

Stride for Detecting Suicidal Thoughts Using Artificial Intelligence

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ABSTRACT

Suicide has been major death cause from an over decade now. The ideation of suicide and its thought process leads to a very dangerous after effect. Since social media is very trending factor now a day's, it can be used to detect suicide ideation. Artificial intelligence which is used for tasks like problem solving, spam filter, speech recognition etc. can also be used for detect suicides over social media. This study is aimed in designing an automated classifier which can detect suicidal thoughts with the help of algorithmic approach by studying various patterns in the discussions or communications. This paper also studies the previous attempts made for the design of such architecture. At the end we conclude the feasibility and practicability of the approach that we are going to use for the detection of suicide attempts on social media.

KEYWORDS: *Suicide, Suicide Prevention, Social Media, Algorithm, Machine Learning*

Introduction

According to a survey conducted in 2016, the number of suicides in India was increased to 2,30,314 [1] due to various reasons. All around the world about 8 lakh people die every year due to suicide, of these 1,35,000 belong to India [2]. India is responsible for 17% of the total deaths caused by suicide all around the globe. Not only the magnitude of the problem is worse but the progress which has been made in understanding and improving the cause of suicide is also very less. Thousands of people fall prey for suicide ideation or suicidal thoughts which are the peoples thought of committing suicide. Suicide not only affects the individual which has become a victim of such death cause but also has a devastating impact on families as well as communities related to the victim. Understanding the ways in which individuals communicate their suicidality is the key to prevent the cause of such disaster. It is predicted that depression by 2030 and mental disorders will be the second leading cause of suicidal attempt/ behavior [3].

Social media is computer-based technology that facilitates the interaction between multiple humans about their ideas, information and other types of expressions. The availability of the smart phone has

enabled majority of the human population to come online and connect with each other through social media. The people now a day's consider social media as a means of entertainment and enjoy the majority of their time on the social media platforms. Such platforms have become a place of expression for majority of people. The participation of people via posts, tweets, messages, stories, snaps, direct messages has made social media a place which is easy to express. Using machine learning, social media can become a way to predict suicide attempt. The aim of this model is to design a classifier which can detect the messages or tweets which go into the category of suicidal thoughts. The system will analyze through social media and search for specific keywords which come under the category of dataset related to suicidal thoughts. This system will collect all such messages and then classify them into different levels of suicidal thought process. According to that levels, it will be decided whether individual requires any intervention.

Background Study

A systematic review is conducted [4] involving use of Machine Learning Methods and applications. They conducted survey from clinical methods to textual

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content analysis. A method is presented based on ML classification for the social network Twitter to identify tweets with risk of suicide [5]. The

categorization of such thoughts detection is discuss in [6] considering both classical content analysis and recent machine learning techniques as shown in Fig 1.

