Sentiment Analysis of Tweets Regarding the Sri Lankan Crisis using Automatic Coding in ATLAS.ti 22

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Abstract—Sri Lanka is experiencing the worst financial crisis in its history. It is discovered that social media is flooded with information, people's opinions, and perceptions about the Sri Lankan crisis. Twitter is considered one of the most popular social media platforms for sharing opinions. Twitter remains one of the world's largest and most influential social networks. This study reflects the opinions of people across the globe on the Sri Lankan crisis through sentiment analysis of Twitter data until July 11, 2022. A Twitter data set having the hashtag srilanka was obtained from Kaggle, and sentiment analysis was performed in ATLAS.ti by automatically applying the proposed codes for each identified sentiment in terms of positive, negative, and neutral. A total of 1663 sentiments were identified from 9474 English-language tweets. Most of the sentiments were negative, exemplifying the unlikely impression of the Sri Lankan crisis. This study delves deeper into the expected cause of the results. In addition, the study gets emblematic standing since it employs ATLAS.ti, a qualitative data analysis software, to conduct sentiment analysis. This study also contributes by revealing a simple way for individuals who need more programming knowledge to use machine learning algorithms and strategies to analyse sentiment.

Keywords—Sri Lankan crisis, sentiment analysis, opinion mining, Twitter analysis, ATLAS.ti

I. INTRODUCTION

No country has been exempted from the financial turmoil of Covid-19 and the rise in oil and food prices caused by Russia's ongoing invasion of Ukraine. It stings rich countries, but it may jeopardise the existence of poor and middle-income countries. Sri Lanka, an island of 22 million people, is under a major economic and political crisis. In the 1970s, Sri Lanka was seen as a low-income country's success story. However, the country is currently experiencing its worst financial and economic crisis since its independence in 1948. Despite good infrastructural development and a largely sustainable growth rate from 2013 to 2019, the current financial collapse resulted from bad economic decisions. The Covid-19 pandemic and the Ukraine-Russia conflict have adversely affected the crisis (Bhowmick, 2022).

It is widely speculated that the power struggle between former president Gotabaya Rajapaksa and the Sri Lankan Parliament has resulted in an ongoing political crisis in Sri Lanka since 2022 (Sri Lankan political crisis - Wikipedia, n.d.). Economic difficulties fuelled the anti-government rallies and mass protests by the Sri Lankans. Political instability has not existed in Sri Lanka since the civil war, owing to widespread anti-government sentiment (Ramachandran, 2022). It is the first economic crisis in the country since its independence in 1948 (Bhowmick, 2022; Sharma, 2022). The crisis has culminated in a terrible social and economic situation in which the government's coffers are empty, and people lack sufficient funds to purchase necessities such as food and medicine. The pandemic, rising energy prices, and tax cuts intended to appease the public have all harmed Sri Lanka's economy. There were severe fuel shortages, medicine, and other necessities due to a constant lack of foreign currency and skyrocketing inflation. People had to wait in long lines outside gas stations for hours due to a lack of foreign reserves. The country needs more money to pay for gas, electricity, or energy. With a total debt of $51 billion, the country's economy has flatlined (Sharma, 2022), causing many severe emotional reactions among Sri Lankans and attracting and anticipating interest from people worldwide.

A. Sri Lankan crisis and social media

Social media is overwhelmed with information, updates, and people's opinions about the situation during the Sri Lankan crisis. People's views regarding the Sri Lankan crisis were not limited to people in Sri Lanka. People and organisations worldwide have used social media to voice their opinions, perspectives, and thoughts about the crisis.

Social media platforms now play a significant role in billions of people's lives. Facebook, YouTube, Instagram, WeChat, TikTok, Snapchat, and Twitter are among the most well-known social media platforms. Various social media are utilised to disseminate information (Musfira *et al*., 2022). Nonetheless, people continue to use it to express their opinions and updates on social media such as Twitter and Facebook. Twitter platform has over 436 million active users and ranks 15th among other leading social media platforms (Dixon, 2022). Since the beginning, Twitter has been an incredibly social thing where instant tweets can initiate rational discussions worldwide. Twitter is often called the "diary platform" because it is conversational, easy-going, and authentic (Woolams, 2021).

