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Sentiment Analysis of Malaysians Citizen's Emotion towards Cyberbullying in Twitter

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Abstract
Cyberbullying, also known as cyber harassment, is a prevalent issue that significantly impacts the adolescent population in Malaysia. As a form of abusive online behavior, cyberbullying has expanded beyond the physical world into the virtual space, where monitoring activities and changes can be difficult. In 2020, Malaysia ranked second in Asia for cyberbullying among youths due to the widespread use of social media platforms, which have become an ideal breeding ground for negative behavior. This study aims to develop a web-based system that can analyze Malaysian citizens' emotional responses to cyberbullying using machine learning techniques. Additionally, emotional responses gained from Twitter will be characterized using emotional models. The machine learning life-cycle methodology will be implemented in this study. The findings revealed that anger emotion had the highest percentage compared to other emotions such as fear, happiness, love, sadness, and surprise. Expanding the scope of the study to include other social media platforms and demographic groups may provide a more comprehensive understanding of cyberbullying in Malaysia. These recommendations may improve the effectiveness of the web-based system and facilitate the development of more efficient strategies for preventing and mitigating the effects of cyberbullying in Malaysia.
Keywords: Sentiment Analysis, Cyberbullying, Emotions, Social media, Twitter

Introduction

Sentiment Analysis is a vital technique in Natural Language Processing that involves analyzing text and identifying emotions such as anger, sadness, and empathy. It can be performed using various free web tools and open-source libraries in programming languages like Python and Java. A dashboard can be used to view the data visualization and summarize all the information acquired (Liu, 2012). Cyberbullying is a growing concern worldwide, including Malaysia. It is a type of abusive online behavior that involves a continuous process of harsh remarks or messages delivered by an attacker or bully. It has spread beyond the physical world into the virtual world, where it is difficult to monitor activities and changes. Social media platforms like Twitter are well-known for harboring cyberbullying, with 10% to 20% of users experiencing it daily. Cyberbullying has significant effects on the victims and

society, yet most people have no idea how to deal with it (Ditchfield et al., 2016). The case of Davia Emilia, who jumped to her death from a third-floor apartment in Batu Kawa New Township, Kuching, Sarawak after asking her followers to vote on whether she should live or die in an Instagram story, is an example of how detrimental cyberbullying can be to a person's life, resulting in death (Nazir, 2019). This case highlights the need for a system that can detect cyberbullying on social media and assist in mitigating cyberbullying threats.

Related Studies

Sentiment analysis has been widely used in various applications such as customer reviews and political analysis. However, its accuracy in detecting emotions and sentiments in text has limitations. One of the main challenges is identifying sarcasm and irony in language, which can alter the meaning of a statement, leading to misinterpretations and false positives in sentiment analysis results (Davidov et al., 2010). Language nuances and cultural context can also impact the accuracy of sentiment analysis, especially in multilingual and multicultural settings (Pang & Lee, 2008). In the context of cyberbullying, sentiment analysis can be a useful tool, but it may not be enough to fully address the issue. Cyberbullying is a complex problem that involves power dynamics, social norms, and psychological factors, among other things. It is important to consider the impact of cyberbullying on the victims, as it can lead to long-term emotional and mental health issues, and even suicide (Patchin & Hinduja, 2015). The use of sentiment analysis to detect cyberbullying has been explored in several studies. In a study by Rezvani et al (2017), a supervised learning approach was used to classify social media posts as either cyberbullying or not. The study found that using sentiment analysis alone was not sufficient to accurately detect cyberbullying and that incorporating other features such as lexicon-based features and syntactic features improved the classification performance. Another study by Kim et al (2021) explored the effectiveness of using sentiment analysis and machine learning techniques to detect cyberbullying in Korean social media. The study found that incorporating sentiment analysis features improved the classification performance, with an accuracy of 83.6%.

However, the development of sentiment analysis technology also raises ethical concerns. The use of machine learning algorithms to detect emotions in text can raise privacy concerns, as it involves processing personal data and potentially exposing it to third parties. It is crucial to ensure that the system complies with data protection laws and that the data is kept secure (Jia & Liang, 2019). Sentiment analysis can be a valuable tool in detecting cyberbullying, but it should not be seen as a solution in and of itself. A more comprehensive approach is necessary, involving education, policy, and ethical considerations, to effectively address the issue of cyberbullying.

