defense Forces and Border Guard, city facility and traffic regulations, public diplomatic events, international cooperation, and refugees from Ukraine.

- Vienna: The emphasis is on emergency service information. They mainly provide updates on security threats, share guidance on contacting the police, and report incidents and information about their operating hours. They also provide directions on what to do in case of specific incidents such as rumors spreading or an assault threat.

While each city has its distinct approach, the common thread among all is their emphasis on public communication, ensuring citizens stay informed and safe.

Search Tweets in English

English search tweets cover a much broader spectrum of subjects. Search tweets are tweets of what citizens are talking with the city police. The range of English search tweets topics paints a unique picture of each location's concerns, narratives, and sentiments. In some cities, users broach heavier subjects, addressing personal safety and public opinion of the police and occasionally deploying derogatory or offensive language.

When discussing the Helsinki Police, tweets gravitate towards severe criminal matters. These include investigations into suspected murder cases involving teenagers, instances of domestic violence, allegations of corruption, and censorship issues.

Conversations with Oslo Police delve into pressing societal challenges such as terrorism, immigration, corruption, and drug-related concerns. Tweets concerning the Paris Police Force frequently mention personal safety issues, such as stalking and harassment incidents, which underscore the demand for enhanced security or protection measures. As for Stockholm, the conversations mainly involve reports of theft and fraud.

In contrast, Berlin's discussions take a more political and historical tone. Users focus on international relations and politics, with some criticizing the Berlin Police for their alleged violent actions against Jewish and Palestinian activists during the *#Nakba75* commemoration. Other tweets interpret the Berlin Police's conduct as reflecting historical anti-Semitic attitudes. Furthermore, a significant discourse revolves around the controversy of the Ukrainian flag ban and its subsequent legalization in Berlin on May 8th and 9th.

For the Prague Police, English-speaking users mainly touch upon everyday city life issues such as parking, public transportation, and road safety, often incorporating sarcasm and historical references into their discussions. Regarding the Rome Police, tweets primarily cover damage due to bad weather , comments linked to sports events, expressions of gratitude or appreciation, and accounts of fraudulent activities within the city.

These English search tweets highlight the diverse range of themes that emerge in social media discussions about city police departments, reflecting the specific concerns, societal issues, and cultural contexts of each location.

6.2 Hashtags

City police commonly use hashtags. The hashtag allows for easy identification and unification of all police-related tweets. Thus, hashtags often align with the social media strategy of city police Twitter accounts. For example, Copenhagen city police wrote in the account biography that hashtag *#politidk* is a standard tag for their tweets. The term itself is a combination of "politi" (the Danish word for "police") and "dk" (the country code for Denmark), essentially signifying "Danish Police." It helps in establishing a recognizable and consistent presence on social media. They could also serve as a tool for identifying popular themes and increasing topics' potential visibility in a sea of tweets[15].

Besides, with a specific hashtag, citizens, journalists, and other interested parties can easily search for and follow police updates and news. They are particularly crucial for tracking events, as specific hashtags are often associated with particular circumstances , such as public order crisis [33]. Hashtags also encourage conversation and engagement. By clicking on or searching the hashtag, people can participate in or follow the discussion around it, contributing to a larger community dialogue. Additionally, In case of public safety incidents or emergencies and important announcements, hashtags can be used to quickly disseminate vital information to the public, which improves the effectiveness of the police's communication [12]. For the police, this is especially visible during ongoing threats, such as shootings.

Given the multifaceted functionalities of hashtags, they play a crucial role in the Twitter analysis. They serve as an effective tool for evaluating the influence of city police on Twitter, primarily because they provide a systematic approach for categorizing, monitoring, and interpreting content and engagement on specific topics.

For a more comprehensive analysis of hashtags, we presume that uppercase letters and diacritics do not contribute additional meanings to the hashtags. Therefore, we standardize all hashtags by converting them to lowercase and normalizing them to eliminate any redundancy in hashtag meanings.

6.2.1 Used Hashtags

Figure 6.3 is a bar chart representing the percentage of account tweets and search tweets containing hashtags. The left blue bar is for hashtag percentage in account tweets, and the right orange bar is for search tweets. We can see that hashtags are much more commonly used in account tweets. Madrid, Copenhagen, Roma, Berlin, and Paris use hashtags in more than 80% of their account tweets. And Berlin search tweets used hashtags the most with 15.72%. As mentioned in retweet section 5.2, Stockholm city police do not tweet additional information than links sharing; thus, they don't use hashtags either.

Figure 6.4 shows each city's hashtag vocabulary size, which could indicate the variety of topics each city is concerned about. Figure 6.5 and figure 6.6 are the word clouds of used hashtags in each city police account tweets and search tweets. With word cloud, we can recognize a pattern of hashtag usage for each city and get an immediate impression of frequently used hashtags.

Moreover, table 6.2 provides information on the top three most frequently used hashtags in account and search tweets for each city.

Account Tweets

Figure 6.4 of hashtags vocabularies shows that Berlin, Madrid, and Rome have the most extensive vocabularies of hashtags, with 2,149, 1,715, and 1,652 unique hashtags, respectively. These

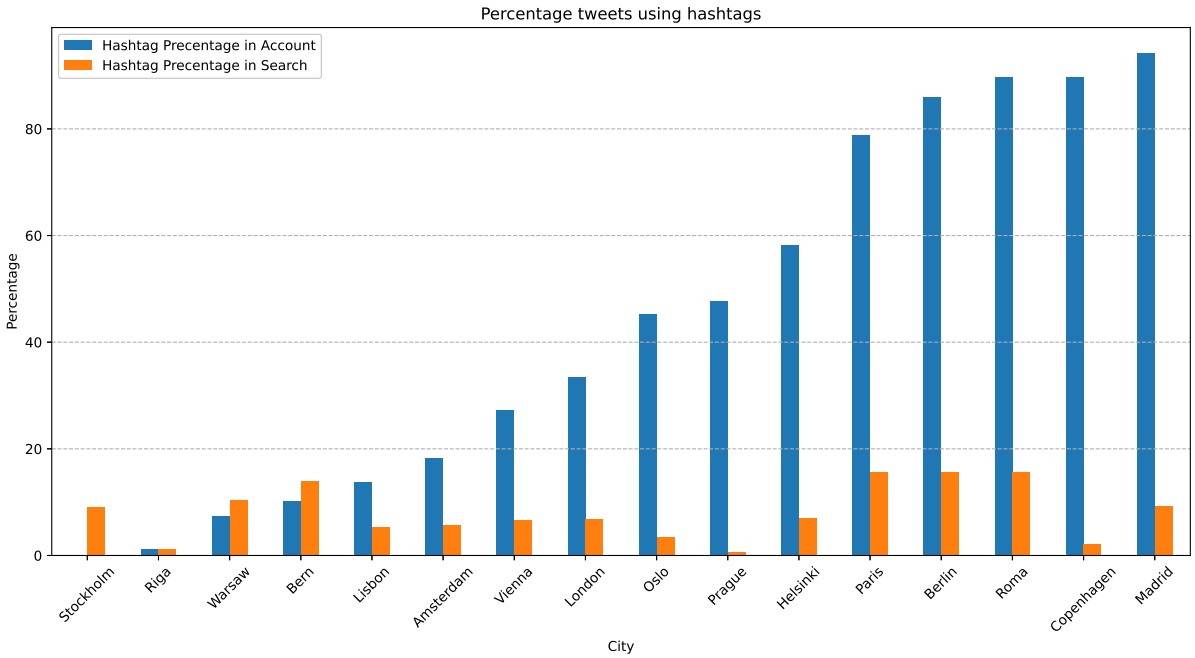

Figure 6.3: Percentage of Tweets Using Hashtags

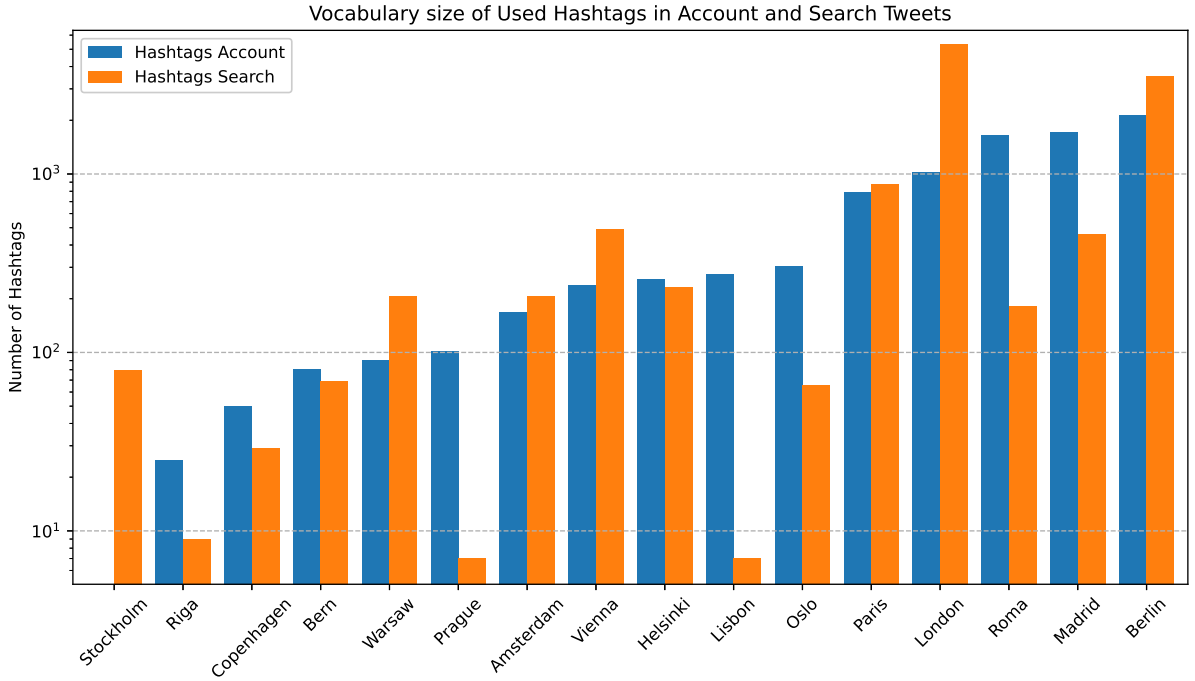

Figure 6.4: Vocabulary Size of Used Hashtags

cities also have a high percentage of tweets containing hashtags, placing them among the top four cities regarding hashtag usage.

