OLAn: Offensive Language Analytics*
User Manual

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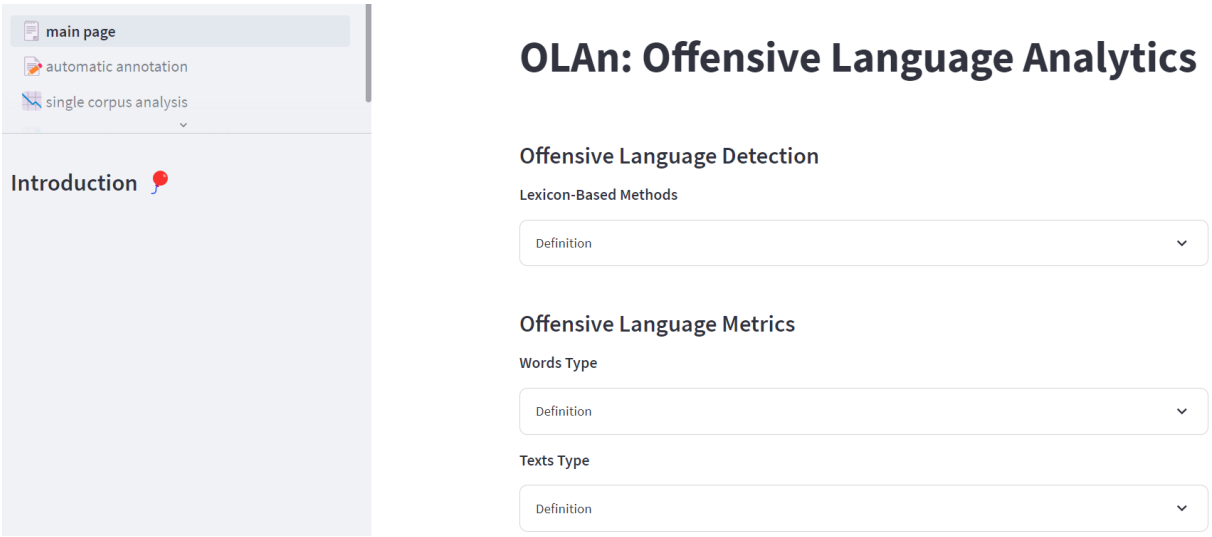


Introduction

Offensive Language Analytics (OLAn) is a social media analysis technology developed to understand the use of offensive language in social media discourse. This manual is specifically designed to guide users through the fundamental functionalities of the OLAn Interface. The core capability of OLAn lies in its ability to analyse public reactions to climate change-related discussions on social media, especially those responses to tweets from social figures who raise public awareness during the Conference of Parties (COPs). By doing so, OLAn provides valuable insights into the nature and dynamics of offensive language used in online conversations about climate change. This understanding is essential not only for moderating online discourse but also for comprehending broader social attitudes and behaviours related to climate change.

*Available at `https://newethos.org/technologies/`

Contents

1 Overview to OLAn: Offensive Language Analytics

Welcome to the User Manual for the OLAn Interface, a comprehensive guide designed to help users effectively navigate and utilise our advanced visualisation tools for offensive language analytics. Built upon the Streamlit Library, the OLAn Interface provides an intuitive account of offensive language usage in online responses to social figures discussing climate change during the Conference of Parties (COP) events. This manual aims to familiarise users with the key features, functionalities, and components of our interface to offer an optimised user experience.

2 Offensive Language Analysis Metrics

2.1 Words Type

To detect offensive words in climate discourse, we decided to rely on the lexicon used by Gorrell et al. (2020). Its vocabulary is mostly extracted from Hatebase which is a repository containing over 3,893 offensive words (https://hate base.org/). The words are chosen to fit a political atmosphere and are divided into three different categories; *slurs words*, *rude words* and *sensitive words*. Respectively, the lexicon is split between 1081 *slur words*, 131 *rude words* and 451 *sensitive words*. We defined the meaning as follows:

- *Slur words* are insults or disparaging remarks that aim to humiliate a person or a group's identity.
- *Rude words* are less intense and are "commonly" aggressive. Most of the time it will take the form of a colloquial expression or an interjection.
- *Sensitive words* are identity markers that can be used in a hurtful and hateful way. They will often be linked to stereotypes and take the form of abuse when linked to slurs or rude words.

Expanding the lexicon used for offensive language detection is a critical aspect of refining our methodology. We identify new potentially offensive words and phrases from large volumes of text data from social media, forums, and online communities. Human annotators assess the relevance and context of potential additions to the lexicon. In total, our lexicon has resulted in 1082 slur words, 134 rude words, and 679 sensitive words.

2.2 Texts Type

A rule-based approach was then used to define offensive language. When sentences exclusively contain sensitive words they are labelled as *potentially abusive*. It means that the context is needed to classify the sentence are abusive or not. When the sentence is composed of at least one slur or rude word then it is labelled as *actually abusive*. Sentences that have no matching words in the dictionary are defined as *non-abusive*.

2.3 User Type

Considering that we are analysing user replies, we calculated the percentage of actually abusive posts sent by each user, as the abusiveness score, to evaluate the offensive tendency

of each user. Users with an abusiveness score near 1 are considered highly offensive, indicating most of their posts are abusive indeed. Conversely, a score close to 0 signifies a more neutral user, with mostly neutral posts. We classify users into five categories based on their abusiveness score: Neutral (score = 0), Mildly Offensive (0 < score < 0.5), 50-50 Offensive (score = 0.5), Intensively Offensive (0.5 < score < 1), and Extremely Offensive (score = 1).

3 General Structure

A comprehensive analytical framework forms the backbone of the OLAn interface. The primary components of this framework include:

- Corpora Selection: Choose the data that needs to be analysed according to different analysis purposes (*Single Corpus Analysis* vs *Comparative Corpora Analysis*).
- Analysis Unit Selection: Select the aspect of analysis, such as words (*Word-based analysis*), posts (*Post-based analysis*) or users (*User-based analysis*).
- Time Scale Selection: Select the desired time scale - choose "overall" for analysis without time sequencing, or "temporary" to incorporate time sequence considerations.
- Analytics Module Selection: Choose various functionalities to analyse data within different analysis aspects (analysis units).

Figure 1 offers a detailed visual representation of these components and their interrelations. In the designed interface, the left-hand sidebar (as illustrated in Figure 2) serves as the main navigation component, providing an overview of the interface's general structure. The following section provides a deep dive into the fundamental components of our interface, which are pivotal for understanding the OLAn interface. To offer a streamlined instruction, we'll delve into the specifics of **Corpora Operation**, **Analysis Unit Selection**, **Time Scale Selection** and **Analytics Module Selection**.

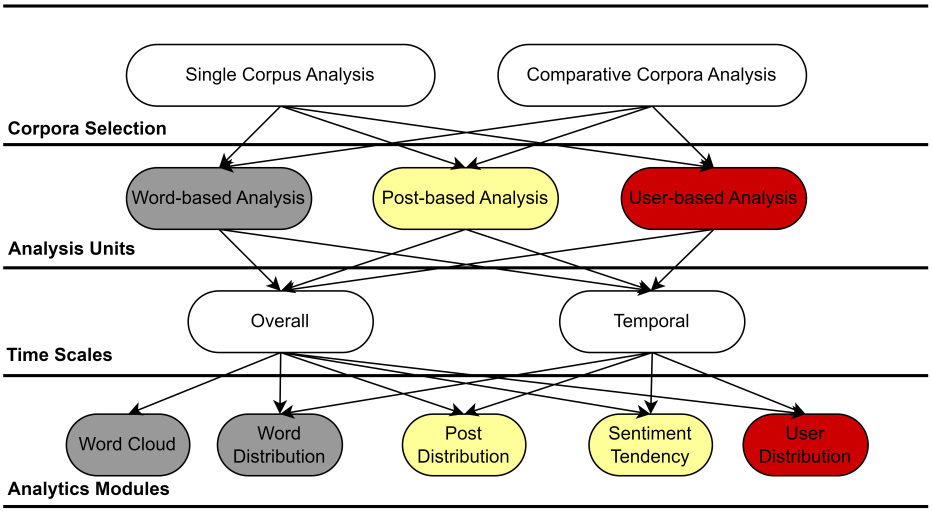


Figure 1: Interface Structure. (Note: In the *Word-based Analysis* section, all active modules are visually marked with a grey highlight. In the *Post-based Analysis* section, active modules are indicated with a yellow highlight. In the *User-based Analysis* section, active modules are distinguished with a red highlight.)

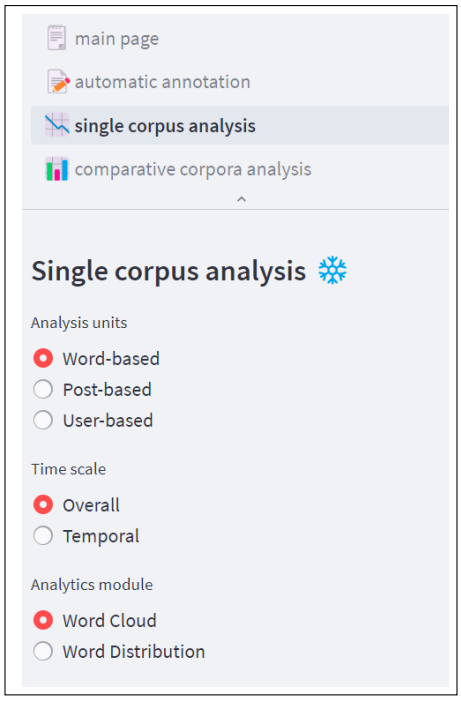


Figure 2: Interface Sidebar

4 Corpora Operation

4.1 Data Description

Our study is centred on analysing the responses to the tweets of social figures concerning the topic of climate change during the two most recent Conferences of the Parties (i.e., COP25 and COP26). The Twitter accounts chosen for analysis include a diverse range of influential figures. Four types of Twitter accounts are selected, including three climate change activists: Leonardo DiCaprio, Greta Thunberg, and Elizabeth Wathuti; two prominent businessmen: Jeff Bezos and Michael Bloomberg; a pair of climate change contrarians: Bjørn Lomborg and Steve Milloy; and four notable politicians: Joe Biden, Boris Johnson, Barack Obama, and Donald Trump.

We have gathered tweet responses from chosen participants engaged in COP26 activities, covering the period from October 31, 2021, to November 12, 2021. Furthermore, due to the keen interest in the reactions of users to Donald Trump during the COP25 conference, we collected replies, responding to Donald Trump's tweets during COP25 related to climate change from December 2, 2019, to December 13, 2019. To account for delayed responses to tweets, the collection of replies was extended to include a period during and after the Conference of the Parties (COP). For COP26, replies were gathered from October 31, 2021, to November 26, 2021. For COP25, the collection period for replies to tweets was from December 2, 2019, to December 27, 2019, allowing for a two-week extension post-COP in both cases. In total, we collected 55,927 tweet replies for analysis. A summary of the collected data is presented in Table 1.

Table 1: Summary of the language resources in the corpus for analysis of offensive language (OL)

Role	Leader	Tweets*	Replies**	Replies words	Followers***
	Leonardo DiCaprio	11	1,432	27,688	1,957,103 **(M)**
	Greta Thunberg	24	7,997	158,787	5,804,735 **(M)**
	Elizabeth Wathuti	15	644	10,470	51,993 **(L)**
Activist	**Total**	**50**	**10,073**	**196,945**	**7,813,831**
	Jeff Bezos	4	1 585	29 886	6,070,595 **(M)**
	Michael Bloomberg	28	836	15 188	2,673,723 **(M)**
Businessman	**Total**	**32**	**2,421**	**45,074**	**8,744,327**
	Bjørn Lomborg	41	426	9 086	185,340 **(L)**
	Steve Milloy	332	1 213	21 727	71,305 **(L)**
Contrarian	**Total**	**373**	**1,639**	**30,813**	**256,645**
	Joe Biden	10	12 283	199 417	36,852,128 **(H)**
	Boris Johnson	27	22 623	426 510	4,779,564 **(M)**
	Barack Obama	9	3 557	68 712	133,302,319 **(H)**
	Donald Trump	1	3 331	63 243	$\approx 8.74 \times 10^7$ **(H)**
Politician	**Total**	**47**	**41,794**	**757,882** (74%)	$\approx$ **262,334,011** (94%)
Total	**11**	**502**	**55,927**	**1,030,714**	$\approx$ **279,148,805**

* Tweets concerning climate change or COP for selected candidates were collected from October 31, 2021 to November 12, 2021 for COP26. Tweets concerning climate change or COP for Donald Trump were collected from December 2, 2019 to December 13, 2019 for COP25

** Replies to selected climate change tweets for COP26 span from October 31, 2021, to November 26, 2021. Replies to selected climate change tweets for COP25 span from December 2, 2019 to December 27, 2019

*** Some followers might overlap between leaders (we calculate Totals as the sum of followers ignoring whether the same person is a follower of more than one leader)

(L) Accounts with fewer than 1,000,000 followers are considered to have a low number of followers

(M) Accounts with followers between 1,000,000 and 10,000,000 are considered to have a medium number of followers

(H) Accounts with more than 10,000,000 followers are considered to have a high number of followers

4.2 Corpora Categorisation

OLAn allows users to select social figures according to role-based selection (i.e., *Role of leaders*), which involves categorising figures based on their societal or professional roles (i.e., politicians, businessmen, activists and contrarians) and follower count-based selection, in which figures are selected based on the number of followers they have on social media platforms (i.e. low, medium and high). Meanwhile, corpora selection involves categorising responses to these figures based on specific time frames: *During COP*, which involves analysing replies these figures receive during the Conference of the Parties) and *After COP*, which involves analysing replies occurring two weeks post-conference.

4.3 Single Corpus Analysis

Users can opt between a single or multiple corpora from the corpora series. When multiple corpora are chosen, they are accumulated to facilitate topic-agnostic offensive language analytics. For example, Figure 3 illustrates the selection of *Leonardo DiCaprio* and *Michael Bloomberg*, which are merged into a single dataset. Users can customise the dataset name by entering it in the text box.

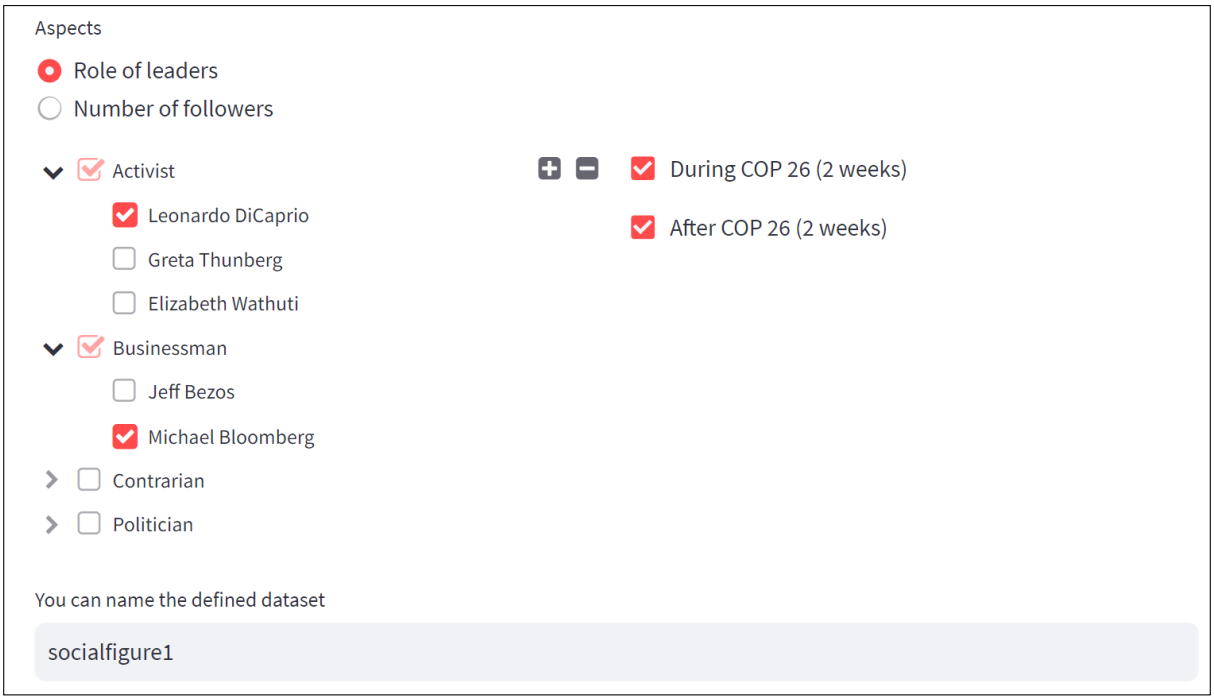


Figure 3: Corpora Selection Menu in *Single Corpus Analysis*

4.4 Comparative Corpora Analysis

Comparative Corpora Analysis is specifically designed for conducting contrasting studies. OLAn enables comparisons between four predefined datasets, which are formed through different combinations of 11 tweet reply datasets related to 11 different social figures.

For instance, after selecting the comparative aspects: *Role of leader* and response period: *During COP* and *After COP* (see Figure 4), as shown in Figure 5, two datasets are enabled for comparison. *Dataset1* is composed of all online dialogues, while *Dataset2* includes all offline dialogues. To enhance the user experience in analysis, each constructed dataset (e.g., *Dataset1*) can be given a customised name to suit individual user preferences.

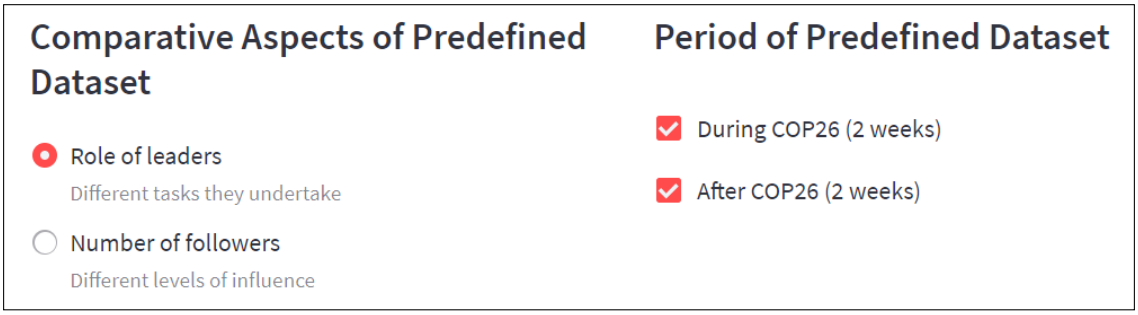


Figure 4: Corpora Selection Menu in *Comparative Corpora Analysis* (Part A)

5 Analysis Unit

Analysis units refer to the specific objects or elements on which an analysis task is performed. Analysis units can vary depending on the data structure and the analysis objective. Our platform offers multiple analysis units to scrutinise the data.