Methodology

A total of 5308 tweets were directly retrieved from Twitter using the search terms "cyberbullying" and "koyak". The extracted tweets have dates ranging from 14 April 2011 until 28 December 2022. Machine Learning Lifecycle (MLLC) methodology has been used in this study. The following is the details activities in the methodology:

a. Data Collection

The first activity in MLLC is data collection. Data collection collects all the data sources from social media, which for this project is Twitter. However, a study has claimed that Twitter is a cyberbullying playground due to it becoming a well-known and effective communication

tool. For this reason, Twitter data that was scraped was seen as a credible source for studies on cyberbullying (Talpur & O'Sullivan, 2020). The MLLC can do several activities, such as conducting experiments to produce data, extracting existing data from databases, or selecting data to be used for modelling, as part of the data gathering process in the finding of Malaysian citizens' emotional reactions to cyberbullying (Spjuth et al., 2021). Tweets from the Twitter streaming API from the official site are collected in excel. To extract tweets, a python module, tweepy, and snscrape combination are applied. A Python module is a file containing Python definitions and statements and is referred to as a module. Modules were used to divide up huge programmes into smaller, more manageable files. Tweepy functions access the Twitter API with a simple Python library. Lastly, for snscrape, it does the job of a scraper for social networking services (SNS). It retrieves the discovered objects, such as the relevant posts, by scraping things like user profiles, hashtags, or searches.

b. Data Preparation

Data preparation is the process of organising the data into a useful exact location. Pre-processing is necessary in order to achieve good quality results (Kamisli Ozturk et al., 2017). Training machine learning models necessitates a large amount of data. For machine learning applications, a range of data can be used as input. Accurate data preparation can make later model debugging easier. In this phase, data will be assembled before being randomly ordered. Detailed analysis of the characteristics, format, and quality of the data was required for data exploration. A dataset of training will be obtained from the Internet. The dataset's distinguishing features are that it includes Malay language and English.

c. Data Cleansing

Data cleaning is the cleaning and transforming of unwanted data into a usable format. It is the process of preparing the data for analysis in the following phase by properly formatting it, choosing the variable to utilise, and cleaning the data. It is among the most crucial steps in the entire process. To overcome the quality difficulties, data cleaning is necessary. There are a few characteristics of unnecessary data that might not be useful, such as missing values, duplicate data, invalid data, and noise. In order to clean the data for this project, various filtering techniques are implemented. It is essential to explore this phase so that the outcome value is not affected. There are a few tools that can be used, such as Tabula, DataWrangler, CSVkit, and many more.

d. Analysis

The fourth step in the methodology is analysis, which involves using various analytical techniques to study the data and create a machine learning model for evaluating the results. Initially, the types of problems where machine learning techniques are most suitable are identified. For this project, Support Vector Machines (SVM) are utilized to build and evaluate the model. The data is then classified into six types of emotions, namely happy, sad, anger, disgust, surprise, and fear, based on Paul Ekman's theory. To categorize these emotions, Excel and other tools are leveraged.

e. Train Dataset

The primary objective of this phase is to observe if there is an improvement or no change in performance. Training a model allows to comprehend various patterns, regulations, and features. Inaccurate training of the model could result in degraded model performance,

which could potentially lead to the failure of the project. For this project, the SVM algorithm in the scikit-learn Python package is used to train the model on the dataset. The scikit-learn is an open-source machine learning Python programme that provides features for both supervised and unsupervised learning, data pre-processing capabilities, and tools for model construction, selection, and evaluation. As a result, the overall performance of the model is enhanced. The model can be saved using either pickle or joblib. Pickle is a standard Python method for serializing objects, while joblib is an alternative approach for saving models with large Numpy arrays or data and can operate as a backend with many parameters on objects.

f. Test Dataset

The penultimate dataset in the process is the test dataset, which is used to confirm the accuracy of the model. The model's accuracy percentage can be measured based on the project requirements. In basic evaluation, metrics such as precision, accuracy, and F1 score are taken into consideration. A comprehensive evaluation of the model's errors and their underlying causes is crucial to arrive at an appropriate evaluation.

g. Deployment

Deployment refers to the process of integrating a machine learning model into an existing production environment for making practical decisions based on data. In the real world, the model is employed by cyberbullying prevention organizations like MCMC and the government. Moreover, in this project, data visualization is accomplished by creating a web-based dashboard using dash. Dash is a Python framework developed by Plotly to build interactive web applications.