Interestingly, we observe some patterns that Berlin's wordcloud consists of numerous hashtags with relatively equal frequencies, indicating a diverse range of topics and interests. Madrid and Rome, on the other hand, have a few prominent stand out.

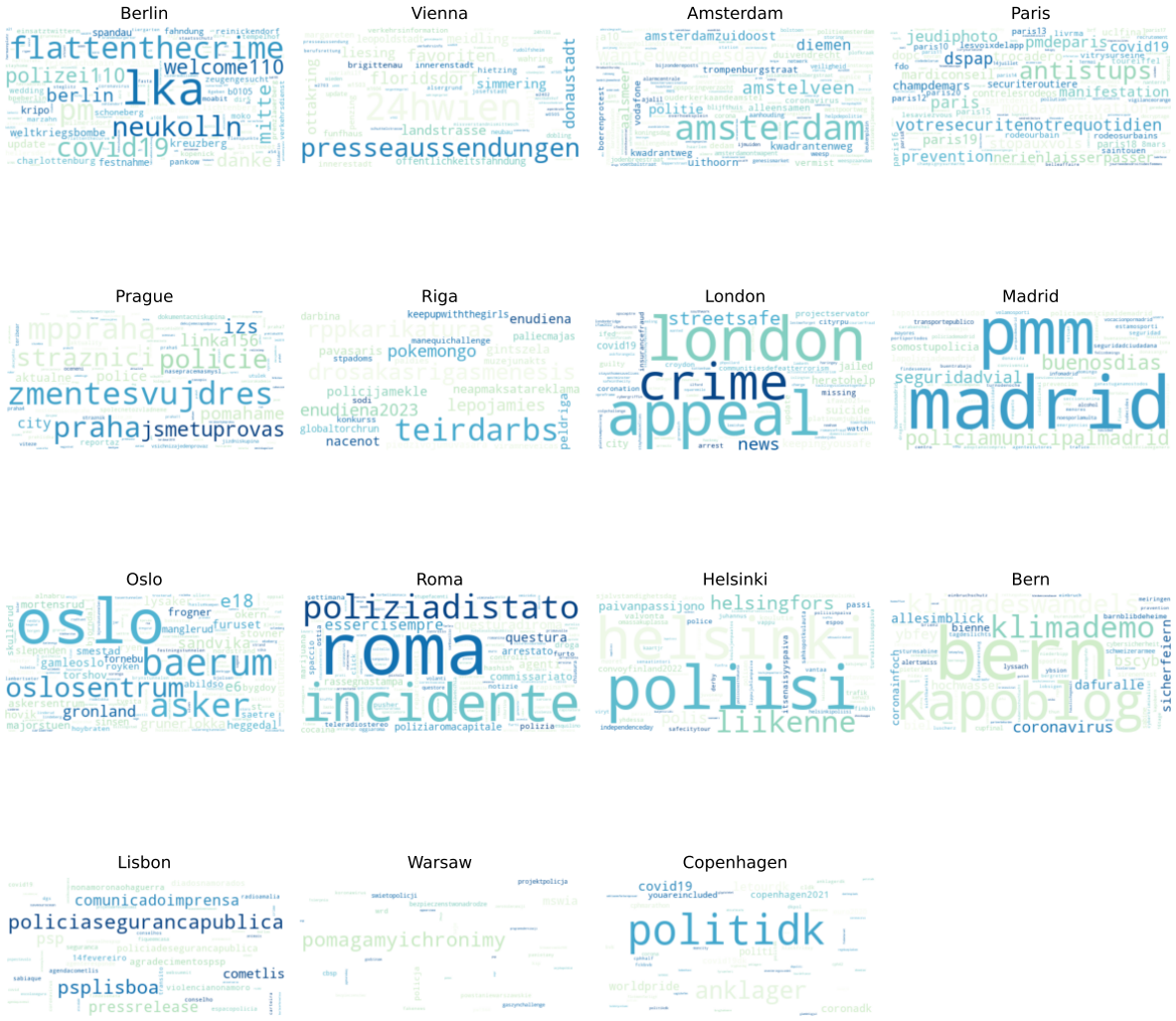

Figure 6.5: Account Hashtags Wordcloud

In contrast, Copenhagen has a smaller vocabulary of hashtags (50), but an impressive 89.82% of their account tweets include hashtags. This suggests a consistent use of specific hashtags in their tweets. The word cloud for Copenhagen prominently features the hashtag *#politdk*, which aligns with the statement *" Vi bruger #politidk "*(We use #politidk) in their account biography.

Based on the strength and number of standout hashtags, the word clouds of account tweets are categorized into four types:

1. Berlin, Vienna, Amsterdam, Paris: They have a wide variety of frequently used hashtags and are visibly prominent in the word clouds.

2. Prague, Riga: They also have many frequently used hashtags but do not stand out as prominently.

Table 6.2: Top 3 Hashtags in Account and Search Tweets

City	Top 3 Hashtags in Account Tweet	Top 3 Hashtags in Search Tweet
Amsterdam	amsterdam, amstelveen, wantedwednesday	medemblik, pullukcu, feyenoord
Berlin	lka, flattenthecrime, pm	berlin, polizei, letztegeneration
Bern	bern, kapoblog, klimademo	bern, sos, barntoday
Copenhagen	politidk, anklager, covid19	politidk, dkpol, dkmedier
Helsinki	poliisi, helsinki, liikenne	poliisi, helsinki, finland
Lisbon	policiasegurancapublica, psplisboa, psp	lisboa, estacionamento, freguesiaalvalade
London	london, appeal, crime	justiceformarshallandmillions, london, police
Madrid	madrid, pmm, policiamunicipalmadrid	madrid, incendio, accidente
Oslo	oslo, baerum, asker	oslo, oslosentrum, brukerjakt
Paris	antistups, votresecuritenotrequotidien, dspap	bravm, nantes, yannickmorez
Prague	zmentesvujdres, mppraha, praha	cc0, publicdomain, poslednidegenerace
Riga	teirdarbs, drosakasrigasmenesis, rppkarikaturas	gabdara, peldsezona, kb3491
Roma	roma, incidente, poliziadistato	roma, atac, pigneto
Stockholm		stockholm, krimpol, svkrim
Vienna	24hwien, presseaussendungen, favoriten	wien, polizei, w1604
Warsaw	pomagamyichronimy, mswia, policja	pyra, warszawa, policja

3. London, Madrid, Oslo, Roma, Helsinki, Bern: They have two or three highlighted hashtags, but each stands strongly.

4. Lisbon, Warsaw, Copenhagen: They have a few highlighted hashtags that are nearly obvious.

From the first blick of wordcloud figure 6.5, it is notable that city names are often used as hashtags, such as Amsterdam, Bern, Oslo, Prague, Roma, London, Helsinki, and Madrid. Additionally, words related to police are widely used, are also widely used, like *#polizei110* for Berlin, *#poliziadistato* for Roma, and *#policies* for Helsinki.

Search Tweets

As shown in the figure 6.3, although the percentage of search tweets using hashtags is lower compared to account tweets, the figure 6.4 shows that search tweets of London and Berlin have a greater variety of hashtags, with 5358 and 3529 unique hashtags, respectively.