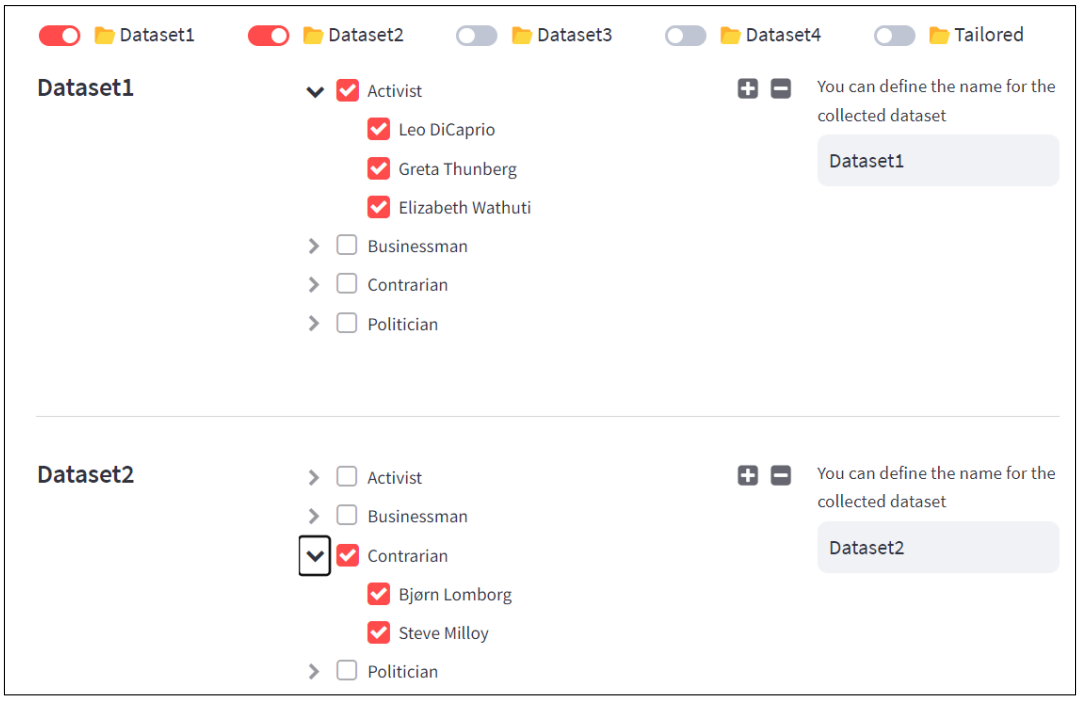
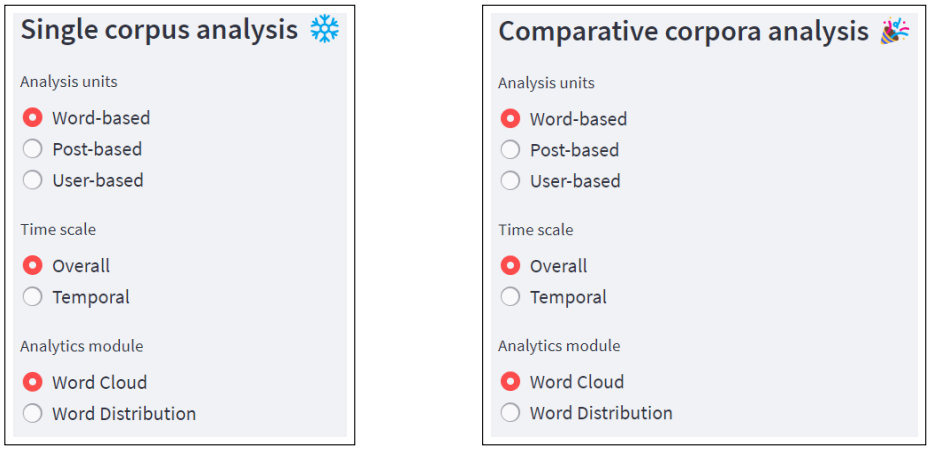


Figure 5: Corpora Selection Menu in *Comparative Corpora Analysis* (Part B)

5.1 Word-Based Analysis

Word-Based Analysis investigates offensive language words within text data. This analysis typically includes techniques such as creating WordClouds, which visually represent the frequency of words used in the text and analysing word distributions to determine the prevalence of offensive words within a given dataset. To access the *Word-Based Analysis* in the interface, please refer to Figure 6 for more instructions, including (a) for *Single Corpus Analysis* and (b) for *Comparative Corpora Analysis*.



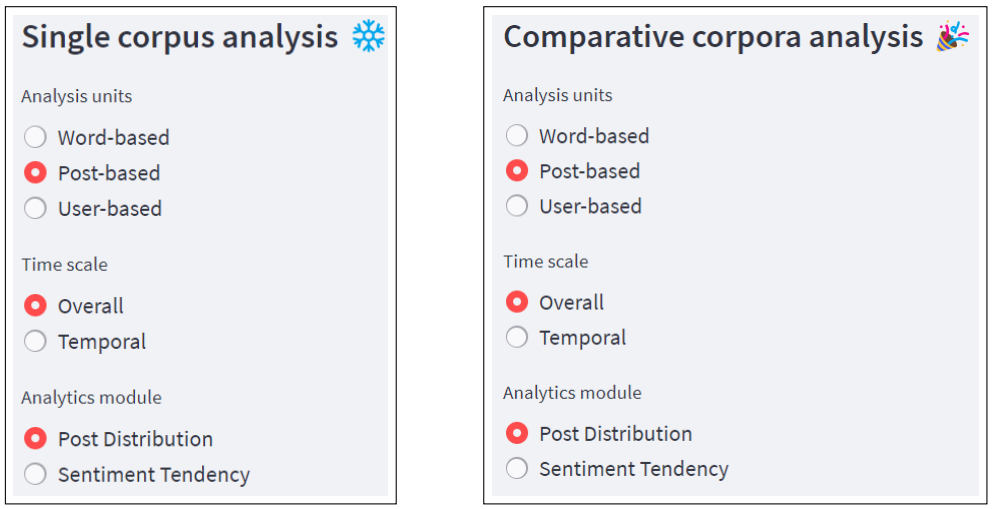
(a) Word-Based Single Corpus Analysis

(b) Word-Based Comparative Corpora Analysis

Figure 6: Word-Based Navigation Menu

5.2 Post-Based Analysis

Post-Based Analysis involves a detailed examination of abusive posts to assess the presence and nature of abusive content. This method typically includes evaluating the distribution of posts, which involves quantifying how frequently abusive posts appear across different posts. Additionally, sentiment distribution analysis is employed to understand the emotional tone of these posts, identifying whether the language used is predominantly negative, natural, or positive. To access the *Post-Based Analysis* in the interface, please refer to Figure 7 for more instructions, including (a) for *Single Corpus Analysis* and (b) for *Comparative Corpora Analysis*.



(a) Post-Based Single Corpus Analysis

(b) Post-Based Comparative Corpora Analysis

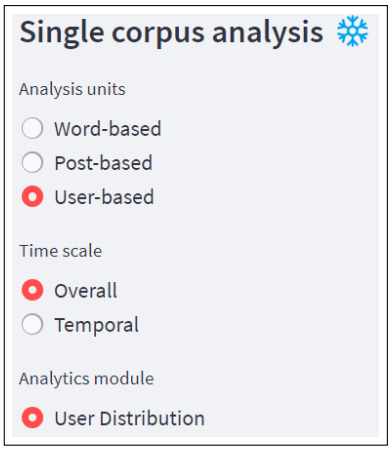
Figure 7: Post-Based Navigation Menu

5.3 User-Based Analysis

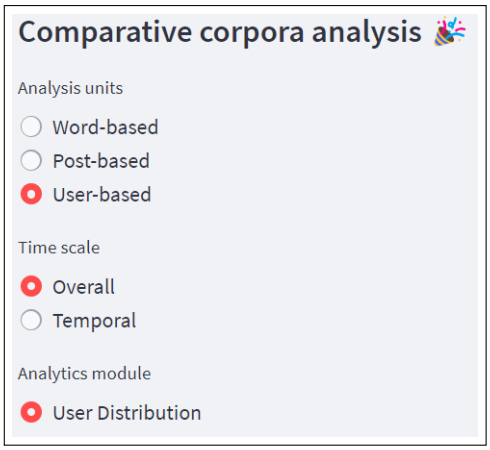
User-Based Analysis in offensive language analytics focuses on examining the offensive language behaviours and patterns of individual users on online platforms, to understand how they contribute to the generation or dissemination of abusive contents. This approach involves profiling users based on their tendency to use abusive language and examines how these users are distributed across various social figures' posts. To access the *User-Based Analysis* in the interface, please refer to Figure 8 for more instructions, including (a) for *Single Corpus Analysis* and (b) for *Comparative Corpora Analysis*.

6 Time Scale

The time scale option is used to determine how time is segmented for offensive language analysis of all user responses. In the designed interface, there are two distinct time scales *Overall* and *Temporal*.



(a) User-Based Single Corpus Analysis



(b) User-Based Comparative Corpora Analysis

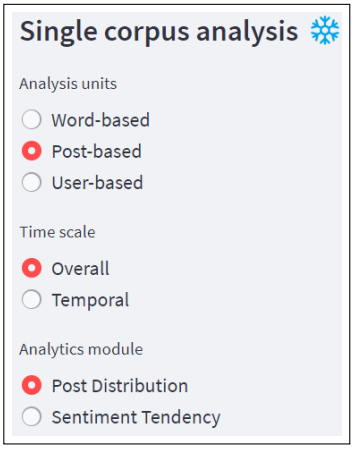
Figure 8: User-Based Navigation Menu

6.1 Overall Time Scale

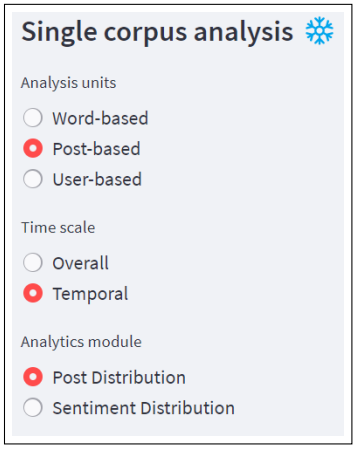
The *Overall* time scale option views all time points collectively, treating the analysis dataset as static. This method does not incorporate temporal information in the analysis of offensive language, neglecting the aspect of time evolution. Figure 9(a) displays the menu list for conducting a *Post-Based Analysis* within the context of the *Overall* time scale.

6.2 Temporal Time Scale

Conversely, the *Temporal* time scale focuses on shorter time intervals measured on a daily basis. This allows for a granular analysis of offensive language occurring within the scope of each COP day. Figure 9(b) displays the menu list for conducting a *Post-Based Analysis* within the context of the *Temporal* time scale.



(a) Post Distribution in Overall Time Scale



(b) Post Distribution in Temporal Time Scale

Figure 9: Time Scales in Post-Based Navigation Menu

7 Analytics Module

The analytics module is where the magic happens. It's designed to bring forth the underlying patterns, insights, and intricacies within the selected corpora.

7.1 Word Cloud

Word Cloud module operates on offensive language words, accompanied by both quantitative and qualitative insights. This module is only linked with *Word-Based Analysis* features, applicable in both *Single Corpus Analysis* and *Comparative Corpora Analysis* functionalities. We will offer guidance on analysing offensive language words using *Word Cloud* module within the context of *Single Corpus Analysis* and *Comparative Corpora Analysis*.

7.1.1 Single Corpus Analysis in Overall Time Scale

Word Cloud It includes three integral components for analysing offensive language words under the context of *Single Corpus Analysis*: (1) *Word Cloud Display* (displaying offensive language words), (2) *Offensive Language Words Frequency* (visualising top 10 offensive language words) and (3) *Qualitative Analysis* (presenting users' replies with offensive language words).

Figure 10 shows the navigation menu of *Word Cloud* module in *Single Corpus Analysis*. Users should also select the offensive language word types for word cloud visualisation to tailor the analysis to users' specific needs.

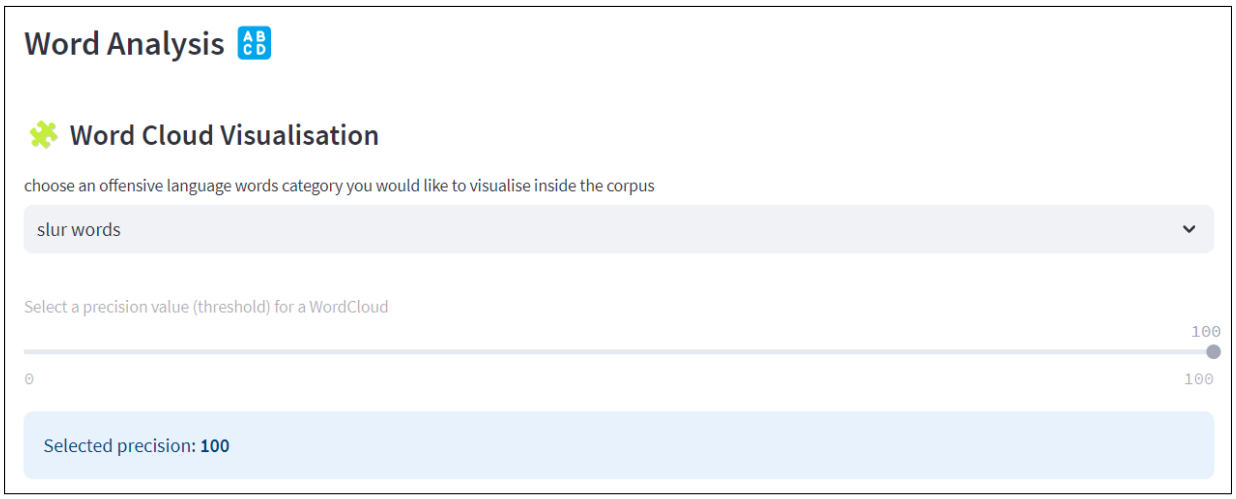


Figure 10: *Word Cloud* Module: Overall Navigation Menu (*Word-Based Single Corpus Analysis*)

Word Cloud Display: This feature visualises offensive language words based on user selection. The resulting word cloud is similar to Figure 11.

Word Frequency Analysis: It visualises the top 15 offensive language word frequencies associated with a chosen offensive language type within the selected corpus. Figure 12 displays an example of the word frequency of the top 10 *slur* words and their percentages, calculated based on the total frequency of *slur* words.

Qualitative Analysis: It exhibits text segments containing the specified offensive language words, as initially pinpointed in the *Word Cloud Display*. Users can display segments given specific word selection and pick the offensive language words from the dropdown list (refer to Figure 12).

Figure 11: *Word Cloud* Module: Example of Word Cloud Visualisation (*Word-Based Single Corpus Analysis*)

7.1.2 Comparative Corpora Analysis in Overall Time Scale

Word Cloud module in *Comparative Corpora Analysis* explores the similarities and differences between various constructed corpora (at most 5 corpora) regarding offensive language word coverage. Similarly, in order to activate the functionality, users need to determine the offensive language word type (see Figure 14). Following the configuration, three key features are available to facilitate in-depth analysis:

Shared Word Cloud: It can showcase the overlapping offensive language words across different corpora using the Word Cloud technique (e.g., Figure 15).

Shared Word Frequency: This feature presents a table displaying the frequency of overlapping offensive language words across different corpora, as visualised using a word cloud (e.g., see Figure 16 and Figure 17). Additionally, this feature provides the total number of shared offensive language words across different corpora in the end, summarising the displayed offensive language words in the table.

Unique Word Frequency: This feature provides a table displaying the frequency of unique offensive language words across different corpora that do not appear in any other corpora, as illustrated in Figure 17. Additionally, this feature provides the total number of unique offensive language words for each corpus in the end, summarising the displayed offensive language words in the table.

7.2 Word Distribution

The *Word Distribution* module allows for the visualisation of the distribution of offensive language words within the chosen corpora. This module is exclusively linked with the *Word-Based Analysis* feature, which is applicable in both the *Single Corpus Analysis* and *Comparative Corpora Analysis* functionalities. To accommodate various corpus operations (i.e., *Single Corpus Analysis* or *Comparative Corpora Analysis*) and time scale options (i.e., *Overall* or *Temporal*),

Word Frequency Visualisation

Top 10 Slur Words Frequency

	words	frequency	percentage
1	idiot	26	13.333%
2	moron	14	7.179%
3	fuck you	13	6.667%
4	piss off / your arse	10	5.128%
5	fuck off	9	4.615%
6	cunt	8	4.103%
7	bastard / loser / coward / stfu	7	3.59%
8	twat	6	3.077%
9	shut the fuck up / asshole	5	2.564%
10	muppet	4	2.051%

Total Slur Words Frequency

	words	frequency
1	Total	195

Figure 12: *Word Cloud* Module: Example for Quantitative Analysis Component (*Word-Based Single Corpus Analysis*)

we will provide instructions for navigating the *Word Distribution* module within the context of *Single Corpus Analysis* and *Comparative Corpora Analysis*, considering both the *Overall* and *Temporal* time scales.

7.2.1 Single Corpus Analysis in Overall Time Scale

Word Distribution module in *Single Corpus Analysis* given *Overall* time scale involves analysing the frequency and distribution of offensive words in the selected dataset without considering temporal information. This type of analysis focuses on the overall prevalence and patterns of offensive language in the corpus as a whole, rather than how these patterns might have changed over time.

Quantitative Analysis Figure 19 illustrates the user interface menu, wherein users are presented with the option to select the unit for the y-axis, offering the choices of "percentage" or "number". Also, it showcases the configuration settings for the y-axis scale, demonstrating both linear and logarithmic scaling options. Additionally, this figure highlights the capacity to adjust the width and height parameters of the visualisation. Figure 20 presents an example of offensive language word distribution in *Single Corpus Analysis* with *Overall* Time Scale.

Qualitative Analysis Figure 20 shows the navigation menu for exploring tweets from social figures that contain the highest number of offensive language words. Users have the option to select the type of offensive language they want to focus on, determine the sorting

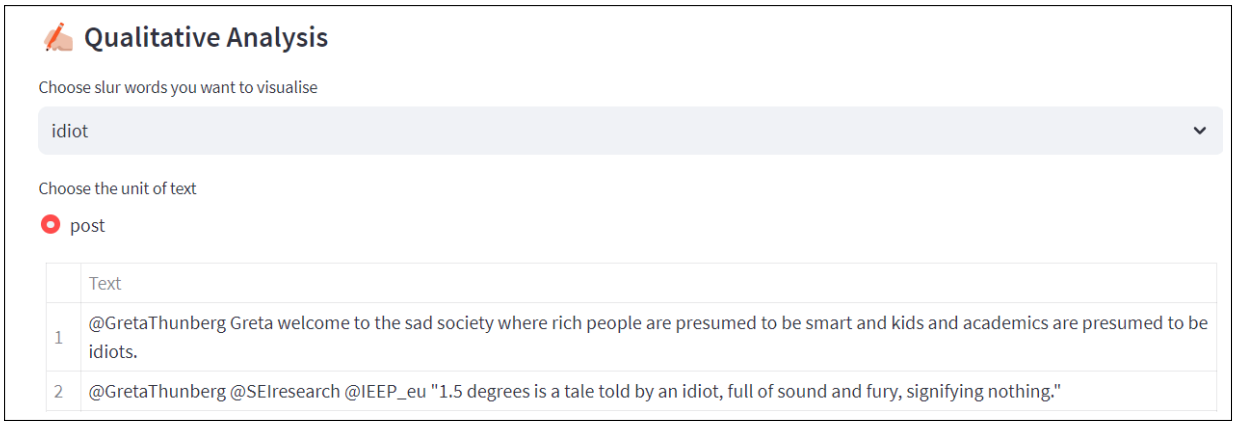


Figure 13: *Word Cloud* Module: Navigation Menu for Qualitative Analysis Component (*Word-Based Single Corpus Analysis*)

Figure 14: *Word Cloud* Module: Navigation Menu of Shared Offensive Language Word Cloud (*Word-Based Comparative Corpora Analysis*)

criteria for the tweet list (either by percentage or by the number of offensive language words), and set a specific range of values to display the top tweets.