Results and Discussion

A total of 5,308 tweets were obtained directly from Twitter for this research, using the search terms "cyberbullying" and "koyak". These tweets were posted between April 14, 2011, and December 28, 2022. Upon applying the built sentiment classifier to predict the emotion of each tweet, it was discovered that 92.8% of all the tweets exhibited the sentiment of anger, as shown in Figure 1. This was followed by happiness (2.3%), sadness (1.64%), love (2.13%), fear (0.92%), and surprise (0.19%).

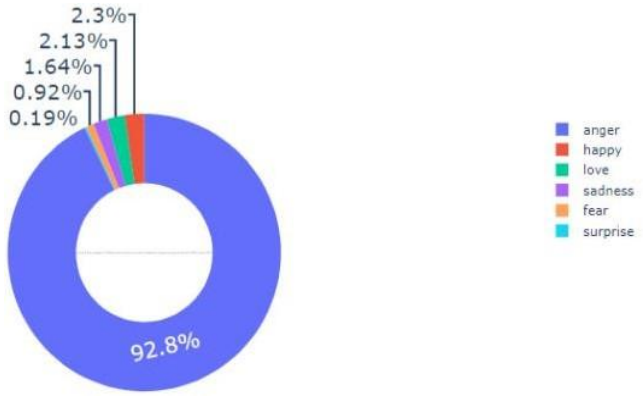

Figure 1 Percentages retrieved from dataset of emotions

The study has found a significant number of emotions related to anger, indicating the gravity of Malaysian citizens' sentiments towards cyberbullying. It is noteworthy that the perceptions of cyberbullying can vary among individuals, with some expressing disapproval while others may hold a positive outlook. As illustrated in Figure 1, the pie chart depicts the percentage distribution of emotions derived from the dataset.

Figure 2 Word Cloud of Anger Emotions

As depicted in Figure 2 above, this study presents a selection of tweets conveying anger from the dataset that was gathered. The tweets contain commonly used words such as "koyak," "tak," and "mental" among others. The trending hashtag #israelkoyak has triggered significant anger among Malaysians due to reports of Israeli soldiers hurling stun grenades inside Al-Aqsa Mosque while Muslim worshippers were praying, which became viral (Yunus, 2021). Regrettably, some individuals are advocating for cancel culture on social media, which is not a favorable practice as it involves calling for the removal (cancelling) of support for individuals, organizations, issues, and even brands. This campaign entails highlighting an issue to draw the attention of as many social media users as possible to the perceived offense, followed by a call for cancellation. As the frenzy of the campaign builds up, the pressure on the targeted individual or organization to review its actions becomes intense (NST Online, 2022). The combination of these factors has led Malaysians to express a considerable amount of rage sentiment throughout this analysis.

Figure 3 Tweet Related to Anger Emotion

Figure 4 Tweet related to Anger Emotion
Translation: Israel and you are the same. Both are easy to tear

As evident in Figure 3, the extracted datasets reveal a few tweets expressing anger towards Israel. While it is commendable to support Palestine, promoting cancel culture is not an advisable approach. If this practice continues, it could result in several unfavorable consequences. Firstly, it could affect the security of the nation, particularly Malaysia. An article titled "Malaysia tightens security after #IsraelKoyak campaign goes viral" highlights the potential implications of such actions. Additionally, the country's online hacktivism has also provoked Israel (Martinus, 2021). This underscores the need for Malaysians to exercise caution when expressing their views on Twitter. Moreover, according to Aiken (2016), individual behavior tends to be more extreme on social media than in the real world. Figure 4 above shows a user comparing a person with Zionist Israel, which has a profoundly negative influence. The 52 criteria of cyberspace can cause people to act impulsively without considering the consequences, leading to aggression and other risky behaviors (Bernama, 2022).

