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IRWA 2024 Part 1: Text Processing and Exploratory Data Analysis

SHA DE TORNAR A CREAR EL GITHUB REPO, AMB LES ESPECIFICACIONS DEL PROJECT, I AFEGIR ALLA COM EXECUTAR EL CODI DE LA PART 1

1. Introduction

In the first part of our project, we aim to pre-process the dataset of tweets related to the Farmers Protests of 2021 and perform Exploratory Data Analysis (EDA). The dataset contains Twitter data, and the objective is to prepare the dataset for further phases of the project, where this information will be used for building a recommender system. This report explains the decisions made in pre-processing the documents and highlights the insights found from the dataset through EDA.

The files used in this part of the project are:

- **farmers_protest_tweets.json**: Contains the raw tweet data, including the tweet text, date, hashtags, likes, retweets, and URLs, needed for the final output of the query.
- **tweet_document_ids_map.csv**: Used to map tweet IDs to document IDs, ensuring consistency across the pre-processing and analysis stages.

2. Document Pre-processing

The initial task is to clean the raw dataset to make it suitable for analysis. The following steps were taken:

Tokenization: We split the text of each tweet into individual tokens (words). This step was crucial for processing each word individually.

Stop Words Removal: Using the NLTK library, common stop words were removed to focus on more meaningful words in the analysis. This reduced noise in the dataset.

Punctuation Removal: All punctuation marks were eliminated from the tweets, as they do not contribute to the semantic meaning in most cases.

Stemming: We applied the Porter Stemmer algorithm to reduce words to their root forms. This helped in grouping words with similar meanings (e.g., 'running' and 'run').

Hashtag and Username Handling: The '#' symbol was removed, but the words starting with it (hashtags) were retained, as they may provide valuable context. The '@' symbol was removed, but the usernames were retained for potential user interaction analysis.

Date Conversion: The tweet dates were converted to pandas `datetime` objects to facilitate time-based analyses.

We generated **two dictionaries** to store the tweet data:

- **original_tweets_dict**: This dictionary contains the unprocessed data including the tweet text, date, hashtags, likes, retweets, and URL. This information is preserved as is, without any tokenization or processing, to be used when retrieving the full tweet content after a query.
- **processed_tweets_dict**: This dictionary contains the tokenized and processed version of the tweets. The tweet text and hashtags are processed (tokenized and stemmed), making this dictionary essential for building the inverted index and classification tasks in future stages of the project. Both dictionaries are linked via the document IDs to ensure consistency.

Example of both dictionaries, showing the output that will be provided after a query, and the dictionary after all the processing.

original_tweets_dict['doc_1']:


```
{'tweet': "#FarmersProtest #ModiIgnoringFarmersDeaths #ModiDontSellFarmers @Kisanektamorcha Farmers constantly distroying crops throughout India. Really, it's hearts breaking...we care about our crops like our children. And govt. agriculture minister is laughing on us🚜🌾WE WILL WIN💪 https://t.co/kLspngG9xE", 'hashtags': ['#FarmersProtest', '#ModiIgnoringFarmersDeaths', '#ModiDontSellFarmers'], 'date': '2021-02-24T09:23:32+00:00', 'likes': 0, 'retweets': 0, 'url': 'https://twitter.com/PrdeepNain/status/1364506237451313155'}
```