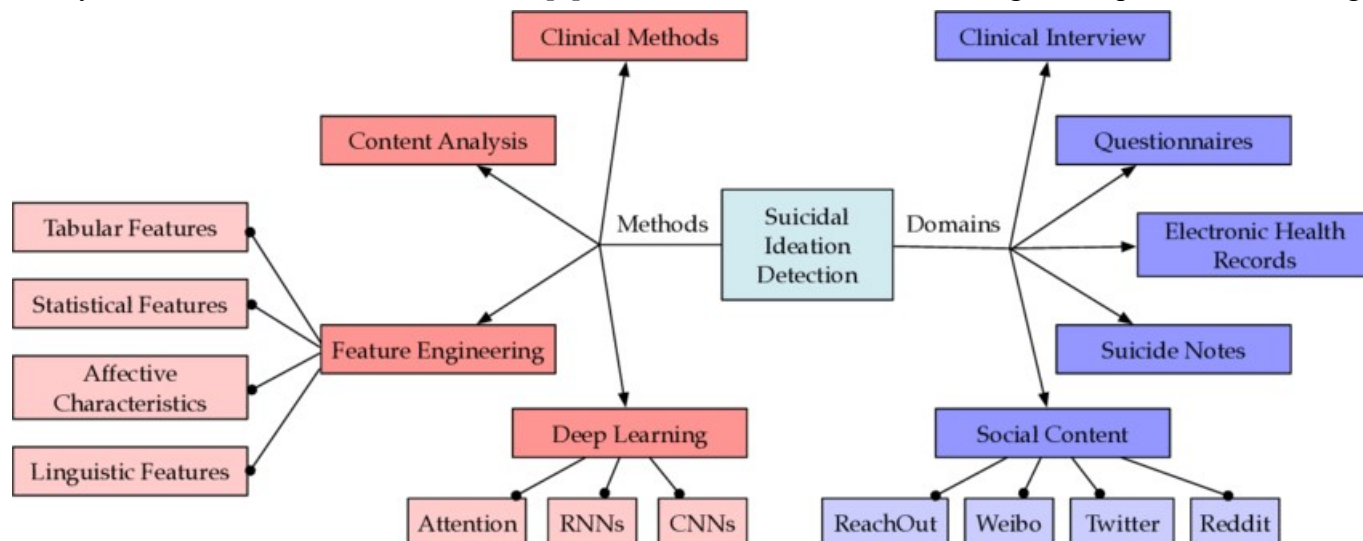


Figure 1: Methods and domains categorizations [6].

The authors used SVM, where SMO (Sequential minimal optimization) is implemented as the best model to identify sentiments leading towards suspected tweets with a risk of suicide. Authors in [7] studied the early identification of suicide thoughts using deep learning and machine learning-based classification approaches applied to social media names Reddit. Implemented a system for automatic emotion detection based in binary SVM classifiers [8]. The researchers used lexical and semantic features to represent the data, as emotions seemed to be lexicalized consistently [9]. Their classification performance varied between emotions was achieved for six of the seven most frequent emotions such as thankfulness, guilt, love, hopelessness and instructions. Several methods based on NLP and ML was developed to study the suicidal behaviour of individuals who attempted suicide [10]. The authors built a set of linguistic, lexical, and semantic features that improved the classification of suicidal thoughts, experiences, and suicide methods, obtaining the best performance using a Support Vector Machine (SVM) model.

AI Based System for Detecting Suicidal Thoughts

The proposed system will take the tweets as the raw input on which the pre-processor will work with the feature selection and converting it into a form of keyword. The pre-processor uses the NLP algorithm. NLP algorithm is a bridge between the human language and computers in terms of understanding the diversity of the feeling through text. The tweet or the message here will be given by the user will enter into the pre-processing system and here the tweet will be processed by doing its sentence segmentation. After segmentation the sentence will no longer have the punctuation marks and symbols in it. The tokenisation

of words will take place after that. In this way the keywords would be created out of the tweets. These keywords will then be compared with the dataset keywords.

The comparison will then depict the percentage of the comparison. 0-30% of the result will be classified into no distress zone i.e., normal conversation which need no intervention. 30- 70% of the result will come under moderate distress levels which can lead to some stress but no very serious in need on intervention. Further any result would come under the severe distress model. The result will be shown to admin which will later decide what has to be done with the data provided on the monitor.

Block Diagram of Proposed System:

This is the basic block diagram of our system as shown in the Fig 1. The input in the system will be tweets and messages from our software which will be processed in the pre-processor. Then looking at the keywords the input messages will be classified into different stress levels. If the message does not contain any keywords then it will be in “No Distress” level. If the message contains keywords such as “feeling low”, “not in the mood” etc. then it be “Moderate Distress” level. If the message contains keywords such as “dying”, “suicide”, “ending my life” etc. then it will be “Severe Distress” level. We shall provide an online Chabot which will help the people in overcoming their depression and living their lives again in a normal and positive way.

