ISSN: 2321-2152

IJMECE

International Journal of modern electronics and communication engineering

E-Mail
editor.ijmece@gmail.com
editor@ijmece.com

www.ijmece.com

ISSN2321-2152
www.ijmece .com
Vol 12Issue1 Feb 2024

EVALUATING PUBLIC ANXIETY FOR TOPIC-BASED COMMUNITIES IN SOCIAL NETWORKS

RAVI KIRAN KUMAR TERA 1, GOLLAPUDI SRIVENKATA VIJAYA ANANA DATTA 2, MOHAMMED ANAN MOHAMMAD YOUNUS 3, MOHAMMAD SAIF 4, KONDOJU NITHISH KUMAR 5,

ABSTRACT

According to the World Health Organization (WHO), one in four people will be affected by mental disorders at some point in their lives. However, in many parts of the world, patients do not actively seek professional diagnosis because of stigma attached to mental illness, ignorance of mental health and its associated symptoms. In this paper, we propose a model for passively detecting mental disorders using conversations on Reddit. Specifically, we focus on a subset of mental disorders that are characterized by distinct emotional patterns (henceforth called emotional disorders): major depressive, anxiety, and bipolar disorders. Through passive (i.e., unprompted) detection, we can encourage patients to seek diagnosis and treatment for mental disorders. Our proposed model is different from other work in this area in that our model is based entirely on the emotional states, and the transition between these states of users on Reddit, whereas prior work is typically based on contentbased representations (e.g., n-grams, language model embeddings, etc). We show that content-based representation is affected by domain and topic bias and thus does not generalize, while our model, on the other hand, suppresses topic-specific information and thus generalizes well across different topics and times. We conduct experiments on our model's ability to detect different emotional disorders and on the generalizability of our model. Our experiments show that while our model performs comparably to content-based models, such as BERT, it generalizes much better across time and topic. Although individual anxiety evaluation has been well studied, there is still not much work on evaluating public anxiety of groups, especially in the form of communities on social networks, which can be leveraged to detect mental healthness of a society. However, we cannot simply average individual anxiety scores to evaluate a community's public anxiety, because following factors should be considered: (1) impacts from interpersonal relations on each individual group member's anxiety levels (the Structural component); (2) topic-based discussions which reflect a community's anxiety status (the Topical component). In this paper, we initiate the study of evaluating public anxiety of Topic-based Social Network Communities (TSNC). We propose an evaluation framework to project the anxiety level of a TSNC into a score in the [0; 1] range. We devise a cascading model to dynamically compute the individual anxiety scores using the Structural influence. We design a probabilistic model to measure anxiety score of social network messages using a generalized user, and compose a tree structure (MC-Tree) to effectively compute the anxiety score of a TSNC from the Topical aspect. For large communities, to avoid expensive real-time computing, we use a small sample to compute the public anxiety within given confidence interval. The effectiveness of our model are verified by precision and recall in an empirical study on real-world Weibo and Twitter data sets.

INTRODUCTION Mental disorders affect a large segment of the public. A report from 2017 estimated that 18.9% of all U.S. adults have some type of mental health issue [21]. The COVID-19 pandemic has most likely increased this number [6]. According to the National Institute of Mental Health (NIMH), the prevalence of anxiety, major depressive, post-traumatic stress, and bipolar disorders among U.S. adults aged 18 or older is much higher than the prevalence of other mental disorders. As stated by the Diagnostic and

ASSISTANT PROFESSOR 1, UG SCHOLAR 2,3,4&5
DEPARTMENT OF CSE, MNR COLLEGE OF ENGINEERING AND TECHNOLOGY, MOHD.SHAPUR, TELANGANA 502285

