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Stress Detection System Based On Social Interactions in Social Networks

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ABSTRACT: Psychological stress is becoming a threat to people's health now a days. With the fast pace of life, more and more people are feeling stressed. It is not easy to detect user's stress in an early stage to protect user. With the popularity of web-based social networking, individuals are used to share their day by day movements and interacting with friends via web-based networking media stages. It make possible to use online social network data for stress detection. In this paper, we proposes framework of detect users stress states is closely related to that of his/her friends in social media, and employ a large-scale dataset from real-world social platforms to methodically study the interaction of users' stress states and social interactions. We first define a set of stress-related textual, visual, and social attributes from various facets, then convolutional neural network (CNN) is used for topic extraction. Using CNN we can perform sentiment analysis of facebook post after formation of topic. The contribution work is detecting users are stressed or not by using support vector method (SVM). After distribution of users are stressed or not, K-nearest neighbours (KNN) algorithm is used for recommendation of hospital on a map as well as admin can send mail of precaution list to user for become healthy and happy in life.

KEYWORDS: Factor Graph Model, Healthcare, Micro-blog, Stress Detection, Social Interaction, Social Media

I. INTRODUCTION

Mental stress is turning into a risk to individual's well-being these days. With the fast pace of life, progressively and more individuals are feeling stressed. According to a worldwide survey reported by Newbusiness in 2010, 1 over half of the population have experienced an appreciable rise in stress over the last two years. Still stress itself is non-clinical and common in our life, excessive and chronic stress can be rather destructive to people's physical and mental health. Users' social interactions on social networks contain useful cues for stress detection. Social psychological studies have made two interesting observations. The first is emotional contagions: a bad mood can be transferred from one person to another during social interaction. The second Social Interaction: people are known to social interaction of user.

The advancement of social networks like Twitter, Facebook and Sina Weibo2, an ever increasing number of people will share their every day events and moods, and interact with friends through the social networks. We first discover a set of attributes for stress detection from facebook-level attribute and user-level attribute. Facebook-level attributes from content of user's single post, and user-level attributes from user's month to month posts. The facebook-level attributes are mainly composed of linguistic, visual, and social attention (i.e. being liked, commented) attributes extracted from a single-'post text, image, and attention list. The user-level attributes however are composed of: (a) posting behavior attributes as summarized from a user's monthly posting and (b) social interaction attributes extracted from a user's social interactions with friends.

Especially, the social communication attributes can further be broken 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 interaction with friends. User level attribute contain Linguistic, Visual, Social. In Linguistic contain Positive & Negative Emotion Words, positive and negative emotions. Visual category contain five-colour scheme, warm color, dull colour, brightness, saturation. Social category contain social attention factors such as number of comments and likes.Thus classification of stressed or non-stressed users by using support vector method. Due to advantage of both facebook post content attributes and

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social interactions to enlarge stress detection. After getting stress level, using k-nearest neighbours algorithm for recommendation of hospital on map for further treatment as well as admin can send mail of precautions list for avoid stress. This paper focus on main methods for stress detection:

Motivation:

1. In existing system, it is not easy to detect stressed and non-stressed user's due to interaction of social network. so we propose framework for detecting user's psychological stress states from user's weekly social media data, leveraging facebook post content as well as user's social interaction then we can find out user are stress or not.
2. If the user are stressed then we can recommend hospital on map which is located nearest distance from current location of user.
3. If the user are non-stressed then admin can send mail of precaution list for avoid stress.

Objectives:

1. To study framework for detecting users psychological stress states from users weekly social media data, leaveraging facebook post content as well as users social interactions. From social interaction of user we find out user are in stress or not.
2. To study convolutional neural network for topic extraction. In which we can perform sentiment analysis of facebook post after formation of topic.
3. To propose support vector method for classification purpose. In which we can classified the positive and negative post after classification we predict users are in stress or not.
4. To study k-nearest neighbours algorithm for recommendation of hospital and precaution. In which If user is stress then we can recommend hospital on map which is located nearest distance from current location of user and if user is non-stress then admin can send mail of precautions list for avoid stress.

