MACHINE LEARNING MODELS FOR TIMELY DEPRESSION DETECTION IN SOCIAL MEDIA

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ABSTRACT

Depression is one of the leading causes of suicide worldwide. However, a large percentage of cases of depression go undiagnosed and, thus, untreated. Previous studies have found that messages posted by individuals with major depressive disorder on social media platforms can be analyzed to predict if they are suffering, or likely to suffer, from depression. With a growth in the use of the social media, we have witnessed a positive connection between the demonstration of Suicidal ideation on social networking sites (such as Twitter) and the suicidal cases. One of the most admired and extensively used online social network sites is Twitter. Twitter becomes the mean where every individual can share their emotions whether the emotions are positive negative or neutral. The aim of this study is to design a model for individuals that run the higher risk of committing suicide. This study aims to determine whether machine learning could be effectively used to detect signs of depression in social media users by analyzing their social media posts—especially when those messages do not explicitly contain specific keywords such as 'depression' or 'diagnosis'. To this end, we investigate several text preprocessing and textual-based featuring methods along with machine learning classifiers, including single and ensemble models, to propose a generalized approach for depression detection using social media texts.

Keywords: machine learning, social media platforms, social network, committing suicide, social media texts.

INTRODUCTION

Machine learning techniques have demonstrated immense potential in automatically analyzing vast volumes of textual data and extracting meaningful insights. Natural language processing (NLP) algorithms, in particular, have been leveraged to develop computational models capable of detecting depression symptoms in user-generated content, such as tweets. These models offer a promising avenue to complement traditional diagnostic approaches and provide an efficient, scalable, and cost-effective means of screening for depression at a large scale. Traditionally, depression is detected using standardized scales requiring patients' subjective responses or clinical diagnoses given by attending clinicians—methods that have some shortcomings. Firstly, people's responses to standardized scales administered in the traditional way are likely to be affected by context, the patient's mental status at the time, the relationship between the clinician and the patient, the patient's current mood, and the patient's past experiences and memory bias. Traditional diagnostic methods also lack temporal granularity. Secondly, people may be unaware or ashamed of their depressive symptoms and unlikely to consult with professional clinicians, especially in the early stages of depression. A previous study found that more than 70% of the population would not consult with professional clinicians if they were in the early stages of depression, meaning that they would be likely to allow their symptoms to worsen before they would consider seeking help. Finally,

detection of depression by traditional methods, being dependent on face-to-face interviews, is costly in terms of both money and time and unaffordable for some people.

LITERATURE REVIEW

Antony Ngunyi (2023) Depression is a major public health problem around the world and contributes significantly to poor health and poverty. The rate of the number of people being affected is very high compared to the rate of medical treatment of the disease. Thus, the disease often remains untreated and suffering continues. Machine learning has been widely used in many studies in detecting depressive individuals from their contents on online social networks. From the related reviews, it is apparent that the application of stacking for diagnosing depression has been minimal. The study implements' stacking based on Extra Tree, Extreme Gradient Boosting, Light Gradient Boosting and Multi-layer perceptron and compares its performance to state of the art bagging and boosting ensemble learners. To better evaluate the effectiveness of the proposed stacking approach, three pertain word embeddings techniques including: Word2vec, Global Vectors and Embeddings from language models were employed with two datasets.

Maqsudur Rahman (2023) When someone threatens or humiliates another person online by sending those unpleasant messages or comments, this is known as Cyberbullying. Recently, Bangla text has been used much more often on social media. People communicate with others on social media through messages and comments. So bullies use social media as a rich environment to bully others,

especially on political issues. Fights over Cyberbullying on political and social media posts are common today. Most of the time, it does a lot of damage. However, few works have been done for monitoring Bangla text on social media & no work has been done yet for detecting the bullying Bangla text on political issues due to the lack of annotated corpora and morphologic analyzers. In this work, we used several machine learning classifiers & a model. That will help to detect the Bangla bullying texts on social media. For this work, 11,000 Bangla texts have been collected from the comments section of political Facebook posts to make a new dataset and labelled the data as either bullied or not.

