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## A Sentiment Analysis of Autism Tweets



**Abstract:** - In the dynamic landscape of social media, where intellectual discourse, information retrieval, and the exchange of ideas thrive, scholarly attention is increasingly drawn to the growing trend of users expressing viewpoints and ideas, notably manifested in a surge of daily tweets related to autism. This research explores the escalating phenomenon of users utilizing emojis, hashtags, reviews, and personal experiences on social media platforms to articulate their encounters with social challenges. The focal point of this research study is the development of the Autism Tweets Visualization Dashboard, a pivotal tool that categorizes and visually represents word usage across social media platforms. Beyond the identification of attitudes in user comments, this innovative dashboard serves as a real-time lens into contemporary social issues. The research aims to enhance public awareness of rights and security, offering valuable insights into a diverse array of perspectives and emotions. Utilizing sentiments analysis, the community gains the ability to swiftly showcase nationwide tweets, pinpointing content relevant to autism, and assessing public sentiment on specific subjects. This research contributes not only to understanding the dynamics of social media expression but also to empowering communities to engage in informed discussions, fostering a deeper understanding of the nuanced landscape of autism-related discourse in the digital realm.

**Keywords:** Autism Spectrum Disorder (ASD), media social, sentiment analysis.

### I. INTRODUCTION

Autism Spectrum Disorder (ASD) is characterised by persistent deficits in social interaction and communication across a variety of contexts, including deficits in social reciprocity, nonverbal communicative behaviours used for social interaction, and abilities to form, sustain, and comprehend relationships. A diagnosis of ASD involves the evidence of confined and repetitive patterns of behaviour, interests, or activities in addition to social communication difficulties. People are not aware of the autism issues that are occurring in the world. This is because a small percentage of people have an attitude that makes them less aware of the autism issues that are present in their community. Sentiment detection in Twitter is a difficult task that differs significantly from sentiment detection in traditional text such as blogs and forums. Autism-related misinformation and the perpetuation of stereotypes can be disseminated via social media. The sharing of personal experiences by individuals may unintentionally perpetuate misconceptions or contribute to a limited and erroneous comprehension of autism in children. Opinions and sentiments expressed by social media users regarding children with ASD are frequently accompanied by stigmatisation or emotion, which can contribute to children's a negative perception of autism. A biased viewpoint may result from emotional narratives devoid of factual information and accurate context.

### II. RELATED WORKS

Autism or autism spectrum disorder (ASD) is a complex condition that includes problems with a person's communication and behaviour. Autism can involve a variety of symptoms and skills. ASD can be a minor problem or disability that requires full-time care in a special facility. The available literature suggests that persons diagnosed with Autism Spectrum Disorder (ASD) and who have relatives with mental conditions have a recognisable behavioural paradigm [1]. This type of behaviour is characterised by elevated levels of intelligence quotient (IQ) and less pronounced language impairments. Nevertheless, prior research has not primarily focused on the investigation of the severity of autism. The present study's hypothesis is that there is a positive correlation between a greater incidence of psychiatric family history and heightened symptoms of autism severity. According to [2], individuals diagnosed with autism disorder encounter challenges in communication. It might be challenging to comprehend how others feel and think. They find it challenging to communicate their feelings verbally as well as

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through gestures, facial expressions, and touch. Individuals with autism may also experience challenges with learning. This occurs as a result of the unevenness in their talent and progress. An individual might, for instance, have difficulty communicating with others but excel in music, art, mathematics, or memory. Consequently, ASD children likely demonstrate exceptional proficiency in analytical testing or problem-solving [3]. However, rather than more children having the disorder, the most recent statistics may be higher due to changes in how those with autism are identified [2], [4].

The explosive growth of discussion platforms, product review websites, e-commerce, and social media facilitates a continuous stream of thoughts and opinions. Today's social media platforms, such as Twitter, Facebook, message boards, blogs, and user forums, are exploding with 'sentiments' [5]. Researchers are able to monitor and respond to various social media sites in real time by utilising sentiment analysis [6].