The word clouds figure 6.6 also exhibit distinct patterns of hashtag usage for each city. City names are among the most frequently used hashtags in search tweets like account tweets. This

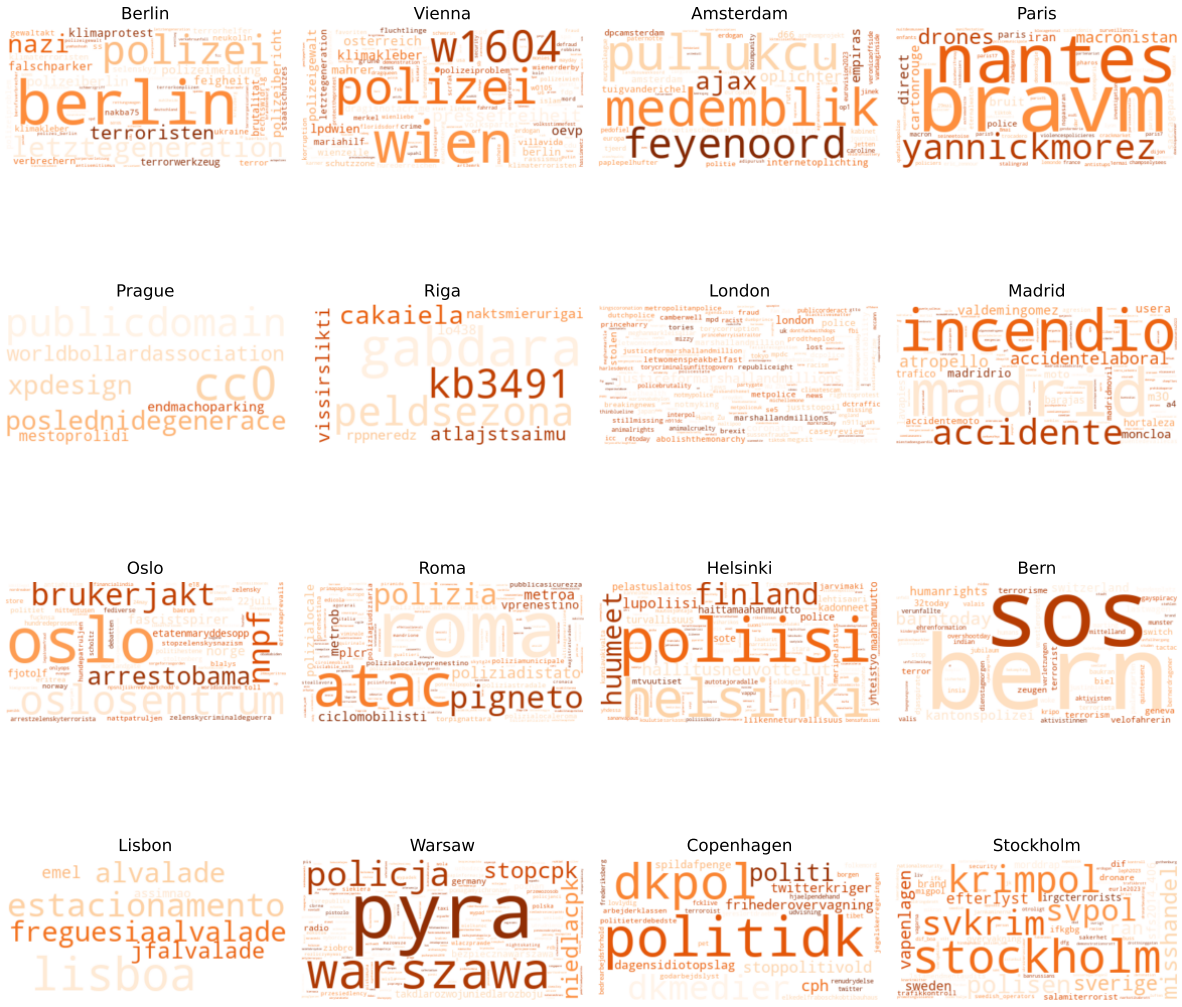

Figure 6.6: Search Hashtags Wordcloud

indicates consistency in hashtag usage across different types of tweets data. It is worth noting that even though Stockholm does not have account tweets containing hashtags, its search tweets utilize 80 hashtags, with *#stockholm* being the most commonly used.

Chapter 7

Context Analysis: Account and Search

7.1 Topics in Account and Search

7.1.1 Topic Modelling Appoarch

To comprehensively understand the discussion around City Police, topic modeling techniques BERTopic[17] were used. This allowed us to categorize the main topics in account tweets and search tweets to gain detailed insights.

Topic modeling helps us understand the key themes and issues highlighted in police communications, giving us insight into the priorities of police officers and their approach to community engagement. It also allows us to identify aspects of policing that the public is most engaged with or concerned about, such as crime rates, specific incidents, or broader issues such as police reform or community-police relations[27].

Topic patterns reveal the focus and public interest in police communications and help identify emerging issues[34]. Especially during specific incidents or crises, analyzing trending topics in police-related tweets can provide valuable insights into the effectiveness of police communications and the information the public seeks[18].

Comparing topic modeling results from different city police departments can help identify commonalities and differences. This can be useful for sharing best practices or understanding the impact of different policing strategies.

Along with BERTopic, several techniques were used to improve its overall performance and efficiency. PCA (Principal Component Analysis) was used to speed up the model embedding process by reducing the dimensionality of the data. And K-means clustering was used to group similar data points. In addition, a Twitter-based sentence transformer model is used to encode the text data and obtain high-quality sentence embeddings.

All tweets were lowercased during the preprocessing phase. Additionally, several other preprocessing steps were performed, including removing mentions, URLs, retweet symbols, emojis, and numbers from the tweets.

Since the tweets were mainly in their local language, they were translated into English using the Google Translate library. This translation step was crucial for a better understanding the content and practical further analysis.

Account tweets use formal language for tweeting, which makes it easier to retain the important information after translation. On the other hand, the vernacular language in search tweets often involves informal language, internet-specific terminologies, and sometimes vague expressions, thus posing a significant challenge to full comprehension. Implementing Topic Modelling

after translation does not reduce this difficulty, especially for non-English tweets.

Using the BERTopic model shows that a significant percentage of tweets revolve around recent events and incidents, while some abstract or coded phrases remain difficult to decipher without additional information.

7.1.2 Topics in Account Tweets

As a communication channel between the public and police, we can discover several common topics touched by most accounts' tweets.

Common Topics in Account Tweets

Insights into Police Work
Most accounts tweeted topics related to police work to give the public a profound understanding of the police's role and responsibilities. Those tweets include daily operations of city police, an overview of how police officers handle cases, an introduction to police-specific terms, and a thorough presentation of the organizational structure and team.

Prague police account discusses a series of programs showcasing the daily work of Prague city police officers. It includes night shifts, holiday events, and training, with videos available for public viewing.

The Riga police account explained a detention procedure. Vienna police tweeted the process of public searches and the reasoning behind the timing public incidents. It also covers how the police handle the high density of operations and how they communicate with the public regarding potential hazards and incident reporting. Moreover, Vienna specifically simplifies and explains its internal language, filled with technical terms and abbreviations, through a regular series. The intent is to ensure the public understands their messages and updates better. This aligns with their most used hashtag, *#24Wien*, a Twitter marathon activity to present police work to the public, surging a sudden peak of their daily tweet, as discussed in level of activity section 5.1.

London police account provides information on police service and the local policing teams. Paris, particularly, highlights the contributions of female police officers, noting that their commitment and dedication extend to every day of the year, not just on special occasions or designated dates.

Law Enforcement Practices - Police action and response
Many tweets encompass various aspects of police action and response, including first aid, making arrests and investigating crimes, implementing safety measures at public events, and managing general control.

- Aid and support:
  Prague city police account mentioned that police officers provided first aid to individuals in distress, including a collapsed woman and a suicidal man, and support to homeless people

- Making arrests and investigating on crimes:
  City police accounts, including but not limited to Paris, Amsterdam, Helsinki, Stockholm, Oslo, and Berlin, involve arrest and investigations of various crimes. Those accounts highlight the police's prompt response to street crime in Paris, theft or burglary in Stockholm, and home robbery in Amsterdam. Meanwhile, the Helsinki police account includes investigations into a violent video circulating on social media and multiple demonstrations

causing temporary inconveniences to traffic. Oslo police account mentioned responses to crime incidents such as potential knife attacks, robberies, and missing person cases.

- Public Safety and security measurements:
  Several Police accounts mentioned that they maintain a presence at certain public events and assist anyone needing help.

  Copenhagen police ensure public safety during various public gatherings and in response to shooting incidents. Bern police mentioned their response to unauthorized rallies in the city. Vienna police account tweeted how they deal with disruptions caused by protests. The Oslo police account discussed public safety events, from Women's Day celebrations to military exercises in populated areas.

  Stockholm police talked about public control over persons and vehicles and their decisions on camera surveillance.

  Additionally, Oslo and Stockholm specifically revolve around incidents of smoke and fires, providing updates at various times

Information dissemination

A significant amount of tweets are information dissemination from police, including reminders, advice, alters, warnings, and announcements that cover a wide range of topics related to public safety and security, urban issues, health, and crime.

- Urban issue:
  Madrid provides information about appropriate disposal points for household items that cannot be deposited in regular street containers. The London police advise citizens to seek assistance from their local council if they face issues with noise disturbances within neighborhoods, including loud noise.

- Raise awareness
  City police accounts of Vienna and Copenhagen tend to raise citizens' awareness of information caution, specifically with fraud prevention and potential scams. Vienna emphasizes the importance of online security, advising the public not to click on suspicious links and to report any instances. Copenhagen also highlights the growing problem of fraud targeting the elderly population in Copenhagen. It emphasizes the importance of not sharing personal information over the phone and encourages everyone to spread this information to vulnerable individuals to prevent fraud.

- Public safety and police presence:
  Lisbon shares public health messages urging people to protect themselves and others, emphasizing the role of the police as a service to citizens. Madrid police tweeted various alerts being activated due to adverse weather conditions. As a result, El Retiro and other city parks implement special measures to maintain safety in certain areas.