7.2.2 Single Corpus Analysis in Temporal Time Scale

Word Distribution module in *Single Corpus Analysis* given *Overall* time scale involves analysing how the usage of offensive language changes over time within the selected single corpus. It could track the frequency of offensive language words over days. For example, Figure 22 shows how the use of offensive language words has increased and decreased in user responses to activists during and after COP26. To customise the visual presentation in *Temporal* time scale, Figure 23 displays the user interface menu, providing users with the choice to pick the unit for the y-axis, with "percentage" or "number" as available options. Furthermore, it demonstrates the configuration settings for the y-axis scale, presenting both linear and logarithmic scaling options. Additionally, this figure emphasises the capability to modify the visualisation's width and height parameters.

7.2.3 Comparative Corpora Analysis in Overall Time Scale

Word Distribution module in *Comparative Corpora Analysis* given *Overall* time scale examines how offensive words or expressions are distributed across different corpora without considering the specific time information or temporal aspects.

For data comparison and representation options, users have the option to choose between two modes of comparison: comparing different leaders or comparing different groups.

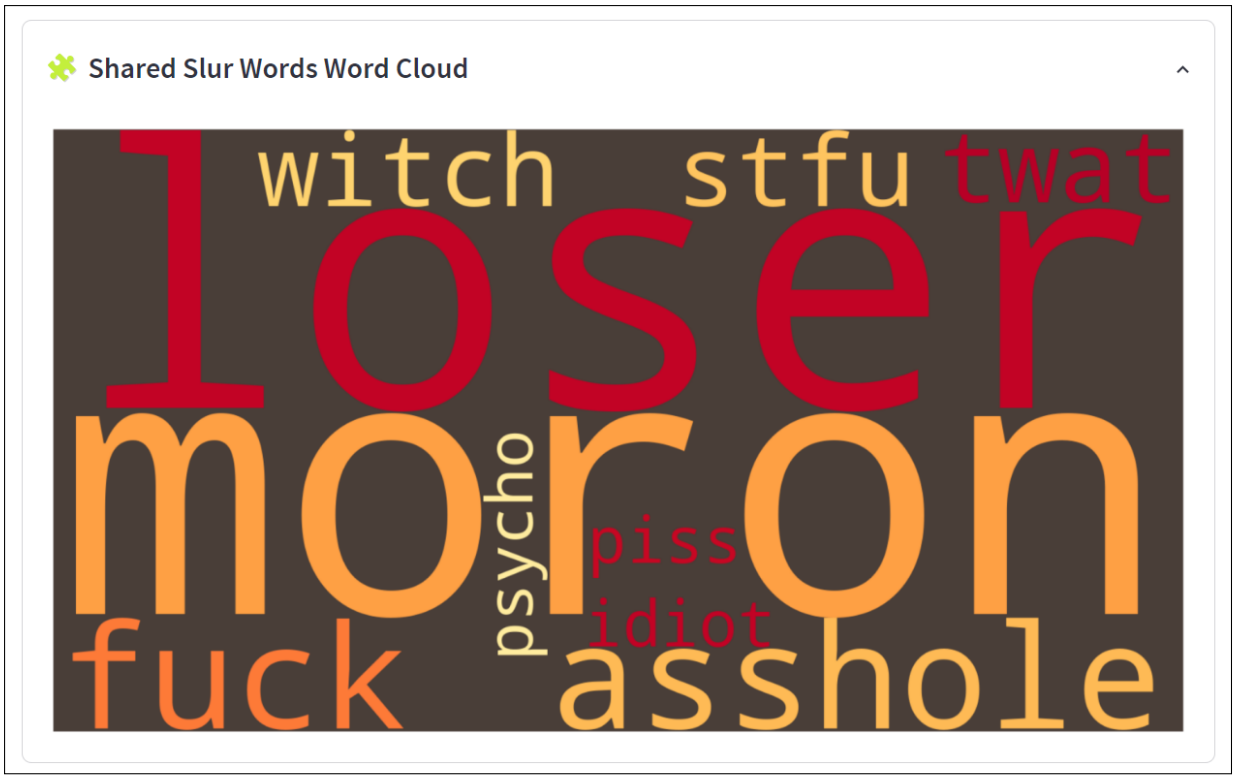


Figure 15: *Word Cloud* Module: Example of Shared Offensive Language Words Cloud (*Word-Based Comparative Corpora Analysis*)

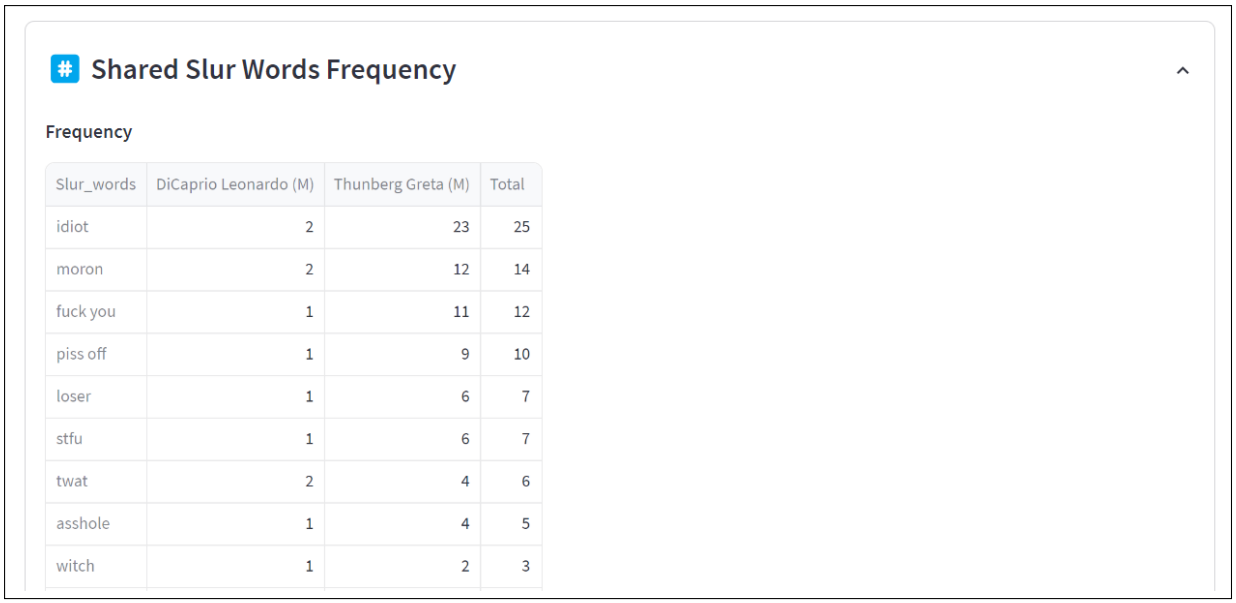
Within the *Word Distribution* module in the *Comparative Corpora Analysis* at the *Overall* time scale, the y-axis offers different units to accommodate various data representations and value measurement needs. Specifically, "number" is used to convey absolute values, "percentage" is employed to indicate values in relation to the whole, and "deviation" serves as a measure to assess differences in comparison to the mean. Additionally, users are given the flexibility to decide whether to include the combined count of slur words and rude words in the presentation, taking into account the distinctions between these categories and sensitive words (see Figure 24).

Regarding customisation and presentation choices, the interface provides two distinct methods for presenting data: tables and bar charts. Users can switch between these presentation formats by using tab selection. In the bar chart format, there are various customisation options available to users (see Figure 24). They can fine-tune the bar chart according to their preferences by choosing different y-axis scales (linear or logarithmic), resizing the figure, changing the font size within the figure, and personalising the figure's title. To better understand these customisable bar charts, refer to the illustrative examples shown in Figure 26.

7.2.4 Comparative Corpora Analysis in Temporal Time Scale

Word Distribution module in *Comparative Corpora Analysis* given *Temporal* time scale focuses on offensive language word distribution across different corpora on a temporal time scale essentially aims to compare how the usage of offensive language varies across different text collections over time.

For data comparison and representation options, users are offered the choice between



Slur_words	DiCaprio Leonardo (M)	Thunberg Greta (M)	Total
idiot	2	23	25
moron	2	12	14
fuck you	1	11	12
piss off	1	9	10
loser	1	6	7
stfu	1	6	7
twat	2	4	6
asshole	1	4	5
witch	1	2	3

Figure 16: *Word Cloud* Module: Example of Shared Offensive Language Words Frequency (*Word-Based Comparative Corpora Analysis*)

two modes of comparison: comparing different leaders or comparing different groups. Within the *Word Distribution* module of the *Comparative Corpora Analysis* at the *Temporal* time scale, users must specify the type of offensive language words they need to visualise. Additionally, the y-axis provides different units to cater to various data representation and value measurement requirements. Specifically, "number" is used to convey absolute values, while "percentage" is employed to indicate values in relation to the whole (refer to Figure 27).

Regarding customisation and presentation choices, the interface supports two distinct data presentation methods: tables and bar charts. Users can switch between these presentation formats using tab selection. In the bar chart format, various customisation options are available to users (refer to Figure 28). They can tailor the bar chart to their preferences by selecting different y-axis scales (linear or logarithmic) and resizing the figure. For a clearer understanding of these customisable bar charts, consult the illustrative examples shown in Figure 29.

7.3 Post Distribution

Post Distribution module allows for the visualisation of the distribution of different post types (i.e., non-abusive posts, potentially abusive posts and actually abusive posts) within the chosen corpora. This module is exclusively linked with the *Post-Based Analysis* feature, which is applicable in both the *Single Corpus Analysis* and *Comparative Corpora Analysis* functionalities. To accommodate various corpus operations (i.e., *Single Corpus Analysis* or *Comparative Corpora Analysis*) and time scale options (i.e., *Overall* or *Temporal*), we will provide instructions for navigating the *Post Distribution* module within the context of *Single Corpus Analysis* and *Comparative Corpora Analysis*, considering both the *Overall* and *Temporal* time scales.

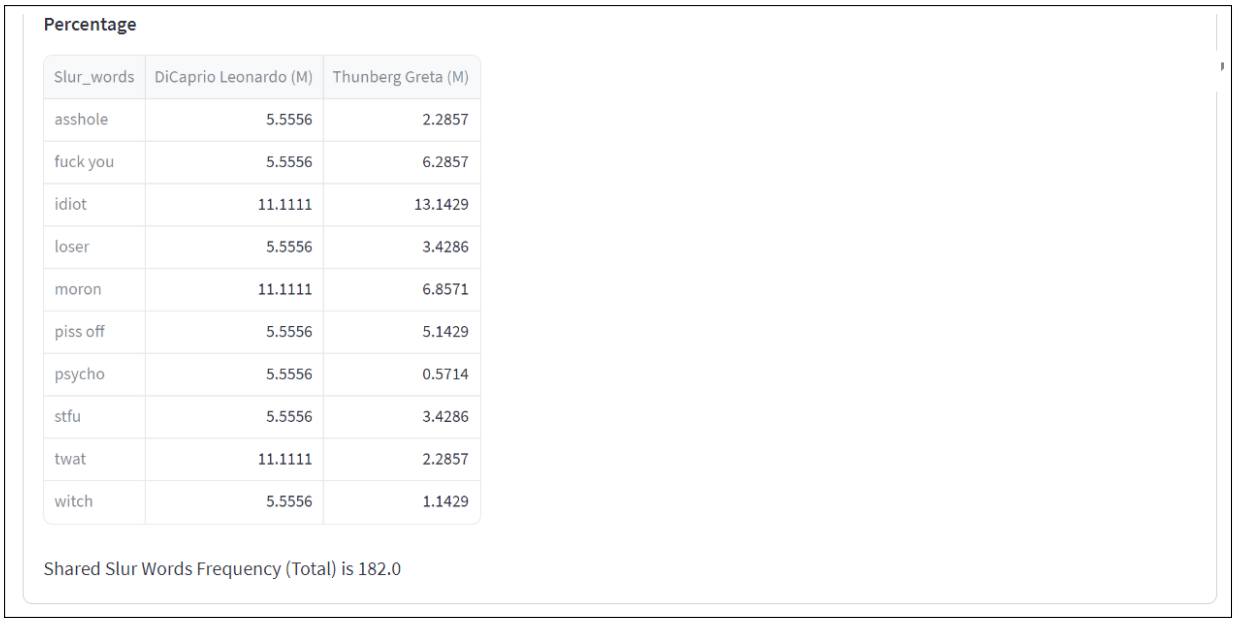


Figure 17: *Word Cloud* Module: Example of Shared Offensive Language Words Frequency (*Word-Based Comparative Corpora Analysis*)

7.3.1 Single Corpus Analysis in Overall Time Scale

Post Distribution module within the *Single Corpus Analysis*, when set to the *Overall* time scale, is dedicated to examining the frequency and distribution of posts with varying degrees of abusiveness (namely, actually abusive, potentially abusive, and non-abusive) within the chosen dataset. Importantly, this analysis does not take into account the temporal aspect. It is concerned with understanding the general prevalence and patterns of abusive posts in the entire corpus, rather than assessing how these patterns may have evolved over time.

Quantitative Analysis Figure 30 illustrates the user interface menu, wherein users are presented with the option to select the unit for the y-axis, offering the choices of "percentage" or "number". Also, it showcases the configuration settings for the y-axis scale, demonstrating both linear and logarithmic scaling options. Additionally, this figure highlights the capacity to adjust the width and height parameters of the visualisation. Figure 31 presents an example of the distribution of different types of posts in *Single Corpus Analysis* with *Overall* Time Scale.

Qualitative Analysis This feature allows users to investigate both user replies and tweets from leaders. Figure 32 presents the navigation menu for exploring user replies categorised by their degree of abusiveness, which includes actually abusive, potentially abusive, and non-abusive replies. Additionally, Figure 33 displays the navigation menu for exploring tweets from selected social figures, sorted by the various degrees of abusiveness in the replies they receive. Users have the flexibility to choose the type of posts they wish to investigate, specify the sorting criteria for the tweet list (whether by percentage or the number of different types of posts), and define a specific range of values to display the top tweets.

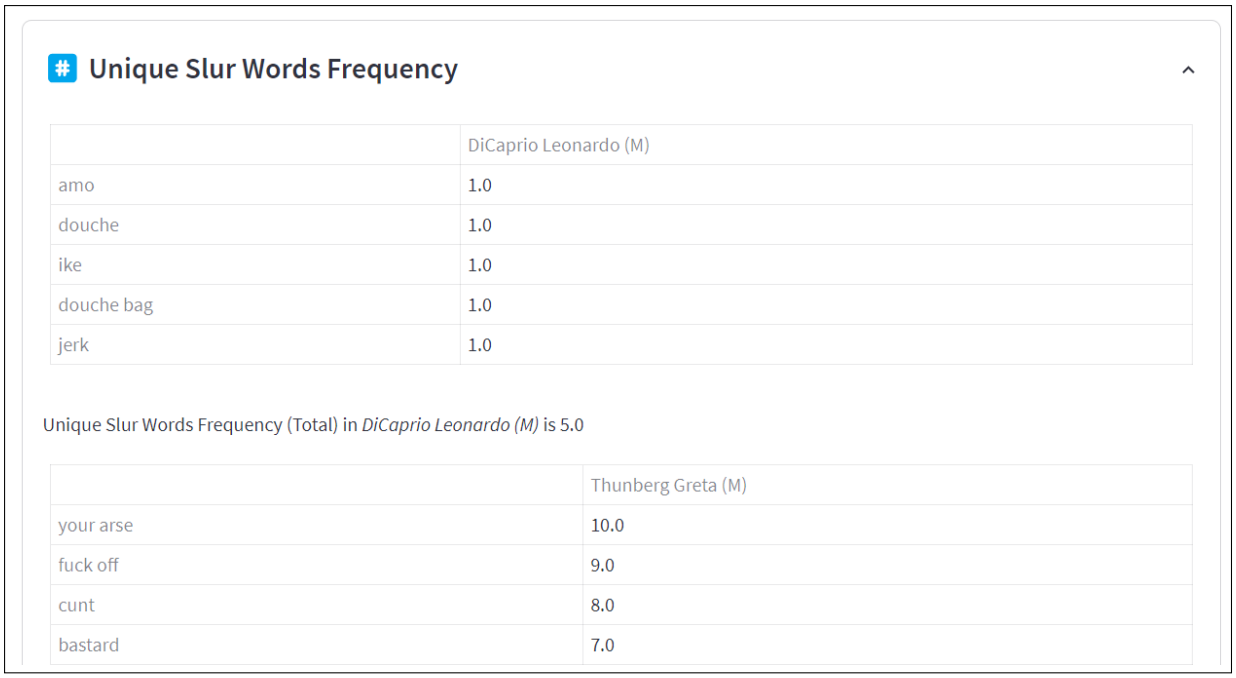


Figure 18: *Word Cloud* Module: Example of Unique Offensive Language Words Frequency (*Word-Based Comparative Corpora Analysis*)

7.3.2 Single Corpus Analysis in Temporal Time Scale

Post Distribution module within the *Single Corpus Analysis*, when set to the *Overall* time scale, involves the analysis of how the abusive content in user replies evolves over days within the selected single user response dataset. This module tracks the changing frequency of various types of posts across days. For instance, Figure 35 illustrates how the distribution of user replies to activists has fluctuated during and after COP26.

To customise the visual representation in the *Temporal* time scale, Figure 34 displays the user interface menu. This menu allows users to select the unit for the y-axis, offering options such as "percentage" or "number." It also showcases the configuration settings for the y-axis scale, providing both linear and logarithmic scaling options. Additionally, this figure highlights the capability to adjust the width and height parameters of the visualisation.

7.3.3 Comparative Corpora Analysis in Overall Time Scale

Post Distribution module in the *Comparative Corpora Analysis*, when configured for the *Overall* time scale, focuses on evaluating the distribution of posts with varying degrees of abusiveness across different corpora. This analysis does not take into account the specific time information or temporal aspects of the data.