Psychology, sociology, natural language processing, and machine learning are all involved in sentiment analysis. More complex forms of analytics have recently been enabled by the exponentially rising volumes of data and computational power. As a result, machine learning has become a popular method for sentiment analysis [7]. The sentiment analysis techniques are divided into two categories which are machine learning and lexicon-based. The majority of sentiment analysis and twitter sentiment analysis algorithms use a feature set to identify sentiment. The chosen elements and their combination play a key role in determining a text's sentiment. Textual elements such as part-of-speech (POS) tags and information from sentiment lexicons have been studied in the literature for online reviews and news articles [8]. The present study examines the impact of social media and news dissemination on the spread of autism research, as seen by increased downloads and citations [9]. Additionally, this study incorporates studies from other topic areas, offering an exploration of the association between media exposure and the reach of articles in the field of autism research. According to [10] their study highlights the insufficiency and deficiency in community awareness regarding children with autism. Parental acceptance is a key initial step in the process of spreading knowledge about autism. It is imperative to build a platform that allows parents of children with autism, as well as the general public, to express their thoughts on this matter. The research highlights the significance of widespread dissemination of these platforms in order to promote greater awareness and comprehension.

### III. METHODOLOGY

The methodology is divided into four phases which are data acquisition, data cleaning, system development and system testing. Each phase is explained in detail in the next subsections.

#### A. Data Acquisition

The datasets utilised in this study are comprehensively detailed in Table 1, which contains a collection of data categories. The dataset was obtained via the Kaggle platform and was subsequently imported into CSV format in preparation for analysis. The Twitter Connector available on Kaggle was of significant importance as it provided users with an efficient means to retrieve Twitter data directly. The dataset comprises 35,606 elements (columns), which serve as a comprehensive representation of the details present in tweet text. The comprehensive data is crucial for assessing the sentiments and perspectives conveyed by Twitter users within the designated period. The dataset comprises a comprehensive snapshot of Twitter activity from January to December 2021, encompassing the entire temporal scope of the information.

**Table 1.** List of Attributes

No.	Attributes	Description
1.	Author id	id Twitter who wrote the text
2.	Created id	Date and time tweet text has been created by user
3.	Geo	The longitude of the geo location
4.	Id	Id for tweet text
5.	Lang	Type of tweet text language
6.	Like count	Total like received from tweets
7.	Quote count	Total quote received from tweets
8.	Reply-count	Total reply received from tweets

No.	Attributes	Description
9.	Retweet-count	Total retweet received from tweets
10.	Source	Type of sources
11.	Tweet	Example of text on Twitter

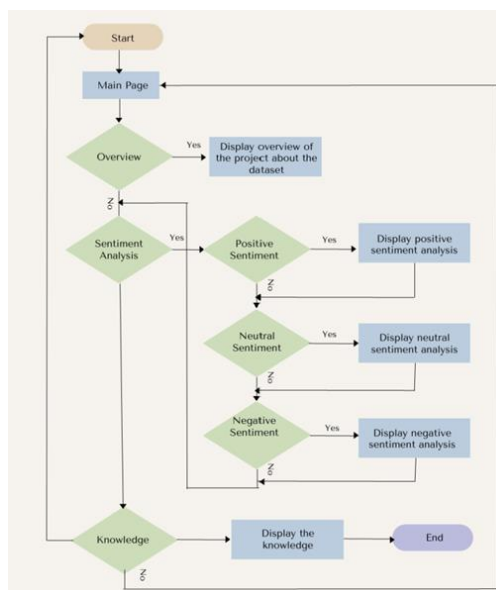
**B. Data Cleaning**

The `isnull()` method is utilised in the data cleaning procedure in Python to detect and exhibit null values present in each row of the dataset. The function in question yields a Boolean mask, wherein each element is assigned a value of ‘True’ if the corresponding element in the dataset is null, and ‘False’ otherwise. By utilising this function, one is able to identify the specific rows that contain null values, as these rows will be denoted as ‘True’ in the resultant output. On the other hand, rows that do not contain null values will be presented as ‘False’. The utilisation of this method is of utmost importance during the data cleaning stage as it enables the focused detection of absent or empty values, hence allowing following procedures such as imputation or elimination of these values to get a more resilient and precise dataset. In the data-cleaning process, six attributes are dropped since they contain many missing values. The attributes are author id, geo, id, like count, quote count, and reply count column. The `defaultString` function is used to set the default value to string data and `defaultfloat` is used to set the default value for float value in datasets. These functions are important to make all the data in the dataset does not have a null value.