  Madrid makes specific announcements from public safety during the night, including information about police patrols, emphasizing their round-the-clock availability and commitment to ensuring citizens' safety. Additionally, London police provide personal safety advice to help protect individuals from street robberies.

- General announcement:
  The Roma police account involves the reopening of various unspecified establishments or services.

Emergency Reporting Guidelines

As discussed in a prior biography section 3.3, most accounts clarify that Twitter is not a 24/7 monitored platform and inappropriate for reporting immediate incidents. However, police encourage the public to make reports. Thus, various city police account regularly offer guidelines for emergencies and reporting.

City police of Rome, Paris, and Copenhagen disseminate information about important emergency contact numbers and their availability. The Vienna Police provides details about designated team members who handle emergencies. Riga's police underscore the importance of reporting violations to the relevant authorities via phone calls or mobile applications.

The Metropolitan Police Service Contact Centre (@MetCC) in London, due to its primary role, publishes a substantial number of tweets about reporting guidelines. These tweets include information about the availability of assistance and reporting non-emergency situations, urgent call guidelines, and the process of online reporting of antisocial behavior (like loud music, vandalism, and antisocial drinking).

Seek public assistance

Many city police accounts seek public assistance, including calls for witnesses and searches for criminals.

- Calls for witnesses:
  Amsterdam police actively sought witnesses to violent incidents, like stabbings, shootings, and robberies. They shared the case information to call for public assistance and witnesses. The police are making efforts to share the case information, descriptions, or images of suspects. Bern police also appealed to potential witnesses concerning several incidents resulting in serious injury. Vienna police conduct public searches for several criminals.

- Reports on misbehavior and crime:
  City polices also encourage people to make reports on misbehavior and crime. London police regularly request individuals to direct message (DM) them to provide additional details regarding various incidents or concerns, ensuring a more personalized and private communication channel. Vienna police provide instructions on how to report incidents. They encourage individuals to send emails detailing all relevant information for an investigation.

Traffic Management and Driving Control

The dynamics of traffic Management and driving control across various cities prominently feature in the police account tweets.

- Traffic management:
  Complex traffic challenges during public events such as football matches and demonstrations have been mentioned, particularly in Madrid and Copenhagen. Notably, these cities proactively provide advice and information about traffic for football matches. Information includes events routes, reminders about potential traffic cuts and parking restrictions in the area, and the suggestion to use public transportation as an alternative to private vehicles. On the other hand, Oslo exhibits frequent traffic incidents and reports vehicle accidents and obstructions. Similarly, Berlin, Stockholm, Roma, and Lisbon routinely report traffic disruptions, such as road closures due to accidents or ongoing maintenance work. Additionally, Prague provides specific information on scheduled traffic restrictions, highlighting a preventive approach to traffic management.

- Driving control:
  Driving control appears in some cities' police accounts. Madrid police highlighted warnings against drunk driving alongside the police's plans to carry out breathalyzer controls. Oslo's police force often intercepts suspicious drug-affected drivers. Prague police also brought up the prevalence of substance-influenced driving. Meanwhile, Copenhagen police enforce reckless driving by seizing vehicles and revoking driving licenses.

Drugs and alcohol-related issues

Beyond substance-influenced driving, drug and alcohol issues surface regularly in city police's tweets.

Drug busts are a common topic frequently in various city police accounts of Warsaw, Lisbon, Prague, Copenhagen, Paris, Helsinki, Berlin, Roma, and Madrid, where authorities actively arrest individuals involved in drug trafficking and possession. In addition, Stockholm's police regularly report public intoxication incidents across the city.

City-Specific Focus in Account Tweets

While city police accounts share various common topics, each city exhibits unique tendencies.

As previously mentioned, London police dedicate a significant portion of their tweets to reporting guidelines, assisting the public in effectively reporting and responding to incidents. The Vienna police invest effort into enhancing the public's understanding of police work, offering insights into daily operations, terminology, and procedures. The topics covered by Prague's police extend to public appreciation for police work and police participation in diverse activities. The Amsterdam and Stockholm police accounts predominantly focus on the crime spectrum within their respective cities, indicating their focus on public safety and crime prevention.

7.1.3 Topics in Search Tweets

Search tweets include many topics, ranging from mundane daily chores, casual interactions, and personal life experiences to strictly political advocacy and discussion of social issues. The tone of these tweets exhibits great diversity, transitioning from quiet conversations and everyday interactions to heated statements and controversial discussions, sometimes even including offensive language and name-calling.

Common Topics in Search Tweets

Nonetheless, we can see many prevalent topics across most cities, including public sentiments towards incidents, safety concerns, societal discussions, and law enforcement opinions.

Public safety concerns and crime rates figure prominently in discussions, especially in densely populated cities. For example, Tweets from Amsterdam show public concerns regarding societal degradation and rising crime rates and urge the police to respond.

Traffic management and road safety formed a significant portion of the search tweets, encapsulating demands for traffic regulation modifications, driving control issues, and complaints about illegal parking. Search tweets from Copenhagen, Warsaw, Berlin, and Lisbon, in particular, talk about cycling in the city. They specifically mentioned the necklaces of bicyclists against pedestrians or the threat of cars against bicyclists.

Most city police search tweets include public sentiments about police performance and conduct, ranging from negative criticism of perceived police abuse of force and criticism of police actions in certain incidents to positive acknowledgment and appreciation of police performance. Specific references to the police's social media management can be found in Helsinki and Oslo search tweets, where Helsinki search tweets criticize the practice of closing comments and hiding

replies; on the other hand, search tweets of Oslo contain appreciation for the police's sense of humor on social media. Notably, the London search tweets also shed light on the aftermath of police actions in response to public reactions. London police have expressed regret and issued apologies for arrests made during nonviolent protests, a subject that has garnered significant attention in public discourse.

Search tweets in several cities consistently feature reports of incidents and call for police action, including on topics as diverse as crime, misconduct, and accidents. London's search tweets referenced incidents that could trigger violence; Amsterdam's reported on transportation accidents; Lisbon's on instances of nighttime incidents. Meanwhile, search tweets in Helsinki highlighted the misuse of public facilities for illegal substances. In Copenhagen, the search tweets draw attention to deceptive emails mimicking police communication.

City-Specific Focus in Search Tweets

Influenced by culture, economy, national policy, and population structure, each city exhibits unique focus areas. Stockholm's search tweets highlight concerns about a surge in crime. Lisbon's reflects a public perception of anti-drug trafficking efforts. Amsterdam's frequently referred to incidents of urban burglary.

Bern's focused on gun-related issues, discussing the presence of real or fake firearms in public places.

Environmental concerns feature prominently in Madrid's search tweets, with public discontent over the lack of green spaces and urban deforestation, such as cutting trees.

Discussions in Riga's search tweets emphasize the issue of improperly parked scooters and advocate for the city's cleanliness.

Prague's search tweets include diverse subjects like taxation and personal wildlife encounters. Oslo's cover many loosely connected topics, such as personal experiences, conflicts, and missing-person investigations. Life experiences within Lisbon and Oslo also characterize tweets from these cities.

Paris's search tweets have the most diverse themes, emphasizing public gatherings aimed at expressing collective sentiments about political or social issues, such as protests, marches, demonstrations, and terrorism. They also contain public perceptions of the police response to these gatherings. We can align this with Paris's daily peak due to a protest in the city 5.1.

The discourse in London's search tweets is politically oriented. It contains demands for the prosecution of politically affiliated suppliers and calls for transparency and fairness in government and the judicial system. Also, Bern's include political discussions about the security needs of the Russian embassy for protection due to the war in Ukraine.

Certain cities incorporated discussions related to religion and multiculturalism. Copenhagen's search tweets relate to a controversial religious incident involving the persecution of a priest. Oslo's reflects criticism and issues related to certain religious and ethnic communities. Certain phrases in Amsterdam's search tweets expressed concerns about the impact of multiculturalism. Conversely, Stockholm's criticized insensitivity to offended Muslims and advocated radical reforms within the Swedish authorities, hinting at potential tensions between different cultural and religious communities.

Media-related conflicts are also the subject of search tweets in Paris and Warsaw. In particular, the discussion in Warsaw focused on an issue of misrepresentation of the privacy of the victim's parents in the media.

Discussions around the city's nightlife emerged in search tweets from Paris and Lisbon. In Paris's search tweets, the discourse centers around strict public control measures implemented at night. In contrast, Lisbon's reported violations related to the city's nightlife.

7.1.4 Topics Comparison

The connection between account and search tweets varies across cities. Bern lacks an evident connection between these tweets data types, while Amsterdam, Berlin, London, and Stockholm exhibit close alignment.

- London: Account tweets focus on reporting channels and citizen engagement, while search tweets highlight authorities' accountability.
- Amsterdam: Both account and search tweets seek assistance. Account tweets involve police requesting public help in investigations, while search tweets express urgency for support and attention.
- Berlin and Stockholm: Both tweet types cover similar crimes and incidents, including discussions on drone surveillance in Stockholm.