It could mine the various social media platforms for opinions and sentiments of the people about any prevailing issues. However, to extract people's opinions through viewer comments on the content that examines the topic, an analyst must carefully select a particular article or piece of information where the interaction and statements were made. In this case, accessing tweets is a much more straightforward and efficient method of acquiring opinions of people in the form of tweets. Consequently, this article summarises the results of an investigation of tweets containing the hashtag #srilanka. This Twitter hashtag was chosen because it tends to adopt a neutral stance, which is preferable to having a hashtag that openly expresses a strong view in either a positive or negative way.

B. Sentiment Analysis

An emotion is a complex feeling state in psychology that generates physical and psychological changes and influences human thought and behaviour. Words like "happy," "sad," "furious," "depressed," "love," "hate," and so on can be used to express emotions (Pudaruth *et al*., 2018). The interpretation and comprehensive classification of emotions (positive, negative, and neutral) inside text data using text analysis techniques are known as sentiment analysis (Jurek, Mulvenna and Bi, 2015). This study investigates tweets on the subject of the "Sri Lankan crisis" as emotional content to meaningfully reflect and interpret them using auto coding in ATLAS.ti 22. The method used to analyse these emotions is known as sentiment analysis. It can be done in various ways, from manual interpretation to implementing machine learning algorithms to enhance and simplify the analysis (Shafana *et al*., 2022). The sentiment analysis technique can track attitudes and emotions from any tweet, article, or comment. Sentiment analysis is becoming more critical in monitoring customer opinion on a product or service.

On the other hand, it can be beneficial to any subject which thus desires to use it. Views on a specific product or service can be examined to determine whether they are positive or negative. As a result, business owners can get feedback on their products, which they can use to improve them. The application of sentiment analysis is expanded to identifying and classifying a piece of writing based on the tone it conveys. It comprehends the social sentiment of a brand, product, or service, determining responder opinion regarding a topic covered via internet forums, interactions, feedback and examining student feedback on lectures, seminars, or study programmes.

The knowledge base that forms the basis of a sentiment analysis system is comprised of sentiment lexicons and datasets. A sentiment lexicon is a repository of words or phrases labelled with emotion. Likewise, a sentiment-annotated dataset includes documents (tweets, sentences, or longer documents) tagged with one or more sentiment labels (Joshi, Bhattacharyya and Ahire, 2017). The necessary text must be extracted using an appropriate web scraping tool to perform sentiment analysis. There are numerous ways to obtain the required text. In addition, there is a large number of datasets available that can be utilised for research purposes.

After retrieving the dataset for sentiment analysis, it must be analysed to determine whether it contains any emotion. It is typically accomplished by searching a collection of lexicons for a specific set of terms or employing pre-trained classifiers such as Support Vector Machines (SVM) or Naive Bayes.

C. Use of ATLAS.ti for Sentiment Analysis.

ATLAS.ti is one of the widely known computer-assisted qualitative data analysis software (CAQDAS) that can be used to analyse unstructured data (Friese, 2019). ATLAS.ti enables researchers to acquire, integrate, and explore the value of primary data using various techniques. Since ATLAS.ti supports a wide range of data types, it facilitates the creation of qualitative analytical links between a wide range of resources, such as video and photos, survey data, and case study transcripts. Friese (2019) described how to use ATLAS.ti in qualitative research. ATLAS.ti expands its application from qualitative data analysis to a few other valuable data analysis features. In addition to qualitative data analysis, ATLAS.ti version 9 (Sentiment Analysis - ATLAS.ti 9 Windows - User Manual, no date) and version 22 (Sentiment Analysis - ATLAS.ti 22 Mac - User Manual, no date) can perform sentiment analysis by exporting texts in the form of comments and tweets from the majority of the leading social networking platforms.