**C. Development**

The objective of this research work is to investigate and gain an understanding of the public sentiments present on Twitter regarding autism. The study utilises sentiment analysis methods to identify the predominant positive, neutral, and negative sentiments among tweets spanning from January to December 2021, utilising a dataset obtained from Kaggle. The research is motivated by the imperative to acquire knowledge regarding the perspectives and attitudes of Twitter users regarding autism, thereby enabling a more comprehensive comprehension of the societal dialogue surrounding this intricate subject matter. The research methodology utilised in this study entails a methodical procedure for managing the Twitter data acquired from Kaggle. Data cleansing is one of the initial stages, which eliminates irrelevant and noisy information. In order to categorise tweets into positive, neutral, and negative sentiments, tokenization and sentiment analysis algorithms are followed. The intensity of sentiments conveyed by users is subsequently quantified through the application of sentiment scoring.

From the Twitter text, it is necessary to segregate the sentiment in order to facilitate analysis. In the event that the sentiment polarity is below zero (<0), it might be classified as "Negative". When the sentiment polarity is equal to zero (0), it indicates a neutral sentiment. If the polarity of sentiment exceeds zero (>0), it will be classified as "Positive".



**Figure 1:** Flowchart of Autism Sentiment Analysis

The flowchart for doing sentiment analysis of Tweets data connected to Autism starts with the collection of a wide array of Tweets pertaining to autism from multiple sources as shown in Figure 1. The flowchart illustrates a systematic procedure, commencing with the acquisition of data from Kaggle, subsequent to which a rigorous data preparation is conducted to assure the integrity and applicability of the dataset. The sentiment analysis phase entails the detection of positive, neutral, and negative sentiments using advanced algorithms. Sentiment scoring is utilised to assign numerical values, facilitating a quantitative evaluation of sentiments. Through the analysis of sentiments conveyed on Twitter with respect to autism, this research attempts to reveal prevailing public perspectives, possible patterns, and fluctuations in sentiment throughout the year 2021. It is anticipated that the resulting insights will enhance our comprehension of the intricate societal perception of autism and its ever-changing characteristics within the realm of online discourse.

*D. System Testing*

The System Usability Scale (SUS) is a standardized questionnaire used in system testing to assess the overall usability and user satisfaction of a software system. In order to develop the Autism Tweets Dashboard, the method that was utilised was system testing with the SUS tool. It was carried out to verify the dashboard's design and see if the general public could engage with it and draw valid conclusions from the visuals.

**Table 2:** System Usability Scale Rating

SUS Score	Grade	Adjective Rating
> 80.1	A	Excellent
> 68 - 80.2	B	Good
> 67	C	Okay
> 51 - 66	D	Poor
< 51	E	Awful

In order to successfully determine the final score on the System Usability Scale (SUS), the dashboard demonstrates remarkable functioning, as evidenced by the fact that all of the respondents reached a unanimous accord among themselves. It is important to highlight that these findings are significant insights that were obtained from the systematic evaluation that was carried out during the phase of system testing.

**IV. RESULTS AND DISCUSSION**

This section presents a thorough examination of the outcomes generated by the prototype, with particular emphasis on the visual depiction of those outcomes. Figure 2 functions as a crucial visual representation, highlighting the main interface of the Autism Tweet Dashboard. The provided visual representation presents a static image of the homepage, functioning as an initial glimpse into the various features and functionalities of the prototype.