Mahim Musharof Shazan (2022) Our lives are significantly impacted by social media platforms such as Facebook, Twitter, Instagram, LinkedIn, and others. People are actively participating in it the world over. However, it also has to deal with the issue of bogus profiles. False accounts are frequently created by humans, bots, or computers. They are used to disseminate rumors and engage in illicit activities like identity theft and phishing. So, in this project, the author'll talk about a detection model that uses a variety of machine learning techniques to distinguish between fake and real Twitter profiles based on attributes like follower and friend counts, status updates, and more. The author used the dataset of Twitter profiles, separating real accounts into TFP and E13 and false accounts into INT, TWT, and FSF. Here, the author discusses LSTM, XG Boost, Random Forest, and Neural Networks. The key characteristics are chosen to assess a social media profile's

authenticity. Hyper parameters and the architecture are also covered.

Pramila M. Chawan (2020) Depression is a common but serious mental health disorder. Still, most people dealing with depression do not approach doctors for this problem. On the other hand, the use of Social Media Sites like Twitter is expanding extremely fast. Nowadays, people tend to rely on these social media applications to share their emotions and feelings. Thus, this readily available content has become helpful for us to analyze the mental health of such users. We can apply various machine learning techniques on social media data to extract the mental health status of a user focusing on Depression. Detecting texts that express negativity in the data is one of the best ways to detect depression. In this paper, this problem of depression detection on social media and various machine learning algorithms that can be used to detect depression have been discussed. The Ensemble Learning approach for solving this problem has been enlightened. We aim to find and implement the most appropriate approach and algorithm to solve this problem.

Ashad Kabir (2018) Purpose Social networks have been developed as a great point for its users to communicate with their interested friends and share their opinions, photos, and videos reflecting their moods, feelings and sentiments. This creates an opportunity to analyze social network data for user's feelings and sentiments to investigate their moods and attitudes when they are communicating via these online tools. Methods although diagnosis of depression using social networks data has picked an established

position globally, there are several dimensions that are yet to be detected. In this study, we aim to perform depression analysis on Facebook data collected from an online public source. To investigate the effect of depression detection, we propose machine learning technique as an efficient and scalable method. Results we report an implementation of the proposed method. We have evaluated the efficiency of our proposed method using a set of various psycholinguistic features. We show that our proposed method can significantly improve the accuracy and classification error rate.

Emotion Detection State-of the-Art Methods

Using Neural Networks, we have discussed more features of Semantic Emotion from Text. The goal of the proposed study is to develop a novel model for emotion recognition that outperforms existing algorithms. This objective was met by the authors with the introduction of SENN, a novel model for text-based emotion identification. Emotional and semantic/syntactic data are combined using pre-trained word representations in the proposed technique. Using a Convolution Neural Network (CNN), SENN was able to effectively extract the text's emotional connections and unique characteristics. The first network layer employs Bidirectional Long-Short Term Memory (BiLSTM) to gather contextual information and concentrate on the semantic link. The suggested model SENN's performance with additional emotion word embedding is an example of a minor issue that needed fixing. This study method is still in its infancy, therefore there may be fresh chances for

academic institutions and development groups to solve these problems.

Attitudes towards Algorithmic Decision-Making

There is a schism in American opinion on AI research and development, with the more affluent, well-educated, male, and technologically adept tending to support the cause. According to Pew, people's level of comfort with social media companies utilizing their data to suggest things like events, people, advertisements, or political campaign messaging is contextual. From most unpleasant to most nice, below is the sequence of these settings. The Pew survey neglected to inquire about respondents' emotional or physical well-being, despite the obvious connection between the two. People did not take their emotions into account when estimating their level of comfort with algorithms, according to this study and the Pew Research Centre's poll.

