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Gone but Not Forgotten: A Novel Approach for Collecting Deleted Tweets

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Introduction: Online social networks, including Twitter, often (or almost always) provide some mechanism for users to withdraw postings that they have previously made, given that one's communication history is public for others to study or criticise. Legitimate reasons for deletion include typos, outdated information, or regrettable content [1], but some users may also delete tweets to facilitate abusive behavior such as spam or manipulating algorithms[2]. Some examples of deleted tweets by celebrities are shown in Figure 1. Analyzing deleted tweets can help identify spam or malicious accounts and can aid in the development of tools to assess the likelihood of regrettable tweets. This analysis can also provide insights into patterns of communication, potential biases, political discourse, and data accuracy. Curating a dataset of deleted tweets is therefore important for comprehensive analysis of the social media landscape.

(a) Exposed phone number (b) Exposed email (c) Fake news

Figure 1: Examples of regrettable deleted tweets

In the past, researchers have collected deleted tweets using the Twitter Compliance Firehose or Twitter's Streaming API([2], [3]) by following certain users over a couple of weeks or months to collect their deleted tweets. However, these methods require a paid subscription.

In this paper, we propose a novel free of cost method for curating a dataset of deleted tweets using the Twitter Stream Grab archive. People who are interested in studying deleted tweets can utilize this method to curate their own dataset. Using the proposed methodology, we introduce a large-scale dataset of deleted tweets: 'Tweeleted' with more than a million deleted tweets along with all of the metadata provided by Twitter, such as the tweet content, hashtags used, accounts mentioned, location information and many more [1].

We have performed detailed data analysis and visualisations to understand our dataset better such as the most frequently occurring words in deleted tweets, the types of users deleting the most amount of tweets, the predominant languages used in deleted tweets, the sentiments expressed in deleted tweets and so on.

Methods Considered: The Twitter Compliance Firehose (CF), Twitter's search API, Wayback Machine, Politwoops or the Twitter Stream Grab are some methods that can be used to collect

[1]The complete list of the metadata provided for each tweet can be found in the Twitter Developer Documentation

deleted tweets. We chose the Twitter Stream Grab as the method for deleted tweet collection as others are either computationally expensive, not scalable, lacking in generality or require paid subscription.

Methodology: We downloaded the collection of tweets from 1-7 June 2021 from the Twitter Stream Grab website that is organised in folders containing a number of JSON files which consist of two types of entries:

1. Tweet: A tweet contains the 'created tweet ID', content and all other metadata.
2. Status deletion notice: A status deletion notice contains the 'deleted tweet ID'.

When a tweet is deleted, Twitter sends out a status deletion notice indicating that the tweet with the given id has been deleted to inform third-party apps to remove this tweet from their databases.

Our process involves collecting tweets and status deletion notices in separate dataframes for each hour of each day. To retrieve deleted tweet content, the tweet IDs mentioned in the status deletion notices dataframes are searched in all previous hour tweet dataframes. If a tweet with the same ID is found, we have successfully found the content and metadata of the deleted tweet and we store it in a separate dataframe.

Due to the large number of collected tweets, a linear search for deleted tweet IDs is not feasible. Therefore, a binary search is used by sorting the created tweet IDs and deleted tweet IDs in their respective dataframes. We first check if a deleted tweet ID is within the range of created tweet IDs for a particular dataframe. If it is, the binary search is followed to retrieve the content of the deleted tweet. This procedure is used to collect deleted tweets that were created and deleted within the same day for a period of 7 days. This process is shown in Figure 2.

Results: We introduced Tweeleted, a large-scale dataset containing 1,021,090 tweets along with all meta-data that Twitter makes available.

We analysed a subset of 'Tweeleted' containing $\sim$150k tweets from 1st June 2021. We summarise our findings here. The most frequently occurring words in the deleted tweets were 'follow', 'retweet', 'giveaway' etc. This indicates that most of the deleted tweets were spam/promotional messages. Although there are several accounts with only 1-2 deletions, we find a few accounts which are deleting a significant amount of tweets in the day. 'English' is the most popular language, followed by 'Japanese' and 'Unknown Language'. The most frequently occurring abusive word was 'fuck', followed by 'shit' and 'fucking'. The maximum number of deleted tweets were retweets followed by status updates, replies, mentions and quotes.

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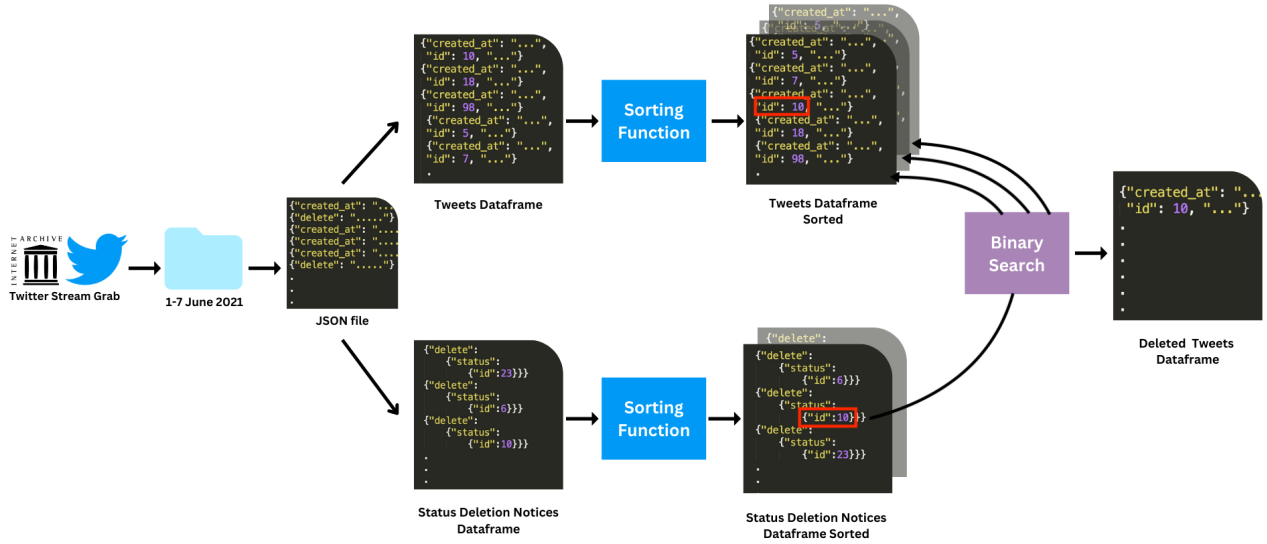

Figure 2: Method to curate a dataset of deleted tweets from Twitter Stream Grab