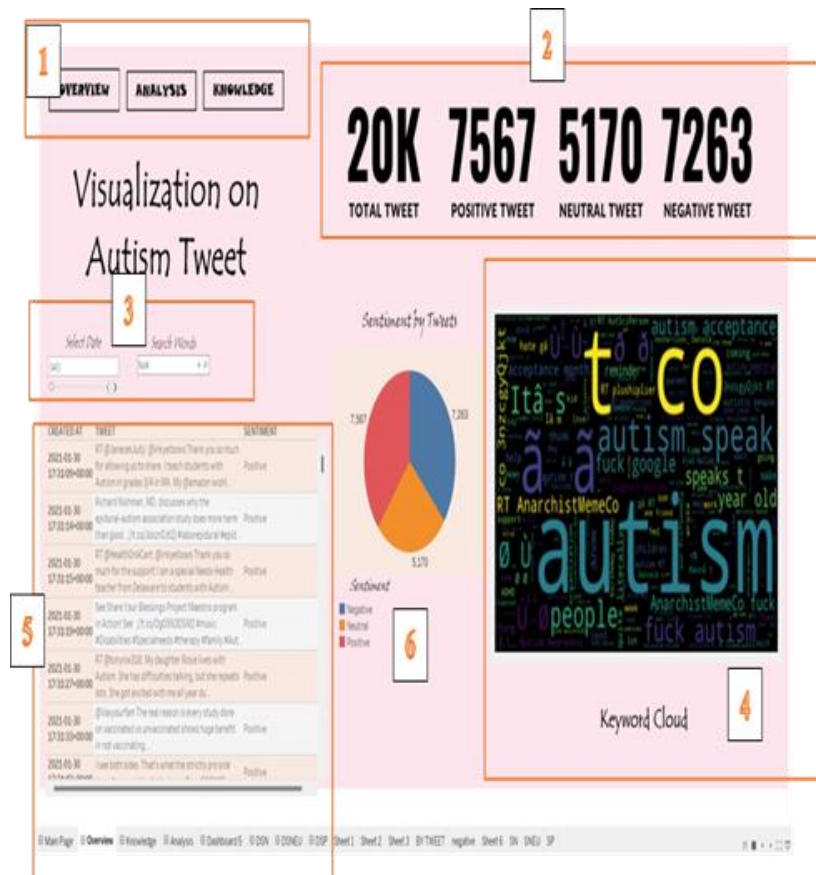
**Figure 2:** Main page

Refer to Table 3, the “Overview” element within the interface system functions as an entry point to a thorough comprehension of the sentiment analysis performed on tweets pertaining to autism. Within this element which functions as a central to provide users with a concise yet insightful summary of the sentiments expressed in the tweets that have been analysed.

**Table 3:** List of Element

Element	Description
Overview	Sentiment Analysis Overview Page.
Analysis	Analysis Page where a table and graph on sentiment analysis are displayed.
Knowledge	Knowledge-based information regarding autism is presented.
Awareness	A page of autism awareness posters is exhibited.

An integral element of the dashboard system, the "Analysis Page" provides users with an in-depth examination of sentiment analysis as it pertains to tweets concerning autism. The present page exhibits a dynamic presentation that combines a graph and table to systematically exhibit the intricate outcomes of sentiment analysis. The "Knowledge" element of the dashboard system functions as a repository of information, providing an extensive collection of data pertaining to autism. The purpose of this section is to present users with thorough and precisely organised information pertaining to autism. The interface system includes an "Awareness" element that presents a compilation of autism awareness posters on a dedicated page. This page uses visual curation to increase awareness about autism and effectively communicates important messages.



