

Breaking The Taint of Suicide Contemplation with The Help of Deep Learning Technique

Shwetha S
Assistant Professor
Department of CSE CIT,
Gubbi, Tumkur

Nayan Kumar S V
Under Graduate Student
Department of CSE CIT,
Gubbi, Tumkur

Abstract:

This broadside explores the possible of deep learning technique in addressing and avoiding suicide contemplation. It deliberates the status of early detection and interference in mental health, and how deep learning can be utilized to analyse patterns and gauges of suicidal behaviour. The paper also highlights the ethical considerations and trials associated using deep learning in psychological health care.

Keywords: Deep Learning, Suicide contemplation, CNN,LSTM.

I.INTRODUCTION:

Suicide is a universal problem related to mental health issue. The primary cause for suicidal thought can be considered to be social media impact on younger mind which may lead to anxiety ,depression ,hyper tension ,stress and overthinking. Approximately one person dies by suicide every 40 s, totalizing 800,000 deaths world wide every year (WHO, 2021b). This disorder may affect young people, being the second main death cause in individuals between 15 and 29 years old in 2016(WHO,2019)[1].

With the development in social mass media, people have started sharing their thoughts online and try to take support from different web environments.

Social medias are increasingly enticing the younger generation as young adults like to socialize more on virtual mode rather than talking to a person next to them.

Many studies have shown that people try to express more about their feelings in virtual media rather than speaking to their very own people. Expression of their feelings about their thought of frustration and suicidal contemplation is more or less likely to be expressed in social medias which may go unnoticed many times by physicians. Here this paper likely to bring up with certain views using deep learning techniques like LSTM-CNN along with NLP to early identify the risk of suicidal thought and behaviour.

Suicides spontaneously act as a outcome of stress, depression, aggravation/oppression, relationship problems, internal violence, mental illness, taunting, family issues, hypothetical issues, monetary issues, etc. [4].In India the suicide amount has been increased by 7.2% as associated to 2020 with India reporting top count of suicides in the world[5].

II. IMPRESSION OF SUICIDE CONTEMPLATION AND ITS EFFECT:

There is numerous way a youth get trapped to an idea of ending their life.

Suicidal behaviour is measured to be a psychological health issue which is to be treated at the earliest even before it gets worse.

The "elements" obligatory for struggled suicide vary from person to person. Considerate risk factors can help offset the myth that suicide is an accidental act or results from stress alone. Few common risk factors that we do know about: 1) previous attempts, 2) depression, 3) drug and alcohol abuse, 4) conduct disorder & behavioural factors, 5) a disruptive and unsupportive family background, 6) relationship conflicts, 7) social and cultural factors, 8) poor coping skills, 9) psychiatric illnesses, 10) the ready availability of lethal means to commit suicide, and 11) Other risk factors[6].

It's important to recognize that suicidal views and behaviours can have a substantial impact on the younger generation. It's critical to address these issues with care, understanding, and empathetic. As long as support, resources, and a safe space for young individuals to express their feelings and seek help is essential in helping them navigate through these difficult emotions. Optimistic open discussions about mental health, destigmatizing seeking help, and encouraging self-care and wellness practices can all pay to creating a more supportive environment for young people facing suicidal ideation.

III. TECHNIQUES USED IN PSYCHOLOGICAL HEALTH CARE

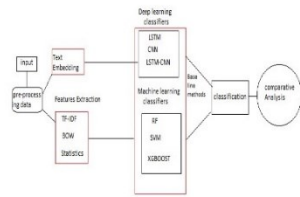


Fig.1 Suicide contemplation Detection Framework

Fig.1 demonstrate an overall impression of our planned outline. It contains two rules for extracting the data [7]. Initially data pre-processing is done were character summaries with Natural Language Preprocessing techniques. When preparing text data for machine learning systems, it's common to apply preprocessing techniques like tokenization, lowercasing, stop words removal and lemmatization. Following data preprocessing, text embedding methods such as Word2Vec or TF-IDF are used to convert words into numerical vectors, which are essential for building deep learning classifiers.

A. LSTM-CNN:

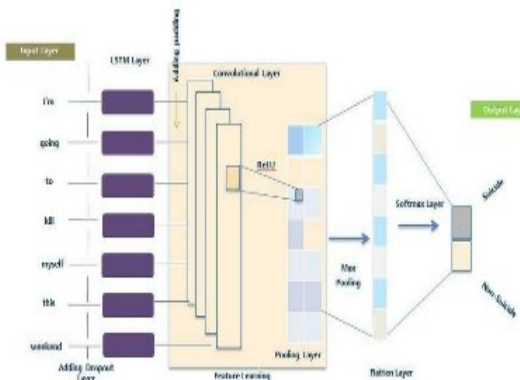


Fig 2.(from [7])LSTM-CNN Construction for Suicide contemplation Detection.

