VISUALISING SOCIAL MEDIA SENTIMENT OF PERCEPTION TOWARDS AUTISTIC PEOPLE

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Abstract

This study aims to develop an interactive dashboard utilising big data visualisation to enhance public awareness of autistic individuals. The research involves analysing sentiment data from social media platforms to gain insights into public perceptions of autism. A visually engaging and informative dashboard was created using tools such as Power BI to effectively visualise these sentiments. The study begins with the extraction and analysis of sentiment data from social media platforms, focusing on comments related to autism. Python is employed for data cleaning to ensure accuracy and relevance. The roBERTa model, known for its robust performance in natural language processing, is utilised for sentiment classification. Data analysis is conducted using Hive on Cloudera to handle large datasets effectively. Subsequently, an interactive dashboard is developed using Power BI to visualise the sentiment analysis results. The dashboard is integrated into a website created with HTML and hosted for accessibility. Consequently, this study successfully analyses public sentiment towards autistic individuals. The developed interactive dashboard effectively visualises these sentiments by revealing the societal perceptions represented by the positive and negative keywords. The dashboard is expected to undergo user experience testing to assess its acceptance as a tool to enhance public perception and awareness towards autistic individuals.

Keywords: *autism, sentiment analysis, big data visualisation, interactive dashboard*

1.0 Background Of The Study

Sentiment analysis is a valuable process for understanding public opinion and emotions on specific topics, including autism. It uses natural language processing and machine learning to identify and classify sentiments in text data and gain insights into the polarity and topic of opinions. In the context of autism, sentiment analysis has been used to examine emotional content in online messages related to autism spectrum disorders, including identifying positive, negative, and neutral emotions expressed in the messages [1]. Additionally, sentiment analysis has been deemed important in assisting autistic individuals in interpreting feelings and emotions in written content, highlighting its potential role in improving communication and understanding for individuals on the autism spectrum [2]. Accordingly, this study aims to utilizes sentiment analysis and data visualization in the context of autism spectrum disorder (ASD), since it has the potential

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to increase public awareness of ASD. Through an interactive dashboard, key statistics and trends in public perception towards autism were visualised using various charts and graphs to raise public awareness effectively.

2.0 Literature Review

2.1 Social Media Sentiment Analysis

Social media sentiment analysis assesses target consumers' attitudes and emotions toward a product, service, or brand by analysing their conversations on social media platforms [3]. By leveraging sentiment analysis on social media, companies can gain valuable insight into the feelings and opinions of their audience, allowing them to make data-driven decisions and improve their brand reputation [4]. This technique has been applied in various areas, including mental health, where it can be used to identify mental health issues and stigma on social media platforms [5]. For example, a study on Turkish Twitter messages related to autism spectrum disorder (ASD) used artificial intelligence methods to analyse the emotional content of these messages [5]. The study found that there were fewer messages containing neutral emotions related to ASD and suggested further research should be conducted on different social media platforms or using other sentiment analysis techniques [5]. In the context of mental health and autism, sentiment analysis can be used to identify and analyse the emotions and feelings expressed in social media posts, enabling a better understanding of the experiences and challenges faced by people with these conditions [6].

2.2Sentiment Analysis on Perception Towards Autistic People

Autism sentiment analysis involves assessing the emotions and attitudes expressed in written communication related to autism. This analysis can be performed using various methods, including rule-based sentiment analysis, dictionary-based sentiment analysis, and machine learning techniques [2]. One study focused on conducting emotional analysis of Turkish Twitter messages on autism using both qualitative and artificial intelligence-based methods [5]. The study found that the word “autism” was used as an insult by some users, and there were fewer messages with neutral emotions. Overall, sentiment analysis of autism-related content can provide insights into the emotions and attitudes that individuals and the public express toward autism. This information can be valuable in understanding the needs of autistic individuals and addressing any stigma or negative perceptions associated with autism.

2.3 Enhancing Positive Perception Towards Autistic People Through Data Visualisation

While there are no specific studies on improving positive perceptions toward autistic people through data visualisation, research has shown that visual sensory experiences are important for autistic people [7]. Additionally, studies have shown that public perception of autism can be influenced by media, social media, and awareness campaigns [8]. Therefore, data visualisation can be a powerful tool to improve public understanding of autism and challenge myths and stereotypes. One possible approach to improve positive perceptions toward autistic people through data visualisation is to create visualisations that highlight the strengths and unique abilities of autistic people. For example, one study found that people with autism have better visual processing skills that could be highlighted in data visualisations [9]. By highlighting the strengths and unique abilities of autistic people and challenging negative stereotypes, data visualisations can help create a more positive perception of autism in society.