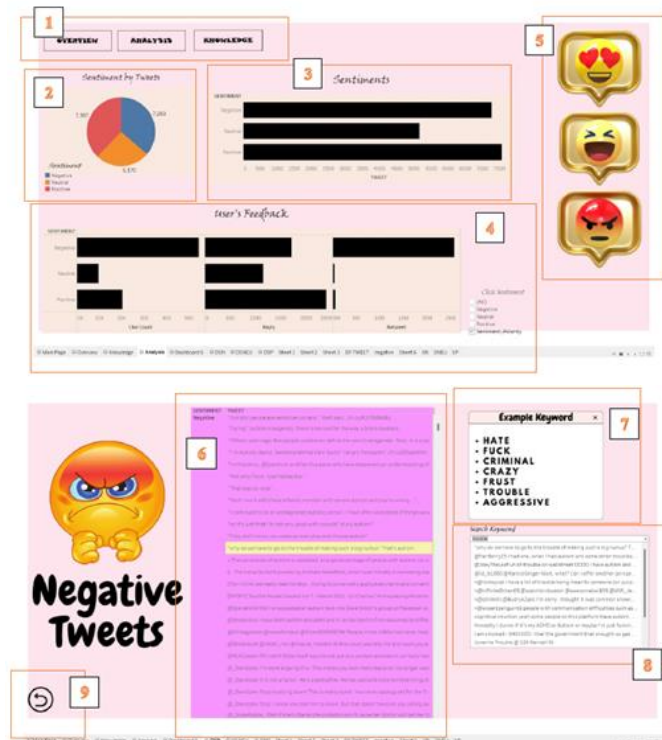
**Figure 3:** Overview Page

Figure 3 depicts the Sentiment Analysis Overview Page, which is an important part of the autism twitter dashboard. It provides a detailed presentation of six essential pieces of information. In Table 4, a comprehensive explanation of the Overview Page of the dashboard is provided. This description elucidates the particular components and information that are shown within this primary component.

**Table 4:** Description for Overview Page

No	Description
1	The Dashboard's Overview, Analysis, and Knowledge buttons facilitate user navigation by directing them to designated pages.
2	The numerical values are determined by the sentiment of the tweets (positive, negative, and impartial) in addition to the overall tweet text.
3	Slicer function is utilised to apply a filter to the data based on the Date filter. This filter has the potential to alter the data displayed in the visualisation for the viewer.
4	The frequently utilised terms in twitter data are displayed in a "Keyword Cloud" to enhance user understanding.
5	The tweet text table displays tweets. For each tweet, the table shows its creation date, count, and emotion.
6	The tweet text table displays data-accessible tweets. The table lists the creation date, quantity of tweets, and sentiment type for each tweet.

Figure 4 provides a graphic representation of the Sentiment Analysis Page's visualisation. It displays graphical components that aid the interpretation and understanding of sentiment dynamics in the analysed autism-related tweets. The Autism Tweet Dashboard serves as an important tool in interpreting and analysing the adverse emotions conveyed in tweets pertaining to autism. The Autism Tweet Dashboard is an effective tool that has been developed to effectively analyse and provide insights into tweets pertaining to autism, particularly those that express negative views. This study explores the functioning and significance of the dashboard in the identification and interpretation of negative attitudes in the context of debates connected to autism.



**Figure 4:** Sentiment Analysis Page

Table 5 explained the Sentiment Analysis Page, outlining the precise elements and features included in this crucial part of the interactive dashboard. The table functions as a crucial point of reference for users, providing valuable insights into the intricate information displayed on the Sentiment Analysis Page. The text thoroughly describes the several components, such as sentiment scores, classifications, and graphical representations, which give users a comprehensive comprehension of the sentiment patterns discovered in tweets connected to autism. The detailed information provided in Table 5 enables users to easily understand and evaluate the results of sentiment analysis. This allows users to effectively interact with the visualised data and get significant insights from the presented information.

**Table 5:** Description for Sentiment Analysis Page

No	Description
1	The Overview, Analysis, and Knowledge button simplifies dashboard use by sending users to specific pages.
[1] 2 (Pie Chart)	Pie charts show the general emotion of tweets as positive, negative, or neutral.
3 (Histogram)	An overall sentiment histogram is created from all tweets, which can be positive, negative, or neutral.
4 (Histogram)	A histogram shows likes, replies, and retweets from all tweets.
5 (Emotion button)	The implementation of the Positive, Neutral, and Negative emotion buttons on this dashboard facilitates user navigation by directing them to designated sites.
6	The table displays tweets pertaining to autism that convey a negative sentiment.
7	The sentiment associated with autism can be determined by analysing specific keywords.
8	In order to retrieve tweets related to a specific topic, users are required to conduct a search using the designated keyword.
9 (Back button)	Upon the activation of the back button by the user, the system will navigate to the Analysis Page.