For data comparison and representation options, users have the option to choose between two modes of comparison: comparing different leaders or comparing different groups. Within the *Post Distribution* module in the *Comparative Corpora Analysis* at the *Overall* time scale, the y-axis offers different units to accommodate various data representations and value measurement needs. Specifically, "number" is used to convey absolute values, "percentage" is employed to indicate values in relation to the whole, and "deviation" serves as a measure to assess differences in comparison to the mean. Furthermore, users have the flexibility to choose the specific types of posts they wish to visualise. The "all" option includes "actually

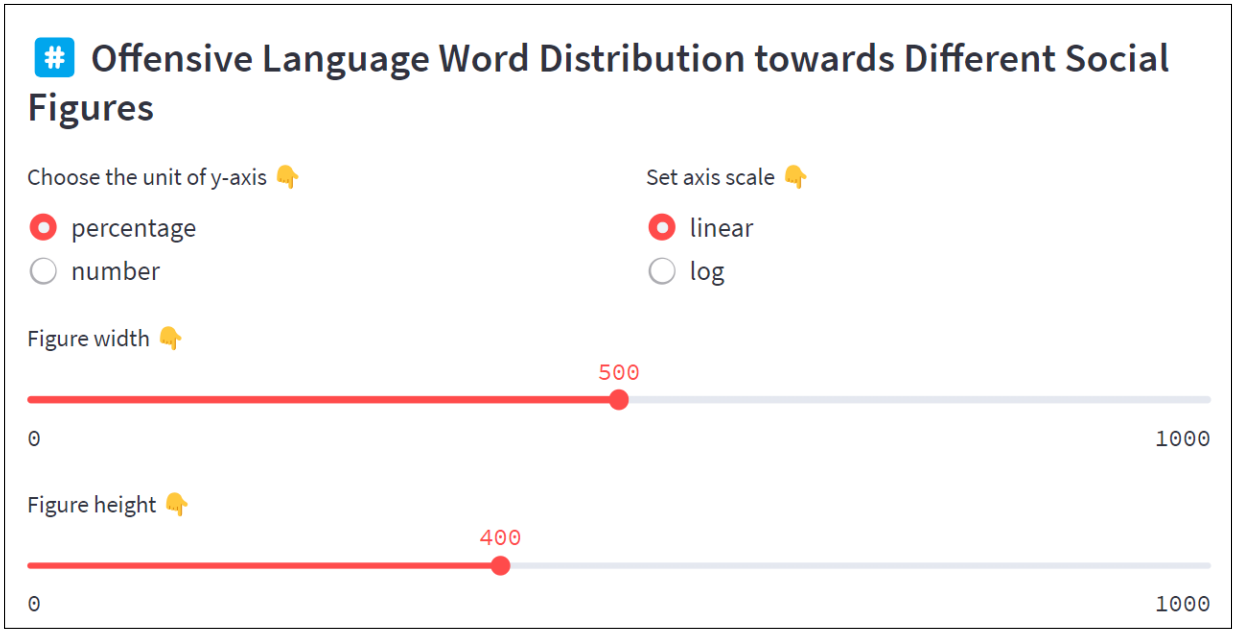


Figure 19: *Word Distribution* Navigation Menu Part-A in *Single Corpus Analysis* with *Overall* Time Scale

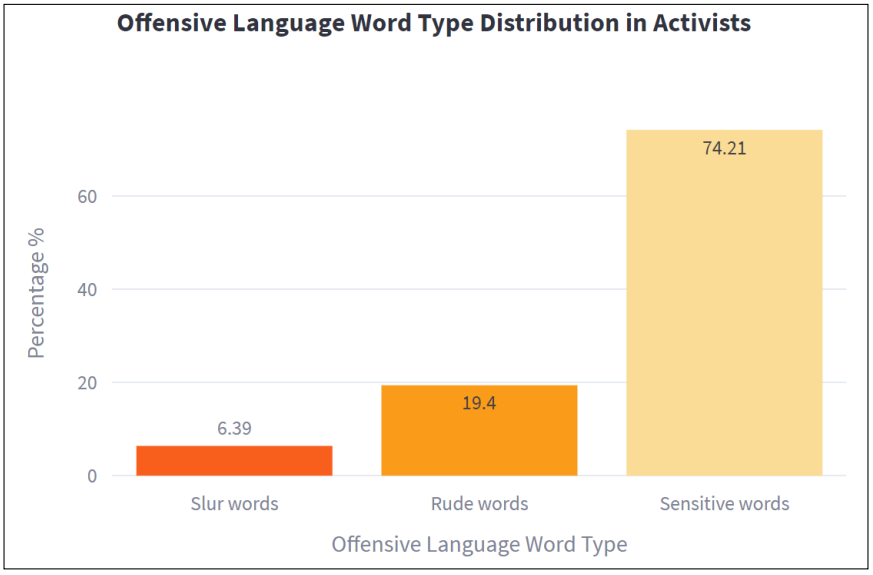


Figure 20: *Word Distribution* Example in *Single Corpus Analysis* with *Overall* Time Scale (Activists)

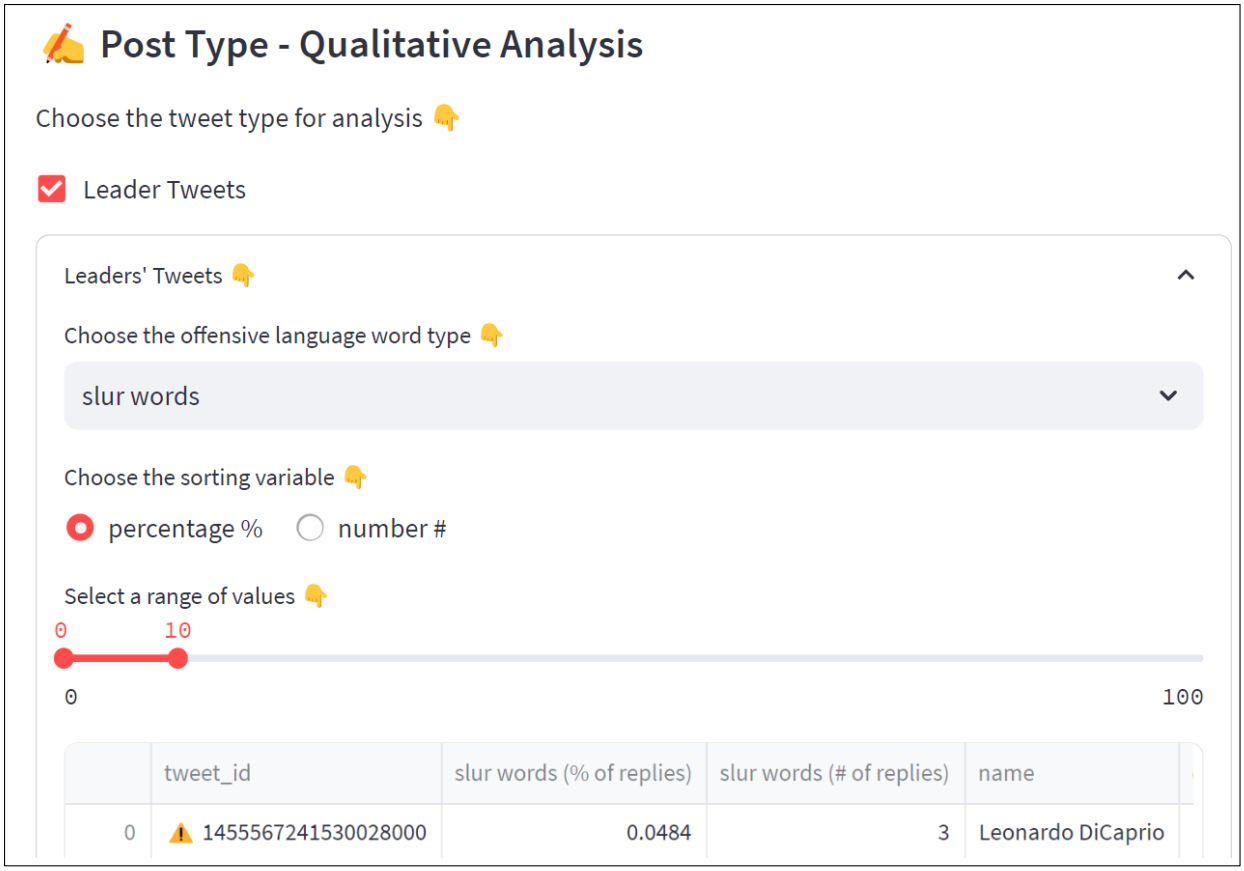


Figure 21: *Word Distribution* Navigation Menu Part-B in *Single Corpus Analysis* in *Overall* Time Scale

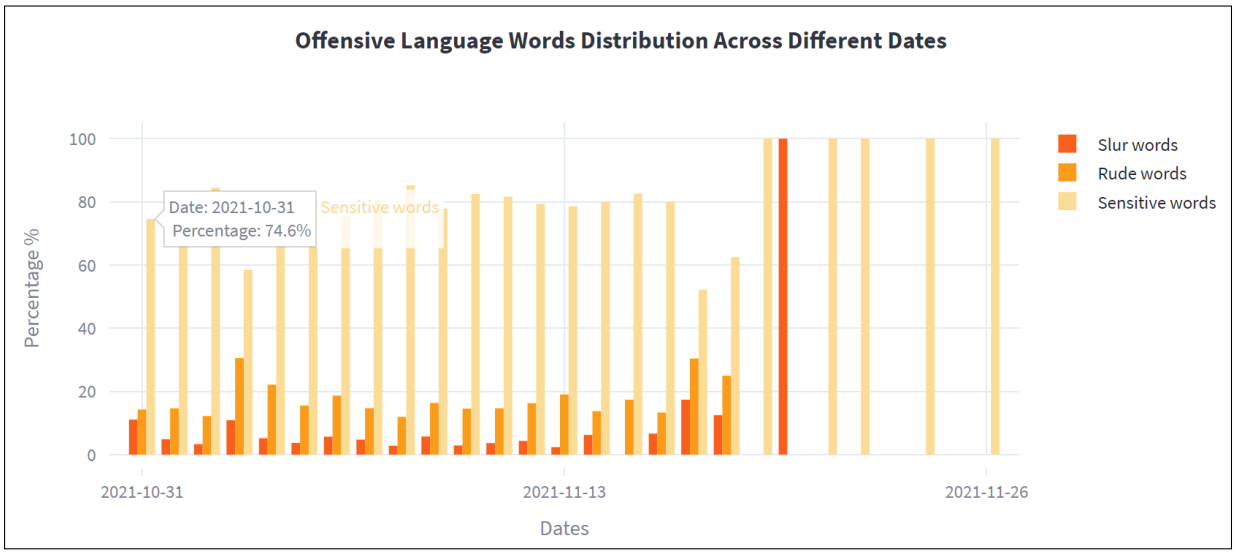


Figure 22: *Word Distribution* Example in *Single Corpus Analysis* with *Temporal* Time Scale (Activists)

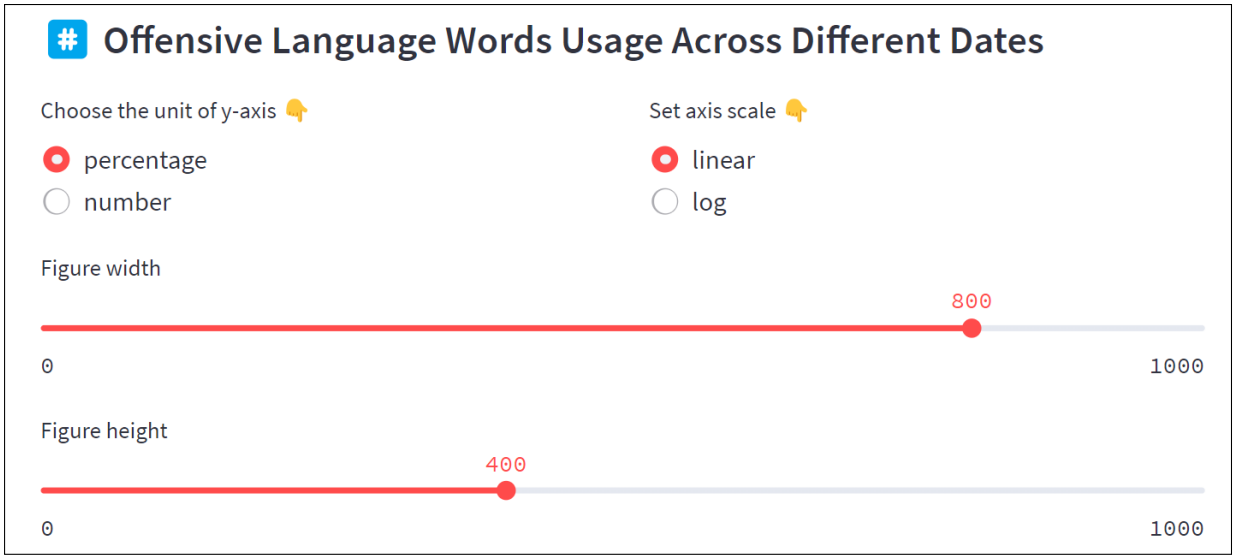


Figure 23: *Word Distribution* Navigation Menu in *Single Corpus Analysis* in *Temporal* Time Scale

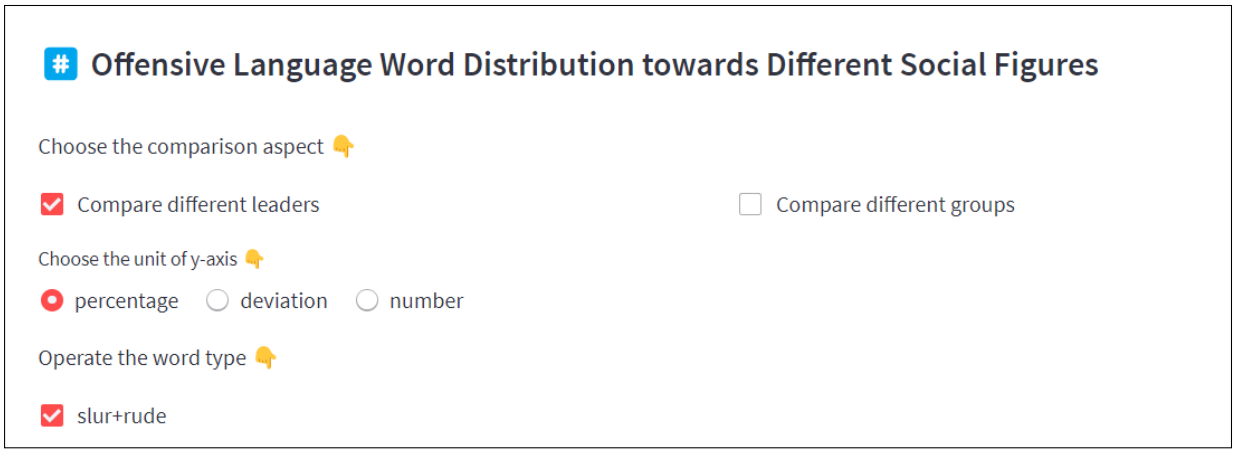


Figure 24: *Word Distribution* Navigation Menu Part-1 in *Comparative Corpora Analysis* in *Overall* Time Scale

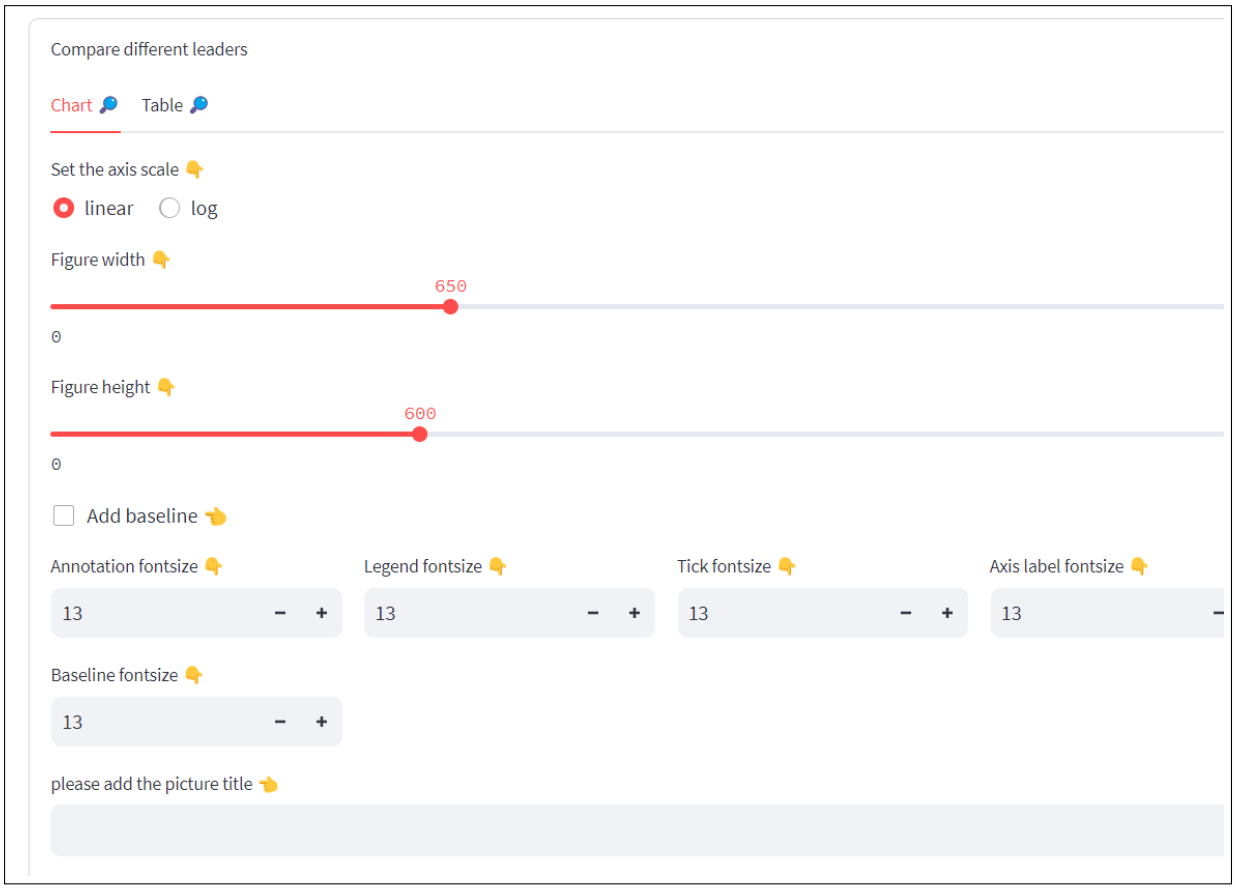


Figure 25: *Word Distribution* Navigation Menu Part-2 in *Comparative Corpora Analysis* in *Overall* Time Scale

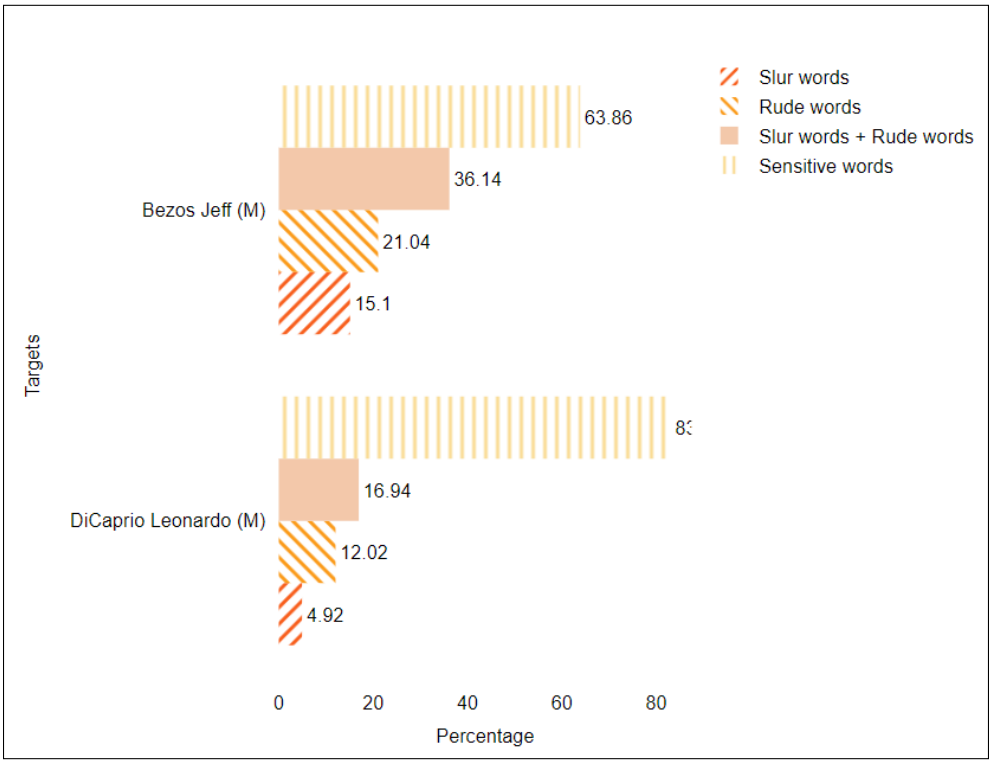


Figure 26: *Word Distribution* Example in *Comparative Corpora Analysis* with *Overall* Time Scale (*Bezos Jeff* vs *DiCaprio Leonardo*)