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3.0 Social Media Sentiment Analysis Towards Autistic People

Researchers have developed highly efficient techniques to handle data which requires sentiment analysis to process data and know its polarity to make the right decision. It includes five data processing steps: data collection, text preparation, sentiment detection, sentiment classification, and output presentation, as shown in figure 1.

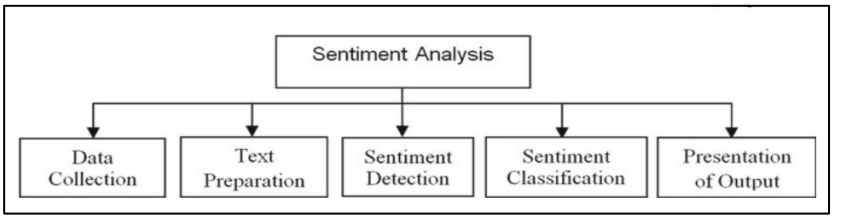

Figure 1. Sentiment Analysis Process

Those steps were adopted in this study, as illustrated in figure 2, and the detailed implementation is discussed in the following section.

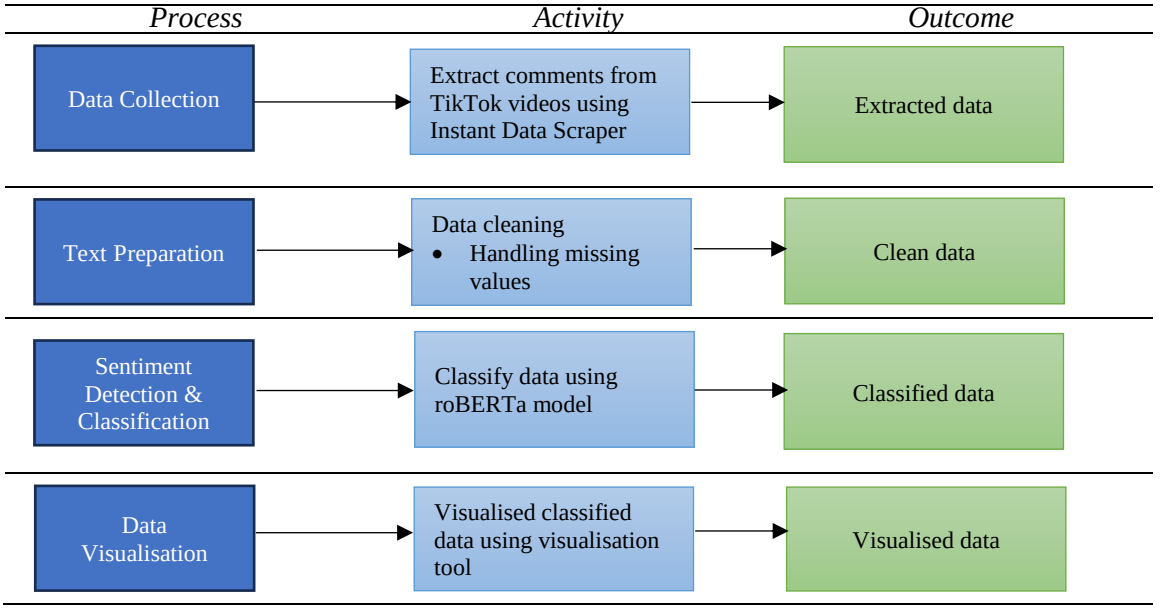

Figure 2. Sentiment Analysis Process Flow for Social Media Perception Towards Autistic People

3.1 Data Collection

Data extraction involves retrieving relevant information from various sources, such as databases, APIs, or web scraping tools, to populate the dashboard with the required data. This study collects data from the selected videos related to autism posted on TikTok platform from 2022 to 2024. The data were extracted from the comments in each video using the Instant Data Scraper, as depicted in figure 3.

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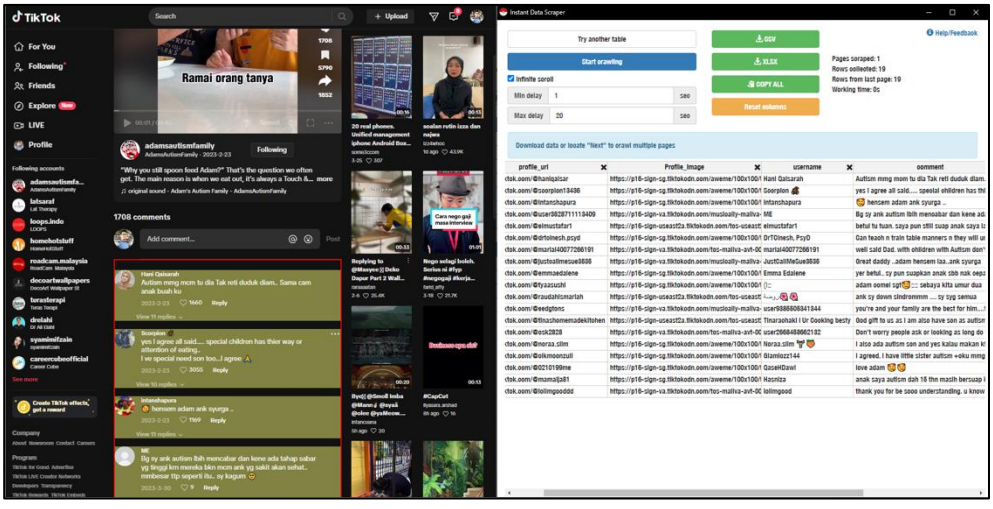