The model described above represents a hybrid approach that showcases the addition of LSTM-CNN. This model aims to classify selected text effectively. The input for the CNN is derived from the output of the LSTM, creating an innovative CNN model on LSTM to abstract the structural characteristics of input words and enhance classification accuracy. In our upcoming LSTM-CNN model, the data is categorized into suicidal or non-suicidal content through successive layers.

Initially, a unique directory is assigned to each term in a verdict within the primary layer to create fixed-length vectors. Subsequently, a layer called dropout is incorporated to avoid overfitting. This is followed by an LSTM layer, which captures long-distance dependencies across the text, along with a convolutional layer for character extraction. The pooling layer sums evidence to reduce feature dimensions, which are then transformed into column vectors for further processing[7].

Dropout layer- The layer in which few neurons in a scheme are ignored during training to avoid over-fitting [12]. When dropout is a The main purpose is to randomly remove the generation of neurons in embedding layers where dropout is applied [11].

LSTM layer-The subset of RNN is Long Short-term Memory (LSTM) . It holds a remembrance cell that controls the bidirectional flow for each gate. The LSTM is a choice for credentials of suicidal contemplation in a social mass media text. The strength of LSTM is to avert vanishing which are seen in RNN models[11].

Convolutional Layer-image identification is done by Convolutional layer with a strong presentation capacity [13,14]. Though, CNN has developed as an multipurpose model used for a wide variety of multiple text group tasks with huge results [15,16,17]. When Convolutional Neural Networks (CNN) are applied to organized text data, the model can efficiently learn patterns that may not be captured as well by a classic feedforward network. CNNs are able to abstract features from text data, irrespective of their positions within the input, which can be advantageous for capturing contextual information.

In a CNN, each neuron represents a specific area within an input sample, such as a segment of an image or text. This allows the model to focus on local patterns and relationships within the data. By utilizing convolutional layers, we can follow a methodology that leverages the strengths of CNNs for text processing tasks[19].

Pooling Layer: The idea behind this layer is to reduce the width of each fixed character map and hold the important data.

Flatten Layer: This layer drives to alter a pooled character strategy into a field vector which is an involvement to the neural network of the sorting task [20]. As the scheduled step ,mutual character maps are flattened through a reform purpose to make the character vector pools concatenated.

FL = pooled. reshape

The equation mentioned above takes records and sums them to generate a single field vector.

Output Layer: The connected layer which analyse a unintended suicidal and non-suicidal text comments on social platform. It uses a text character vector from both a pooling and convolutional layer output which is shadowed by substantial activation purposes for avoiding incline explosion[21]. Numerous functions are applied in categorizing an input word into a binary arrangement based on the categorized prepared dataset [26]. SoftMax activations on output layer is applied in a proposed model.

IV .BENEFITS AND LIMITATIONS OF DEEP LEARNING TECHNIQUES IN PSYCHOLOGICAL HEALTH CARE

1)Initial uncovering: With the help of available large dataset from various sources one can identify the pattern and predict the mental health condition of a individual using a Deep learning algorithms.

2)Modified treatment: By analysing discrete data, deep learning models can adapt treatment to each individual's precise needs.

3)Isolated one-to-one care: Deep learning can allow Isolated one-to-one care of mental health indications, providing continuous support to individuals even outside of traditional clinical settings.

Not just the benefit but there are some limitations of using deep learning in the field of mental health:

Data privacy concerns: since all these Deep learning models require access to complex personal data, rising alarms about confidentiality and safety.

Absence of interpretability: since the algorithms are complex enough to interpret it is difficult to understand how decisions are grasped.

Bias and simplification issues: Deep learning models may exhibit bias based on the information they are skilled on, leading to inaccurate predictions or generalizations that do not apply to all individuals.

Since all the models are skilled based on the information available by data set, chances of inaccurate predictions of issues on certain individuals may be possible.

V. IMPLEMENTING DEEP LEARNING FOR SUICIDE PREVENTION

A. Data Collection: The planned work uses Twitter and Reddit data to train the algorithm for suicide contemplation detection. Initially, suicide-related statements from subreddits devoted to suicide were compiled where users sought support from the online community. These posts are usually written by people who have suicidal feelings; hence they can be considered as suicide-provoking statements. Added on to this, typical posts from other subreddits related are collected. The suicide contemplation posts were revised manually to generate a subset of phrases which were then used as search terms in social media [9].