Depression Diagnosis

Globally, people with mental illness account for a disproportionate share of the avoidable deaths and excessive healthcare expenditures each year. Major depressive illness is the primary focus due to its prevalence, yet this study encompasses other mental disorders as well. A person's thoughts, actions, and emotions are all negatively impacted. This illness will have far-reaching effects, affecting not only the affected person but also their community and society at large. Nearly two-thirds of all suicides annually are caused by depression. There is a lack of awareness of the issue since many depressed persons postpone treatment for a long time or deny they have a problem. Factors that already contributed to mental instability before the corona virus illness (COVID-19) pandemic become more worse. Many people throughout the globe have had to drastically alter their way of life because of the COVID-19 epidemic, and this has the potential to cause serious sadness.

RESEARCH METHODOLOGY

Preparing of social network data, in particular Facebook user's comments is one of the primary challenges which bear information on whether or not they could contain depression bearing content. The machine learning techniques offer a solution as a series of stages, each stage allowing a particular data representation. People frequently experience mental health issues. Depression is the fastest-growing health disorder; it is caused by a change in mood, which includes elements of motivational and emotional conditions. Despite the popularity of social media platforms and the rapidity with which they have permeated almost every aspect of our lives, there is a significant lack of clear data on how they affect us personally, such as our behaviour, social relationships, and mental health. We conducted a quantitative study in this study to train and test various machine learning classifiers to determine if a user of a Twitter account is depressed based on tweets initiated by the user or his/her Twitter activity. We then apply supervised machine learning approaches to study each factor types independently. It comprises descriptions of common project phases, tasks associated with each phase, and an explanation of the interconnections between these activities as a methodology. It is intended to enable to arrange, break down and discover knowledge in unstructured data like open-ended survey

responses, social media, interviews, articles and web content.

RESULTS AND DISCUSSION

Their internal consistency was higher than that of earlier studies. Our disagreement spanned from 2 to 3, however we did reach consensus that a tweet may convey distress. Based on this experiment, the annotators reached a consensus about the pain levels for levels 2 and 3. We also chose to eliminate certain tweets that came out negative for anxiety since annotating was so difficult. There seemed to be an abundance of them. To do this, we followed directions and mined AFINN net for expressions, counting the number of positive and negative phrases in each tweet. Following our intuition, we kept the bad tweets and deleted the positive ones after evaluating the tweets.

Table 1: Distribution of tweet labels with distress level 0-3

annotator1	annotator2			
	0	1	2	3
0	7,993	241	23	2
1	84	233	72	0
2	5	13	70	7
3	1	1	3	5

When comparing distress levels 0-3, the two annotators found a Kappa value of 0.59. Since kappa compensates for the agreement by chance, we do away with percentage agreement in its favour. For 7,993 tweets tagged as "no-distress," the two annotators reached a unanimous decision, whereas 760 were deemed to indicate a hint of sadness, as shown in Table 1. The figures show a distinct discrepancy. We decided to run our primary experiments for a binary class problem as there were too many "no-distress" tweets (7,993) and not enough "distress" tweets (760).

Table 2: Distribution of tweet labels with distress level 0-1

annotator1	annotator2	
	0	1
0	7,993	266
1	90	404

Either the person behaves in a manner that might lead to future depression or shows overt symptoms of sadness. Someone knowledgeable in medical or public health should look at this more.

Table 3: 100 users – annotations

Annotator 2	annotator1	
	not-depressed	Depressed
not-depressed	51	11
depressed	4	50

It was expected that five individuals would be in a "no-distress" condition, thus their tweets were removed from the sample.