SpaCy is the natural language processing engine used by ATLAS.ti (Sentiment Analysis - ATLAS.ti 22 Mac - User Manual, no date). SpaCy is a Python library for advanced natural language processing and machine learning that is open-source and free. It can produce text pre-processing systems for deep learning, information extraction systems, and natural language processing systems (spaCy Industrial-strength Natural Language Processing in Python, no date). One step at a time, input data is processed in a pipeline to build on the knowledge acquired in the prior stage. With ATLAS.ti, the first step in sentiment analysis is to employ a tokeniser to divide a given text into digestible chunks and remove ellipses. To give the word a vector, the tokeniser consults a vocabulary for each language. This vector, which

was pre-learned through the use of a corpus, exhibits a certain level of usage similarity in the corpus utilised. The next element is the tagger, which labels each token and lexeme (if a token is a word) with part-of-speech tags. The sentiment analysis pipeline is trained on a variety of texts, including social media conversations and opinions on a wide range of topics and products. The language used will determine how ATLAS.ti employs modified pre-trained models (Sentiment Analysis - ATLAS.ti 22 Mac - User Manual, no date).

The scholarly literature on the ability to harness public sentiment in social media, considering various circumstances as a crucial tool, is growing significantly. This development of technological acceptance is fueled by the healthy expansion of the big data framework, which has resulted in an increase in applications and academic literature based on sentiment analysis employing social media data in the previous and current decades (Sharef, 2014; Sharef, Zin and Nadali, 2016).

The majority of studies on sentiment analysis of social media data focus on social networks like Twitter, Facebook, and MySpace (Pudaruth *et al*., 2018). However, sentiment analysis on YouTube videos and comments has also increased recently. Firstly, this section deliberates on the relevant work that used Twitter data to perform sentiment analysis. Secondly, this section discusses studies done on analysing how people feel about the Sri Lankan crisis.

D. Sentiment analysis on Twitter data. Bae and Lee (2012) utilised sentiment analysis approaches to investigate the influence of influential real-world individuals on their Twitter followers in order to comprehend the emotional impact of tweets on the audience. Pearce *et al*. (2014) analysed tweets regarding the Intergovernmental Panel on Climate Change (IPCC) to determine how users responded to other users' climate change-related posts. It was revealed that people respond positively to those who share their thoughts. Anwar Hridoy *et al*. (2015) investigated the iPhone 6's popularity in seven distinct locations in the United States by analysing tweets. Similarly, Shafana and Safnas (2022) conducted a sentiment analysis and topic modelling on South Asian Twitter data regarding distant learning. The results indicate that the public has a favourable view of remote learning, as it is the optimal way to conduct learning activities during the Covid-19 pandemic.

Relatedly, Pagolu *et al*.(2016) executed a sentiment analysis to witness how well the stock price changes of a company are correlated with the opinion of the public being expressed in tweets about that company. Pagolu *et al*.(2016) used two distinct textual representations, N-gram and Word2vec, to examine public sentiment in tweets. The analysis employed supervised machine learning techniques to tweets and analysed the association between a company's stock market movements and sentiments in tweets. Similarly, two types of empirical studies, statistical analysis and sentiment analysis of the tweets related to the Covid-19 disease have been performed by (Kumar Rajput, Ahuja Grover and Kumar Rathi, 2020). Sentiment analysis was performed to understand better People's general opinions on Twitter during the spread of the

disease. The results revealed that most tweets were positive in valence, with only about 15

Though the economic instability started before 2022, the real crisis was experienced in early 2022 and boomed as a public revolution against the government in April 2022. Due to this fact, extensive studies related to analysing the impact of the Sri Lankan crisis through the lens of people have yet to exist in the academic literature widely. The lack of comprehensive studies to analyse the people's opinions regarding the Sri Lankan crisis initiated the primary aim of this study. However, the aims and expected contributions of this study are two-fold: 1) analysing the sentiment of people regarding the Sri Lankan crisis, and 2) applying the ATLAS.ti auto coding feature as a preliminary study to perform sentiment analysis.