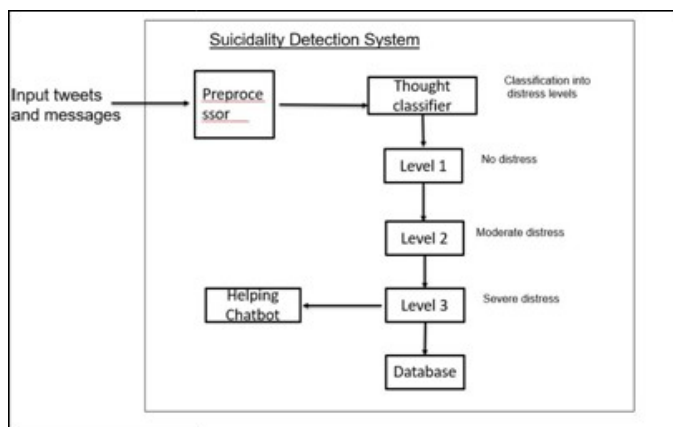


Figure 1: Basic Block Diagram of the System

Object Oriented Design

When the tweets from the user are passed into this NLP classifier they are analysed to understand the meaning of the message. The tweets are considered to be raw data termed as the input sentences in this figure. The tweet will also have the time and date along with its user name of the person who has sent it. The input here can be anything posted by the user like he's enjoying something, tried something new, about new boss in the office etc. It can also consist of the slangs people now use. So, it becomes very important to classify the sentences to obtain the proper keywords. Sentence segmentation is all about separating each and every word of the sentence into a separate entity named as token as shown in Fig 2. This process is also called as tokenisation. After tokenisation is performed the sentence is converted in separate words for further pre-processing. Now the separated tokens are tagged as parts of speech like nouns, adjectives, verbs. This is done so that the keyword finding becomes much simpler.



Fig 2: Use Case for Classification of Sentences

Lemmatization is step where the words are compared right to base this is the dictionary in this case all the words plural are converted back to its singular form or the correct form as to get compared from the dataset. Then the process of comparison takes place, where the

keywords obtained from the tweet are compared to the keywords in the dataset. If the keywords come out exactly as stated in the dataset the classifier it will give up the output in percentage.

Class Diagram:

Following Fig 3 depicts the class diagram of the of the system. It will consist of 5 classes as shown below. They are admin, user, user application account and chat classification. The admin will have 2 entities namely login-id and password. The admin class will monitor user class as well as all the classes. The user whereas will have login-id, password, phone, email. The user will be allowed to create account, tweet and retweet. They can also follow other users. User application class will consist of tweets, retweets, follow. User will create account which will have its details. At last, it will consist of chat classification class which will have three levels of distress which are severe distress, moderate distress and no distress.

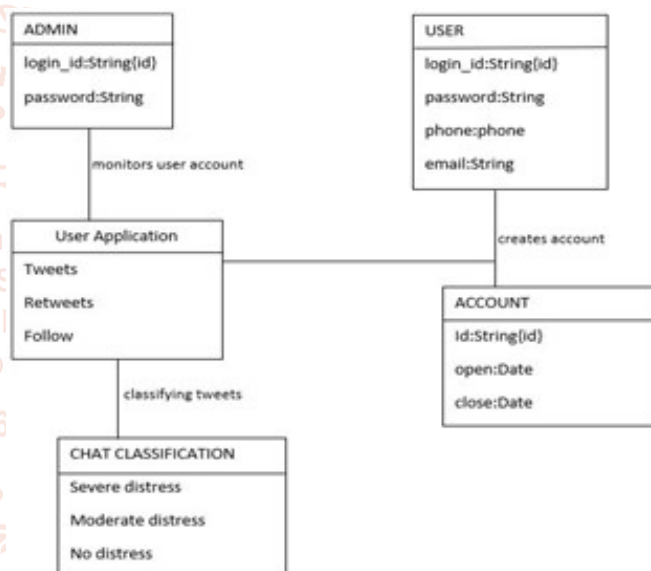


Figure 3: Class Diagram of the System

Expected outcome

The proposed system is expected to give good accuracy and work independently for multiple users working simultaneously; when compared to truth values. The system has to be robust and flexible for any user with no age limit. The proposed system can detect all the victims of the suicidal thoughts who tend to post everything on the social media.

Conclusion

A successful design has been created which can be used to detect the social media suicidal thoughts. This design is user friendly, flexible and efficient at the same time. Proposed system will handle multiple users provide all the statistics of the tweets with date and time. Hereby we conclude the paper by showing the design and the working of the system. By studying various references of the previously published papers, we come to a conclusion that the

proposed system can be implemented to expect the predicted results. The implementation cycle will be important as this will decide the execution and how close the design can reach in terms of expected outcomes. The future scope of the system includes providing a chatbot to intervene automatically making it fully automated and thus contributing to social harmony.

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