statistical manual of mental disorders (DSM-5), mood features are the most important and essential features for diagnosing anxiety disorders (AD), major depressive disorder (MDD), and bipolar disorder (BD). According to DSM-5, anxiety disorders are a set of disorders which share features of excessive fear and anxiety; features of major depressive disorder include loss of interest or pleasure
in most activities and having consistent depressed moods; bipolar disorder (BD) is a mood disorder characterized by the existence of at least one manic or hypomanic episode and one depressive episode [2]. Though prevalent in U.S. adults, post-traumatic stress disorder is not as closely related with mood as the other three disorders; it mainly is based on the experience of a shocking, scary, or dangerous event. In this paper, we focus on the three common mental disorders (AD, MDD and BD) which are closely related with mood. Considering their close relationship with emotions, we refer to them as emotional disorders. 1 These disorders can cause great impairment in daily functioning and are often assessed through clinical interviews, brief self-rated and clinician-rated measures. Bipolar and related disorders are often related with great impairment in marital and work functioning and increased risk of suicide [20] and Mood Disorder Questionnaire (MDQ) is used for identifying clients. major depressive disorder is associated with impaired cognitive and social functioning [18, 26] and Patient Health Questionnaire (PHQ-9) is used for recognizing clients. People diagnosed with anxiety disorders overestimate danger in certain situations and exhibit avoidance behaviors that prevent them from functioning normally and we use Generalized Anxiety Disorder Screener (GAD-7) to figure out clients. Although these inventories have outstanding screening sensitivity and specificity, they have one significant problem. Because patients must take the initiative and be proactive in participating in completing these inventories, often times potential patients are unwilling to take the survey which will cause undiagnosis or misdiagnosis. Nearly two-thirds of people with a known mental disorder never seek help from a health professional because of stigma, discrimination and neglect [24]. This problem is complexified by the fact that some emotional disorders will also prevent patients from seeking help. For example, clients with major depressive disorder might not have the energy to proactively seek help, and bipolar disorder is often misdiagnosed for major depressive disorder wrongly because people experience more subjective stress to seek help during the depressive episode [16]. To address this problem, unprompted screening tools have been receiving more attention in recent years, especially those leveraging social media data to gain insight into people's mental states. Most of the existing unprompted screening tools are based on psycholinguistic analysis of the content of user-generated text. For instance, the use of absolutist words [1] or the use of first-person pronouns [27, 33, 34], have been shown to be predictive of emotional disorders. However, these content-based features capture "vulnerability factors" which still exist even after patients have recovered [1] and are influenced by topical information [17], which raises doubts about the generalizability of the current unprompted screening models and, at best, limit their applications. To overcome the shortcomings of unprompted screening models based on content representations, we propose an unprompted screening model based on the transition between different emotions expressed by the users on social media. This is inspired by the fact that emotions are topic-agnostic and that different emotional disorders have their own unique patterns of emotional transitions (e.g., rapid mood swings for bipolar disorder, persistent sad mood for major depressive disorder, and excessive fear and anxiety for anxiety disorders). Specifically, we create an emotional "fingerprint" for each user by capturing their transition probability matrix of different emotional states. We hypothesize that there will be similarities in the emotional fingerprints between users with similar mental disorders, which can be used for unprompted detection of such disorders. Moreover, our emotion-based model provides greater interpretability, making it more acceptable to mental health clinicians. Emotions can be manifested in many different modalities such as text, image, audio, and video which makes emotions by nature a multimedia phenomena. In this paper, although we only focus on the emotions represented by text, which is one of the most common representations of emotions on social media, the methods proposed here can be easily extend to other modalities

RELATED WORK In recent years, social media has become a valuable source for emotional disorders identification and analysis. Several studies have used Twitter data to detect users with major depressive disorder [11], post-traumatic stress disorder (PTSD) [10] and bipolar disorder [5, 8, 9]. Reddit has also been used for studying emotional disorders; specifically for psycholinguistic analysis of emotional

disorders [7, 12, 17, 27, 36], the detection of posts indicating anxiety disorders [31] and the detection of users with emotional disorders [29, 32] . Previous approaches to detect users with emotional disorders have usually relied on the linguistic and stylistic features of usergenerated text [8, 29, 29, 31, 36]. Inspired by the great success of deep learning methods in the field of natural language processing, deep learning models have also been used for this task. Feature attention networks [32] and hierarchical attention networks [30] which extracts features at post-level and concatenates them at user-level have been built for detecting users with major depressive disorder. These models have shown high interpretability but limited improvement in performance. While concatenating all posts of a user has been shown to be better for this task due to its capture of global features, the interpretability of the model is limited because of its multi-channel design [23]. However, no existing approaches have focused on the patterns of emotional transition of users, which is not only the core characteristic of emotional disorders, but is also more robust to domain and topic information. In fact, psychologists have demonstrated that the patterns of individuals with emotional disorders are different from those of emotionally healthy individuals regarding emotional reactivity and regulation. For instance, in social anxiety disorder, negative emotions can be detected constantly because of problematic emotional reactivity and deregulation [19]. At the same time, individuals with major depressive disorder are more likely to be unable to shift from negative emotions to positive emotions compared with healthy individuals [25]. Built on previous research, we proposal the ER method to represent user posts which is based on the patterns of emotional transition of users, and focus on the global features