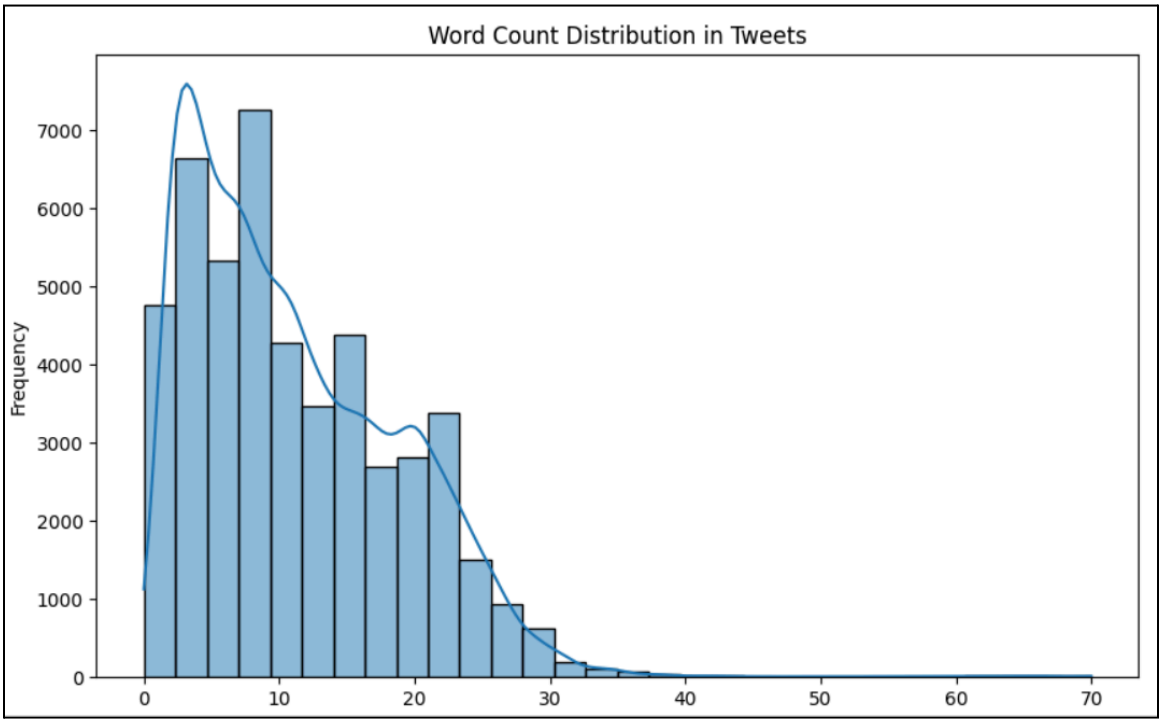

processed_tweets_dict['doc_1']:


```
{'tweet': ['kisanektamorcha', 'farmer', 'constantli', 'distroy', 'crop', 'throughout', 'india', 'realli', 'heart', 'breakingw', 'care', 'crop', 'like', 'children', 'govt', 'agricultur', 'minist', 'laugh', 'usw', 'win'], 'hashtags': ['farmersprotest', 'modiignoringfarmersdeath', 'modidontsellfarm']}
```

3. Exploratory Data Analysis (EDA)

To explore and gain a deeper understanding of the dataset of tweets related to the Farmers Protests of 2021, which we extracted from the json file, we conducted various types of analysis on the data. Here is a brief description of all the analysis done:

Word Count Distribution in Tweets: A histogram showing the distribution of word counts across tweets. This facilitates our understanding of the common tweet length and allows us to analyze the average length of the tweets in the dataset.



Average Sentence Length: The code calculates the average number of words per tweet, providing a useful insight that will be used in the future of the project

```
average_sentence_length()
```

```
Average Sentence Length: 11.18 words
```

Vocabulary Size: The total number of unique words in the processed tweets. This gives an idea of the richness of the language used in the tweets.

```
vocabulary_size()

Vocabulary Size: 32248 unique words
```

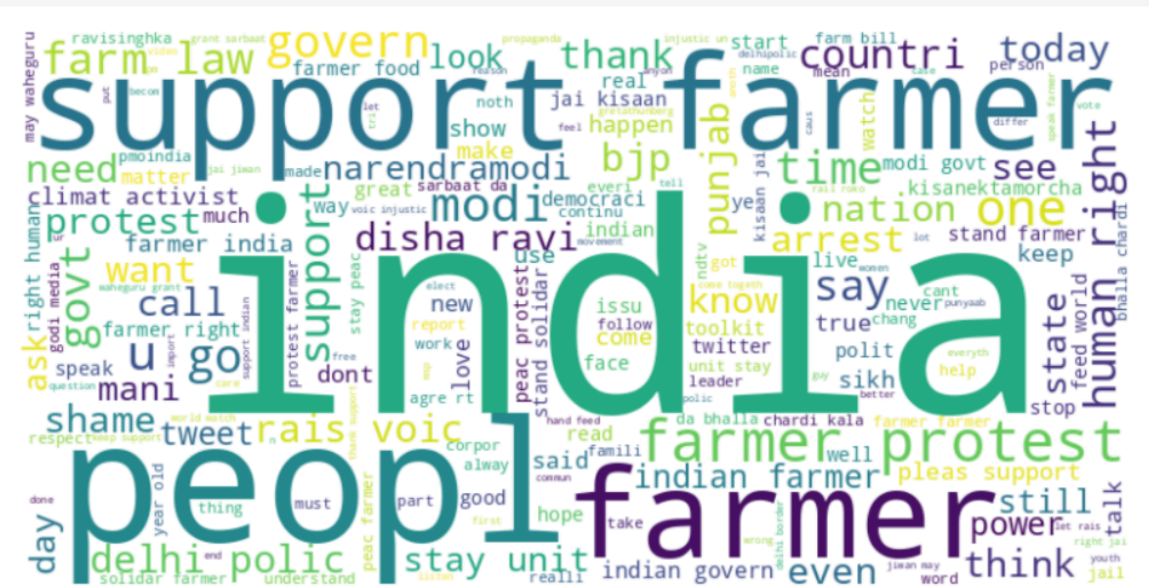
Ranking of Tweets by Retweets: A table of the top 10 tweets ranked by retweet count, highlighting the most popular or influential tweets, and identified by their doc_id.

```
ranking_by_retweets()

Top 10 Tweets by Retweets:
                                                          tweet  retweets
doc_3203   There's a #FarmersProtest happening in Germany...      6164
doc_38410  disha ravi, a 21-year-old climate activist, ha...      4673
doc_38012  Disha Ravi broke down in court room and told j...      3742
doc_46206  Farmers are so sweet. Y'all have to see this @...      3332
doc_27071  india is targeting young women to silence diss...      3230
doc_45142  Bollywood has betrayed Panjab &amp; the farmer...      3182
doc_35993  Please, where did you get your PhD from? Anti-...      2495
doc_9846   This is Revolution. More than 2.25lac people a...      2258
doc_38262  Wish you fly over the Delhi border and look at...      2208
doc_41472  They went after our grandparents. #GurmukhSing...      1933
```

