

Detecting Stress based on Social Network

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Abstract: Psychological stress is threatening people's health. It is significant to detect stress timely for proactive care. With the height of popularity of social media, people are used to sharing their daily activities and interacting with friends on social media platforms, making it feasible to leverage online social network data for stress detection. In this paper, we find that users stress state is closely related to that of friends in social media, and we employ a large-scale dataset from real-world social platforms to methodically 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 hybrid model graph model combined with Convolutional Neural Network to tweet content and social interaction information for detecting user stress. Experimental result scan improves the detection performance. By further analyzing the social interaction data, we also discover several phenomena.

Keywords: stress detection, factor graph model, social media, Social interaction

1. Introduction

Mining social emotions from text and more documents are assigned by social users with emotion labels such as happiness, sadness, and surprise. Emotions gave a new aspect for document categorization, and therefore it helps online users to select related documents related to emotional preferences. The ratio with manual emotion labels is still very tiny comparing to the huge amount of web/enterprise documents. We first define a set of stress-related textual, visual, and social attributes from various aspects, and then propose a novel hybrid [4].

2. Research methodology

Inspired by psychological theories from tweet level and user level we define set of attributes: 1) tweet level attributes from content of user's one tweet and 2) user level attributes from user's weekly tweets.

- The tweet-level attributes are mainly built up on basis of linguistic, visual, and social attention (i.e., being liked, retweeted, or commented) attributes extracted from a single-tweet's text, image, and attention list.
- The user-level attributes are composed of:
 - (a) posting behavior attributes as summarized from a user's weekly tweet postings; and
 - (b) social interaction attributes extracted from a user's social interactions with friends.

- In particular, the social interaction attributes can further be classified into: (i) social interaction content attributes extracted from the content of users' social interactions with friends; and (ii) social interaction structure attributes extracted from the structures of users' social interactions with friends.

3. Basic concepts of how the project actually works

A. System framework

A novel hybrid model we proposed in this in this framework i.e. a factor graph model combined with Convolution Neural Network to leverage tweet content and social interaction information for stress detection. We analyze the correlation of user's stress states and their social interactions on the networks, and address the problem from the standpoints of: (1) social interaction content (2) social interaction structure

B. Attributes categorization

We first define two sets of attributes to detect stressed and non-stressed users on social media platforms: 1) tweet-level attributes from a user's single tweet; 2) user level attributes summarized from a user's weekly tweets.

C. Tweet-level attributes

Tweet-level attributes defines the linguistic and visual content, as well as social attention factors (being liked, commented, and re tweeted) from a single tweet.

D. User-level attributes:

Compared to tweet-level attributes extracted from a single tweet, user-level attributes are extracted from a list of user's tweets in a specific sampling period.

E. Description

- First we have to login into login page of Stress detection app.
- App will verify the person as admin or user.
- If it is user exists, then the user will get access to his/her account details. If user does not exist, then the link is provided to create new account.
- After creating new account user will get access to account details.
- Then the user has to follow friends on social media app

where user can like, comment, tweet, post and retweet.

- If the person identified as admin, then he/she will be able to view all users. Admin can add the stress words. The app will analyze each user's stress level by analyzing user activity such as comments, tweets and retweets on weekly basis as well as overall stress level of all users.

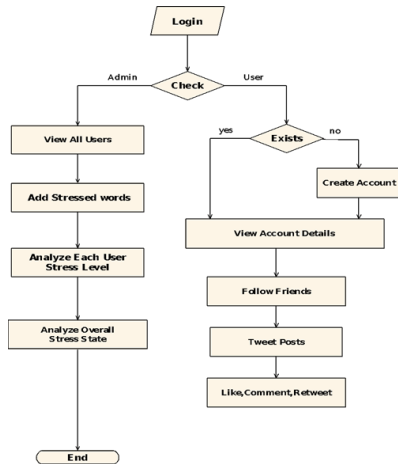


Fig. 1. Flowchart

4. Features

- Experimental result show that by exploiting the user's social interaction attribute, the proposed model can improve the detection performance by 6-9 over that of the state-of-art method. This include that the proposed attribute can serve as good cues in tackling the data sparsity and ambiguity problem. Moreover, the proposed model can also efficiently combine tweet content and social interaction to enhance the stress detection performance.
- Beyond user's tweeting content, we analyze the correlation of user's stress states and their social interaction on the network, and address the problem from the standpoint of (1) social interaction content, by investigating the content difference between stressed and non-stressed user's social interaction and (2) social interaction structure, by investigating the structure difference in terms of structural diversity, social influence, and strong/weak tie.
- We build several stressed -twitter-posting datasets by different ground-truth labelling method from several popular social media platform and thoroughly evaluate our proposed method on multiple aspects.
- We carry out in-depth studies on a real-world large scale dataset and gain insight on correlation between social interaction and stress, as well as social structure of stressed users.

5. Future work and optional modules

A. Existing system

- The future scope of the project is to develop a system that not only detecting the stress and also able to analyze the people mind means that it will play as a survey system. So that it may provide a better solution on behalf of people of the society for every debatable.
- Concepts and also it will indirectly play an important role in political, government and also social media. So we may efficiently analyze stress and also find solution to every social issues by means of polling and analyzing comments.

B. Algorithm

We compare the following classification method for users-level psychological stress detection with our FGM+CNN model

- Logistic Regression (LRC); it trains a logistic regression classification model and then predicts user's label in the test set.
- Support Vector Machine(SVM); it is a popular ad binary classifier that is proved to be effective on a huge category of classification problems. In our problem we use SVM with RBF kernel.
- Random Forest(RF); it is an ensemble learning method for decision tree by building a set of decision trees with random subset of attribute and bagging them for classification results.
- Gradient Boosted Decision Tree(GBDT) it trains a gradient boosted decision tree model with features associated with each other.
- Deep Neural Network (DNN) for user-level stress detection; it is proposed to deal with the problem of user-level stress detection problem with a convolutional neural network (CNN) with cross auto encoders. we can compare our proposed model with the real baseline method [5].

C. Problem statement

Psychological Stress is affecting People's heath. Due to rapid pace of life, pressure and demand placed at work more and more people are feeling stressed. According to a worldwide survey reported by New business in 2010, over half of the population have experienced an appreciable rise in stress over the last two years. Though stress itself is non-clinical and common in our life, excessive and chronic stress can be rather harmful to people's physical and mental health. Long-term stress has been found to be related to many diseases, e.g., clinical depressions, insomnia etc. according to existing research works. Moreover, according to Chinese Center for Disease Control and Prevention, suicide has become the top cause of death among Chinese youth, and excessive stress is considered to be a major factor of suicide.

D. User level stress



Fig. 2. User level stress

E. Overall stress level of all users

Overall Stress Level of all Users

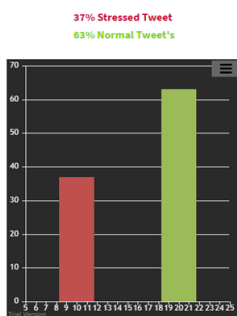


Fig. 3. Overall stress level of all users

6. Conclusion

In this paper, we presented a framework for detecting users' psychological stress states from users' weekly social media data, leveraging tweets' content as well as users' social interactions. we studied the correlation between user' psychological stress states and their social interaction behaviors on the employing real-world social media data. To fully leverage both content and social interaction information of users' tweets, we proposed a hybrid model which combines the factor graph model (FGM) with a convolutional neural network (CNN) [4].

References

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