II. METHODOLOGY

The dataset made available by Thakun (2022) in "Kaggle" was used to collect tweets that were found to be relevant to the crisis in Sri Lanka. The dataset was referred to as the "Sri Lankan crisis." This dataset includes all of the recent tweets that have used the hashtag #srilanka, and it is a true reflection of how the public generally feels about the prevailing crisis in the country. The dataset includes 10,004 recent tweets as of July 11 2022. Thus, the dataset is likely to be easily used for sentiment analysis on people's emotions about the situation in Sri Lanka. The dataset was subsequently exported to ATLAS.ti for additional analysis in the subsequent steps.

A. Step one: Data Clean-Up

Step one requires a data clean-up. The Kaggle dataset contains approximately 38 fragments of meta-data, including the conversation ID, user ID, place, language, and several others. For this study, only the tweet content text was used. In addition, non-English tweets were removed using the filter option in Excel, yielding a total of 9474 English tweets.
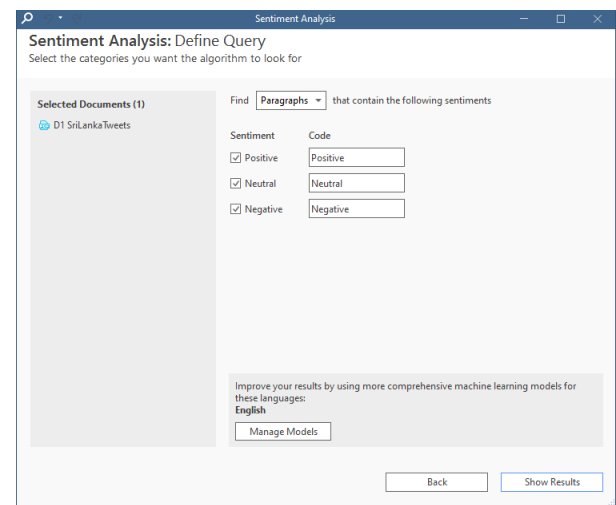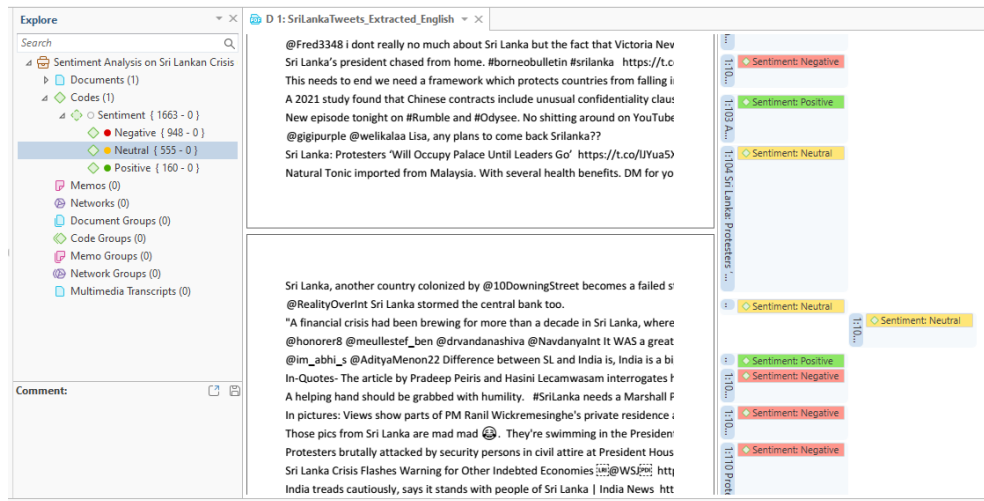

Figure 1: Assigning Codes for Identified Sentiments

Figure 2: Sample of How Sentiments are Identified as Quotations and Coded

Figure 3: Sample of Identified Words Describing Negative Emotions

Figure 4: Sample of Identified Words Describing Neutral Emotions

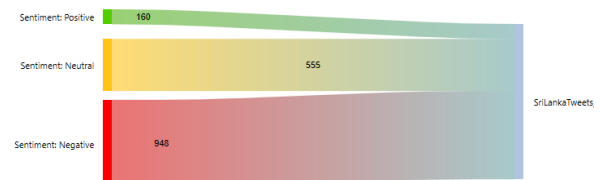Figure 5: Sample of Identified Words Describing Positive Emotions

Figure 6: Visualisation of the concentrated identified sentiments

B. Step two: Export the file to ATLAS.ti

The cleaned file containing the tweets in English was uploaded as a primary document to ATLAS.ti.

C. Step three: Defining Queries for sentiments

In this step, the categories in terms of the positive, neutral and negative sentiments were selected for the machine learning algorithm to look for. In addition, codes were assigned for all the sentiments (Figure 1). Codes were applied to all the tweets identified as paragraphs by the machine learning algorithm used in ATLAS.ti. For this analysis, the advanced model for English was chosen.

D. Step four: Sentiment Analysis

The tweets were lastly tagged into positive or negative emotions or neutral by using the auto code feature in AT-LAS.ti by applying "Apply proposed Codes" to all the sentiments identified from the tweets. The auto-coder incorporates lexicons for positive, negative and neutral sentiments. Figure 2 depicts a sample segment of the document containing tweets as paragraphs in which sentiments were identified as quotations and coded as positive, negative, or neutral. The code for sentiments was coloured green for positive, red for negative, and yellow for neutral to facilitate visualisation.

III. RESULTS

This study used ATLAS. ti version 22 for the analysis of the tweets. ATLAS.ti has a feature for automatically applying the proposed codes for the identified emotions or sentiments as positive, negative, or neutral. Figures 3, 4, and 5 portray the word clouds generated for the positive, negative, and neutral sentiments, using a built-in function in ATLAS.ti to generate the word cloud. Turmoil, collapse, loan, suffer, debt, inflation, corruption, crisis, China, Rajapaksa, and insurrection are a few of the words from the negative sentiments identified as the peak sentiment from the analysis. In addition, the words Ukraine and fertiliser have also been identified as a negative accent. It was highly discussed and claimed in much grey literature that the unintended consequences caused by the war conditions in Ukraine had hastened Sri Lanka's economic meltdown. It resulted in a rapid depletion of foreign exchange reserves and has left its citizens without basic necessities (Chellaney, 2022; Shih, 2022). In addition, Sri Lanka's sudden transition to organic fertiliser from synthetic fertiliser served a severe lesson; it also boosted the crisis expressed by people with negative emotions (Guzman, 2022; Torrella, 2022). Similarly, the keywords protestor, Sri Lankan protest, and people tend to reflect a neutral emotion. Correspondingly, the words revolution, people, democracy, riot, Sri Lankan protest, the slogan of "gohomegotta," and hope reflected the positive feelings of the people.

It is quite unacceptable to commonly observe that the keyword "Sri Lanka protest" appears to be seen in all three emotions, which could lead to a discussion. The frequency of the keyword for each emotion, on the other hand, is as follows. Overall, the negative emotions were represented by 64 tokens, neutral emotions by 28 tokens, and positive emotions by 24 tokens. It was also noted that the word is generated from the hashtag token and not from the tweet content itself.

A total of 1663 sentiments resulted from the sentiment analysis of 9474 tweets that contain the hashtag #srilanka, in which a total of 948 negative sentiments (57%), 555 neutral sentiments (33.3%), and 160 positive sentiments (9.6%) were identified. The Sankey diagram in Figure 6 depicts the concentrated sentiments from the tweets at a glance, indicating that the Sri Lanka crisis has been viewed negatively by people all over the world, with a minimum of 160 positive sentiments identified.

Table 1 shows the sample tweets taken as a quotation for sentiments and the sample codes. The rows of the table are coloured to make it easier to navigate and visualise each distinct sentiment.

IV. DISCUSSION

This study attempts to provide a sense of the general opinion of people across the globe regarding the Sri Lankan issue. Twitter is a suitable platform for people to express their opinions exclusively. Consequently, sentiment analysis of Twitter data on Sri Lanka throughout the crisis period

Table I: Sample Results after Automatically Applying Proposed Codes for Sentiment in ATLAS.Ti.

Sample tweet	Emotion
"Every 60 Seconds in Sri Lanka, a minute passes. So as in Zimbabwe, this must sink deep in the heads of those in power today. Tyranny has an end, people will always triumph!"	Positive
"Let's hope our assistance to the people of Sri Lanka is a step up from our assistance to Libya and Ukraine. Otherwise they may be better off without it."	Negative
"Crisis won't go away even if Gota goes: The economic plan Sri Lanka needs cannot happen without fresh elections, national & provincial"	Negative
"Proud Lions Club, travel related utility, but gives back to the local community (mainly Sri Lanka for now) as well as the NFT community."	Neutral
"Unprecedented developments in Sri Lanka were inevitable: Strategic affairs experts"	Negative
"I don't think people understand the extent of global pain if the Dollar keeps screaming higher Examples? Look at Sri Lanka, Argentina.. etc"	Neutral
"Bro wait a second.. those video were taken by police and army... Check their hands and listen to what they say... What a drama bro, what a drama... We should give Oscar winning awards to them. They are really better than some actors in Sri Lanka"	Negative
"It is time for all of humanity to rise and bring an end to the dark elite. The people of every nation must rise as they are doing in Sri Lanka, Albania, Argentina, Netherlands. It is time"	Positive
"Canadians need to go Sri Lanka on this globalist tard"	Neutral
"Pls take action, We all with u don't want to become their puppets Sri Lanka opposition meets to name new government amid turmoil"	Negative
"Sri Lanka has seen a most brutal civil war in recent years and has suffered a history of corruption. Their misfortune is not an avenue for your Bitcoin crusade. You have a lot more to learn. Their struggles is far from solely related to fiat money."	Neutral
"Wouldn't you want to know what kind of water is in the showers of the state house? I'm guessing it's liquid nitrogen."	Negative
"Oh wow, We all know India wants to be nest uncle sam. What about Afghanistan. And entire world know India will do anything to protect rajapaksha family,because as long as they are in the power they will dest sri lanka and finally flee to real USA. Then India can easily grab lk."	Neutral
"You don't get to decide how democracy is challenged - "honesty and compassion"? Sorry? The correct answer is within the laws of our country, however, leaders are not free from reproach & must follow same. Go tell the people of Sri Lanka they aren't being "compassionate" enough."	Positive
"It's Sri Lankas internal matter. India should not interfere in any way. All India can do is to provide humanitarian aid if required to the people of sri lanka."	Negative
"Thanks to the technology and to the brave people..."	Positive

was carried out on collected Twitter data till July 11, 2022. The findings prove the apparent negative perception regarding the Sri Lankan crisis, reflecting that the people's general opinion remains unfavourable. Despite the peak of negative sentiment toward the crisis, there was a considerable amount of neutral emotion, indicating that people were not in a position to comment on the catastrophic crisis in Sri Lanka. However, based on the keywords "global crisis," "Ukraine," and "revolution," it could be expected that people have mapped the Sri Lankan crisis with the conflicts faced by other countries around the world and prefer to cognitively represent the Sri Lankan situation similar to the worldwide global crisis. Meanwhile, the dense frequency of positive emotion underlines quite positive concerns of people about the Sri Lankan crisis. They were also about revolutionary protestors and appreciating the contribution of the Sri Lankan community to the revolution. As a result, it is evident that the Sri Lankan crisis has instilled negative emotions worldwide.

In addition, the study utilised the auto-coding feature of ATLAS.ti to do sentiment analysis on the collected Twitter data. As a result, it is considered a preliminary study for future research into using ATLAS.ti for opinion or sentiment analysis in various contexts. In addition, this study sought to make both a practical and a theoretical contribution by demonstrating a simple and straightforward method for conducting sentiment analysis or opinion mining using ATLAS.ti. It will benefit individuals such as business analysts and social scientists who are not expected to possess sufficient programming knowledge to implement machine learning algorithms and strategies for their research related to analysing people's opinions.

V. LIMITATIONS AND FUTURE DIRECTION

Several limitations should be addressed in the current study, even though the limitations do not impact the general conclusion regarding the people's attitudes concerning the Sri Lankan crisis. The findings are subject to at least three limitations. Regarding the methodology, the sentiment analysis used auto coding by applying all of the proposed codes for identified sentiments in ATLAS.ti. As no extensive study has been undertaken to evaluate the level of accuracy of opinion mining or sentiment analysis by automatically applying the proposed codes in ATLAS.ti, a comparative analysis of emotions identified by employing machine learning algorithms or any other highly practised methodologies for sentiment analysis is highly advised to prove the accuracy of the outcome. Second, in terms of research data, this study used only Twitter data for the analysis. It is obvious that people are actively involved on Facebook, a YouTube-like visual social network for opinion sharing. Thus, it would be advantageous to undertake a comprehensive study using comments from Facebook, YouTube, and Instagram, as well as other prominent visual-based social media platforms, in order to strengthen the outcomes of the current study. Finally, this study exclusively used tweets in English. However, the dataset contains tweets in other languages, such as Arabic,

Spanish, German, Hindi, Indonesian and Tamil. As a result, analysing tweets in different languages could provide impressive results.

REFERENCES

Anwar Hridoy, S. A., Ekram, M. T., Islam, M. S., Ahmed, F., Rahman, R. M. (2015). Localised twitter opinion mining using sentiment analysis. *Decision Analytics, 2*(1), 1-19.

ATLAS.ti Scientific Software Development GmbH [ATLAS.ti 22 Windows]. (2022). Retrieved from https://atlasti.com

2022 *Sri Lankan political crisis - Wikipedia* (no date). Available at: https://en.wikipedia.org/wiki/2022_Sri_Lankan_political crisis (Accessed: August 13, 2022).

Chellaney, B. (2022). *Ukraine war hastens Sri Lanka's economic meltdown - Nikkei Asia*. Available at: https://asia.nikkei.com/Opinion/Ukraine-war-hastens-Sri-Lanka-s-economic-meltdown (Accessed: August 13, 2022).

Dixon, S. (2022). *Biggest social media platforms 2022 | Statista*. Available at: https://www.statista.com/statistics/272014/global-social-networks-ranked-by-number-of-users/ (Accessed: August 13, 2022).

Friese, S. (2019). *Qualitative data analysis with ATLAS. ti*. Sage.

Guzman, C. de. (2022). *How Organic Farming Worsened Sri Lanka's Economic and Political Crisis | Time*. Available at: https://time.com/6196570/sri-lanka-crisis-organic-farming/ (Accessed: August 13, 2022).

Joshi, A., Bhattacharyya, P. & Ahire, S. (2017). "Sentiment Resources: Lexicons and Datasets," in Cambria, E. *et al.* (eds) *A Practical Guide to Sentiment Analysis*. Cham: Springer International Publishing, pp. 85–106. DOI: 10.1007/978-3-319-55394-8$_5$.

Jurek, A., Mulvenna, M. D. Bi, Y. (2015). "Improved lexicon-based sentiment analysis for social media analytics," *Security Informatics, 4*(1). doi: 10.1186/s13388-015-0024-x.

Musfira, A. F., Ibrahim, N., Harun, H. (2022). A Thematic Review on Digital Storytelling (DST) in Social Media. *The Qualitative Report, 27*(8), 1590-1620. https://doi.org/10.46743/2160-3715/2022.5383

Rajput, N., Ahuja Grover, B. Rathi, V. (2020). *WORD FREQUENCY AND SENTIMENT ANALYSIS OF TWITTER MESSAGES DURING CORONAVIRUS PANDEMIC A PREPRINT.*

Pagolu, V. S. *et al.* (2016). "Sentiment analysis of Twitter data for predicting stock market movements," in 2016 *International Conference on Signal Processing, Com-*

munication, Power and Embedded System (SCOPES), pp. 1345–1350. doi: 10.1109/SCOPES.2016.7955659.

Pearce, W., Holmberg, K., Hellsten, I. and Nerlich, B., 2014. Climate change on Twitter: Topics, communities and conversations about the 2013 IPCC Working Group 1 report. *PloS one, 9*(4), p.e94785.

Pudaruth, S. *et al*. (2018). "Sentiment Analysis from Facebook Comments using Automatic Coding in NVivo 11," ADCAIJ: Advances in *Distributed Computing and Artificial Intelligence Journal, 7*(1), pp. 41–48. DOI: 10.14201/adcaij2018714148.

Ramachandran, S. (2022) *Rajapaksa Clan Losing Grip on Power in Sri Lanka – The Diplomat*. Available at: https://thediplomat.com/2022/04/rajapaksa-clan-losing-grip-on-power-in-sri-lanka/ (Accessed: August 13, 2022).

Sentiment Analysis - ATLAS.ti 9 Windows - User Manual (no date). Available at: https://doc.atlasti.com/ManualWin.v9/SearchAndCode/SearchAndCodeSentimentAnalysis.html (Accessed: August 14, 2022).

Sentiment Analysis - ATLAS.ti 22 Mac - User Manual (no date). Available at: https://doc.atlasti.com/ManualMac.v22/SearchAndCode/SearchAndCodeSentimentAnalysis.html (Accessed: August 13, 2022).

Shafana, A. R. F., Nihla, M.I.F., Musfira, A.F., Naja, M.F. (2022). Comparative analysis of machine learning algorithms along with lexical analysers for sentiment analysis in Tamil language. 10th International Symposium – 2022.South Eastern University of Sri Lanka, Sri Lanka

Shafana, A. R. F. and Safnas, S. M. (2022). "Does technology assist to continue learning during pandemic? A sentiment analysis and topic modeling on online learning in south asian region," *Social Network Analysis and Mining, 12*(1). DOI: 10.1007/s13278-022-00899-4.

Sharef, N., (2014). Review of sentiment analysis approaches in big data era. In Proceedings of the Malaysian National Conference of Databases,(NCD'14), Serdang (pp. 7–12).

Sharef, N. M., Zin, H. M. and Nadali, S. (2016). "Overview and future opportunities of Sentiment Analysis approaches for big data," *Journal of Computer Science, 12*(3), pp. 153–168. DOI: 10.3844/jcssp.2016.153.168.

Shih, G. (2022). *Sri Lanka was struggling with its worst economic crisis in history. Then war erupted in Ukraine. - The Washington Post*. Available at: https://www.washingtonpost.com/world/2022/04/17/sri-lanka-crisis-default-ukraine/ (Accessed: August 13, 2022).

spaCy · Industrial-strength Natural Language Processing in Python (no date). Available at: https://spacy.io/ (Accessed: August 13, 2022).

Thakur,V.(2022, July). Twitter Dataset: Sri Lanka Crisis.Version 1. Retrieved (August 13, 2022) from https://www.kaggle.com/datasets/vishesh1412/twitter-dataset-sri-lanka-crisis

Torrella, K. (2022). *Sri Lanka's organic farming disaster, explained* - Vox. Available at: https://www.vox.com/future-perfect/2022/7/15/23218969/sri-lanka-organic-fertilizer-pesticide-agriculture-farming (Accessed: August 13, 2022).

Woolams Ben (2021) *Why Is Twitter Making A Comeback As One Of The Most Popular Social Channels? | The Drum*. Available at: https://www.thedrum.com/opinion/2021/09/06/why-twitter-making-comeback-one-the-most-popular-social-channels (Accessed: August 13, 2022).