Figure 3. Data Extraction Using Instant Data Scraper

Since 21 videos were involved, the extraction process was repeated multiple times for a month. As a result, several datasets were produced and merged into a single set using Python. Consequently, 10,495 rows of data were combined in a single Excel file, which was ready for further analysis.

3.2 Text Preparation

Subsequently, the dataset was prepared by cleaning it of errors and inconsistencies to ensure its quality and reliability. The cleaning process involved handling missing values, renaming column names, removing unnecessary columns, adding new columns and replacing unnecessary symbols. Figure 4 illustrates one of the crucial cleaning processes: handling missing values. Referring to figure 4, 49 rows of the profilImage, 4 rows of the username, and 350 rows of the comment columns had missing values after the checking process conducted using the isnull() function. Hence, all the affected rows were dropped using the dropna() function, resulting in a dataset free from missing values.

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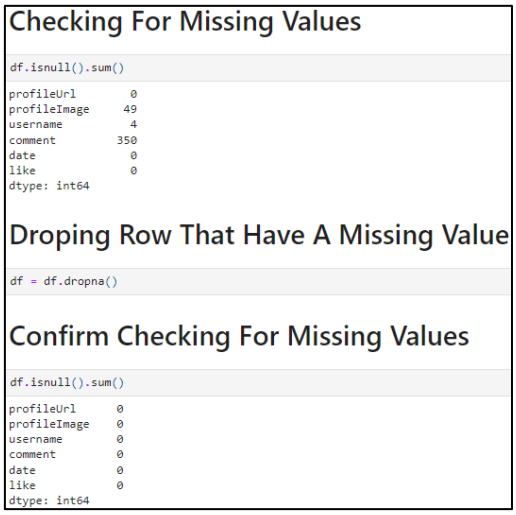

Figure 4. Data Cleaning: Handling Missing Values

3.3 Sentiment Detection and Classification

Sentiment detection consists of examining phrases and sentences extracted from reviews and ideas. The phrases were then classified according to the polarity of the opinions they contained, such as positive or negative, good or bad, and like or dislike. Based on these ratings, comments are tagged with the appropriate sentiment category. This process includes tokenising the text, feeding it into the sentiment analysis algorithm, and interpreting the model output to classify sentiment. In this study, a robustly optimised BERT retraining (roBERTa) approach presented by [10] is used to analyse and categorise each comment as positive, neutral or negative based on its textual content. The classified data is then structured into a format suitable for visualisation, with each comment tagged with its respective sentiment category. This classification makes it easier to visualise the sentiments of perception towards autistic individuals.

3.4 Data Visualisation

Finally, the classified data was visualised through an interactive and visually appealing dashboard. The dashboard was developed using Microsoft Power BI by importing the cleaned and sentiment-labelled dataset from the Cloudera Hive data warehouse. Various types of charts, such as bar charts, line charts, and pie charts, were considered to display the key metrics of the number of total comments, sentiment distribution over time, and the correlation between sentiment and engagement metrics such as likes. An interactive element, such as filters and slicers, is also built in to allow users to drill down into specific data segments and customise their view based on their needs. This data visualisation is presented and elaborated in the following section.

4.0 Findings: Visualisation Of Sentiments On Perception Towards Autistic People

The dashboard serves as an easy-to-use platform to provide a comprehensive data visualisation for users to explore and understand public perception towards autistic people. Figure 5 illustrated a bar chart that provides an overview of public perception towards autistic people by visualising comment trends, highlighting notable spikes in engagement during

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specific periods. The overview also includes key metrics, which comprise the total number of users, likes, and comments. This visualisation helps users understand fluctuations in public discourse and engagement over time.