Some other cities share one prominent topic in both sets of tweets:

- Warsaw and Rome: Both types of tweets address Drug-Related Incidents. In Rome, account tweets are about arrests, while search tweets mention protests against drug consumption.
- Prague: Account tweets showcase diverse police activities, while search tweets express dissatisfaction and criticism of police efficiency.
- Helsinki: Account tweets investigate a violent video, while search tweets raise concerns about online bullying and police response.
- Paris: Account tweets highlight prompt police response, arrests, and domestic situations, while search tweets mention area controls and drone surveillance.
- Madrid: Both types of tweets touch on environmental matters, with account tweets focusing on waste disposal and search tweets addressing local environmental issues.
- Vienna: Account tweets engage the public, ask for tips, and explain police terminology, while search tweets express gratitude and recognition of police response.

Account and search tweets across cities commonly involve traffic and crime issues. However, their content differs in perspective and focus. Account tweets are from the perspective of law enforcement and provide more official updates, policing activities, safety measures, and public service announcements. Whereas search tweets, from the public's perspective, encompass public opinions on police work, concerns about public safety, political issues, and personal experiences. These variations are likely due to differences in priorities and perceptions between the official Paris police account and the general public discourse.

Unlike Vienna, both account and search tweets refer to a specific protest, climate activists' blockades. Specific cases mentioned in each tweet type have minimal overlap due to their different time ranges, where account tweets cover a longer period as shown in[section data topology4.2, and search tweets are from the recent two months.

7.2 Sentiment in Account and Search

The sentiment expressed in city police related tweets can provide valuable insights into police communication style and the public perception of their messages. This report examined three

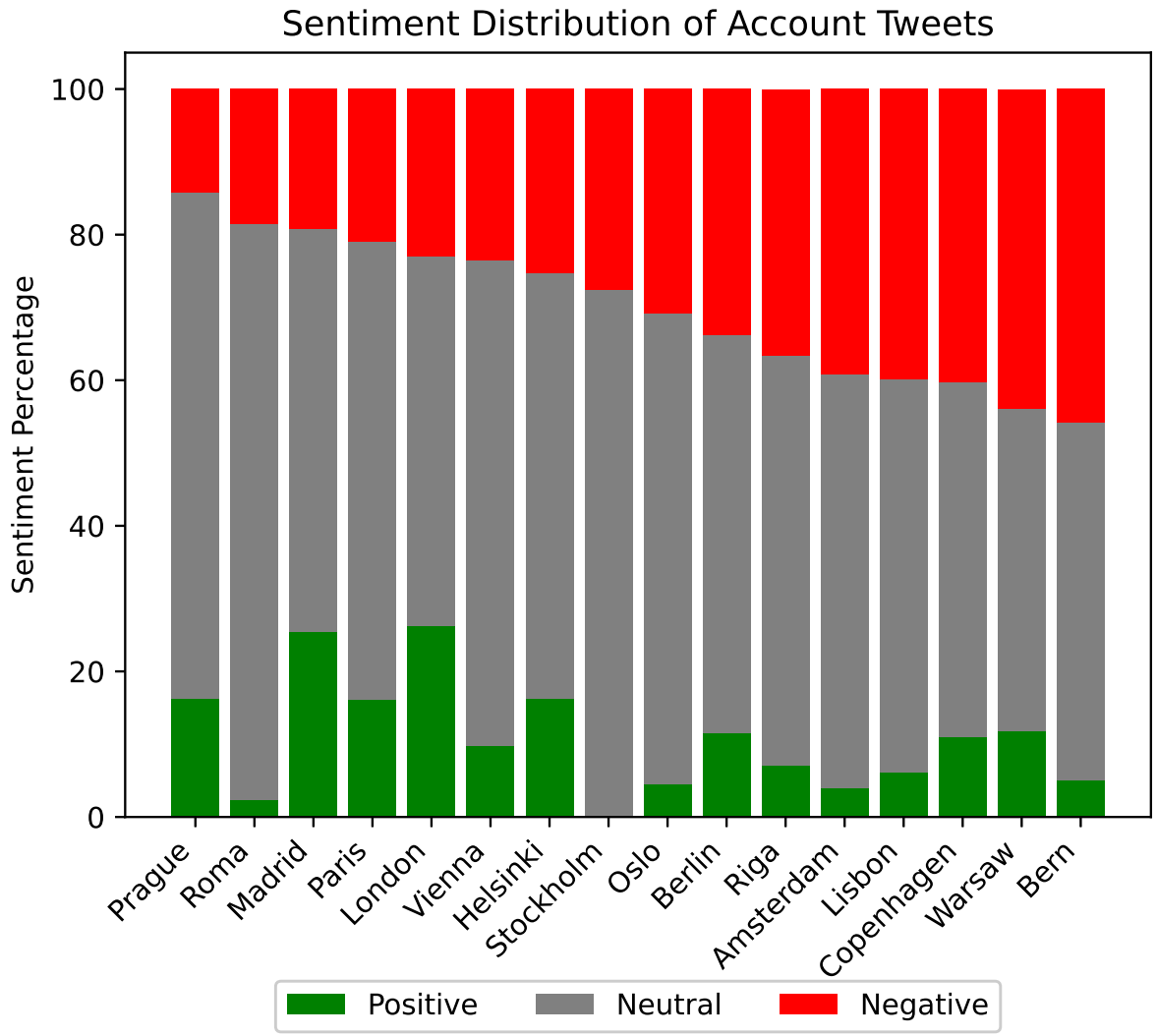

Figure 7.1: Sentiment Distribution of Account Tweets

types of sentiment (positive, neutral, and negative) in both account and search tweets. A RoBERTa-base model[3], specifically trained on tweets and fine-tuned for sentiment analysis, was utilized to assign sentiment labels to each tweet.

Figure 7.1 presents a stacked bar chart demonstrating the sentiment distribution of account tweets. The height of each bar corresponds to the proportion of tweets with a specific sentiment label. Notably, the neutral sentiment dominates account tweets, likely because the main role of official police accounts is to disseminate information.

Account tweets of Bern and Warsaw have the highest percentage of negative tweets, at 45.82% and 44.29%, respectively. The main themes of Bern's account tweets were calls for witnesses and reactions to public events, while Warsaw's tweets were mainly related to crime.

In contrast, account tweets of London and Madrid have the highest percentage of positive tweets, at 26.27% and 24.45%, respectively. London's account tweets consistently provide updates and encourage citizen cooperation, while Madrid frequently issues reminders and safety alerts for the public.

Figure 7.2 represents the sentiment distribution in search tweets, with a significantly higher

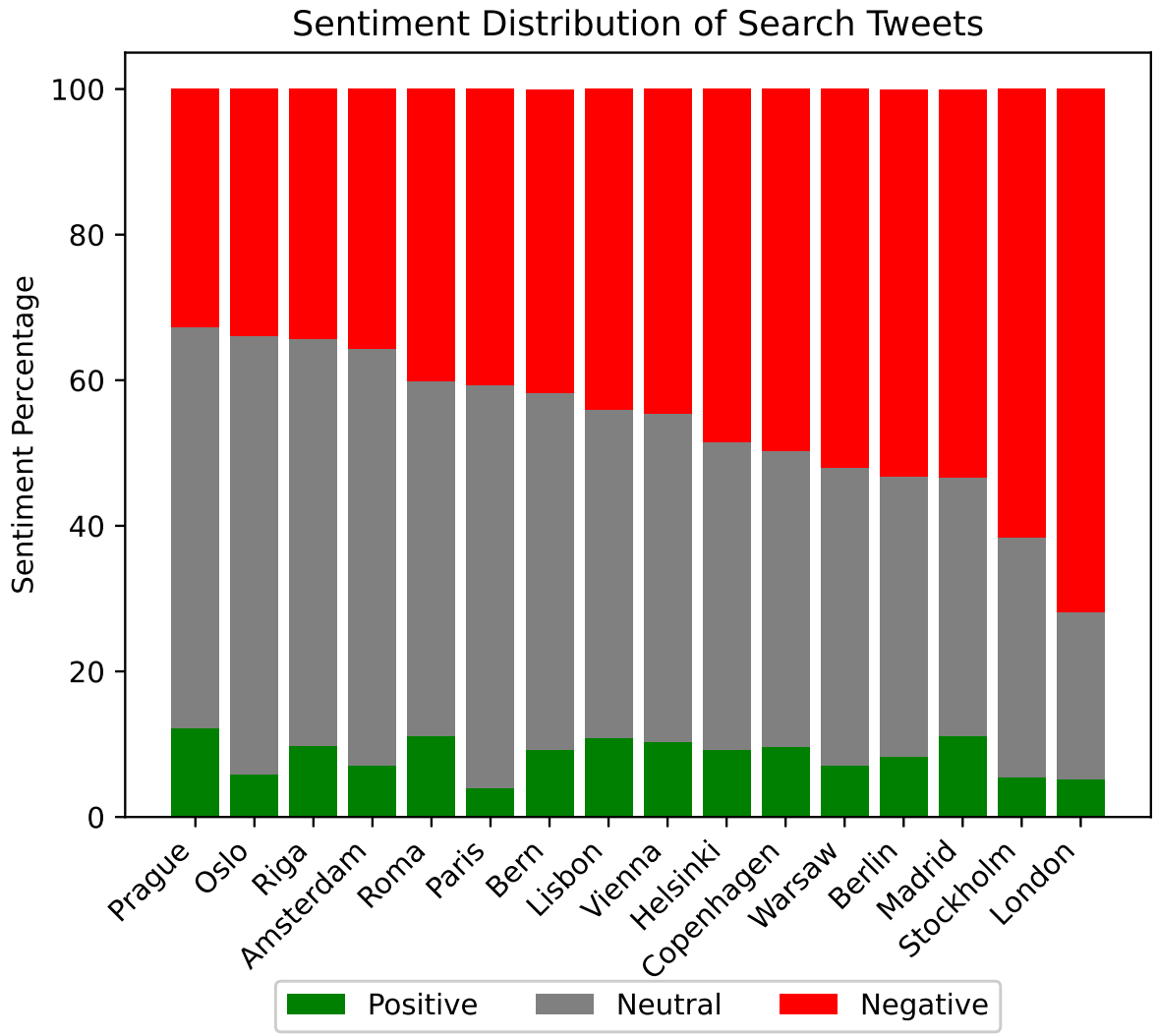

Figure 7.2: Sentiment Distribution of Search Tweets

percentage of negative tweets, averaging 46.14% of all search tweets, compared to only 8.5% for positive sentiment. Interestingly, while London's account tweets had the highest positive sentiment among account tweets, they had the most significant proportion of negative sentiment among search tweets at 71.88%. Stockholm follows closely behind, with 61.6% of search tweets expressing negative sentiments.