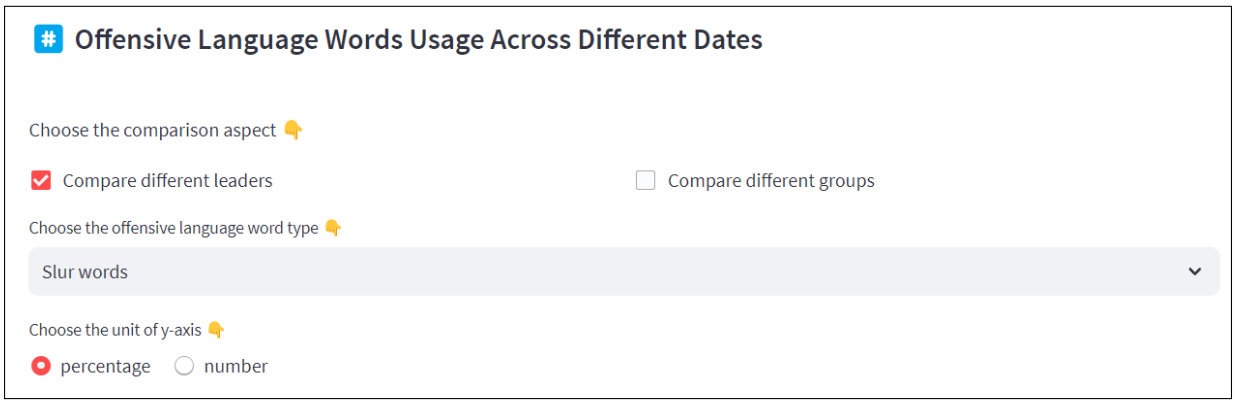


Figure 27: *Word Distribution* Navigation Menu Part-1 in *Comparative Corpora Analysis* in *Temporal* Time Scale

Figure 28: *Word Distribution* Navigation Menu Part-2 in *Comparative Corpora Analysis* in *Temporal* Time Scale

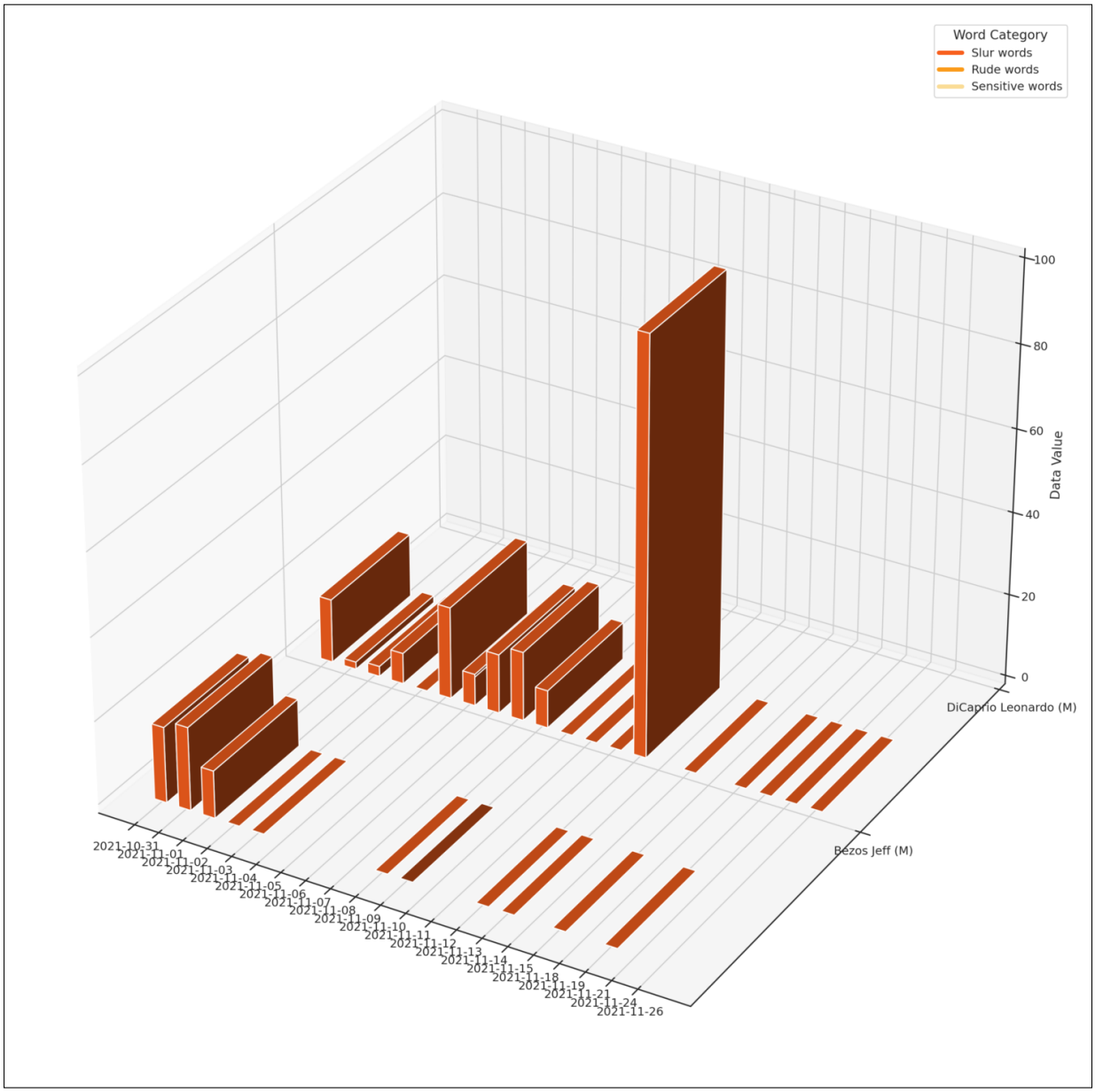


Figure 29: *Word Distribution* Example in *Comparative Corpora Analysis* with *Temporal* Time Scale (*Bezos Jeff* vs *DiCaprio Leonardo*)

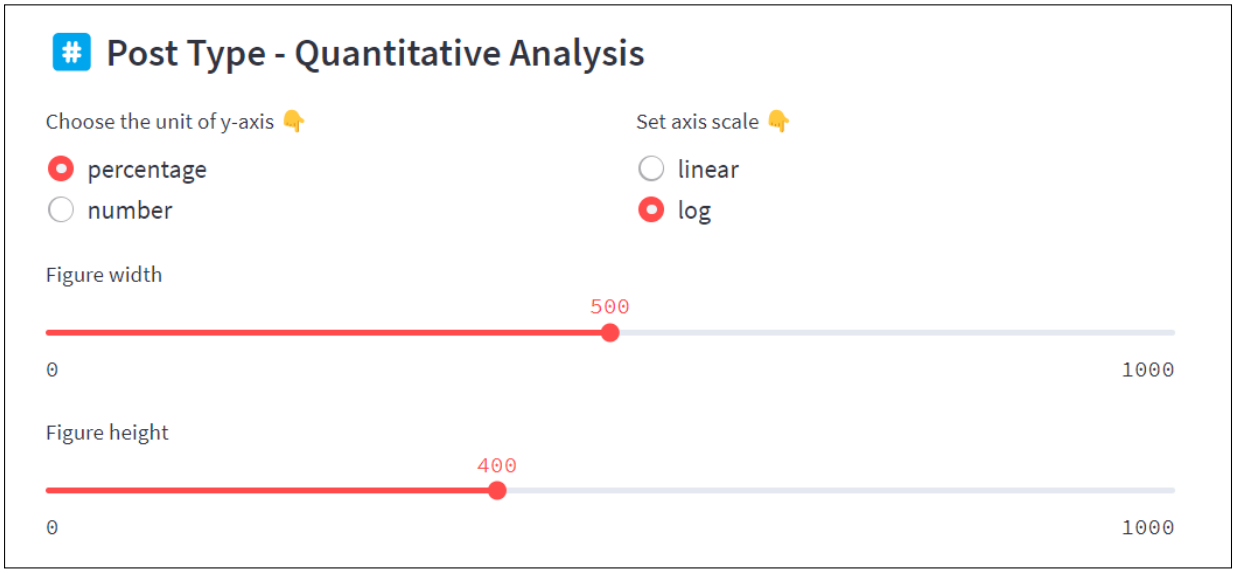


Figure 30: *Post Distribution* Navigation Menu Part-A in *Single Corpus Analysis* with *Overall* Time Scale

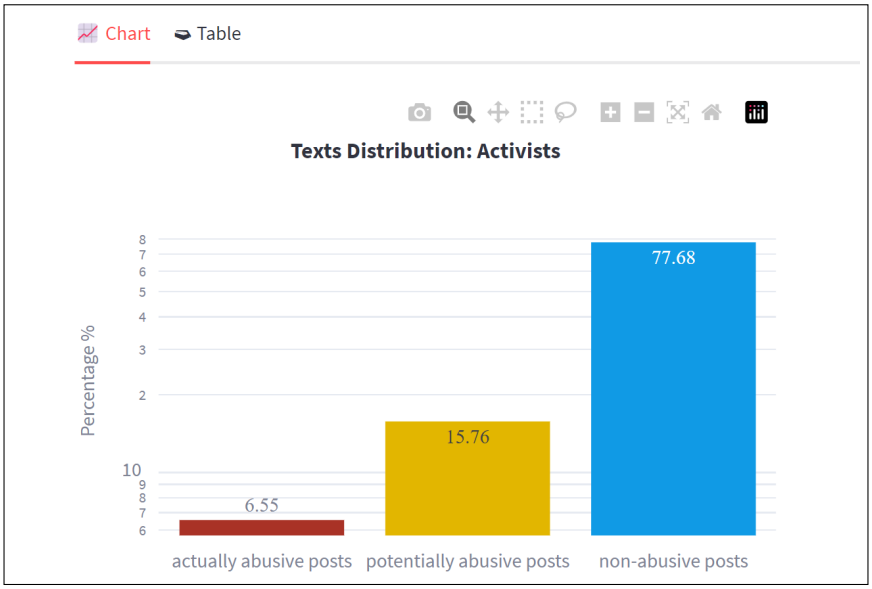


Figure 31: *Post Distribution* Example in *Single Corpus Analysis* with *Overall* Time Scale (Activists)

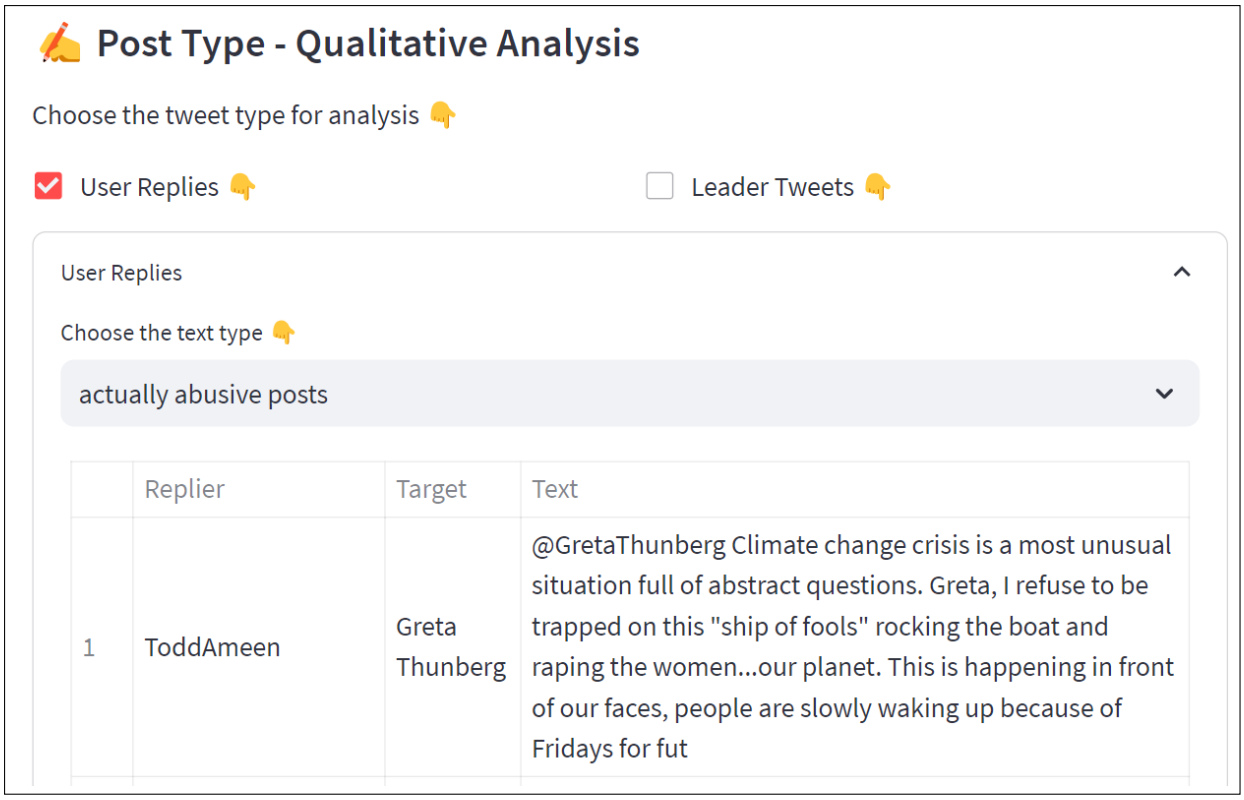


Figure 32: *Post Distribution* Navigation Menu Part-B in *Single Corpus Analysis* in *Overall* Time Scale

abusive," "potentially abusive," and "non-abusive" posts, while the "abusive" option includes "actually abusive" and "potentially abusive" posts (refer to Figure 36).

Regarding customisation and presentation choices, the interface provides two distinct methods for presenting data: tables and bar charts. Users can switch between these presentation formats by using tab selection. In the bar chart format, there are various customisation options available to users (see Figure 37). They can fine-tune the bar chart according to their preferences by choosing different y-axis scales (linear or logarithmic), resizing the figure, changing the font size within the figure, and personalising the figure's title.

7.3.4 Comparative Corpora Analysis in Temporal Time Scale

Post Distribution module within the *Comparative Corpora Analysis*, when set to the *Temporal* time scale, is primarily designed to analyse post distribution across various corpora over time. Its main objective is to compare the distribution patterns of different types of posts across different text collections over time.

For data comparison and representation options, users are offered the choice between two modes of comparison: comparing different leaders or comparing different groups. Within the *Post Distribution* module of the *Comparative Corpora Analysis* at the *Temporal* time scale, users must specify the type of offensive language words they need to visualise. Additionally, the y-axis provides different units to cater to various data representation and value measurement requirements. Specifically, "number" is used to convey absolute values, while "percentage" is employed to indicate values in relation to the whole (refer to Figure 38).

Regarding customisation and presentation choices, the interface supports two distinct data presentation methods: tables and bar charts. Users can switch between these presenta-

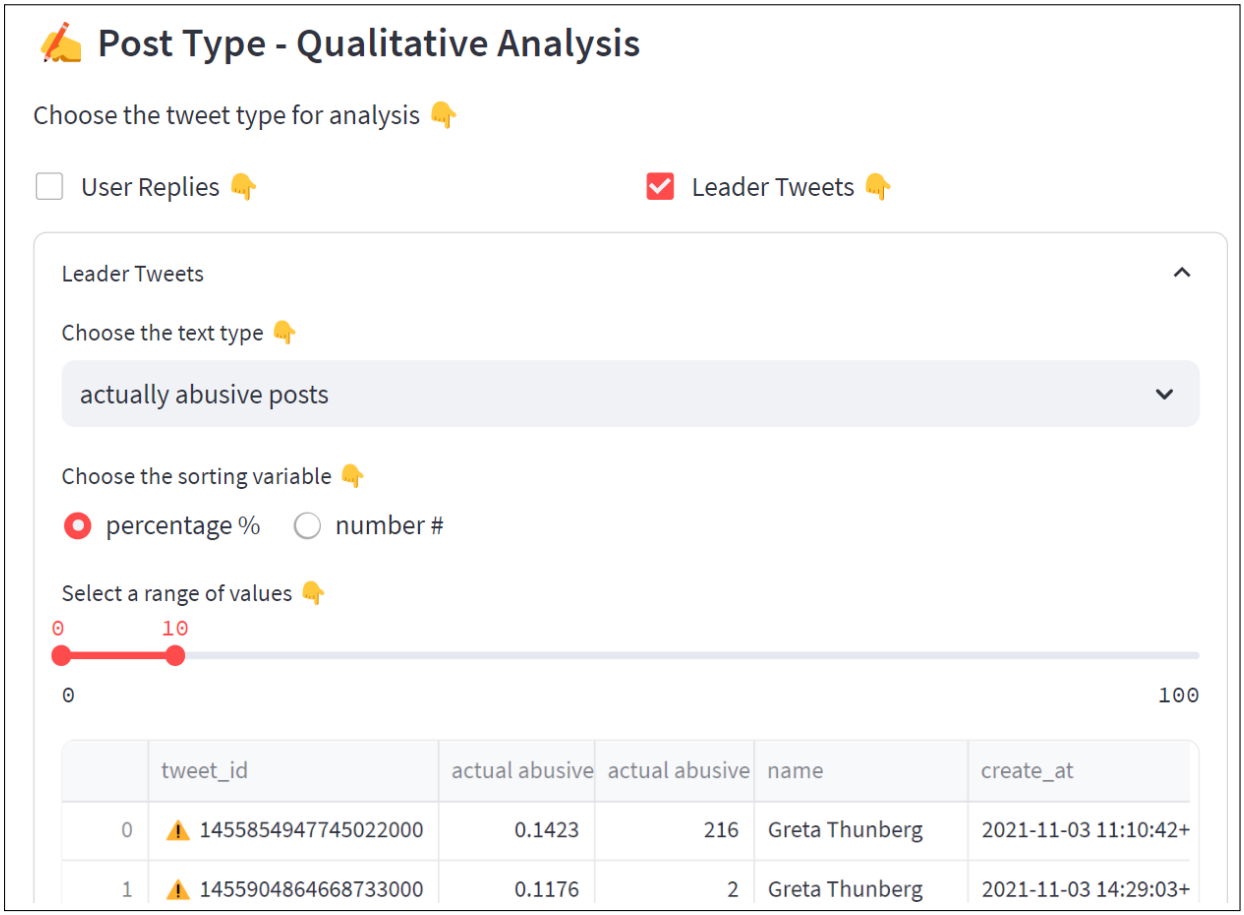


Figure 33: *Post Distribution* Navigation Menu Part-C in *Single Corpus Analysis* in *Overall* Time Scale