Word Cloud for Most Frequent Words: A word cloud representing the most frequently used words in the processed tweets.

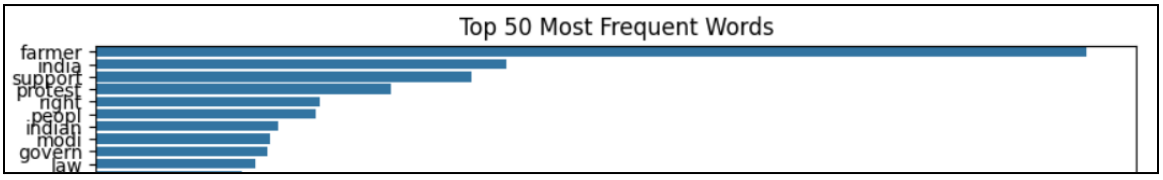
```
generate_wordcloud()
```



We also provided the top 50 words and their count; here are the top 10:

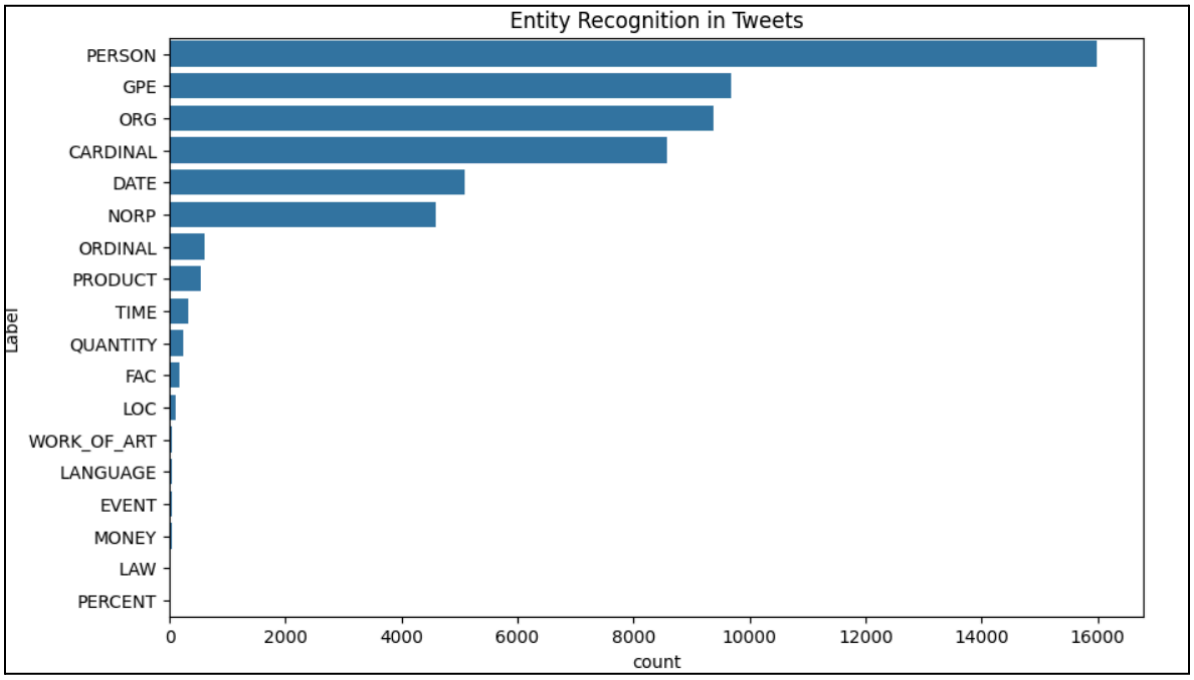
```
most_frequent_words()

Top 50 Most Frequent Words:
          Word  Count
0       farmer  15789
1        india   6539
2      support   5985
3      protest   4698
4        right   3566
5        peopl   3503
6       indian   2908
7         modi   2773
8       govern   2724
9          law   2545
10        govt   2319
```