Figure 5 Tweet About Anger Emotion About Cyberbullying
Translation: I'm a survivor (to be honest). That's why I don't want her to get into it. Not everyone is mentally strong brother. That's why I'm against cyber-bullying

Figure 6 Tweet About Anger Emotion About Cyberbullying

In the extracted dataset, there are also various angry tweets about cyberbullying. Some people are aware of the harm caused by cyberbullying. For instance, Figure 5 above shows a user who is a survivor of cyberbullying and is against those who engage in such behavior. Moreover, not everyone can tolerate cyberbullying, and not everyone wishes to be a victim of it. Additionally, there is a tweet in which a Malaysian citizen expresses concern about cyberbullying and asks how to report it. This issue has provoked anger among Malaysians towards cyberbullying, indicating their concern for those who are being bullied. This is a positive development from Malaysian citizens regarding cyberbullying. Figure 7 also emphasizes that "cyberbullying is never okay." All these tweets were retrieved from Malaysia, clearly indicating that while some individuals may enjoy engaging in cyberbullying, there are also those who are angry towards it.

Figure 7 Tweet About Anger Emotion About Cyberbullying

Analysis of Malaysian's Citizen Emotions Towards Cyberbullying from 2020 until 2022

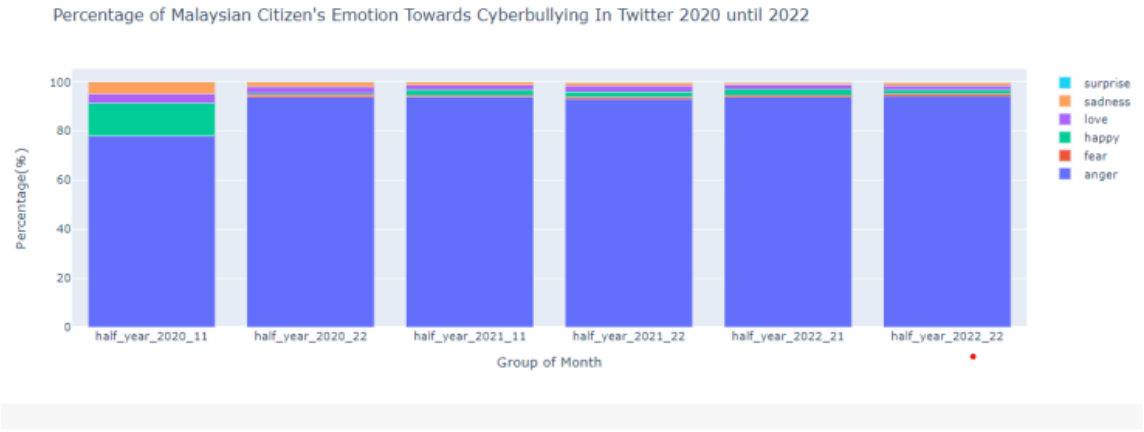

Figure 8 Malaysian's Citizen Emotions Towards Cyberbullying

As depicted in Figure 8 and Figure 9, cyberbullying is a prevalent issue in contemporary times. Anger is the dominant emotion associated with cyberbullying, as evidenced by its consistent prominence throughout the period spanning from the second half of 2020 to the completion of the second half of 2022. The nature of the anger emotion can be positive or negative, depending on the content of the tweet. For example, hashtags such as #IsraelKoyak and political issues during GE15 might have contributed to the prevalence of anger sentiment during this period. The percentage of tweets expressing anger emotion was consistently higher than any other emotions during the second half of 2020, from July to December. This suggests that there are significant reasons behind the high levels of anger associated with cyberbullying during this period.

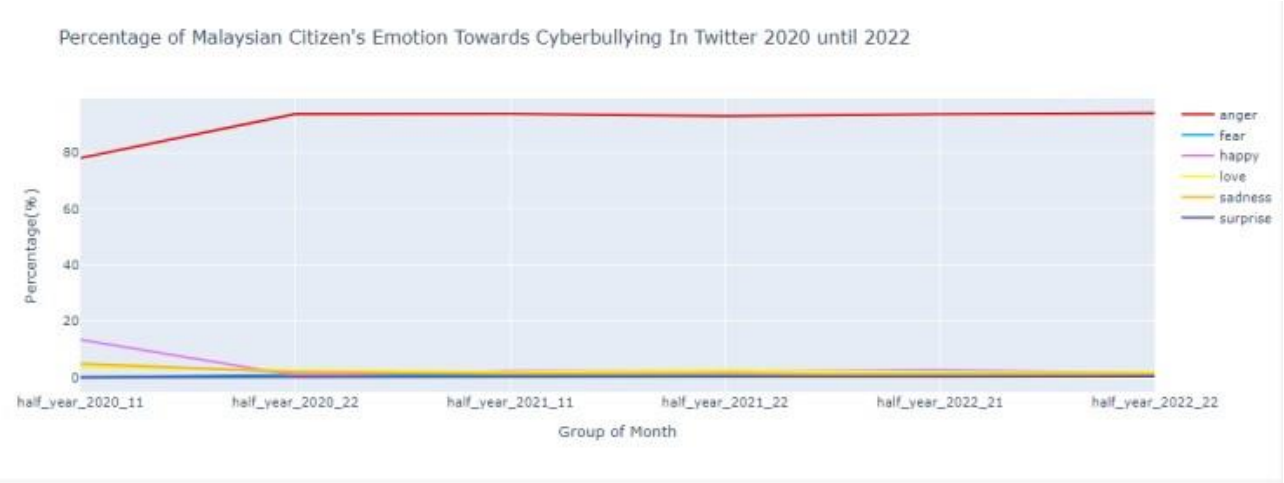

Figure 9 Malaysian's Citizen Emotions Towards Cyberbullying

Conclusion

Cyberbullying has emerged as a significant social issue in recent years, and its impact on victims can be devastating. Victims of cyberbullying can experience a range of negative emotions, including anger, fear, sadness, and anxiety. The prevalence of cyberbullying and its harmful effects have made it a growing concern in Malaysia, and there is a need to develop effective strategies to prevent and address it. This study's contribution is its use of sentiment analysis to gain insights into Malaysian citizens' emotions towards cyberbullying on Twitter. Sentiment analysis is a powerful tool that can be used to understand how people feel about specific topics or issues. In this study, sentiment analysis was used to analyze tweets related to cyberbullying and identify the emotions associated with them. The assessment of emotions from cyberbullying incidents is significant as it provides valuable insight into the cyberbullying landscape for Malaysian citizens. Given the various emotions experienced by those who are cyberbullied, it is essential for authorize organizations in Malaysia such as MCMC to monitor cyberbullying cases on Twitter. Thus, a web-based sentiment analysis of Malaysian citizens' emotions towards cyberbullying on Twitter was developed, with the aim to understand the Malaysian sentiment towards cyberbullying. These processes involved extracting user tweets from Twitter, utilizing a constructed sentiment classifier to identify the tweets' emotions, and displaying the results on a web application. Standard sentiment analysis classifier performance metrics like precision, recall, and F1-score were used to assess the sentiment analysis classifier created for the completion of this study. The Paul Ekman Model's six emotions were used, and the user emotions were predicted by the sentiment classifier with varied degrees of accuracy.

The study's findings indicate that anger is the dominant emotion associated with cyberbullying in Malaysia. This is concerning as anger can often lead to aggressive behavior, which can exacerbate cyberbullying incidents. The study's results highlight the need for more effective measures to address cyberbullying and its associated emotions, particularly anger. The study's contribution extends beyond its specific findings. The use of sentiment analysis to gain insights into social issues like cyberbullying can be a valuable tool for policy-makers, researchers, and practitioners. It can help to identify the emotions associated with specific issues, which can inform the development of effective strategies to prevent and mitigate their negative effects. Furthermore, this study underscores the importance of utilizing sentiment analysis in combination with other techniques to gain deeper insights into complex social issues like cyberbullying. For instance, qualitative research methods can be used to understand the context in which cyberbullying occurs and the experiences of victims and perpetrators. Combining sentiment analysis with qualitative research can provide a more comprehensive understanding of cyberbullying and its associated emotions.

In conclusion, this study's contribution is significant in advancing our understanding of the emotions and sentiments associated with cyberbullying in Malaysia. The study's findings can inform policy-making, intervention strategies, and education campaigns aimed at preventing cyberbullying and its negative effects. Furthermore, the study highlights the importance of utilizing sentiment analysis in combination with other techniques to gain deeper insights into complex social issues.

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