EXISTING SYSTEM

Natural language processing tasks on social networks benefit from word embedding. For example, sentiment analysis can determine the polarity of a given piece of text or the attitude of the author [10], [16], [41], [58], [66]. The word embedding method [4], [54], [62] uses a low-dimension vector to represent a word in corpus. The work in [27], [37]– [39] focus on training models to better evaluate the similarity among words. [51] uses word embedding techniques in anxiety evaluation on Reddit. On the other hand, [56] uses dyadic memory networks to deal with aspect-based sentiment analysis, and [63] proposes a capsule model based on Recurrent Neural Network (RNN) for sentiment analysis. However, no existing work has focused on evaluating the anxiety level of given text. In this paper, we utilize the word embedding techniques and propose a probability based method to evaluate the anxiety scores of social network messages of a topic community.

Emotions are increasingly shaped and spread on social networks, but not in an even manner for different emotions or sentiments. A stronger sentiment correlation is found to exist for social network users sharing more interactions [14]. And tweets with dominance values, e.g., intense tweets, are more likely to be retweeted [42]. In the case of spreading of rumors, replies expressing greater negative emotions (e.g., surprise, disgust) are more correlated to false rumors than to truth [60]. Communities formed by discussion of certain topic can go to extremes, i.e., members usually end up in the same direction of inclinations, but at a more extreme position, after the deliberation. Such phenomenon is known as group polarization [53]. The social network structure minimizing polarity and disagreement is studied in [40], by means of optimization over graph topologies. A social network visualization tool is proposed in [17] to help diversify Twitter users' connections and reduce political polarization.

DISADVANTAGES

In the existing work, the system is not implemented Anxiety Evaluation based on Topic-based Community.

This system does not provide quantitatively evaluate the public anxiety of a Topic-based Social Network Community.

PROPOSED SYSTEM

The Structural component. A community's structure (i.e., relations between members) influences information diffusion and its

members' behaviors [26], [48]. The structural balance theory indicates that a person's sentiment status (positive or negative) is mainly determined by the relations involving this person [47]. In general, negative emotions spread faster and deeper in social network than positive emotions [42]. In a word, emotions are increasingly formed among connected users on social networks. Therefore, relationships among community members play an important role in forming the public anxiety of a TSNC.

The Topical component. In a TSNC, members discuss with others to interchange their thoughts and feelings to the specific topic via social network messages. These messages reflect members' emotional states, esp. "anxiety" that we focus in this paper, and make up another key component to evaluate a community's anxiety. Given the interactions embedded in the message posting, forwarding, and commenting processes, simply averaging the anxiety scores of messages is inadequate, because the crowd is no simple summation or averaging of its members [5].

Our solution. We propose a framework to evaluate public anxiety of a TSNC. For each community, our framework computes its Structural and Topical anxiety scores separately and normalizes a linear combination of the two scores into range [0; 1] as the community's public anxiety score, where larger score corresponds to higher public anxiety.

Advantages

The system is more effective due to presence of PUBLIC ANXIETY EVALUATION FRAMEWORK and Framework of Evaluating Public Anxiety for Topic-Based Social Network Communities.

The system is more effective due to presence of Cascading Model for Computing Structural Public Anxiety Score.

CONCLUSIONS

In this paper, we define and study the problem of evaluating public anxiety of topic-based social network communities (TSNCs). We design a quantitative framework to evaluate a TSNC's anxiety level, using both Structural and Topical components. For the Structural anxiety score, we propose a cascading model to iteratively compute community members' anxiety scores considering their kth degree neighbors. For the Topical anxiety score, we propose a stochastic model to measure the message anxiety score and design a tree structure (MC-Tree) to organize Weibo messages of the community to facilitate computation. For large communities, we show how to economically use a small sample of the community to compute the public anxiety within given confidence interval. Our model exhibits high precision and recall in an empirical study on real-world data sets.