The utilisation of sentiment analysis on a dataset sourced from Twitter offers valuable insights into the viewpoints and attitudes conveyed in comments pertaining to the perception of autism in children. This entails comprehending the common perspectives, misunderstandings, and degrees of awareness present in the digital media community. The analysis of sentiment on Twitter about perceptions of autism in children provides significant insights into public attitudes, feelings, and beliefs. The acquisition of this knowledge is crucial in the development of impactful awareness initiatives, the cultivation of comprehension, and the establishment of a more conducive environment for individuals on the autism spectrum and their families.

## V. CONCLUSION

The main aim of this research was to create a user-friendly dashboard that allows for the visualisation of tweets linked to autism, together with an analysis of the sentiment expressed in these tweets. The established system functions as a beneficial instrument for users who wish to analyse public discussions on social media. It helps identify feelings that span from positive to negative or neutral, specifically related to social issues. The system's primary advantage resides in its capacity to not only visually depict sentiment patterns using graphs but also deliver definitive insights derived from the analysed data. This research effectively utilised the Tweet Text dataset acquired from Kaggle to improve the precision and significance of sentiment analysis in the realm of autism-related discussions. The achieved results show promise, but there is room for additional improvement, especially in the shift from static CSV data to real-time data. The real-time nature of data can provide consumers with prompt and pertinent insights into the changing trends of sentiment on social media sites. An inclusion of this feature would not only enhance the functionality of the system but also enhance the user experience by making it more interactive and captivating. In future studies, it may be beneficial to investigate the incorporation of real-time data streams to guarantee that the dashboard continues to offer up-to-date and meaningful information in the ever-changing realm of social media discussions about autism.

## VI. ACKNOWLEDGEMENT

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## REFERENCES

- [1] D. Sipsock, H. Tokadjian, G. Righi, E. M. Morrow, and S. J. Sheinkopf, "Autism severity aggregates with family psychiatric history in a community-based autism sample," *Autism Res.*, vol. 14, no. 12, pp. 2524–2532, 2021.
- [2] M.-C. Lai, M. V. Lombardo, and S. B. Cohen, "Seminar Autism," *October*, vol. 6736, no. 09, pp. 1–12, 2009.
- [3] T. Zorcec and N. Pop-jordanova, "Main Needs and Challenges of Parents," *Masa*, vol. 41, no. 2, pp. 81–88, 2020.
- [4] W. A. Naji, M. Q. Waheeb, and D. H. Hamza, "Autism spectrum disorder: Review article," *Medico-Legal Updat.*, vol. 20, no. 2, pp. 320–325, 2020.
- [5] A. Jawed, H. Graham, and J. Smith, "Digital trends in autism: a scoping review exploring coverage of autism across YouTube, Twitter, and Facebook," *Front. Digit. Heal.*, vol. 5, no. September, pp. 1–15, 2023.
- [6] M. Bordoloi and S. K. Biswas, *Sentiment analysis: A survey on design framework, applications and future scopes*, vol. 56, no. 11. Springer Netherlands, 2023.
- [7] J. Hartmann, M. Heitmann, C. Siebert, and C. Schamp, "More than a Feeling: Accuracy and Application of Sentiment Analysis," *Int. J. Res. Mark.*, vol. 40, no. 1, pp. 75–87, 2023.
- [8] Z. Drus and H. Khalid, "Sentiment analysis in social media and its application: Systematic literature review," *Procedia Comput. Sci.*, vol. 161, pp. 707–714, 2019.
- [9] A. Longo and B. N. Hand, "Brief Report: The Impact of Social and News Media Coverage on the Dissemination of Autism Research," *J. Autism Dev. Disord.*, no. 0123456789, 2022.
- [10] A. Mokhtar, D. A. Dania, F. Nurena, N. A. Afqah, N. S. Nasuha, and N. A. Farisah, "Children with autism: the educational aspect," *Int. J. Stud. Child. Women, Elder. Disabl.*, vol. 19, no. October, pp. 1–12, 2023.