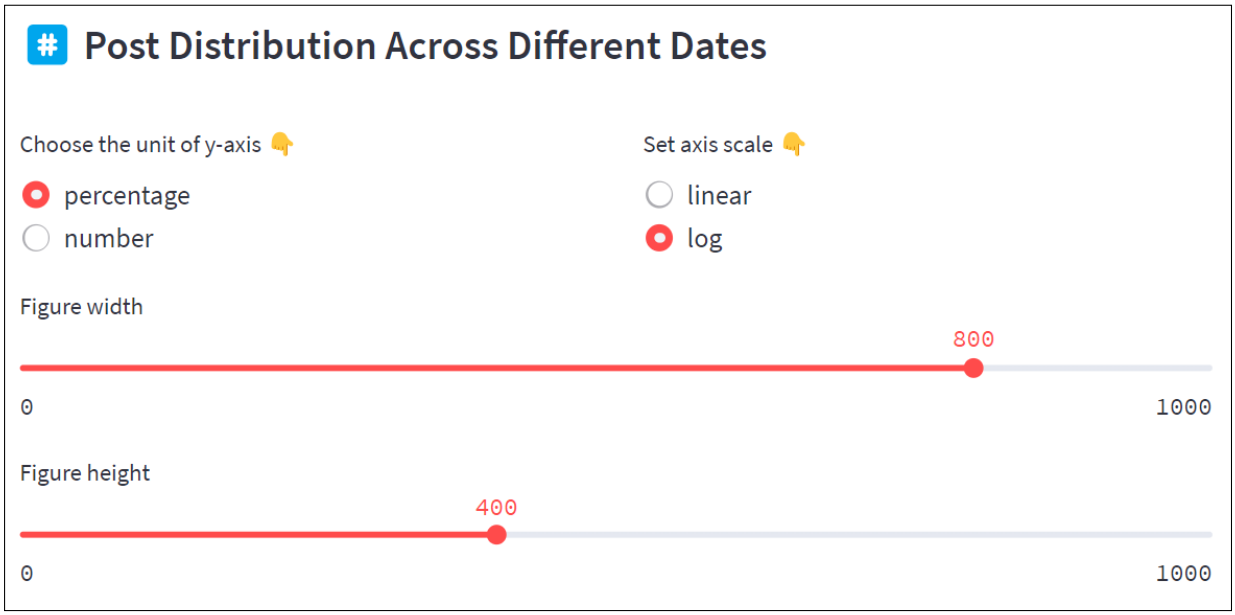


Figure 34: *Post Distribution* Navigation Menu in *Single Corpus Analysis* with *Temporal* Time Scale (Activists)

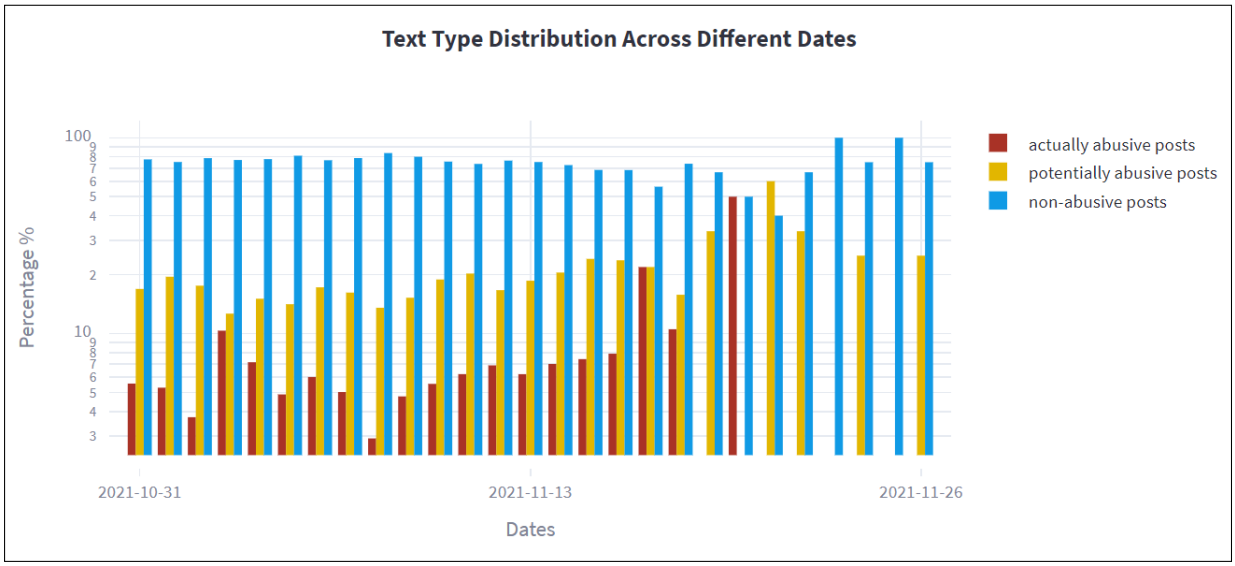


Figure 35: *Post Distribution* Example in *Single Corpus Analysis* in *Temporal* Time Scale

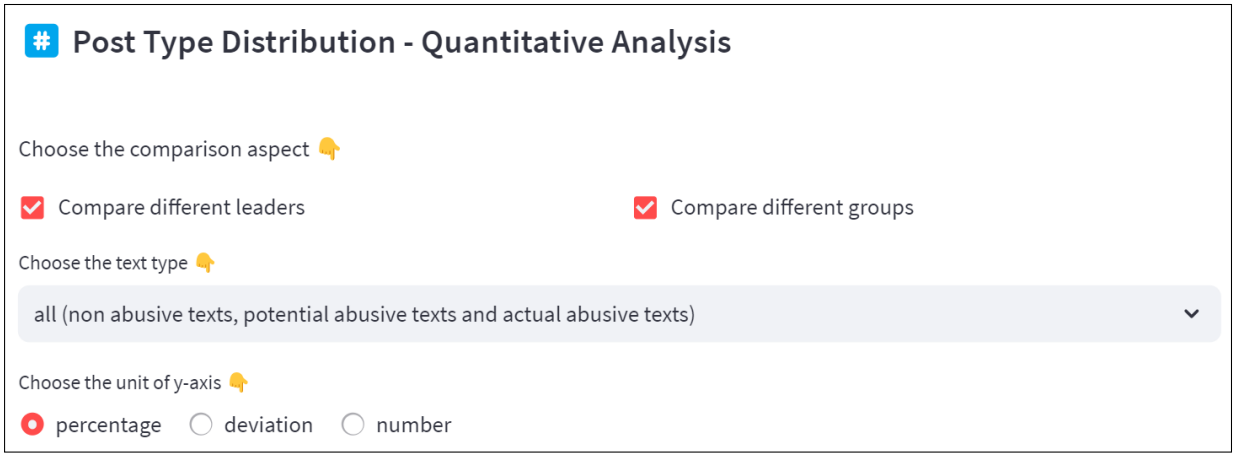


Figure 36: *Post Distribution* Navigation Menu Part-1 in *Comparative Corpora Analysis* in *Overall* Time Scale

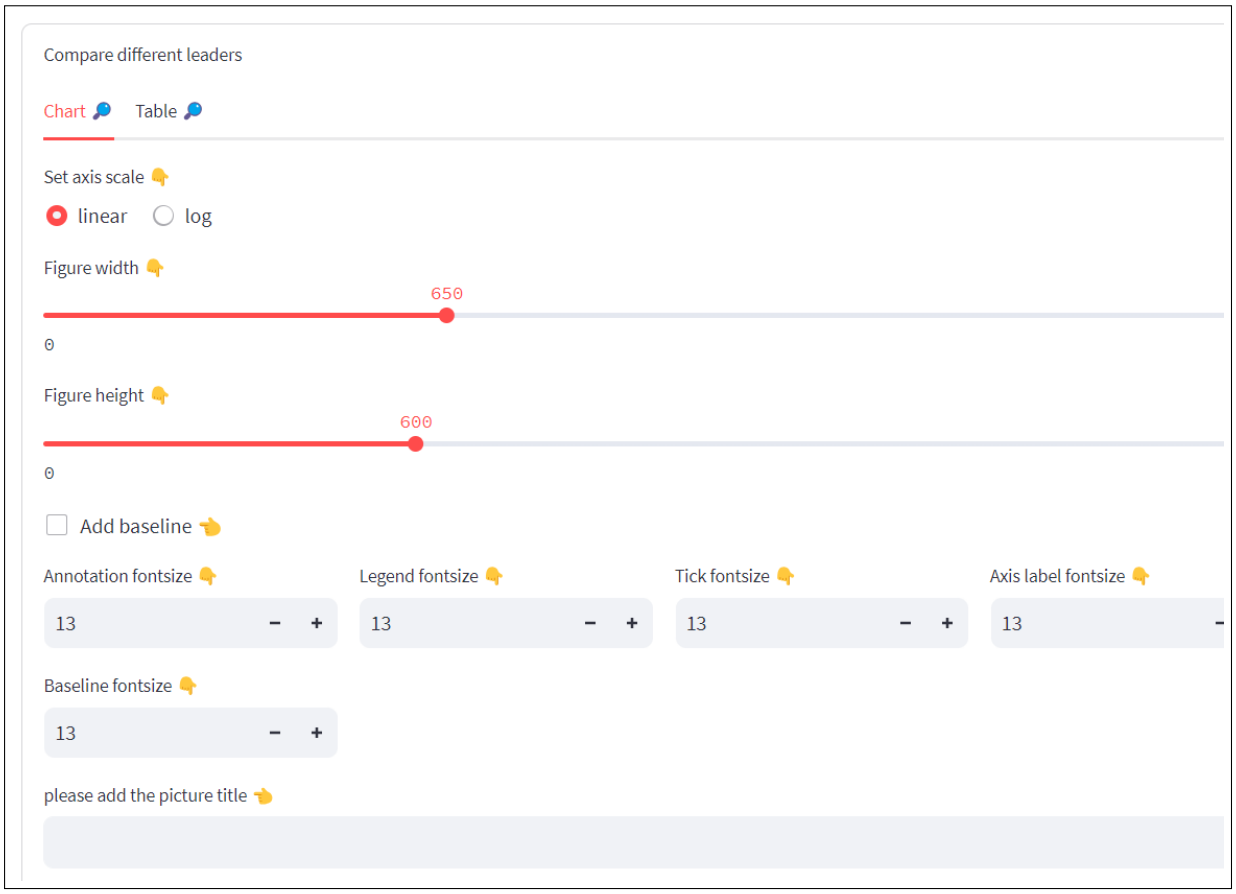


Figure 37: *Post Distribution* Navigation Menu Part-2 in *Comparative Corpora Analysis* in *Overall* Time Scale

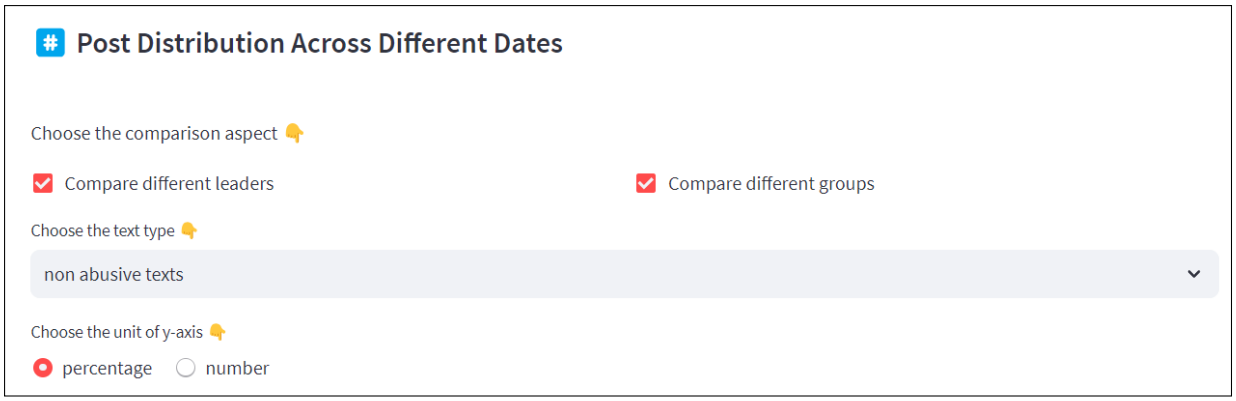


Figure 38: *Post Distribution* Navigation Menu Part-1 in *Comparative Corpora Analysis* in *Temporal* Time Scale

Figure 39: *Post Distribution* Navigation Menu Part-2 in *Comparative Corpora Analysis* in *Temporal* Time Scale

tion formats using tab selection. In the bar chart format, various customisation options are available to users (refer to Figure 39). They can tailor the bar chart to their preferences by selecting different y-axis scales (linear or logarithmic) and resizing the figure.

7.4 Sentiment Tendency

Sentiment Tendency module is designed for visualising the distribution of sentiment (i.e., positive, neutral, and negative) within different types of posts given selected corpora. This module is exclusively associated with the *Post-Based Analysis* feature, and it is available only in the *Overall* time scale. Moreover, it can be applied in both the *Single Corpus Analysis* and *Comparative Corpora Analysis* functionalities. We will provide instructions for navigating the *Post Distribution* module within the context of both *Single Corpus Analysis* and *Comparative Corpora Analysis*, specifically focusing on the *Overall* time scale.

7.4.1 Single Corpus Analysis in Overall Time Scale

Sentiment Tendency module within the *Single Corpus Analysis*, when set to the *Overall* time scale, is dedicated to examining the frequency and distribution of sentiment (i.e., positive,

Figure 40: *Sentiment Tendency* Navigation Menu in *Single Corpus Analysis* with *Overall* Time Scale (Quantitative)

neutral and negative) within different types of user replies from the chosen dataset. It is concerned with understanding the general prevalence and patterns of sentiment across different types of posts in the entire corpus.

Quantitative Analysis Figure 40 illustrates the user interface menu, wherein users are presented with the option to select the unit for the y-axis, offering the choices of "percentage" or "number". Also, it showcases the configuration settings for the y-axis scale, demonstrating both linear and logarithmic scaling options. Additionally, this figure highlights the capacity to adjust the width and height parameters of the visualisation. Figure 31 presents an example of sentiment distribution in different types of posts in *Single Corpus Analysis* with *Overall* Time Scale.

Qualitative Analysis This functionality enables users to inspect user replies based on their sentiment categories. Figure 42 displays the navigation menu, which allows users to explore user replies categorised by sentiment, including positive, neutral, and negative.

7.4.2 Comparative Corpora Analysis in Overall Time Scale

Sentiment Tendency module in *Comparative Corpora Analysis*, configured for the *Overall* time scale, is designed to investigate the distribution of replies with different sentiment categories across various corpora (see Figure 45). It's important to note that this analysis does not consider the specific time information or temporal aspects of the data.

For data comparison and representation options, users can select between two modes: comparing different leaders or comparing different groups. Within the *Sentiment Tendency* module in *Comparative Corpora Analysis* at the *Overall* time scale, the y-axis offers various units to accommodate different data representations and value measurement needs. Specifically, "number" conveys absolute values, "percentage" indicates values relative to the whole, and "deviation" measures differences compared to the mean. Additionally, users have the flexibility to choose the specific types of posts they want to investigate sentiment for. The "all" option covers "actually abusive," "potentially abusive," and "non-abusive" posts, while

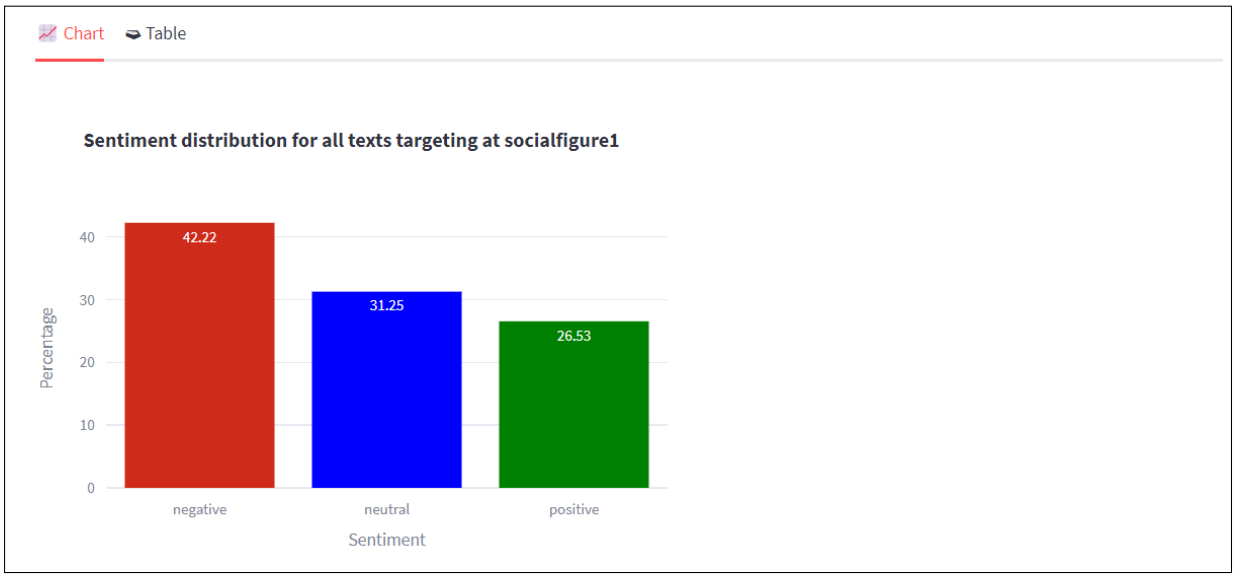


Figure 41: *Sentiment Tendency* Example in *Single Corpus Analysis* with *Overall* Time Scale (Quantitative)