Acknowledgement. This work is supported by the National Natural Science Foundation of China under Grant Nos. 61802414, 61632016, 61521002, 61925205 and 61661166012, the National Basic Research 973 Program of China under Grant No. 2015CB358700, the Social Science Foundation of Beijing under Grant No. 18XCC011, the Humanities and Social Sciences Base Foundation of Ministry of Education of China under Grant No. 16JJD860008.

REFERENCES

[1] Mohammed Al-Mosaiwi and Tom Johnstone. 2018. In an absolute state: Elevated use of absolutist words is a marker specific to anxiety, depression, and suicidal ideation. Clinical Psychological Science 6, 4 (2018), 529–542.

[2] American Psychiatric Association et al. 2013. Diagnostic and statistical manual of mental disorders (DSM-5®). American Psychiatric Pub.

[3] Jason Baumgartner, Savvas Zannettou, Brian Keegan, Megan Squire, and Jeremy Blackburn. 2020. The pushshift reddit dataset. In Proceedings of the International AAAI Conference on Web and Social Media, Vol. 14. 830–839.

[4] Charley Beller, Rebecca Knowles, Craig Harman, Shane Bergsma, Margaret Mitchell, and Benjamin Van Durme. 2014. I'ma belieber: Social roles via selfidentification and conceptual attributes. In Proceedings of the 52nd Annual Meeting of the Association for Computational Linguistics (Volume 2: Short Papers). 181–186.

[5] Adrian Benton, Margaret Mitchell, and Dirk Hovy. 2017. Multi-task learning for mental health using social media text. arXiv preprint arXiv:1712.03538 (2017).

[6] Wenjun Cao, Ziwei Fang, Guoqiang Hou, Mei Han, Xinrong Xu, Jiaxin Dong, and Jianzhong Zheng. 2020. The psychological impact of the COVID-19 epidemic on college students in China. Psychiatry research (2020), 112934.

[7] Arman Cohan, Bart Desmet, Andrew Yates, Luca Soldaini, Sean MacAvaney, and Nazli Goharian. 2018. SMHD: a large-scale resource for exploring online language usage for multiple mental health conditions. arXiv preprint arXiv:1806.05258 (2018).

[8] Glen Coppersmith, Mark Dredze, and Craig Harman. 2014. Quantifying mental health signals in Twitter. In Proceedings of the workshop on computational linguistics and clinical psychology: From linguistic signal to clinical reality. 51–60.

[9] Glen Coppersmith, Mark Dredze, Craig Harman, and Kristy Hollingshead. 2015. From ADHD to SAD: Analyzing the language of mental health on Twitter through self-reported diagnoses. In Proceedings of the 2nd Workshop on Computational Linguistics and Clinical Psychology: From Linguistic Signal to Clinical Reality. 1–10.

[10] Glen Coppersmith, Mark Dredze, Craig Harman, Kristy Hollingshead, and Margaret Mitchell. 2015. CLPsych 2015 shared task: Depression and PTSD on Twitter. In Proceedings of the 2nd Workshop on Computational Linguistics and Clinical Psychology: From Linguistic Signal to Clinical Reality. 31–39.

[11] Munmun De Choudhury, Scott Counts, and Eric Horvitz. 2013. Social media as a measurement tool of depression in populations. In Proceedings of the 5th Annual ACM Web Science Conference. 47–56.

[12] Munmun De Choudhury and Sushovan De. 2014. Mental health discourse on reddit: Self-disclosure, social support, and anonymity. In Eighth international AAAI conference on weblogs and social media.

[13] Paul Ekman. 1999. Basic emotions. Handbook of cognition and emotion 98, 45-60 (1999), 16.

[14] Amerigo Farina, Jon Allen, B Brigid Saul, et al. 1968. The role of the stigmatized person in affecting social relationships. Journal of Personality (1968).

[15] Amerigo Farina, Donald Gliha, Louis A Bourdreau, Jon G Ale, and Mark Sherman. 1971. Mental illness and the impact of believing others know about it. Journal of Abnormal Psychology 77, 1 (1971)