II. STATE OF THE ART

The existing work remains incapable of detecting stress from post itself, from follow-up interactive comments made by user and his/her friends. We can find that user is actually stressed from work. In this system, a unified hybrid model integrating convolutional neural network (CNN) with factor graph model (FGM) to leverage both Facebook post content attributes and social interactions to enhance stress detection. Thus, simply relying on a user's Facebook post content for stress detection is insufficient. Users with high psychological stress may exhibit low activeness on social networks. Stress detection performance is low. The stress detection system applies support vector method, k-nearest neighbours, and convolutional neural network. These are described below:

The paper [1] presents a programmed pressure identification system from cross-media microblog information. In this paper build up a three-level system to characterize the issue. To start with get to set of low-level highlights from the tweets. At that point characterize and extricate center level outlines in light of mental and craftsmanship plans: phonetic characters from tweets' writings, visual characters from tweets' pictures, and social characters from tweets 'remarks, retweets and top choices. At long last, a Deep Sparse Neural Network is made to take in the pressure classes coordinating the cross-media characters. Trial comes about view that the proposed strategy is powerful and effective on recognizing mental worry from microblog information. The future work, is to research the social connections in mental worry to additionally enhance the location execution.

The paper [2] develops a medical phrasing assignment scheme to connection the dictionary gap between health seekers and healthcare knowledge. The scheme comprises of two components, local mining and global learning. In local mining approach, attempts to code the individual medical record by independently extracting the medical concepts from the medical record itself and then mapping them to authenticated terminologies. It may suffer from information loss and lower precision, which are caused by the absence of key medical concepts and the presence of irrelevant medical concepts. In Global learning approach, it works towards enhancing the local medical coding via collaboratively discovering missing key terminologies and keeping off the irrelevant terminologies by analyzing the social neighbors. The future scope is make the inquiry of how to flexibly organize the unstructured medical content into user needs-aware ontology by leveraging the recommended medical terminologies.

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The paper [3] proposes a MoodCast process based on a dynamic continuous factor graph model for modeling and conclude users' emotions in a social network. MoodCast formalizes the problem into a dynamic continuous factor graph model and defines three types of factor functions to capture the different types of information in the social network. For model learning, it uses a Metropolis-Hastings algorithm to obtain an approximate solution. Experimental results on two different real social networks demonstrate that the proposed approach can effectively model each user's emotion status and the prediction performance is better than several baseline methods for emotion prediction.

The paper [4] presents new deep CNN architecture, MaxMin-CNN, to better encode both positive and negative filter detections in the net. In this work MaxMin strategy aims at preserving and propagating significant negative detection values through the net. This difference with standard CNN facilitates us to protect and transfer more information through the network. Then evaluate and compare the strategy to classical deep CNNs on two benchmarks CIFAR-10 and MNIST. Results shows that MaxMin networks perform better than CNNs, whatever the configuration considered. Finally, MaxMin strategy reaches very good performances on CIFAR-10 outperforming several recent and much more complex deep architectures. The principle is very simple and many deep networks could benefit of this MaxMin strategy with only minor adaptations.

The paper [5] proposes novel methods to analyze photo tags and tag relationships, using data from Flickr, ImageNet and Concept Net. A novel network inference algorithm, ICR is designed to estimate latent relationships from tag co-occurrence. This method obtain tag statistics on thousands of tags from millions of images. The proposed tagging algorithm generalizes to unseen tags, and is further improved upon incorporating tag-relation features obtained via ICR. The future work, of this paper is techniques to better incorporate multi-word terms and out-of-vocabulary words; advanced NLP techniques for learning word relations from free-form text; evaluation of latent concept relation suggestion, and predicting the type of relations.

The paper [6] proposes a pairwise factor graph (PFG) model to model the social influence in social networks. In this paper formulate and tackle the problem of dynamic social influence analysis and present a pairwise factor graph (PFG) model to model the pairwise influence. Specifically, the influence between two users is modeled as a marginal probability of two hidden variables in the factor graph model. An efficient learning algorithm is proposed. Next, propose a time-dependent factor graph (DFG) model to further incorporate the time information, which is described as a factor function across time windows. Thus influence is propagated across social networks of different time windows. Experimental results on three different types of data sets shows that the proposed approach can effectively discover the dynamic social influences. In future work apply the inferred social influence to help influence maximization. Parallelization algorithm is used.

Disadvantages:
1. Stress detection performance is low.
2. User's do not always express their stressful states directly in facebook post.
3. User's with high psychological stress may exhibit low activeness on social networks.

III. PROBLEM PP

Mathematical module:
Notation-
1. FP**:-**Facebook post like FP1, FP2….FPN
2. SU:-Stressed user
3. NSU:-Non-Stressed user
4. TU:-Total User
5. TNUP:-Total No.of user Post
6. TNSP:-Total No.of Stress Post
7. TNNSP:-Total No.of Non-Stress user Post

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Equations:
SU=TNUP-TNSP
i.e. Stressed User = total no. of user post-total no.of user stress post.
NSU=TNUP-TNNSP
i.e.Non- Stressed User=total no. of user post-total no.of non- user stress post

Algorithms:

1. Convolutional Neural Network (CNN) algorithm-This algorithm used for topic extraction. In which perform sentiment analysis of facebook post after formation of topic.
CNN algorithm has two main processes:
I. Convolution process: uses skilled filter Fx, deconvolution of input picture (first phase is input picture, after convolution is feature picture of every phase, specifically Feature projection), then computes bias bx, finally get convolution layer Cx.
II. sampling process: It needs n pixels of each part through pooling steps, convert into pixel, then scalar weighting Wx + 1 weighted, add bias bx + 1,so getting an activation function, then yeild narrow n times feature map Sx + 1.
Input: User facebook post
Output: Extraction of topic

2. Support Vector Machine Algorithm- This algorithm used for classification purpose. In which classification of positive and negative post after classification predict user are in stress or not.
Input: Extracted user facebook post
Output:-Classified user stress positive post or negative post.
Process:
Step1: SVMs augment the edge around the separating hyperplane.
Consider continuous separability in 2 dimensions, it can separate by a line in higher measurements also it can find separating hyperplane by linear programming (e.g. perceptron): separator. it tells as ax + by = c
Step2: The decision function is fully specified by a subset of training samples, the support vectors.
Step3: Quadratic programming problem
Step4: Text classification method for example, a combination of these 0s and 1s in the feature vector along with the known label will be the Training input to our SVM classifier. It should be noted that the label in the feature vector should be numeric only or the SVM classifier. Finally we can get 0 for positive, 1 for negative and 2 for neutral labels.

3. KNN (K Nearest Neighbours) algorithm-This algorithm used for recommendation of hospital on map which is located nearest distance from current location of user and send mail of precaution list to user for avoid stress
Input: Take stressed and non-stressed user according to positive and negative post
Output: Recommendation of hospital and precaution list.
Process:
Step 1: determine parameter K= number of nearest neighbors.
Step 2: count the length between query occurrence and all training samples.
Step 3: describe distance and determine nearest neighbors depend on the K-th minimum distance.
Step 4: collect the category ^{y} of nearest neighbors.
Step 5: uses simple major part of the group of nearest neighbors as indication value of query instance.

Methodology:

The field of study that focuses on the interactions between human language and computers is called Natural Language Processing. In Natural Language Processing contain different techniques like:
1. Sentiment Analysis: Sentiment analysis is the process of determining whether a piece of writing is positive, negative or neutral. It is also known as opinion mining, deriving the opinion or attribute of a user. This techniques is used to discover of how people feeling about particular topic Natural Language Processing for sentiment analysis focused on emotions is extremely useful.

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2. Topic Extraction: Extracting topic is one of the most important tasks when working with text. In this technique, clustering about a similar topic occur in a collection of a documents or an information, from this we get more accurate information. Readers benefit from topic keywords because they can judge more quickly whether the text is worth reading. Website creators benefit from topic keywords because they can group similar content by its topics.

3. Part-Of-Speech Tagging: A Part-Of-Speech Tagger is a piece of software that reads text in some language and assigns parts of speech to each word, like noun, verb, and adjective. In this technique, given a sentence, determine the part of speech for each word. Many words, specially common ones, can serve as multiple parts of speech. For example, "book" can be a noun ("the book on the table") or verb ("to book a flight"); "set" can be a noun, verb or adjective; and "out" can be any of at least five different parts of speech.

4. Stemming: Stemming is the process of reducing inflected words to their word stem, base or root form generally a written word form. A stemmer for English, for example, should identify the string "cats" (and possibly "catlike", "catty" etc.) as based on the root "cat", and "stems", "stemmer", "stemming", "stemmed" as based on "stem". A stemming algorithm reduces the words "fishing", "fished", and "fisher" to the root word.

IV. THE UUU

In a proposed system architecture we can detect user are in stress or not due to interaction of social network. In a social network contain Facebook, twitter, sina weibo2 etc. On a Facebook user are interact with other people. User can post different posts on a Facebook.

There are three types of information that we can use as the initial inputs such as Facebook-level attributes, user-level posting behavior attributes, and user-level social interaction attributes. Facebook-level attributes describe the linguistic such as positive and negative words and visual content like brightness, cool color, dull color, warm color, saturation as well as social attention factors (being liked, commented,) of a single Facebook post. User level posting behavior attributes as summarized from a user's monthly Facebook postings, post time, and post type. Social interaction attributes extracted from a user's social interactions with friends. In particular, the social interaction attributes can further be broken into: (i) social interaction content attributes extracted from the content of users' social interactions with friends like words and emotions; and (ii) social interaction structure attributes extracted from the structures of users' social interactions with friends.

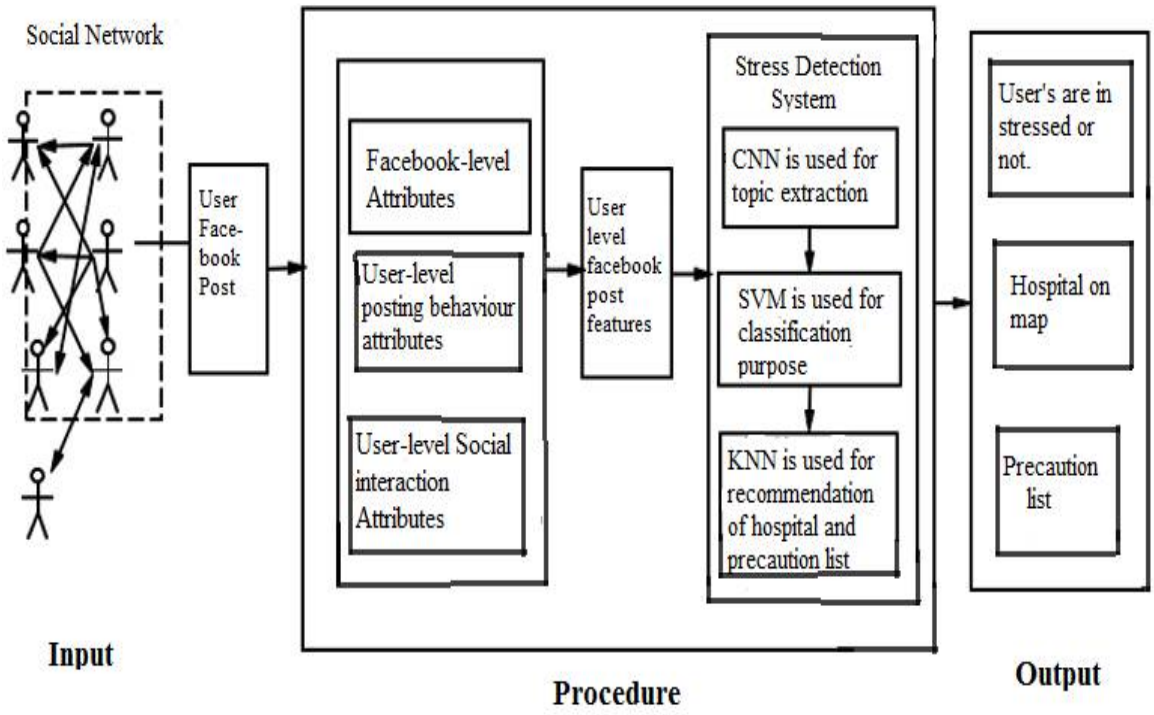

Fig.1 Proposed System Architecture

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The fig.1 shows the proposed system architecture that describes how the system works below:
1. On this user input post we can fetch user level Facebook post features on that input of Facebook post.
2. Conventional neural network (CNN) is used for topic extraction. In which we can perform sentiment analysis of facebook post after formation of topic.
3. Support Vector Method (SVM) is used for classification purpose. In which we can classified positive and negative post. After classification we can predict user are stressed or not.
4. After distribution of user's are in stress or not, K-nearest neighbors algorithm (KNN) is used for recommendation hospital on map as well as admin can send mail of precaution list to user for avoid stress to convert into healthy and happy in life.

Modules of Proposed System:
1. Admin module: Role of admin is check user's are in stress or not. If user is stressed then suggest hospital on map which is located nearest distance from current location of user and if user is non-stressed then send mail of precaution list for avoid stress.
2. User module: Role of user can post any image, status, check-in etc. on facebook, which are happen in user daily life whereas user can views suggested hospital and precaution list.
Advantages:
1.System detects users' psychological stress states from users' monthly social media data, leveraging Facebook post' content as well as users' social interactions.
2. System can sends mail to users about to take precautions.
3. System can recommend hospital on a map.

V. SYSTEM ANALYSIS

In existing scheme, detecting user's stress with the help of convolutional neural network (CNN) and factor graph model (FGM). In this system stress detection performance is low so, we proposes the framework of detecting user's psychological stress states by using support vector method and k-nearest neighbors. We employ large scale datasets from real-world social media platform. Stress detection system collect the more no.of attributes from social networking sites like facebook, twitter sina weibo2.These attributes are taken from facebook which are given below:

Table 1: Facebook post attributes

Attributes	**Class**
Happy	Non-Stress
Grateful	Non-Stress
Awesome	Non-Stress
Excellent	Non-stress
Boring	Stress
frustrating	Stress
Bad	Stress
Tension	Stress

For experimental set up, use Windows 7 operating system, Intel i3 processor, 4 GB RAM, 200GB Hard disk, Eclipse Luna JDK 7 tool, MySQL. To calculate the results, take the token of each user from facebook developer site. After getting token of single user then classify stress and non-stress posts.

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Table 2: Stressed and non-stressed posts

Sr. No.	Stress Posts	Non Stress Posts	Total Post
1	40	60	100

According to stressed and non-stressed post classify stressed and non-stressed users.

Table3: Stressed and Non-Stressed User

Sr.No.	No. Stressed User	No. Non- Stressed User
1	30	50

The Performance evaluation of stress detection system is held using stressed and non-stressed post then detect stressed and non-stressed user's whereas in existing system, accuracy of detecting user's stress states is low as compared proposed system.

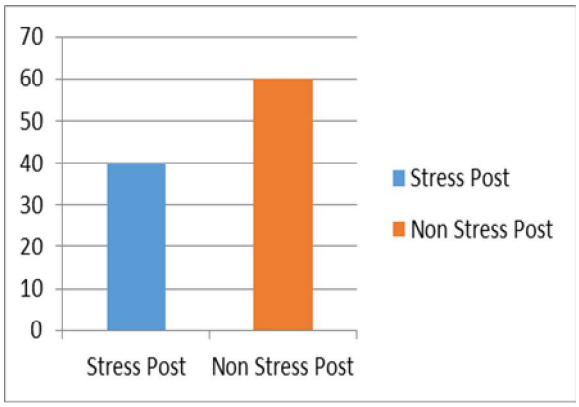

Fig 2. Classification of stressed and non-stressed post

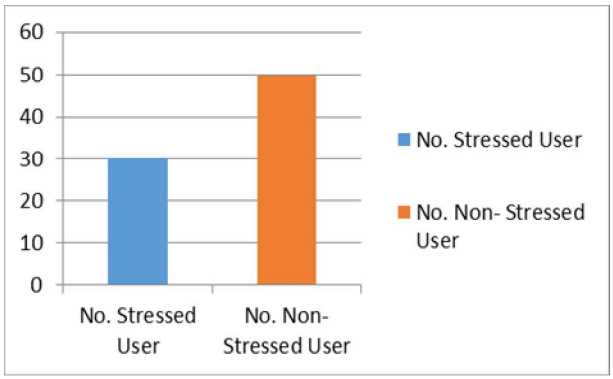

Fig 3. Classification result of stressed and non-stressed user

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VI. CONCLUSION

Psychological stress is threatening people's health. It is serious to detect stress timely for proactive care. Therefore we presented a framework for detecting users' psychological stress states from users' monthly social media data, leveraging facebook post' content as well as users' social interactions. Employing real-world social media data as the basis, we studied the correlation between user' psychological stress states and their social interaction behaviors. We proposed detecting user are in stress or not due to facebook posts by using convolutional neural network, support vector method and k-nearest neighbors. In this work we can perform sentiment analysis of facebook post after formation of topic by using convolutional neural network (CNN). After formation of topic we will classify user are stress or not according to positive and negative post by using support vector method (SVM). Finally we classified stressed and non-stressed users then recommend hospital to stressed user on map which is located nearest distance from current location of user whereas send mail of precaution list to non-stressed user for avoid stress to become happy and healthy life. In future work, we can mail the health precaution video to user. We can also detect stress using other social networking sites like twitter, whatsapp, instagram, etc.

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