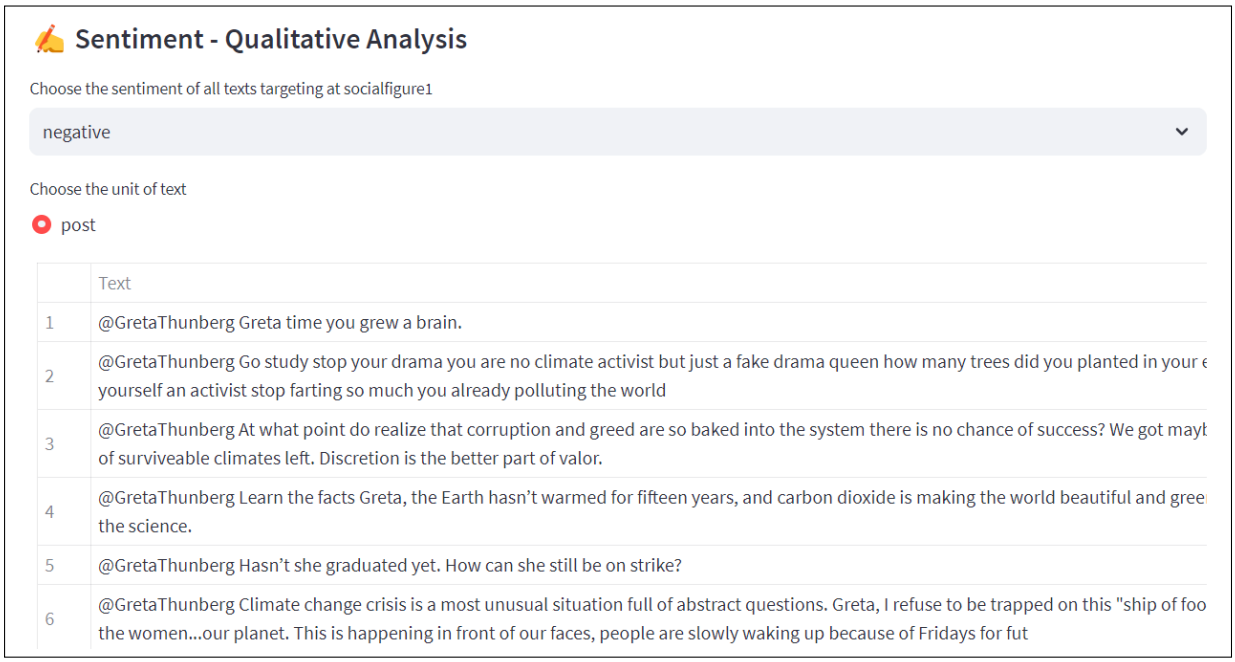


Figure 42: *Sentiment Tendency* Navigation Menu in *Single Corpus Analysis* with *Overall* Time Scale (Qualitative)

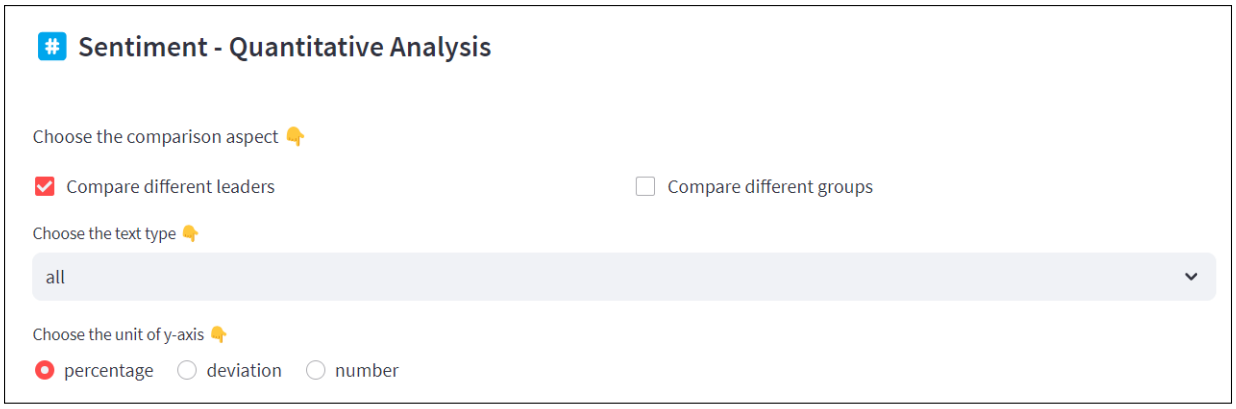


Figure 43: *Sentiment Tendency* Navigation Menu Part-1 in *Comparative Corpora Analysis* in *Overall* Time Scale

the "abusive" option includes "actually abusive" and "potentially abusive" posts (see Figure 43).

Regarding customisation and presentation choices, the interface offers two distinct methods for presenting data: tables and bar charts. Users can switch between these presentation formats using tab selection. In the bar chart format, there are various customisation options available (see Figure 44). Users can fine-tune the bar chart to their preferences by choosing different y-axis scales (linear or logarithmic), resizing the figure, adjusting the font size within the figure, and personalising the figure's title.

7.5 User Distribution

User Distribution module enables the visualisation of user types' distribution based on their abusive post scores, including categories such as Neutral, Mildly offensive, 50-50 offensive, Intensively offensive, and Extremely offensive, within the selected corpora. This module is exclusively associated with the *User-Based Analysis* feature, which can be applied in both the *Single Corpus Analysis* and *Comparative Corpora Analysis* functionalities. To cater to various corpus operations (i.e., *Single Corpus Analysis* or *Comparative Corpora Analysis*) and time scale options (i.e., *Overall* or *Temporal*), we will provide instructions for navigating the *User Distribution* module within the context of both *Single Corpus Analysis* and *Comparative Corpora Analysis*, considering both the *Overall* and *Temporal* time scales.

7.5.1 Single Corpus Analysis in Overall Time Scale

User Distribution module in *Single Corpus Analysis*, when configured for the *Overall* time scale, is designed for analysing the frequency and distribution of responders with different levels of abusiveness, including Neutral, Mildly offensive, 50-50 offensive, Intensively offensive, and Extremely offensive, within the selected dataset. It's important to note that this analysis does not consider the temporal aspect; rather, it focuses on gaining insights into the overall prevalence and distribution patterns of offensive users within the entire corpus.

Quantitative Analysis Figure 46 illustrates the user interface menu, wherein users are presented with the option to select the unit for the y-axis, offering the choices of "percentage" or "number". Also, it showcases the configuration settings for the y-axis scale,

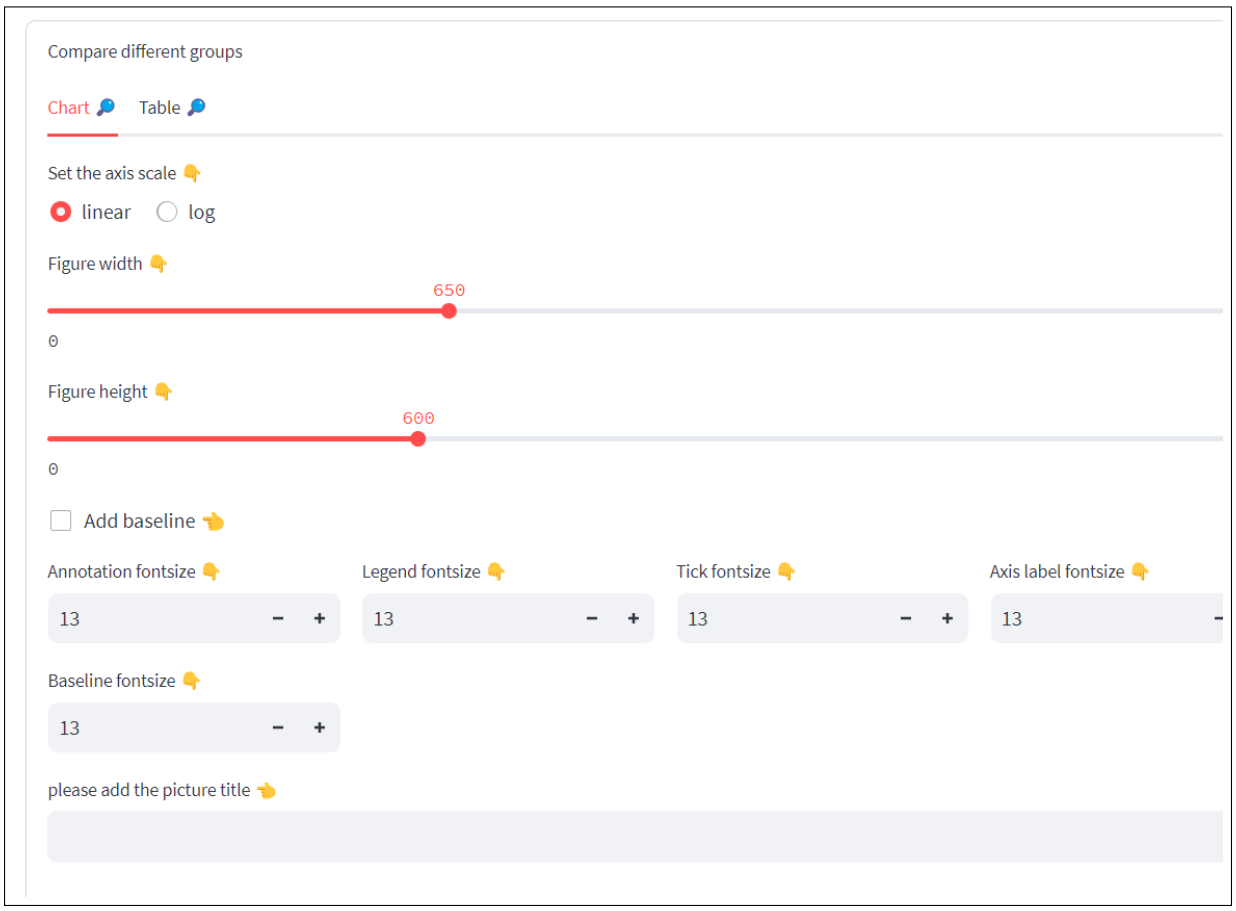


Figure 44: *Sentiment Tendency* Navigation Menu Part-2 in *Comparative Corpora Analysis* in *Overall* Time Scale

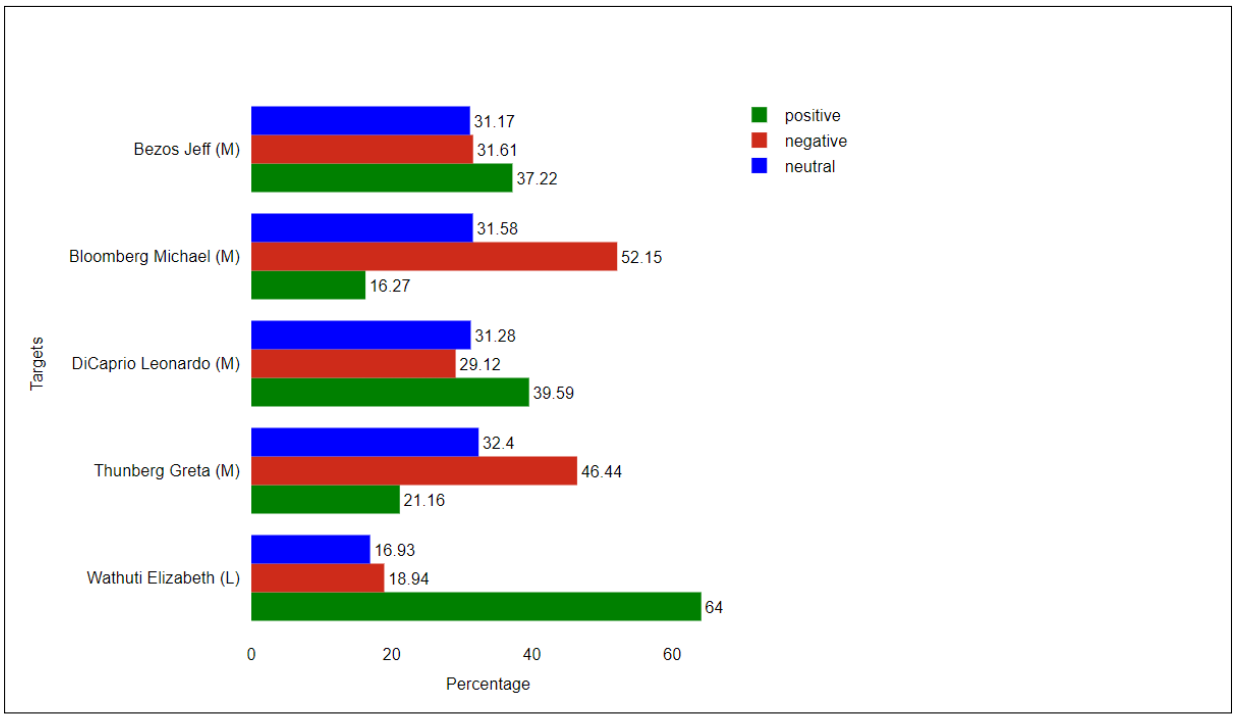


Figure 45: *Sentiment Tendency* Example in *Comparative Corpora Analysis* in *Overall* Time Scale

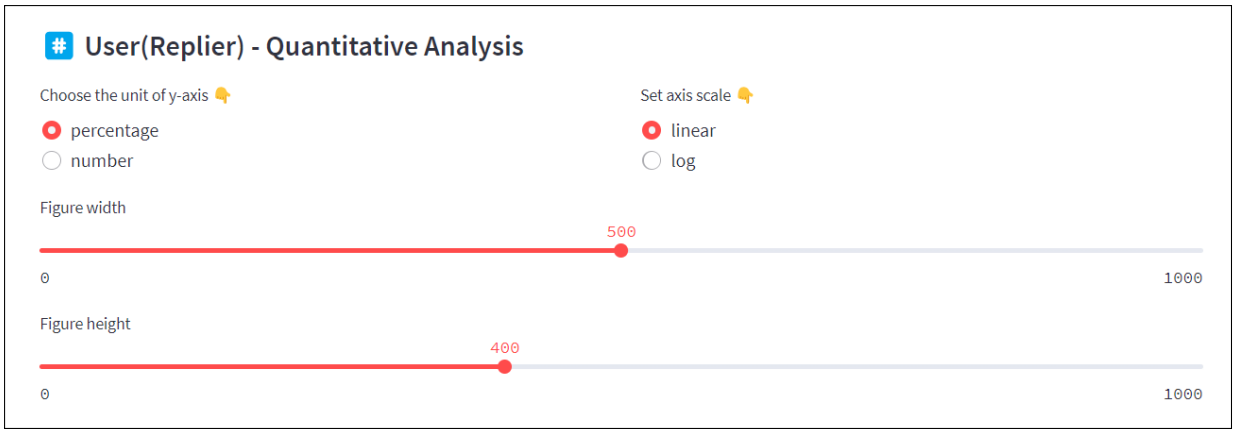


Figure 46: *User Distribution* Navigation Menu (Quantitative) in *Single Corpus Analysis* with *Overall* Time Scale

demonstrating both linear and logarithmic scaling options. Additionally, this figure highlights the capacity to adjust the width and height parameters of the visualisation. Figure 47 presents an example of the distribution of different types of users in *Single Corpus Analysis* with *Overall* Time Scale.

Qualitative Analysis This feature empowers users to delve into user distribution patterns. Figure 48 showcases the navigation menu, offering users the capability to explore the distribution of users categorised by their abusive post scores, which include categories like Neutral, Mildly offensive, 50-50 offensive, Intensively offensive, and Extremely offensive.

7.5.2 Single Corpus Analysis in Temporal Time Scale

Sentiment Tendency module within *Single Corpus Analysis*, when configured for the *Overall* time scale, focuses on analysing how user distribution changes over days within the selected single user response dataset. This module tracks variations in the number and the distribution of different types of responders over time. For instance, Figure 50 demonstrates how the distribution of various types of responders to activists has shifted during and after COP26.

To customise the visual representation in the *Temporal* time scale, Figure 49 displays the user interface menu. This menu allows users to choose the unit for the y-axis, with options such as "percentage" or "number." It also presents configuration settings for the y-axis scale, offering both linear and logarithmic scaling options. Additionally, this figure emphasizes the capability to adjust the width and height parameters of the visualisation.

7.5.3 Comparative Corpora Analysis in Overall Time Scale

User Distribution module in *Comparative Corpora Analysis*, configured for the *Overall* time scale, is designed to investigate the distribution of responders with different levels of abusiveness across various corpora (see Figure 53). It's important to note that this analysis does not consider the specific time information or temporal aspects of the data.

Regarding data comparison and representation options, users have the choice between two modes of comparison: comparing different leaders or comparing different groups. Within the *User Distribution* module in *Comparative Corpora Analysis* at the *Overall* time

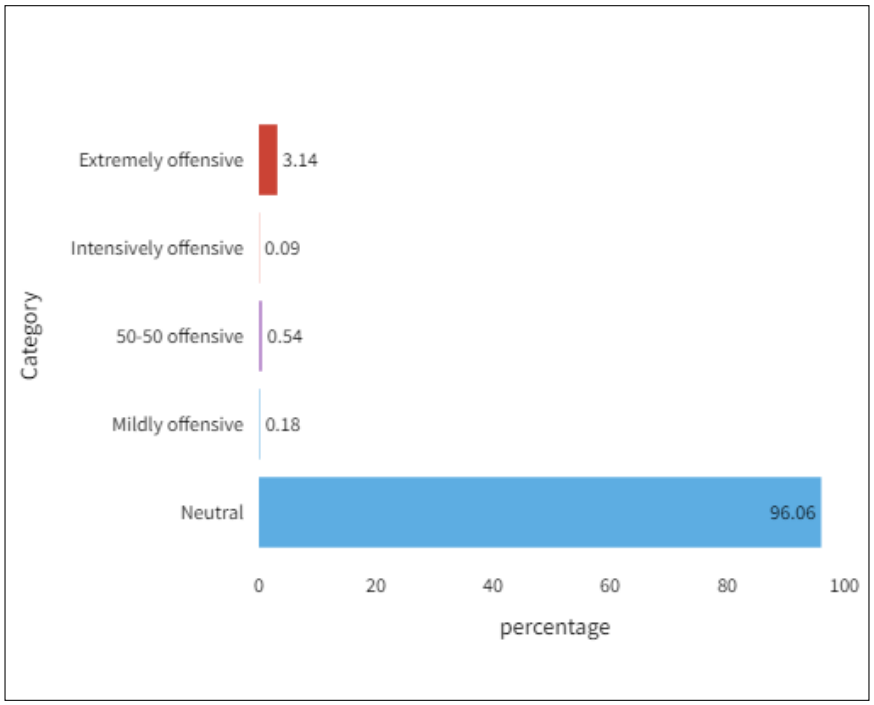


Figure 47: *User Distribution* Example in *Single Corpus Analysis* with *Overall* Time Scale (Activists)

Figure 48: *User Distribution* Navigation Menu (Qualitative) in *Single Corpus Analysis* in *Overall* Time Scale

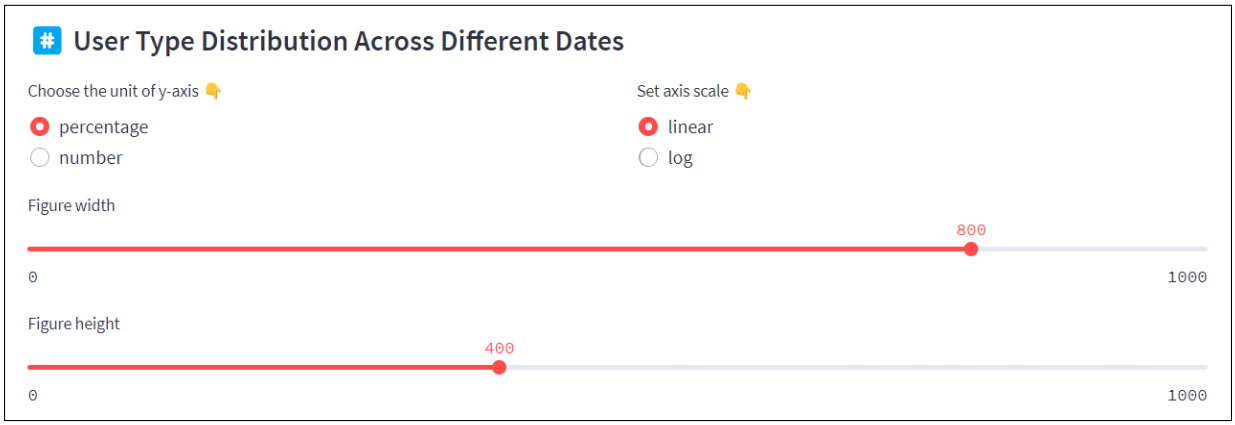


Figure 49: *User Distribution* Navigation Menu in *Single Corpus Analysis* with *Temporal* Time Scale