Table 4: outcomes at the user level for classifying people as "not-depressed" based on "self-reported" status

Model Name	Accuracy	Precision	Recall	F1
baseline	0.9469	1.0000	0.111	0.0111
exp1-svm-Original	0.9114	NA	0.0001	NA

exp1-svm-SMOTE	0.7944	0.1816	0.6984	0.1641
exp1-svm-Down	0.74146	0.1114	0.8114	0.1441
exp1-svm-Original	0.94411	0.1111	0.0111	0.1441
exp1-svm-SMOTE	0.8441	0.1114	0.6141	0.1144
Exp3-svm-SMOTE	0.1164	0.9644	0.1144	0.4698

The accurate classification of many "self-reported" users has also contributed to improved performance. To that end, the annotators were not given any information pertaining to these five users. In the end, we used Twitter to track down the missing people. Just five people made constituted the so-called "control" group. The majority of their tweets consisted of rewets, links, and ads.

CONCLUSION

"Depressed" and "not-depressed" were also used to label users next to their tweets. Afterwards, we developed two classifiers through trial and error: one for tweets that can identify when a tweet indicates distress, and another for users that can identify when a person is depressed. Some people's social media posts and language patterns may indicate depression, according to scientists. Social media has become a significant part of day-to-day human life. Social media provides an accessible medium to connect with family and friends for communicating and sharing. People use social media environments to interact with old companions, maintain relationships, or even meet new friends, thus strengthening the overall connectivity among social media users. Prompting responsible use of language analysis technologies can help researchers avoid harming or stigmatizing individuals who may have a depression diagnosis. One thing to keep in mind when building detection models is that different cultures may have different ways of expressing emotions and difficulties through language. Additionally, it seems appropriate and applicable for these methods to function as a complementary tool to the more traditional, established methods for diagnosing depression. However, further research is still needed in the areas of sample size, optimization of predictive approaches and features, generalizability, privacy issues, and general research ethics.

REFERENCE

1. Ashad Kabir (2018), "Depression detection from social network data using machine learning techniques",Health Information Science and Systems,ISSN no:2047-2501,Vol.6(1),Pages.8.DOI:10.1007/s13755-018-0046-0
2. Pramila M. Chawan (2020),"Depression Detection on Social Media using Machine Learning Techniques: A Survey",International Research Journal of Engineering and Technology (IRJET),ISSNno:2395-0056,Vol.07,Issue.11,
3. Antony Ngunyi (2023),"A Stacking-Based Ensemble Approach with Embeddings from Language Models for Depression Detection from Social Media Text",Journal of Data Analysis and

Information Processing, ISSNno: 2327-7203,Vol.11,No.4,Pages.420-453.

4. *Maqsudur Rahman (2023),"Social Media Cyberbullying Detection on Political Violence from Bangla Texts Using Machine Learning Algorithm",Journal of Intelligent Learning Systems and Applications,ISSNno:2150-8410,Vol.15,No. 4,Pages.108-122.*

5. *Leelakumar Raja Lekkala (2023),"Importance of Machine Learning Models in Healthcare Fraud Detection",Voice of the Publisher,ISSNno:2380-7598, Vol.9,No.4,Pages.207-215.*

6. *Mahim Musharof Shazan (2022),"Fake Profile Detection Using Machine Learning Techniques",Journal of Computer and Communications,ISSNno: 2327-5227,Vol.10,No.10,Pages.74-87.*

7. *Yifan Jin (2019),"Predicting the Stock Price Movement by Social Media Analysis",Journal of Data Analysis and Information Processing,ISSNno:2327-7203,Vol.7,No.4,Pages.295-305.*

8. *Shahram Latifi (2023),"A Survey of the Machine Learning Models for Forest Fire Prediction and Detection",International Journal of Communications, Network and System Sciences,ISSNno:1913-3723,Vol.16,No.7,Pages.131-150.*

9. *Aseel Helal Taemees (2018),"Framework to Classify and Analyze Social Media Content",Social Networking,ISSNno:2169-3323,Vol.7,No.2,Pages.79-88.*

10. *E. Okang'o (2021),"Machine Learning Approaches for Classifying the Distribution of Covid-19 Sentiments",Open Journal of Statistics,ISSNno: 2161-7198,Vol.11,No.5,Pages.620-632.*