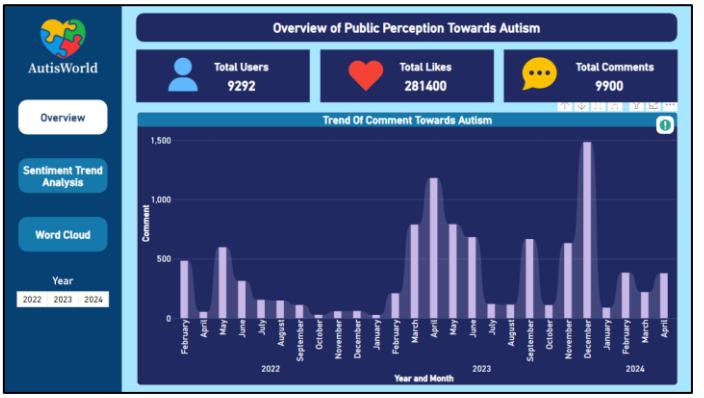

Figure 5. The Overview of Perception Towards Autistic People

Subsequently, the sentiment distribution of comments over time is visualised using the clustered bar chart, as depicted in figure 6. The sentiment categories were represented using colour-coded bars: red for negative perceptions, yellow for neutral perceptions, and green for positive perceptions.

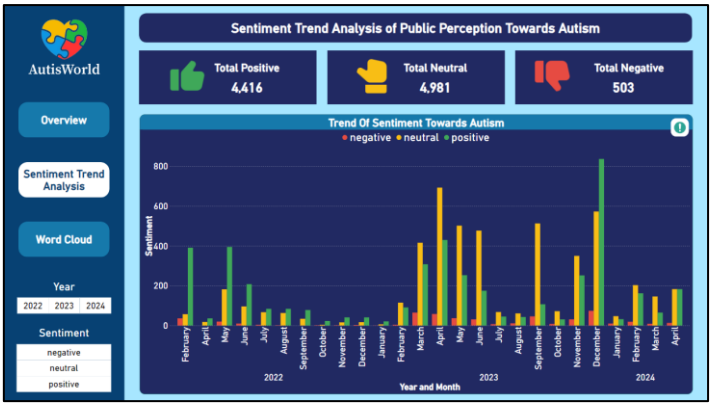

Figure 6. The Sentiment Category of Perception

The dashboard also features a word cloud that visualises the positive and negative keywords expressed in the posted video's comments. The size of each word reflects its frequency of use. As shown in figure 7 (left), the most positive words include “thank”, “bless”, “love”, “beautiful”, “strong”, and “patient”. In contrast, figure 7 (right) highlights the most negative words, such as “hard”, “suffer”, “struggle”, “severe”, “anxiety”, and “die”.

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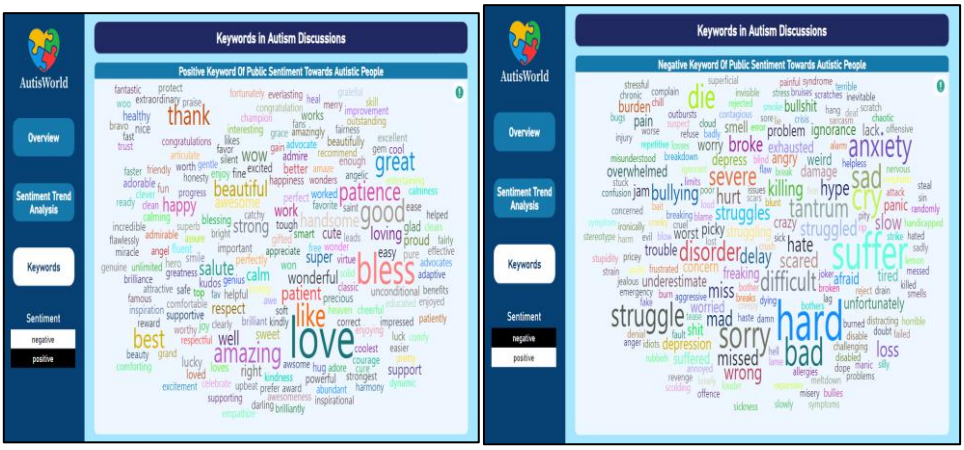

Figure 7. (left) Positive Keyword; (right) Negative Keyword

5.0 Conclusion

This study successfully analyses public sentiment towards autistic people on social media platforms and visualises those sentiments through an interactive dashboard. By carefully following the sentiment analysis process flow, the data was successfully extracted from TikTok videos' comments, cleaned using Python, and classified using the roBERTa model before being analysed using Hive on Cloudera. Subsequently, by developing a Power BI-based interactive dashboard, the sentiments were embedded in a user-friendly website that provided an accessible platform for visualising sentiment data. To conclude, the authors propose that it would be fruitful to evaluate the usefulness and acceptance of the dashboard in the future. Furthermore, it is also suggested to extract the sentiment from multiple social media platform to expand the result of the positive and negative keywords. Besides, the inability to extract gender and age information using the Instant Data Scrape tool on the TikTok platform impacts the depth of the sentiment analysis, as demographic factors can play a crucial role in understanding the nuances of public sentiment. These recommendations are believed to help relevant industries, researchers, and policymakers to plan and develop targeted digital interventions and support systems for individuals with autism [11].

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