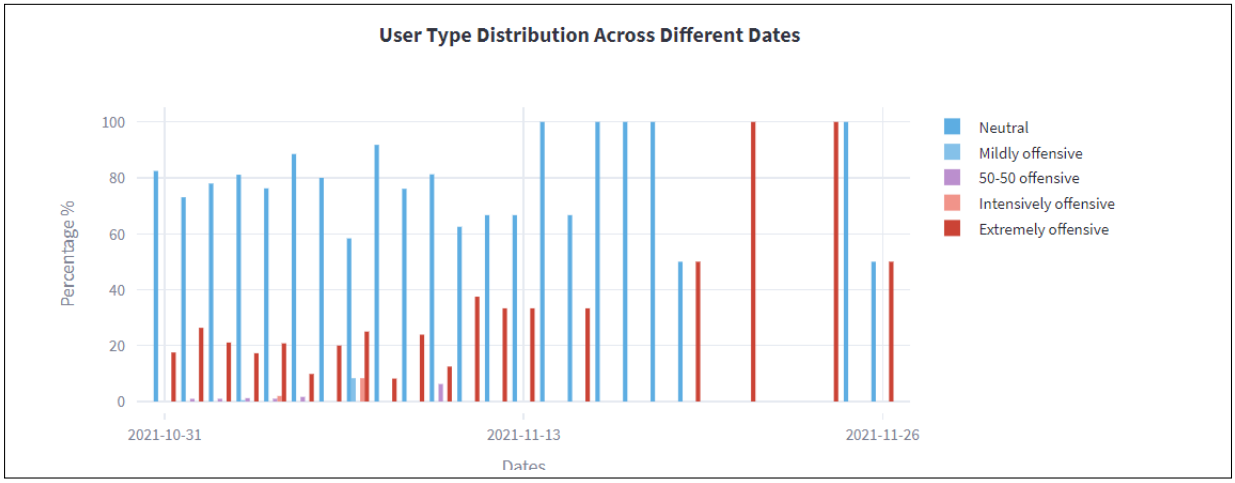


Figure 50: *User Distribution* Example in *Single Corpus Analysis* in *Temporal* Time Scale (Activists)

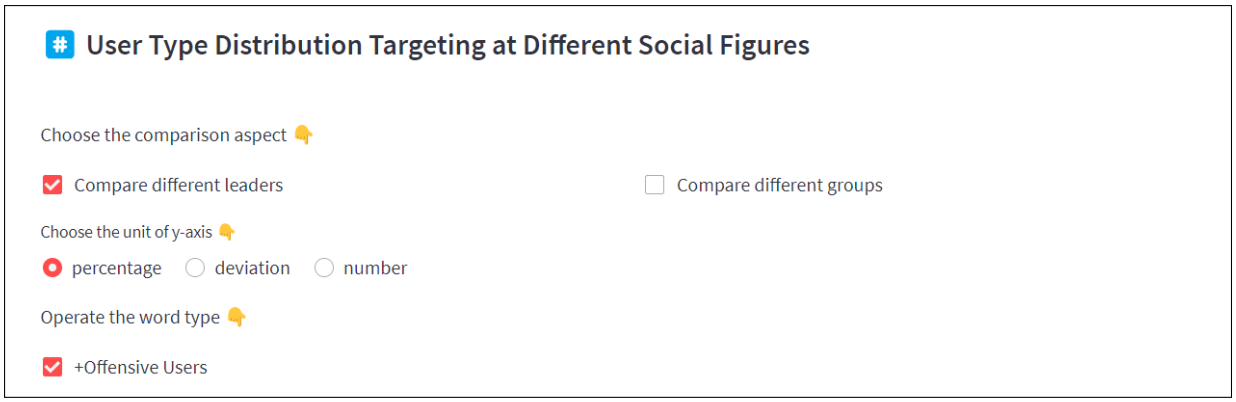


Figure 51: *User Distribution* Navigation Menu Part-1 in *Comparative Corpora Analysis* in *Overall* Time Scale

scale, the y-axis provides various units to accommodate diverse data representations and value measurement requirements. Specifically, "number" is used to convey absolute values, "percentage" indicates values in relation to the whole, and "deviation" measures differences in comparison to the mean. Additionally, users can decide whether to include the combined count of offensive users (including Mildly offensive, 50-50 offensive, Intensively offensive, and Extremely offensive) in the presentation, allowing for consideration of distinctions between neutral users and offensive users (see Figure 51).

Regarding customisation and presentation choices, the interface provides two distinct methods for presenting data: tables and bar charts. Users can switch between these presentation formats by using tab selection. In the bar chart format, there are various customisation options available to users (see Figure 52). They can fine-tune the bar chart according to their preferences by choosing different y-axis scales (linear or logarithmic), customising colours for various variables, resizing the figure, changing the font size within the figure, and personalising the figure's title.

7.5.4 Comparative Corpora Analysis in Temporal Time Scale

User Distribution module within the *Comparative Corpora Analysis*, when configured for the *Temporal* time scale, is primarily focused on analysing how user distribution evolves across various corpora over time (see Figure 56). Its primary goal is to compare the distribution patterns of different user types across different datasets as they change over time.

For data comparison and representation options, users are provided with two modes of comparison: comparing different leaders or comparing different groups. Within the *User Distribution* module of the *Comparative Corpora Analysis* at the *Temporal* time scale, users must specify the type of users they want to visualise, which includes Neutral, Mildly offensive, 50-50 offensive, Intensively offensive, Extremely offensive, or All. Additionally, the y-axis offers different units to accommodate various data representation and value measurement needs. Specifically, "number" is used for conveying absolute values, while "percentage" indicates values in relation to the whole (see Figure 54).

In terms of customisation and presentation choices, the interface supports two distinct data presentation methods: tables and bar charts. Users can easily switch between these presentation formats through tab selection. Within the bar chart format, users have access to various customisation options, including the ability to select different y-axis scales (linear or logarithmic) and resize the figure (refer to Figure 55).

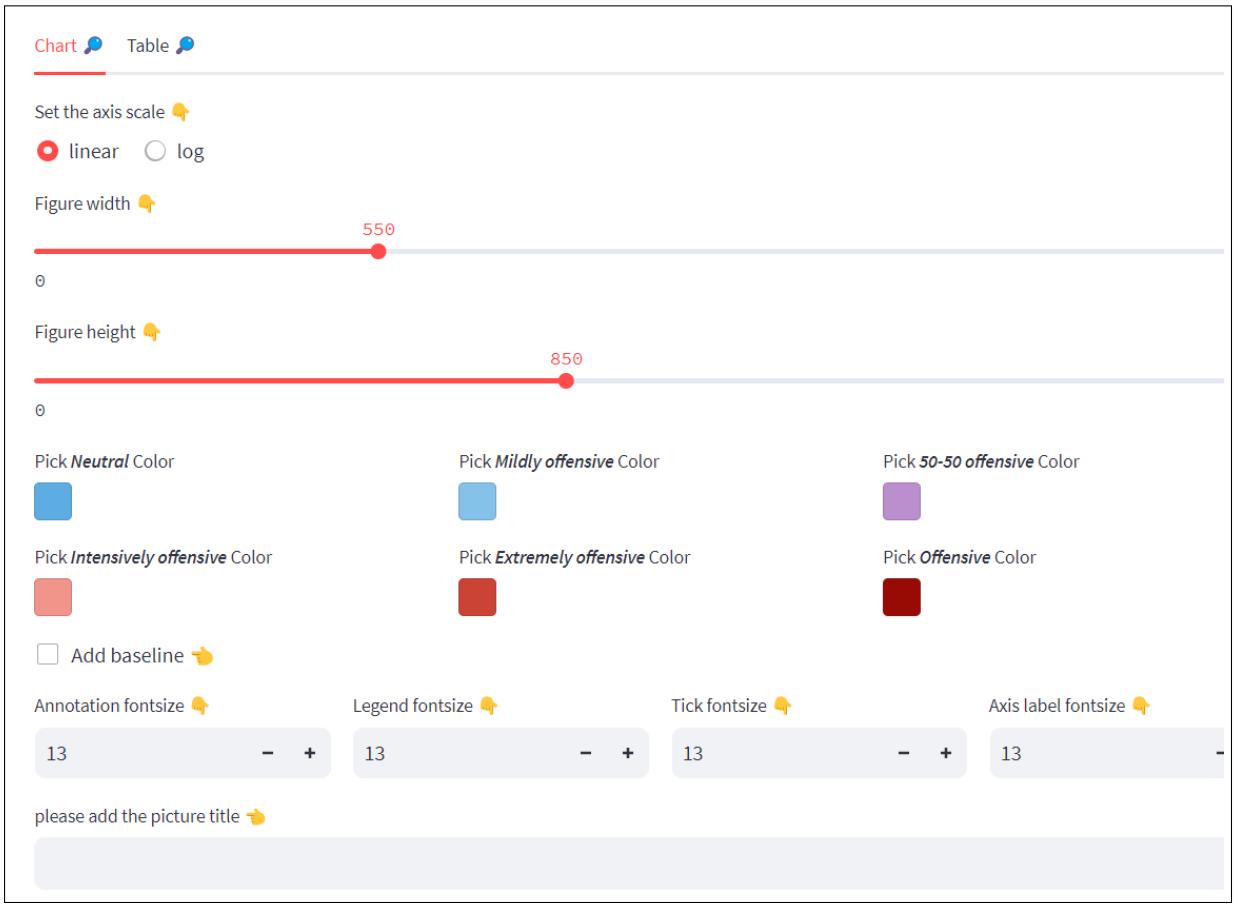


Figure 52: *User Distribution* Navigation Menu Part-2 in *Comparative Corpora Analysis* in *Overall* Time Scale

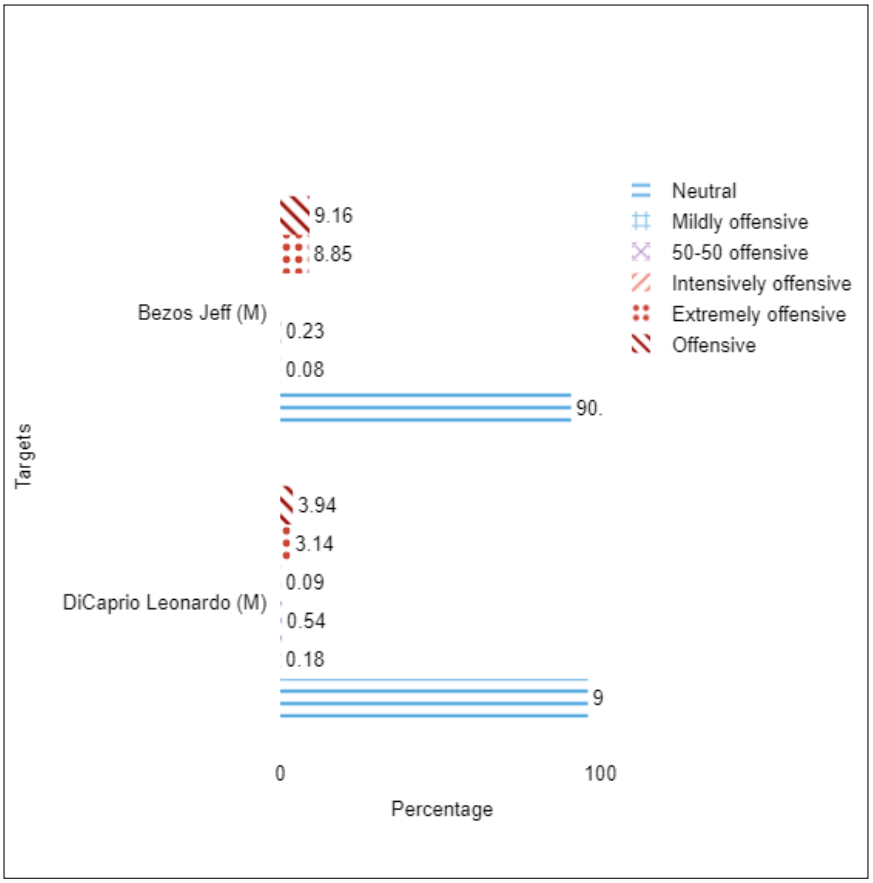


Figure 53: *User Distribution* Example in *Comparative Corpora Analysis* in *Overall* Time Scale

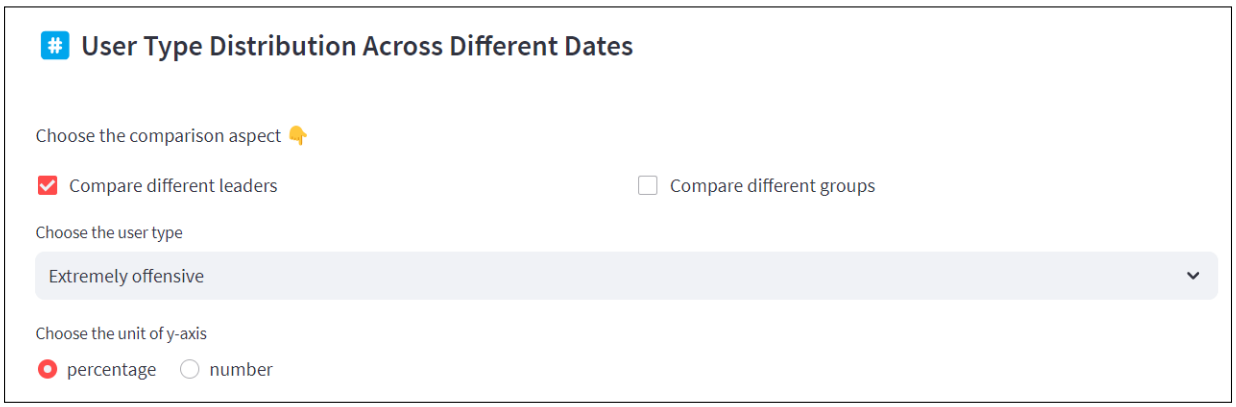


Figure 54: *User Distribution* Navigation Menu Part-1 in *Comparative Corpora Analysis* in *Temporal* Time Scale

Figure 55: *User Distribution* Navigation Menu Part-2 in *Comparative Corpora Analysis* in *Temporal* Time Scale

8 Conclusion

Throughout this user manual, we have endeavoured to provide a comprehensive guide to utilising the features and functions of the OLAn. As users familiarise themselves with the Interface and its functionalities, we encourage users to regularly revisit this manual for clarification and guidance. Additionally, with the evolving nature of technology and research, it's essential to stay updated on the latest features and best practices associated with the system.

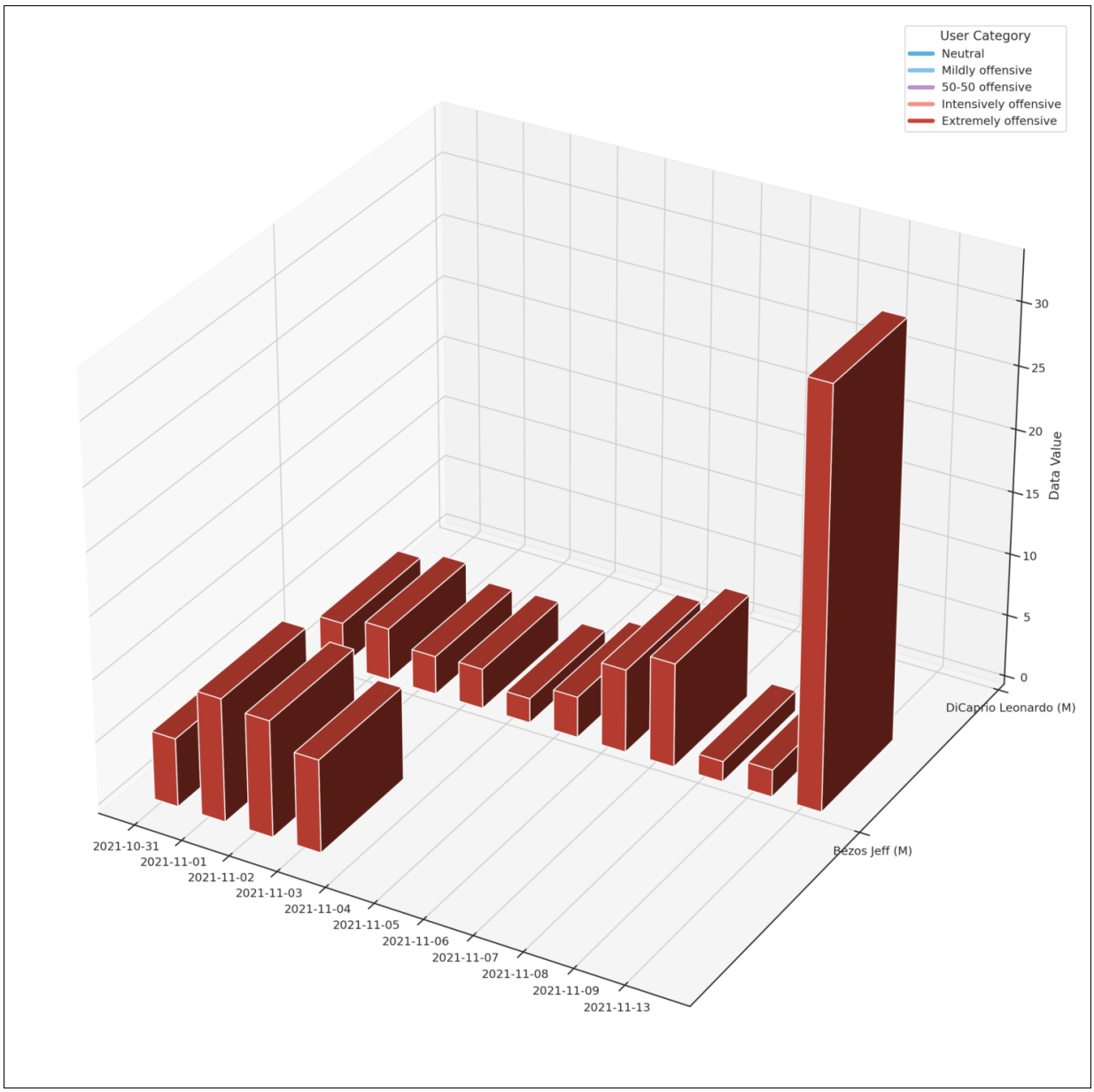


Figure 56: *User Distribution* Example in *Comparative Corpora Analysis* in *Temporal* Time Scale

References

Gorrell, G., M. E. Bakir, I. Roberts, M. A. Greenwood, and K. Bontcheva (2020). Online abuse toward candidates during the UK general election 2019. *arXiv preprint arXiv:2001.08686*.