Depression and Stress Monitoring System via Social Media Data using Deep Learning Framework: A Review

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Abstract: *Mental health issues such as stress and depression are among the most publicly recognised and debilitating. The use of social networking to improve depression and stress detection may need the use of automatic health monitoring systems. An approach called Sentiment Analysis makes use of natural language processing and content mining to identify how people are feeling or what they think. bursting with emotion Computing is the study and advancement of frameworks and devices that can perceive, decode, process and replicate human effects.. For example, the combination of deep learning and sentiment analysis could help in the evaluation and monitoring of mental health issues, such as the evaluation of depression and stress. Here, we'll take a look at how to use methods like sentiment analysis and deep learning to detect and track depression and stress. In addition, an integrated multimodal framework for stress and depression testing is offered, which includes estimation research and a slew of ways for processing feelings. Furthermore, the paper compares the structure of such a framework with the basic concerns that it explores.*

Keywords: Stress and Depression; Ehealth; Sentiment Analysis, Social Media, Deep Learning

I. INTRODUCTION

Human-generated text can be found in abundance on social media platforms like Facebook and Twitter. Internet users' thoughts, feelings, and perceptions are reflected in their comments, feedback, and critiques. In this study, a knowledge-based system is presented, which contains an emotional health monitoring system to identify users with suspected psychological problems, such as depression and stress. Psychological symptoms are typically detected in a passive manner. Using online social behaviour extraction, the author argues that it is possible to actively detect mental illness at an early stage. Online social activity records do not have the ability to track psychological aspects that are considered in standard diagnostic criterion questionnaires.

Many people experience depression and stress at some point in their lives. This is a problem that affects the entire community. Currently, approaches for detecting and diagnosing depression and stress rely on self-reporting and an informed assessment by medical professionals. Healthcare expenditures can be reduced by improving the job of medical professionals and providing them with better tools for monitoring and diagnosing patients' health. In order to achieve these goals, sentiment and deep learning technologies could provide effective tools and systems for objective evaluation. A psychologist or psychiatrist isn't going to be replaced by these tools and systems, but they could help them make better decisions.

Our new and novel method to the profession of psychological disorder detection does not trust the self-disclosure of these psychological elements through questionnaires. A machine learning technique that uses social network data to identify with high precision likely cases of psychological condition detection is proposed here instead. Using large-scale data sets and machine learning, we examine the characteristics of the two major forms of mental illness that exist.

II. RELATED WORK

Renata L. Rosa, Gisele M. Schwartz, Wilson V. Ruggiero, and Dem´ostenes Z. Rodr´ıguez - The information that people submit about their perspectives on a variety of topics is made available through online social networks (OSN). Consequently, software programmes such as monitoring and recommendation systems (RS) are able to gather and evaluate this data. In this study, a Knowledge-Based Recommendation System (KBRS) is presented. One component of this system is an emotional health monitoring system, which is designed to identify users who may be suffering from probable psychological disturbances such as stress or depression.

Guang Yang, Haibo He, Fellow, IEEE, and Qian Chen - Even though there has been a lot of research done on sentiment analysis of microblog posts, it is still difficult to do because posts typically only contain a small amount of contextual information. In the context of microblogging, emoticons are used often, and each one has a distinct emotional connotation. They are vitally crucial emotional cues for the sentimental interpretation of microblog posts. In order to solve this problem, they built an emotional space in the form of a feature representation matrix and then projected emoticons and words into the emotional space depending on the semantic composition of the data.

M. Al-Qurishi, M. S. Hossain, M. Alrubaian, S. M. M. Rahman, and A. Alamri - An integrated social media content analysis platform is proposed by the authors of this paper. This platform makes use of three levels of features, namely user-generated content, social graph connections, and user profile activities, in order to analyse and detect anomalous behaviours in large-scale social networks. These behaviours differ significantly from the norm in large-scale social networks. In the process of identifying highly adaptable harmful users, a variety of different kinds of analysis have been carried out in order to gain a better understanding of the various user behaviours.

Huijie Lin, Jia Jia, Jiezhon Qiu, Yongfeng Zhang, Lexing Xie, Jie Tang, Ling Feng, and Tat-Seng Chua - We leverage a large-scale dataset from real-world social platforms to comprehensively explore the association between users' stress levels and social interactions. In this work, we find that a user's stress condition is closely related to that of his or her friends in social media. First, we define a set of stress-related textual, visual, and social attributes from a variety of perspectives. Next, we propose a novel hybrid model, which is a combination of a factor graph model and a Convolutional Neural Network, to leverage tweet content and information about social interactions for the purpose of stress detection.

Budhaditya Saha, Thin Nguyen, Dinh Phung, Svetha Venkatesh - Individuals, families, and, by extension, society as a whole are all profoundly impacted by the condition known as mental illness. Studies on the textual symptoms of mental health problems can make use of the rich resource provided by social networks since they enable people with mental diseases to communicate with other people who also suffer from the same condition through online communities. It is common for people to have more than one mental illness at a time. For instance, a patient who already suffers from anxiety may also struggle with despair.

Chun-Hao Chang, Elvis Saravia, Yi-Shin Chen - In this paper, we aim to build predictive models that leverage language and behavioural patterns, particularly those that are used in social media, to determine whether or not a user is suffering from two different types of mental disorder. Specifically, we focus on identifying people who use social media. These predictive models have been made possible by the utilisation of a revolutionary data collecting procedure that has been dubbed "Subconscious Crowdsourcing." This method assists in the collection of a patient dataset in a quicker and more trustworthy manner. According to the results of our research, obtaining certain language patterns and social interaction characteristics from trustworthy patient datasets can make a significant contribution to both the ongoing investigation and the identification of mental diseases.

Andrey Bogomolov, Bruno Lepri, Michela Ferron, Fabio Pianesi, Alex (Sandy) Pentland- In this paper, we propose an alternative method that provides evidence that daily stress can be reliably recognised based on behavioural metrics, derived from the user's mobile phone activity and from additional indicators, such as the weather conditions (data pertaining to transitory properties of the environment) and the personality traits. In addition, we provide evidence that daily stress can be reliably recognised based on behavioural metrics, derived from the user's mobile phone activity (data concerning permanent dispositions of individuals). For a scenario involving recognising two classes of everyday stress, our multifactorial statistical model, which is not dependent on the characteristics of the individual being studied, achieves an accuracy score of 72.28 percent. Because of its greatly compressed and low-dimensional feature space, the model is easy to apply for the vast majority of multimedia applications (32d). In addition, we determine and talk about the signs that have a high degree of predictive value.

Bimal Viswanath† Alan Mislove Meeyoung Cha Krishna P. Gummadi – For the purpose of capturing this idea in this paper, conduct research on how activity between users in the Facebook social network has evolved over time. The strength of ties shows a general pattern of diminishing activity as the social network link matures, as well as the fact that there is a tendency for links in the activity network to rapidly arrive and go over the course of time. For instance, just thirty percent of user pairings on Facebook engage with each other in a consistent manner from one month to the next. It is interesting to note that despite the quick rate of change observed in the activity network's links during the course of the study; several graph-theoretic features of the activity network were found to be unaffected.

I.-R. Glavan, A. Mirica, and B. Firtescu - Tools that are part of social media are widely used in online communication and are gaining popularity as a part of the communication process that takes place between citizens and public institutions. The purpose of this research is to undertake an investigation on the manner in which Official Statistical Institutes use social media to communicate with members of the public and to disseminate information. In order to determine which of the two social media platforms—Twitter or Facebook—is the more useful instrument for the process of communication in the area of official statistics, a technique called linear regression is used. In line with the findings of several previous studies, our research indicates that Twitter is a more effective platform than Facebook for increasing the interaction that exists between official statistics and ordinary persons. Next, using NodeXL, an analysis was performed on the characteristics of the Twitter network that were being discussed under the hashtag "official statistics." The results of this research highlighted the untapped potential of this network by official statistical agencies.

A. E. U. Berbano, H. N. V. Pengson, C. G. V. Razon, K. C. G. Tungcul, and S. V. Prado - Electroencephalography (EEG) signal analysis is utilised throughout the presentation of new research on brain engineering. The research focuses on the categorization of many types of stress, including emotional, mental, physical, and no stress at all. One of the primary contributors to a wide range of illnesses and conditions that affect one's health is stress. As a result, it is essential for individuals to keep an eye on their levels of stress. Because the human body accumulates stress in a variety of ways and responds to it in a variety of ways, we can divide stress into two categories: mental and emotional stress. It is generally agreed that the traditional approaches to classifying stress, such as through questionnaires and self-assessment exams, are subjective because they depend on the respondent's own perception. In light of this, the EEG signal analysis serves as the research project's objective method for categorising different types of stress. The Discrete Wavelet Transform is then used to do pre-processing, extraction, and selection of the characteristics included within the EEG recordings (DWT). After that, we use these features as inputs into an Artificial Neural Network (ANN) to classify the stress, and we validate the results using the K-fold Cross Validation Method. In the final step, the findings obtained through the software assisted method and those obtained through the traditional method are contrasted and compared. S. L. Bangare et al. [11-17] have worked in the brain tumor detection. N. Shelke et al [18] given LRA-DNN method. Suneet Gupta et al [19] worked for end user system. Gururaj Awate et al. [20] worked on Alzheimers Disease. P. S. Bangare et al [21-23] worked on the object detection. Kalpana Thakare et al [24-29] have worked on various machine learning algorithms. M. L. Bangare et al. [30-31] worked on the cloud platform. Rajesaheb R. Kadam et al [32] and Sachindra K. Chavan et al. [33] have discussed security issues with cloud.

2.1 Gap Analysis

Sr No	Title	Author	Journal	Description
1	Online Public Shaming on Twitter: Detection, Analysis, and Mitigation	Rajesh Basak, Shamik Sural , Niloy Ganguly, and Soumya K. Ghosh	IEEE 2019	Author proposed Shaming tweets are categorized into six types: abusive, comparison, passing judgment, religious/ethnic, sarcasm/joke, and what aboutery, and each tweet is classified into one of these types or as non shaming using support vector machine.
2	Anyone Can Become a Troll: Causes of Trolling Behavior in Online Discussions	Justin Cheng, Michael Bernstein, Cristian Danescu-Niculescu-Mizil, Jure Leskovec	ACM-2017	Both negative mood and seeing troll posts by others significantly increases the probability of a user trolling, and together double this probability. A predictive model of trolling behavior shows that mood and discussion context together can explain trolling behavior better than an individual's history of trolling.
3	Deep Learning for Hate Speech Detection in Tweets	Pinkesh Badjatiya, Shashank Gupta, Manish Gupta, Vasudeva Varma	International World Wide Web Conference	Hate speech detection on Twitter is critical for applications like controversial event extraction, content recommendation and sentiment analysis. Task to classify a tweet as racist, sexist

		Committee-2017	or neither. The complexity of the natural language constructs makes this task very challenging.
4	Statistical Twitter Spam Detection Demystified: Performance, Stability and Scalability	Guanjun Lin,Sun, Surya Nepal, Jun Zhang,Yang Xiang, Senior Member, Houcine Hassan	IEEE TRANSACTIONS 2017	Due to the popularity of online social networks, cyber criminals are spamming on these platforms for potential victims. In this paper, performance of a wide range of mainstream machine learning algorithms are compared, aiming to identify the ones offering satisfactory detection performance and stability based on a large amount of ground truth data.
5	Hate Speech on Twitter: A Pragmatic Approach to Collect Hateful and Offensive Expressions and Perform Hate Speech Detection	HAJIME WATANABE, MONDHER BOUAZIZI , AND TOMOAKI OHTSUKI	Digital Object Identifier – 2017	Hate speech refers to the use of aggressive, violent or offensive language, targeting a specific group of people sharing a common property, whether this property is their gender, their ethnic group or race or their believes and religion. Ternary classification of tweets into, hateful, offensive and clean.
6	Defining and predicting troll vulnerability in online social media	Paraskevas Tsantarliotis, Evaggelia Pitoura, Panayiotis Tsapara	Springer-2017	Novel concept of troll vulnerability to characterize how susceptible a post is to trolls. Measures of troll vulnerability with respect to both the volume and the proximity of the trolling associated with each post.
7	Locate the Hate: Detecting Tweets against Blacks	Irene Kwok and Yuzhou Wang	AAAI, 2013	Author proposed supervised machine learning approach, employing inexpensively acquired labeled data from diverse Twitter accounts to learn a binary classifier for the labels "racist" and "nonracist."
8	Cyber Hate Speech on Twitter: An Application of Machine Classification and Statistical Modeling for Policy and Decision Making	Pete Burnap and Matthew L. Williams	Policy Internet 2015	Classification features were derived from the content of each tweet, including grammatical dependencies between words to recognize "othering" phrases, incitement to respond with antagonistic action, and claims of well-founded or justified discrimination against social groups.
9	Common Sense Reasoning for Detection, Prevention, and Mitigation of Cyberbullying	KARTHIK DINAKAR, BIRAGO JONES, CATHERINE HAVASI, HENRY LIEBERMAN, and ROSALIND PICARD	ACM 2012	Propose an "air traffic control"-like dashboard, which alerts moderators to large-scale outbreaks that appear to be escalating or spreading and helps them prioritize the current deluge of user complaints. For potential victims, we provide educational material that informs them about how to cope with the situation, and connects them with emotional support from others. A user evaluation shows that in-context, targeted, and dynamic help during cyberbullying situations fosters end-user reflection that promotes better coping strategies.

10	Automatic identification of personal insults on social news sites	Sara Owsley Sood, Elizabeth F. Churchill and Judd Antin	J. Assoc. Inf. Sci. Technol 2012	In this paper, we address this question through a machine learning approach to automatic detection of inappropriate negative user contributions. Our training corpus is a set of comments from a news commenting site that we tasked Amazon Mechanical Turk workers with labeling. Each comment is labeled for the presence of profanity, insults, and the object of the insults

III. CONCLUSION

The proposed technology puts people's health at risk by automatically identifying those who are depressed or stressed. In this way, users who are depressed can be caught before they take dramatic measures that could have a long-term effect. As a result of our research into the association between user mental health and social interaction behaviour, we urge that users take health measures via mail when interacting with others.

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