A large proportion of search tweets in London emphasized calls for accountability and fairness. Stockholm's search tweets, on the other hand, primarily focused on crime reporting and public security concerns.

Finally, figure 7.3 depicts the sentiment distribution of different tweet types for each city in one view. Some cities exhibit consistent sentiment distribution patterns, while others show apparent differences between account and search tweets. This contrast is particularly evident in London, Stockholm, and Madrid. Most of their account tweets were neutral, yet over half of their search tweets conveyed a negative tone.

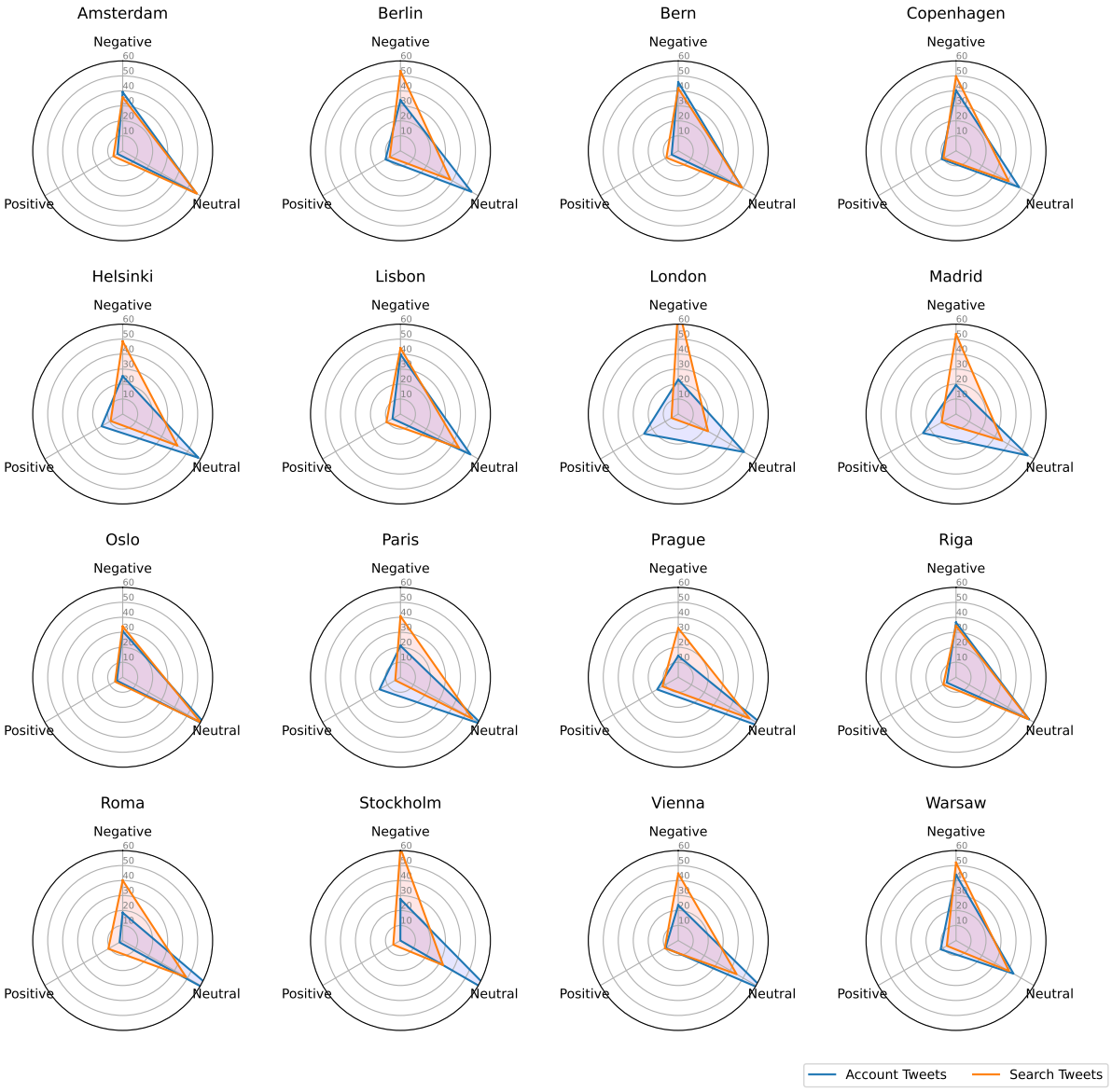

Figure 7.3: Sentiment Distribution of Each Account and Search Tweets

Chapter 8

Discussion and Conclusion

8.1 Results

We answer the research questions by summarizing the main findings:

RQ 1: Various city police accounts assert that Twitter isn't an apt medium for crime reporting or emergency service, instead pointing users to appropriate emergency contact channels or official websites.

Tweets frequency and timing differ among police departments. They often use social media more frequently during special events or emergencies. For example, Vienna and Berlin-1 police departments initiated live-tweeting events known as Twitter marathons. While Rome and Prague's police Twitter accounts are inactive, they remain active on other platforms like Facebook and Instagram.

The frequency of retweets also varies, with Helsinki and London's police accounts showing a higher tendency to retweet. In contrast, Vienna, Oslo, and Lisbon's police have lower retweet ratios. Accounts of government bodies, local law enforcement, emergency services, and transportation services were often retweeted, reflecting the departments' duties. Future research could explore why retweet ratios vary among cities and the type of content retweeted.

All police accounts used resource-sharing, with over 80% of tweets from ten accounts featuring shared resources such as photos and links. There was, however, no correlation between media content and engagement levels, which contradicts the general assumption.

Generally, police accounts restricted their posted URLs to official city authorities' websites or similar sources. Copenhagen, Vienna, Berlin, and Paris police accounts tweeted links of their own or other city-related Twitter accounts and social media platforms.

Local languages predominantly feature in all city police accounts' tweets, as well as search tweets. Interestingly, despite English tweets being aimed at an international audience, their topics aligned closely with all tweets.

Hashtags were more frequently used in account tweets than search tweets, with city names and police-related terms commonly used. Account tweets of Berlin, Madrid, and Rome had the most diverse hashtag vocabulary, indicating a wide array of topics and interests.

RQ 2: Topic modelling revealed various subjects in account tweets closely associated with police duties, such as police action and response, emergency reporting guidelines, traffic management, and control. Furthermore, issues related to drugs and alcohol were frequently mentioned, and the platforms also served as public relations outlets, highlighting police work.

Some city police department exhibits a unique focus on Twitter. Vienna police strive to help the public understand their work, London police provide reporting guidelines, Prague police highlight public appreciation, and Amsterdam concentrates on crime-related topics.

Search tweets often discuss disparate topics about city police, primarily complaints or concerns over crime rates and public safety. City-related search tweets have various focuses; Paris police's search tweets focused on public gatherings, Madrid's on environmental issues, and Copenhagen's, Oslo's, and Amsterdam's on crime-related and multicultural concerns.

The sentiment of tweets aligns with their topics, with account tweets generally neutral and search tweets primarily negative.

8.2 Future Work

Because of the richness of the data set collected, there is a range of potential avenues for future investigations. Future research could assess the popularity of Twitter in each city or country. At the same time, demographic analysis of followers and the following could shed light on the social network structure of these accounts.

In addition, a detailed survey could be conducted to understand the content retweeted by these police accounts. Such as what topics are being retweeted by accounts with high retweet ratios; conversely, how do accounts with lower retweet ratios share similar types of information? Meanwhile, an analysis could be done on hashtags, investigating their meaning and role in driving engagement

Moreover, linking engagement and topics to an activity timeline can provide a clearer picture of how discussions evolve. And the tone conveyed in account, and search tweets can enhance our understanding of the emotional fluctuations involved in interactions and topics.