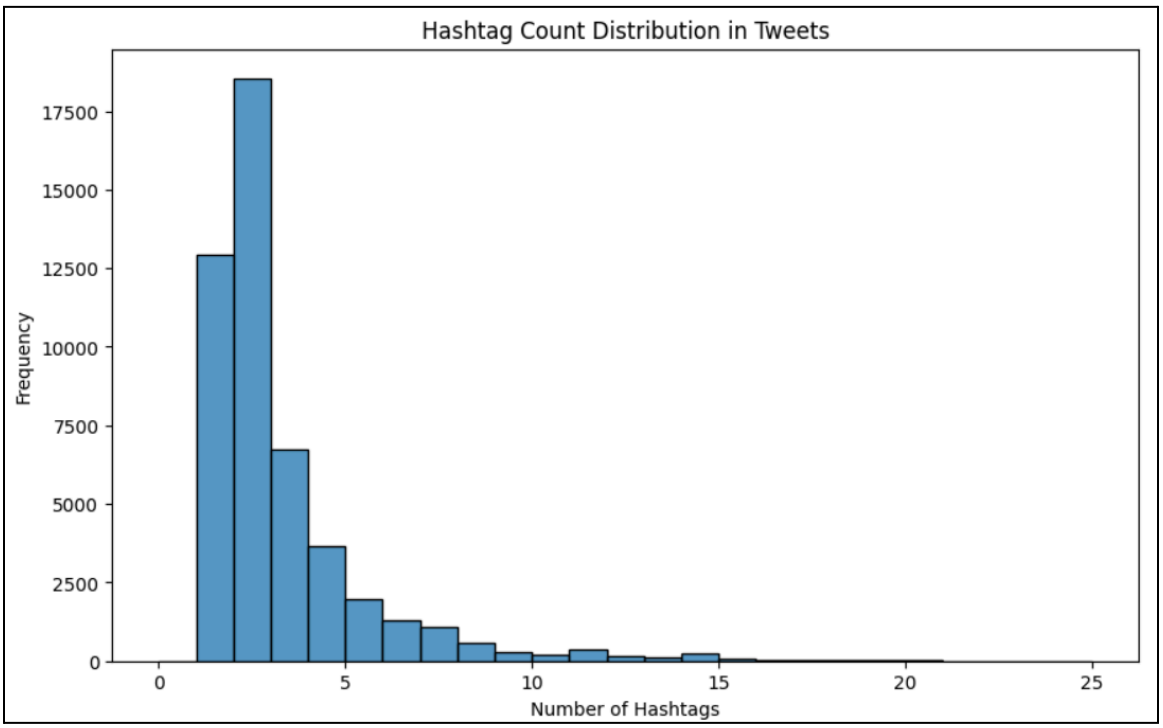
We don’t have any surprises here, as the top words are farmer, India, support and protest, all related to the tweets that we are analyzing.

Entity Recongnition: An algorithm that analyzes the words of the tweets and classifies them by an entity. Here is the the distribution by type:



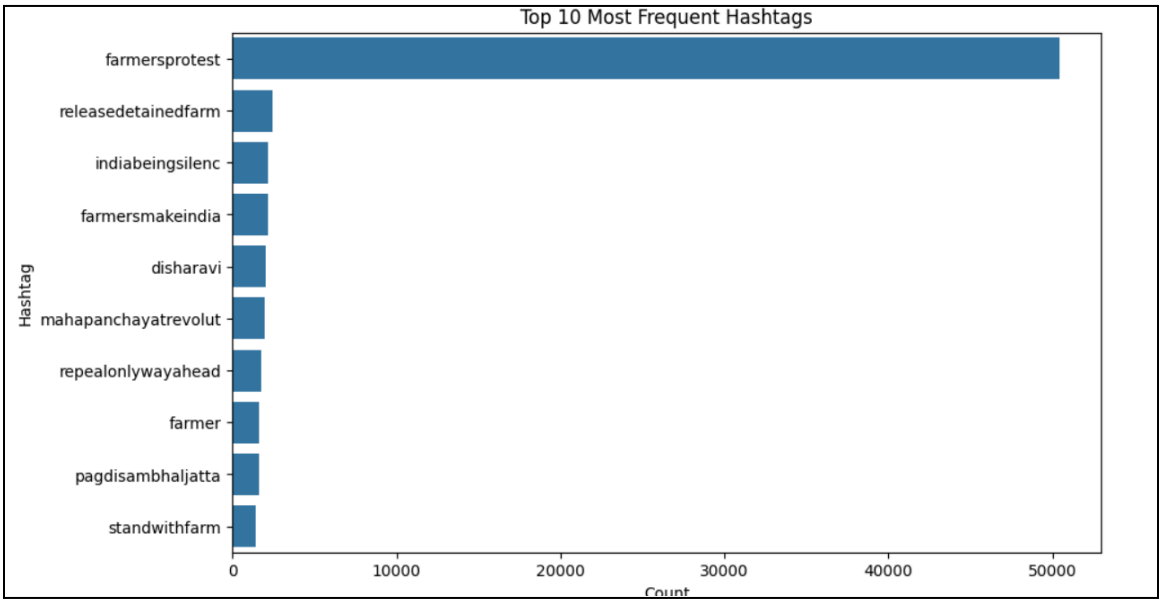
The number one entity recognized in the tweets are persons. This could be expected, as normally these kind of protests are addressed to specific people, most likely being part of the government and organizations.

Hashtag Count Distribution: A histogram showing how many hashtags are used per tweet.



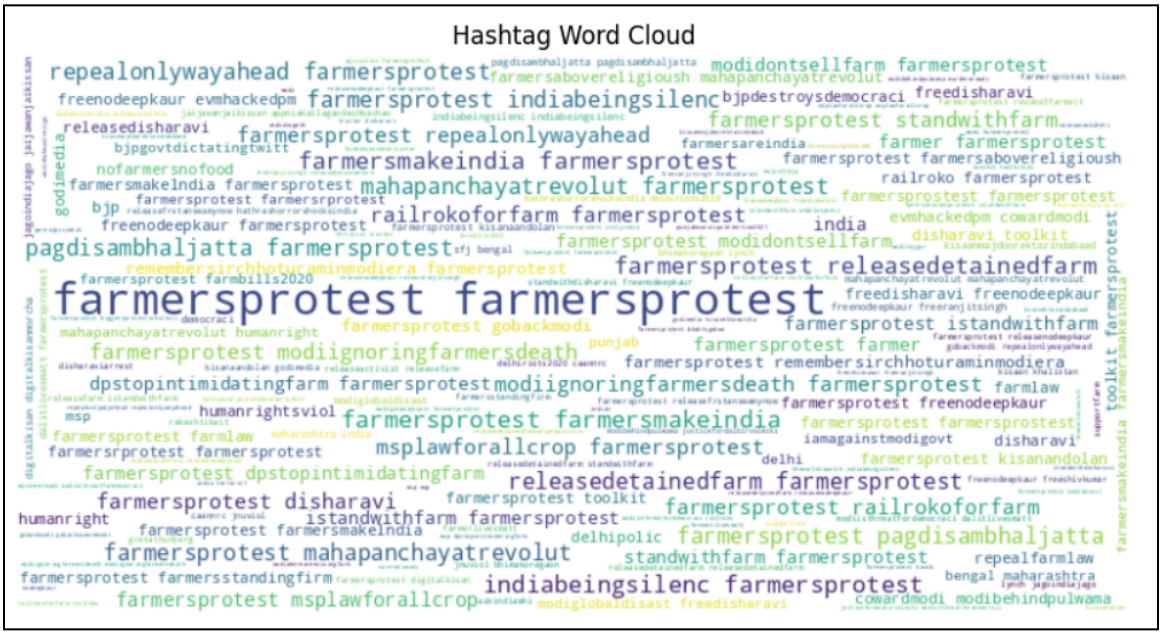
We observe that the most common number of hashtags per tweet is 3, followed by 2.

Most Frequent Hashtags: A bar chart showing the top 10 most frequently used hashtags in the dataset.



It makes sense that the top hashtag is farmersprotest, as we are analysing the farmers protest in India in 2021.

Hashtag Word Cloud: A word cloud visualizing the most frequently used hashtags.



4. Conclusion

Through this pre-processing and exploratory analysis, we have cleaned the dataset and identified key patterns. The cleaned dataset is now ready for future tasks, such as building an inverted index and developing the recommender system. The EDA results give us a

clearer understanding of the tweet content and user engagement, which will guide us in the next phases of the project.

Github Link: