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Depression Monitoring System via Social Media Data using Machine Learning Framework

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Abstract: ***Stress and Depression is one of the most widely recognized and handicapping mental issue that relevantly affects society. Automatic health monitoring systems could be crucial and important to improve depression and stress detection system using social networking. Sentiment Analysis alludes to the utilization of natural language processing and content mining approaches planning to recognize feeling or opinion. Full of feeling Computing is the examination and advancement of frameworks and gadgets that can perceive, decipher, process, and mimic human effects. Sentiment Analysis and deep learning techniques could give powerful algorithms and frameworks to a target appraisal and observing of mental issue and, specifically of depression and stress. In this paper, the application of sentiment analysis and deep learning methodologies to depression and stress detection and monitoring are discussed. In addition, a fundamental plan of an incorporated multimodal framework for stress and depression checking, that incorporates estimation investigation and full of feeling processing strategies, is proposed. In particular, the paper traces the fundamental issues and moves comparative with the structure of such a framework.***
Keywords: Stress and depression; ehealth; sentiment analysis, social media, deep learning.

I. INTRODUCTION

Social media is arguably the richest source of human generated text input. Opinions, feedback and critiques provided by internet users reflect attitudes and sentiments towards certain topics.This paper presents a knowledge-based system, which includes an emotional health monitoring system to detect users with possible psychological disorders specially depression and stress. Symptoms Of these psychological disorder are usually observed passively. In this situation, author argue that online social behaviour extraction offers an opportunity to actively identify psychological disorder at an early stage. It is difficult to identify the disorder because the psychological factors considered in standard diagnostic criteria questionnaire cannot be observed by the registers of online social activities.

Depression and stress is one of the most common and disabling mental disorders, and has a relevant impact on society. Currently, methods for depression and stress detection and diagnosis rely on self-reporting coupled with the health care practitioners informed assessment. The provision of effective health monitoring systems and diagnostic aids could be crucial and important to improve health professional's work and lower healthcare costs. Sentiment and deep learning technology could help to tackle these objectives by providing effective tools and systems for objective assessment. Such tools and systems do not aim to replace the psychologist or psychiatrist but they could support their decisions.

Our approach, New and innovative for the practice of psychological disorder detection, it does so do not trust the self-disclosure of those psychological factors through the questionnaires. Instead, propose a machine learning technique that is detection of psychological disorder in social networks which exploits the features extracted from social network data for identify with precision possible cases of disorder detection. We perform an analysis of the characteristics and we also apply machine learning in large-scale data sets and analyse features of the two types of psychological disorders.

II. RELATED WORK

Renata L. Rosa, Gisele M. Schwartz, Wilson V. Ruggiero, and Dem´ostenes Z. Rodr´ıguez - Online social networks (OSN) provide relevant information on users' opinion about different themes. Thus, applications, such as monitoring and recommendation systems (RS) can collect and analyze this data. This paper presents a Knowledge-Based Recommendation System (KBRS), which includes an emotional health monitoring system to detect users with potential psychological disturbances, specifically, depression and stress.

Guang Yang, Haibo He, Fellow, IEEE, and Qian Chen - Sentiment analysis on microblog posts has been studied in depth, sentiment analysis of posts is still challenging because of the limited contextual information that they normally contain. In microblog environments, emoticons are frequently used and they have clear emotional meanings.

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They are important emotional signals for microblog sentimental analysis. They address this issue by constructing an emotional space as a feature representation matrix and projecting emoticons and words into the emotional space based on the semantic composition.

M. Al-Qurishi, M. S. Hossain, M. Alrubaian, S. M. M. Rahman, and A. Alamri - In this paper, author propose an integrated social media content analysis platform that leverages three levels of features, i.e., user-generated content, social graph connections, and user profile activities, to analyze and detect anomalous behaviors that deviate significantly from the norm in large-scale social networks. Several types of analyses have been conducted for a better understanding of the different user behaviors in the detection of highly adaptive malicious users.

Huijie Lin, Jia Jia, Jiezhon Qiu, Yongfeng Zhang, Lexing Xie, Jie Tang, Ling Feng, and Tat-Seng Chua - In this paper, we find that users stress state is closely related to that of his/her friends in social media, and we employ a large-scale dataset from real-world social platforms to systematically study the correlation of users' stress states and social interactions. We first define a set of stress-related textual, visual, and social attributes from various aspects, and then propose a novel hybrid model - a factor graph model combined with Convolutional Neural Network to leverage tweet content and social interaction information for stress detection.

Budhaditya Saha, Thin Nguyen, Dinh Phung, Svetha Venkatesh - Mental illness has a deep impact on individuals, families, and by extension, society as a whole. Social networks allow individuals with mental disorders to communicate with others sufferers via online communities, providing an invaluable resource for studies on textual signs of psychological health problems. Mental disorders often occur in combinations, e.g., a patient with an anxiety disorder may also develop depression.

Chun-Hao Chang, Elvis Saravia, Yi-Shin Chen - In this paper, aim at building predictive models that leverage language and behavioral patterns, used particularly in social media, to determine whether a user is suffering from two cases of mental disorder. These predictive models are made possible by employing a novel data collection process, coined as Subconscious Crowdsourcing, which helps to collect a faster and more reliable dataset of patients. Our experiments suggest that extracting specific language patterns and social interaction features from reliable patient datasets can greatly contribute to further analysis and detection of mental disorders.

Andrey Bogomolov, Bruno Lepri, Michela Ferron, Fabio Pianesi, Alex (Sandy) Pentland- In our paper, propose an alternative approach providing evidence that daily stress can be reliably recognized based on behavioral 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 (data concerning permanent dispositions of individuals). Our multifactorial statistical model, which is person-independent, obtains the accuracy score of 72.28% for a 2-class daily stress recognition problem. The model is e_cient to implement for most of multimedia applications due to highly reduced low dimensional feature space (32d). Moreover, we identify and discuss the indicators which have strong predictive power.

Bimal Viswanath† Alan Mislove Meeyoung Cha Krishna P. Gummadi – In this paper, study the evolution of activity between users in the Facebook social network to capture this notion. Also find that links in the activity network tend to come and go rapidly over time, and the strength of ties exhibits a general decreasing trend of activity as the social network link ages. For example, only 30% of Facebook user pairs interact consistently from one month to the next. Interestingly, and find that even though the links of the activity network change rapidly over time, many graph-theoretic properties of the activity network remain unchanged.

I.-R. Glavan, A. Mirica, and B. Firtescu - Social media tools are wide spread in web communication and are gaining popularity in the communication process between public institutions and citizens. This study conducts an analysis on how social media is used by Official Statistical Institutes to interact with citizens and disseminate information. A linear regression technique is performed to examine which social media platforms (Twitter or Facebook) is a more effective tool in the communication process in the official statistics area. Our study suggests that Twitter is a more powerful tool than Facebook in enhancing the relationship between official statistics and citizens, complying with several other studies. Next, performed an analysis on Twitter network characteristics discussing "official statistics" using NodeXL that revealed the unexploited 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 - The paper presents further research on neural engineering that focuses on the classification of emotional, mental, physical and no stress through the use of Electroencephalography (EEG) signal analysis. Stress is one of the leading causes of several health-related problems and diseases. Therefore, it becomes necessary for people to monitor their stress. The human body acquires and responds to stress in different ways resulting to two classifications of stress namely, mental and emotional stress. Traditional methods in classifying stress such as through questionnaires and self-assessment tests are said to be subjective since they rely on personal judgment. Thus, in this study, stress is classified through an objective measure which is EEG signal analysis.

The features of the EEG recordings are then pre-processed, extracted, and selected using Discrete Wavelet Transform (DWT). These features are then ussed as inputs to classify stress using Artificial Neural Network (ANN) and validated using K-fold Cross Validation Method. Lastly, the results from the software assisted method is compared to the results of the traditional method.

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 whataboutery, and each tweet is classified into one of these types or as nonshaming 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 Committee-2017	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 or neither. The complexity of the natural language constructs makes this task very challenging.
4	Statistical Twitter Spam Detection Demystified: Performance, Stability	Guanjun Lin,Sun, Surya Nepal, Jun Zhang,Yang Xiang, Senior Member,	IEEE TRANSACTIONS	Due to the popularity of online social networks, cyber criminals are spamming on these platforms for potential victims. In

	and Scalability	Houcine Hassan	2017	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,	KARTHIK DINAKAR, BIRAGO JONES, CATHERINE HAVASI, HENR Y LIEBERMAN, and	ACM 2012	Propose an “air traffic control”-like dashboard, which alerts moderators to large-scale outbreaks that appear to be

	and Mitigation of Cyberbullying	ROSALIND PICARD		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. PROPOSED APPROACHES

In the proposed systemic approach, we formulate the task as a classification problem to detect four types of detection of psychological disorders in social networks using the sentiment analysis and ssdeep learning framework:

1) Stress
2) Depression
3) Positive comments
4) Negative comments

An innovative solution to monitor and detect potential users with emotional disorders, according to the classification of sentences with depressed or stressed content.

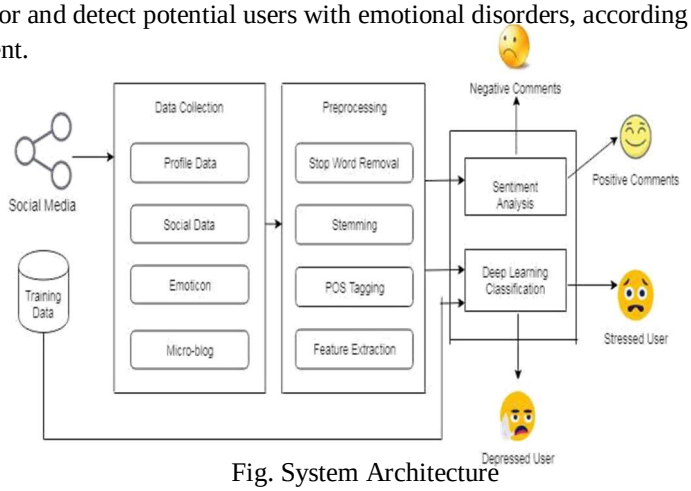


Fig. System Architecture

IV. CONCLUSION

In this proposed system, automatically identifying potential online users with depression and stress is threatening people's health. Thus users suffering from depression can be identified and they might be helped before they take any drastic steps which might have a long lasting impact. Using the data of the social networks of the real world as a basis, we study the correlation between the states of psychological disorder of users and their social interaction behaviour we recommend the user for health precautions to send by mail for user interaction

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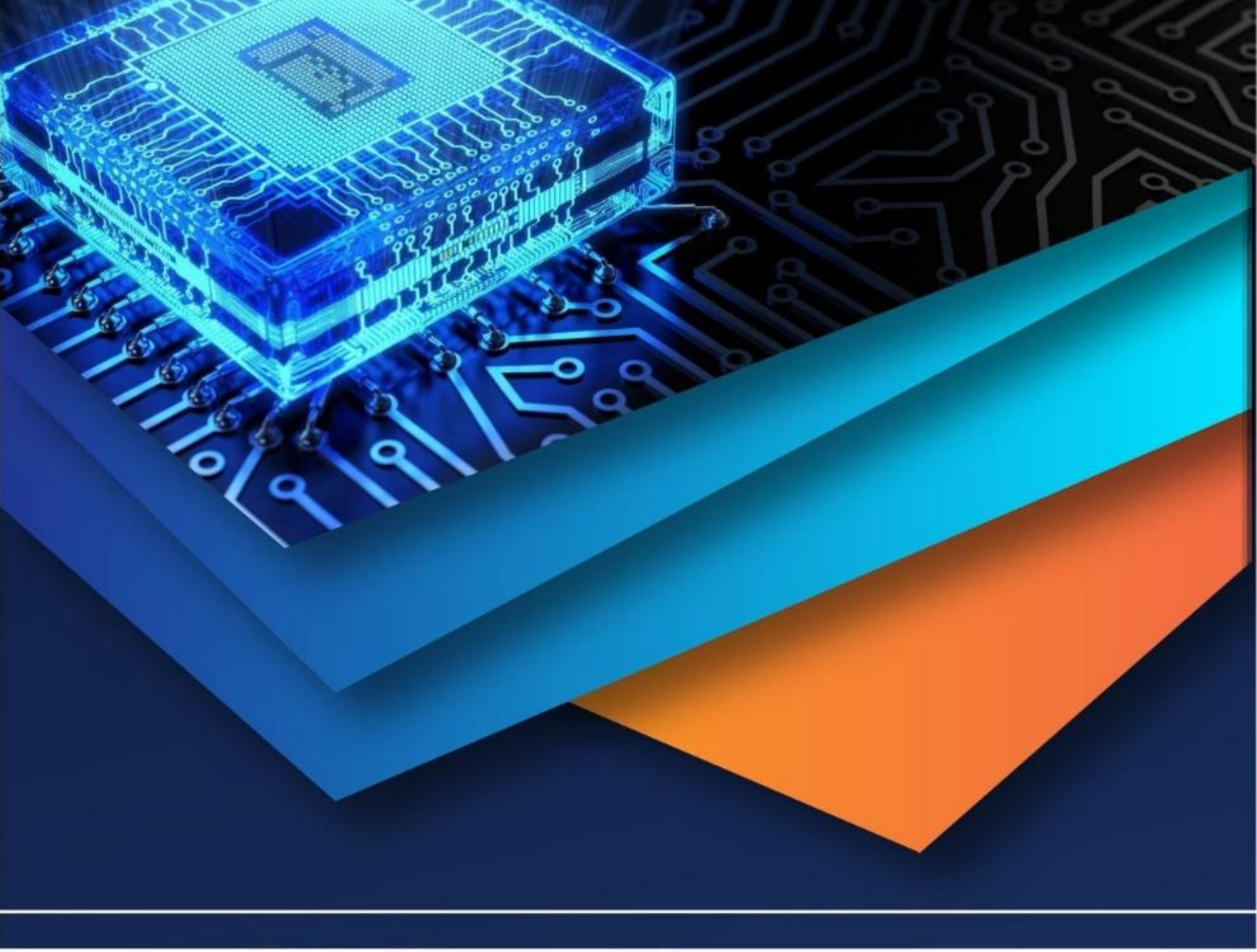
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