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Appendix A

Appendix-table

City	Collected_account_tweets	Start_account_date	End_account_date
Amsterdam	3364.0	2019-09-12	2023-06-01
Berlin	6947.0	2018-10-03	2023-06-01
Bern	3354.0	2019-09-19	2023-06-01
Copenhagen	3448.0	2020-08-07	2023-06-01
Helsinki	3401.0	2020-08-11	2023-06-01
Lisbon	3286.0	2015-08-25	2023-05-27
London	12244.0	2019-11-27	2023-06-01
Madrid	3535.0	2021-10-25	2023-06-01
Oslo	4188.0	2022-09-02	2023-06-01
Paris	3552.0	2021-02-03	2023-06-01
Prague	365.0	2016-12-20	2023-03-06
Riga	3238.0	2016-02-26	2023-05-31
Roma	6399.0	2016-10-19	2023-01-06
Stockholm	3907.0	2022-07-20	2023-06-01
Vienna	3955.0	2022-09-26	2023-06-01
Warsaw	3507.0	2020-05-23	2023-06-01

Table A.1: Collection Account Tweets

City	Collected_search_tweets	Start_search_date	End_search_date
Amsterdam	2313.0	2023-04-04	2023-06-01
Berlin	75244.0	2023-03-27	2023-06-01
Bern	186.0	2023-04-06	2023-05-31
Copenhagen	1690.0	2023-04-01	2023-06-01
Helsinki	2810.0	2023-04-01	2023-06-01
Lisbon	204.0	2023-04-05	2023-05-31
London	218133.0	2023-04-01	2023-06-01
Madrid	13387.0	2023-04-01	2023-06-01
Oslo	1418.0	2023-04-01	2023-06-01
Paris	43493.0	2023-03-31	2023-06-01
Prague	750.0	2023-04-04	2023-06-01
Riga	797.0	2023-03-18	2023-06-01
Roma	606.0	2023-04-04	2023-06-01
Stockholm	978.0	2023-04-02	2023-06-01
Vienna	6491.0	2023-04-05	2023-06-01
Warsaw	4495.0	2023-04-01	2023-06-01

Table A.2: Collection Search Tweets

Table A.3: Region Populations

Region	Population	Date	Resource
Amsterdam (include Amstelveen, Diemen,Uithoorn)	1,079,079	01-01-2023	[7]
Berlin	3,769,495	2021	[1]
Bern(Canton)	1,047,422	2022	[11]
Copenhagen	653,664	01-01-2023	[12]
Helsinki	656,920	31-12-2020	[13]
Lisbon	2,727,000	2022	[8]
London	8,799,800	Mid-2021	[2]
Madrid	3,305,408	01-01-2021	[5]
Oslo(include Asker and Bærum)	1,064,235	2022	[15]
Paris (district: 75,92,93,94)	2,102,650	01-01-2023	[3]
Prague	1,357,326	01-01-2023	[14]
Riga	614,618	2022	[16]
Rome	4,216,553	01-01-2023	[4]
Stockholm	984,748	31-12-2022	[9]
Vienna	1,982,097	01-01-2023	[10]
Warsaw	1,863,056	Dec-2022	[6]

[1] https://www.statistik-berlin-brandenburg.de/bevoelkerung

[2] https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/bulletins/populationandhouseholdestimatesenglandandwales/census2021

[3] https://www.insee.fr/fr/statistiques/1893198#consulter

[4] http://dati.istat.it/?lang=en#

[5] https://www.ine.es/jaxiT3/Datos.htm?t=2911#!tabs-tabla

[6] https://stat.gov.pl/obszary-tematyczne/ludnosc/ludnosc/powierzchnia-i-ludnosc-w-przekroju-terytorialnym-w-2022-roku,7,19.html

[7] https://opendata.cbs.nl/statline/#/CBS/nl/dataset/70072ned/table?dl=3B993

[8] http://www.demographia.com/db-worldua.pdf

[9] https://www.scb.se/en/finding-statistics/statistics-by-subject-area/population/population-composition/population-statistics/pong/tables-and-graphs/population-statistics---year/swedens-50-largest-municipalities-2022/

[10] https://www.statistik.at/en/statistics/population-and-society/population/population-stock/population-at-beginning-of-year/quarter

[11] https://www.pxweb.bfs.admin.ch/pxweb/en/px-x-0102020000_202/px-x-0102020000_202/px-x-0102020000_202.px/table/tableViewLayout2/

[12] https://www.statbank.dk/statbank5a/SelectVarVal/Define.asp?MainTable=FOLK1A&PLanguage=1&PXSId=0&wsid=cftree

[13] https://www.hel.fi/hel2/tietokeskus/julkaisut/pdf/21_06_09_Helsinki_facts_and_figures_2021.pdf

[14] https://www.czso.cz/csu/czso/population-of-municipalities-1-january-2023

[15] https://www.ssb.no/statbank/table/05277

[16] https://www.riga.lv/en/riga-numbers

City	Top3 Account Lang	Top3 Search Lang
Amsterdam	{'nl': 3293, 'en': 20, 'de': 4}	{'nl': 2061, 'en': 77, 'es': 15}
Berlin	{'de': 6795, 'en': 63, 'nl': 11}	{'de': 67650, 'en': 3570, 'nl': 146}
Bern	{'de': 3314, 'en': 13, 'fr': 10}	{'de': 162, 'fr': 6, 'en': 5}
Copenhagen	{'da': 3410, 'en': 29, 'no': 3}	{'da': 1447, 'en': 58, 'no': 34}
Helsinki	{'fi': 3104, 'sv': 130, 'en': 107}	{'fi': 2524, 'en': 39, 'et': 36}
Lisbon	{'pt': 2782, 'es': 346, 'en': 16}	{'pt': 178, 'es': 5, 'in': 2}
London	{'en': 12169, 'fr': 1, 'tr': 1}	{'en': 207287, 'es': 1191, 'ur': 302}
Madrid	{'es': 3478, 'en': 37, 'pt': 13}	{'es': 12688, 'pt': 60, 'en': 54}
Oslo	{'no': 4126, 'da': 52, 'sv': 3}	{'no': 1035, 'da': 128, 'en': 63}
Paris	{'fr': 3509, 'en': 7, 'es': 6}	{'fr': 41488, 'en': 659, 'es': 58}
Prague	{'cs': 341, 'pl': 2, 'en': 1}	{'cs': 676, 'en': 23, 'pl': 5}
Riga	{'lv': 3197, 'en': 4, 'in': 1}	{'lv': 738, 'ru': 8, 'en': 5}
Roma	{'it': 6049, 'en': 32, 'pt': 8}	{'it': 509, 'en': 15, 'es': 13}
Stockholm	{'sv': 2755, 'no': 627, 'da': 192}	{'sv': 767, 'en': 79, 'fr': 27}
Vienna	{'de': 3722, 'en': 79, 'lt': 3}	{'de': 5801, 'en': 185, 'tr': 31}
Warsaw	{'pl': 3502, 'en': 1}	{'pl': 4203, 'en': 21, 'cs': 7}

Table A.4: Top 3 languages of account and searches tweets.

Table A.5: Retweets of Account Tweets

City	retweet percentage	quoted percentage on retweets	percentage of self retweet
Amsterdam	11.5	2.33	1.55
Berlin	7.95	11.96	4.53
Bern	1.82	3.28	0.0
Copenhagen	4.29	12.16	11.49
Helsinki	18.26	11.43	0.97
Lisbon	0.27	0.0	0.0
London	21.61	3.93	4.12
Madrid	2.23	0.0	2.53
Oslo	0.31	0.0	15.38
Paris	11.23	7.52	5.51
Prague	4.93	5.56	0.0
Riga	4.48	9.66	0.0
Rome	1.56	4.0	49.0
Stockholm	0.0	0.0	0.0
Vienna	0.13	0.0	0.0
Warsaw	11.58	0.74	0.0

City	Top3_mentioned_accounts	Top3_retweeted_accounts	Top3_Reply_accounts
Amsterdam	AmsterdamNL, BrandweerAA, Politie	AmsterdamNL, BrandweerAA, Burgernet_NH	POL_Amsterdam, Nikya33, benMetMax
Berlin	Berliner_Fw, GStABerlin, polizeiberlin	GStABerlin, PolizeiBerlin_P, VIZ_Berlin	polizeiberlin, PolizeiBerlin_E, Reporter$_{F}lash$
Bern	Bern_Stadt, UQUky, kanton_bern	SKPPSC, fedpolCH, kanton_bern	PoliceBern, CenaJohannes, VeritasLos
Copenhagen	AnklagereKbh, KobenhavnPoliti, Rigspoliti	AnklagereKbh, KobenhavnPoliti, Rigspoliti	KobenhavnPoliti, AsserFahrenholz, MalikaAndersen
Helsinki	DPasterstein, HelsinkiPoliisi, SuomenPoliisi	DPasterstein, Sisaministerio, SuomenPoliisi	HelsinkiPoliisi, KarnaMikko, ambrowoll
Lisbon	PSPCOMETLIS, PSP_Portugal, YouTube	CamaraLisboa, PSP_Portugal, ansegrodoviaria	PSPCOMETLIS, CamaraLisboa, AntnioFreire2
London	MetCC, MetPoliceEvents, metpoliceuk	CityPoliceCops, MetPoliceEvents, ansegrodoviaria	CityPolice, metpoliceuk, MetCC
Madrid	DGTes, MADRID, SAMUR_PC	EmergenciasMad, MADRID, cgm_madrid	policiademadrid, Madridonasangre, BomberosMad
Oslo	VTSost, oslopolitiops, politietost	VTSost, oslopolitiops, politietost	oslopolitiops
Paris	GDarmanin, PompiersParis, prefpolice	GDarmanin, Interieur_Gouv, nicolas_nordman	prefpolice, PMdeParis, Ugobernalicis
Prague	HasiciPraha, MP_Praha, PolicieCZ	HasiciPraha, PolicieCZ, PrahaEU	MP_Praha, Milena67074990, ivan_pilip
Riga	MStakis, RigasDome, Valsts_policija	RigasDome, Valsts_policija, ltvzinas	RigasPP, saliktengriba, jaanisosiits
Roma	PLRomaCapitale, Roma, poliziadistato	PLRomaCapitale, Roma, poliziadistato	luli___67, PLRomaCapitale, StranoAlex
Stockholm			
Vienna	Stadt_Wien, letztegenAT, wienerlinien	Esterreicherr, LPDnoe, Stadt_Wien	LPDWien, BeeDj21, bakiwaka_
Warsaw	MSWiA_GOV_PL, Policja_KSP, PolskaPolicja	CBSPolicji, MSWiA_GOV_PL, PolskaPolicja	Policja_KSP, mfirko, mbCARMAC

Table A.6: Top 3 mentioned accounts, retweeted accounts, and reply accounts

Appendix B

Appendix-plot

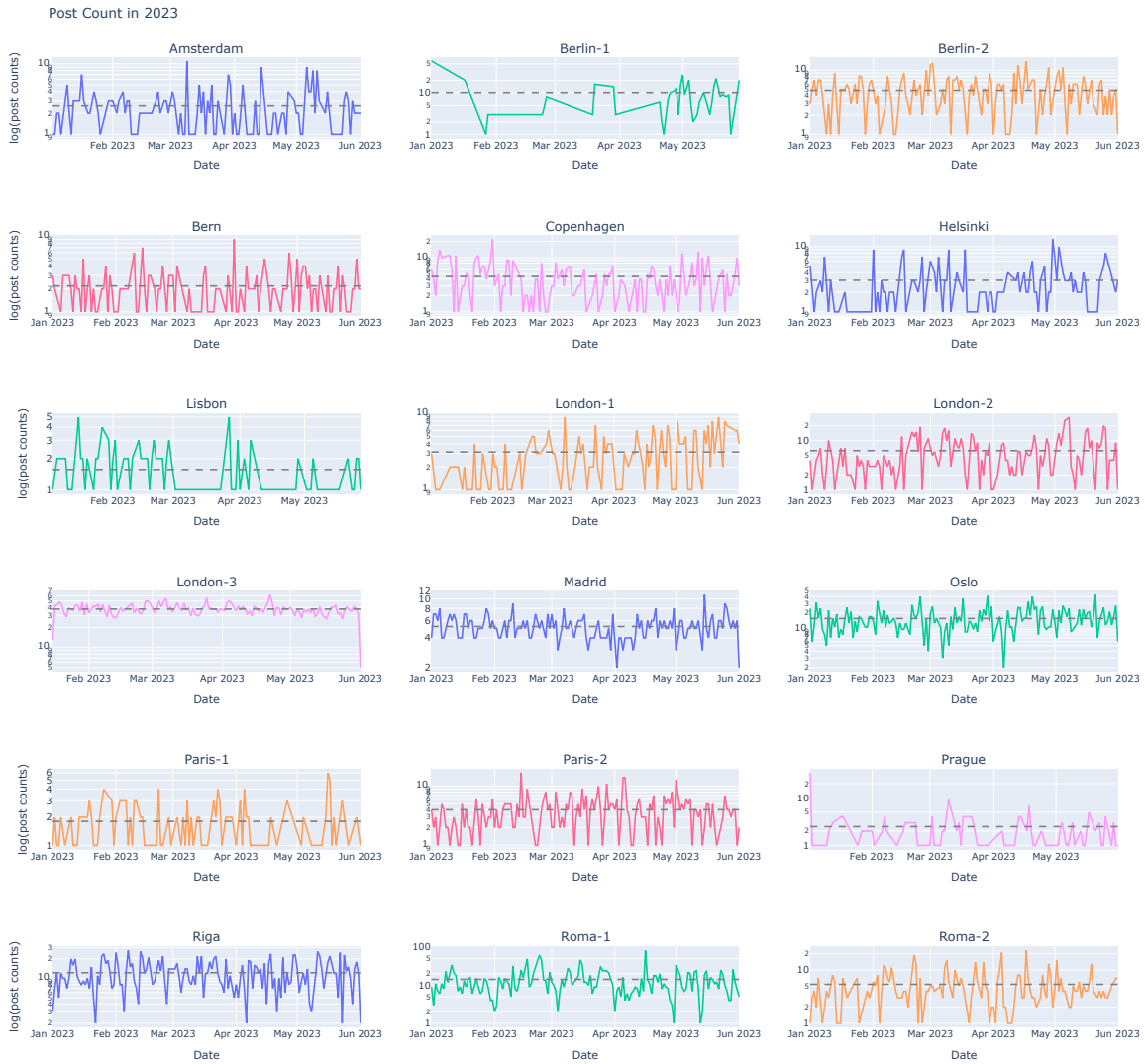

Figure B.1: 2023 Daily Post Counts of Account Tweets

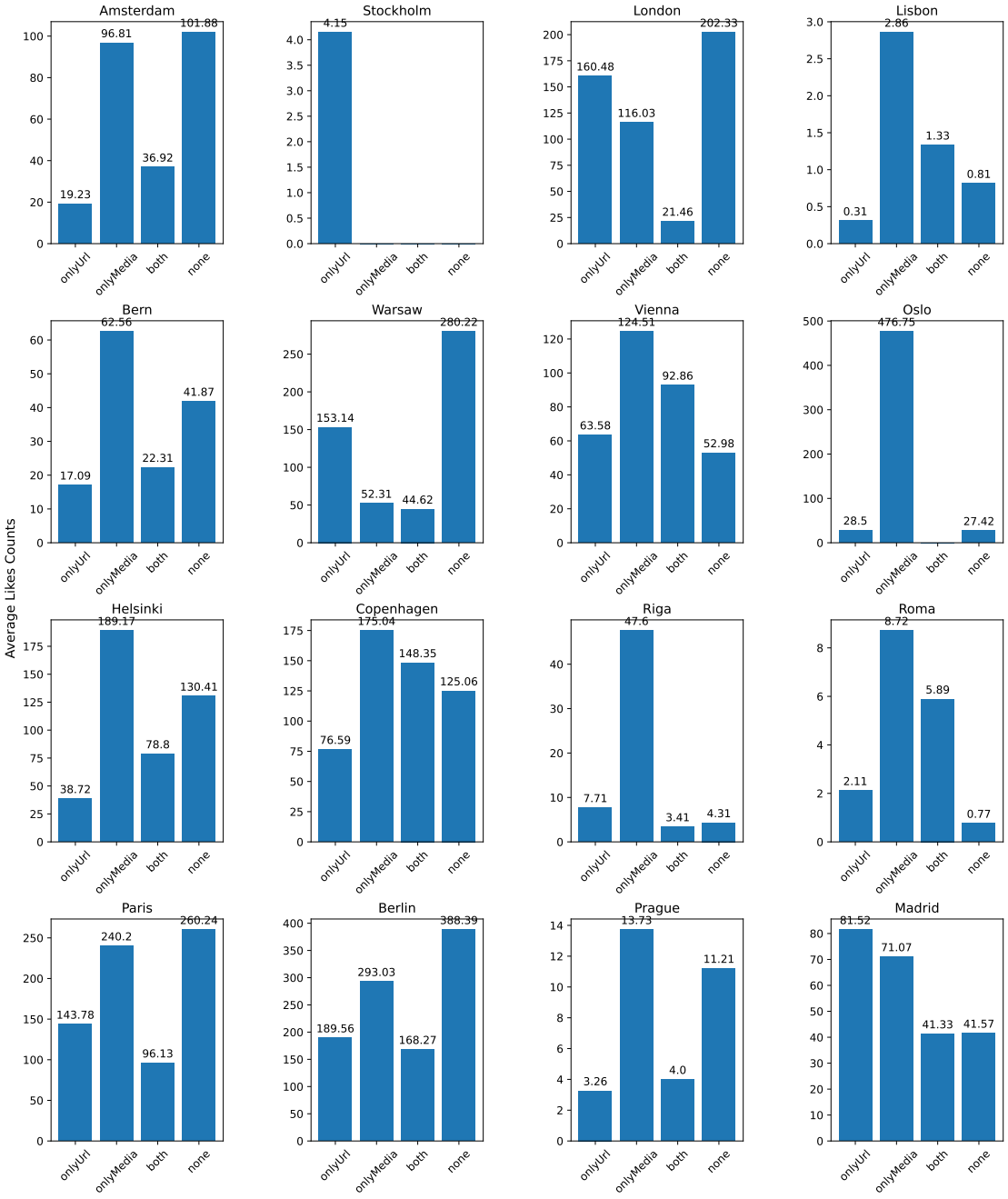

Figure B.2: Retweets and Likes Counts for Resource Sharing Types