B. Data preparation: Data collected from online mass media cannot be straightly used for feature extraction due to the presence of various noises that are widespread in the uncooked data. This raises a problem in word matching and also in semantic scrutiny. The problem is more overstated as data from online social mass media may contain grammar and spelling mistakes, emojis, and other unwanted characters. Therefore, the data needs to be pre-processed to ensure that the computational model accomplishes reliable predictive analysis.

C. Feature extraction

An important step in assembling detailed evidence about users in order to provide high accuracy in suicide contemplation detection. Several features were saved from tweets in this study.

D. Data set

The data is collected from reddit dataset where handlers express their opinions and sentiments via suggestion. They relate through comment threads attached with every proposal of the different handlers. These reddit posts were categorized using 4 partitions which includes no risk, low risk, moderate risk, and severe risk outlined as[10]:

- o No Risk: No possibility that the user has suicidal tendency.
- o Low Risk: Some factors might be present here depicting that this user might have suicidal tendency, but chances are very low
- o Moderate Risk: There are chances that the user has a tendency to attempt suicide.
- o Severe Risk: There is high chance that the user will attempt to suicide.[10].



Fig.3.words that show high risk suicidal texts.

Table 1. Examples of Human Annotations of Reddit Posts.

| Suicidal Posts | Non-Suicidal Posts |
|---|--|
| Want to die, end it now, I wanna die with a blunt I'm going to kill myself this weekend | There is no one "correct" way to talk to someone struggling with suicidal thoughts, Children of suicide parents. |
| I want to slit my wrists tonight, I tried to commit suicide | I think you should tell people how you feel, I think suicide is a permanent option that most of the time results out of a temporary issue. |
| I wish guns for suicide, nobody cares if I die i want to die Where can i go to commit Suicide?? | Will you ever get over the news that one of your parents committed suicide? |
| Where can i go to commit suicide?? I don't know what else to do. | Friend has given up, seriously considering suicide |
| Just over life, die alone, sleep forever I'm writing my suicide note right now. I plan to kill myself soon. | National Suicide Prevention online chat I think suicide is a permanent option that most of the time results out of a temporary issue. |
| what's the point in living when I will always be alone | Method used in chris cornell and chester bennington's suicides. |

The above Table 1 [7] show the posts collected in reddit dataset which can be categorized as suicidal and non-suicidal. Which are given as input for LSTM-CNN model as a training dataset based on the trained data the model will early detect about the suicidal contemplation of a social mass media user and predict the same.

VI. RESULT ANALYSIS OF A GIVEN EXPERIMENT

Based on the complete data list of reddit post result analysis is done by the uncovering of suicidal inclinations from the certain data[10]. We studied the Unembellished Risk labelled posts associated with suicidal inclination and created a list of the most common words and then compared this with those obtained from Low-Risk labelled posts. The proposed model is used to detect the signs of suicidal views. We used four classifiers to regulate the inference features collected from the dataset[9]. The performance of the strategies can be computed in four different ways: True Positive (TP): Suicide ideation cases that are both positive and predicted to be positive. True Negative (TN): the cases of suicide ideation that are negative and predicted as negative. Cases of suicidal ideation that are actually negative but predicted to be positive. Suicide ideation cases that are positive but are predicted to be negative[9].

Accuracy is used to predict to see the proposed model is true to given extent

$$A = \frac{TP+TN}{TP+TN+FP+FN}$$

Precision the true positive cases that are predicted as constructive.

$$P = \frac{TP}{TP+FP}$$

To identify the entire amount of positive cases in a given actual positive cases we use recall

$$R = \frac{TP}{TP+FN}$$

The persistence was to examine which combination of language, thematic, statistical, sequential, and demonstrative variables works finest in terms of accurateness for posts category of suicidal opinions. Language characteristics were used in combination with sentiment analysis and temporal features to identify the range of risk[9].

VII. CONCLUSION

The persistence of this work is to obtain. Data from social platforms in order to our understand of suicidal thoughts and behaviour. Several texts which suits a taught are extracted from the data set, including language, theme, sentiment analysis, character analysis, and temporal, and it is proved by experimentation one can successfully separate regular post with suicidal post. Based on the results, it is possible to achieve prediction act by sensibly choosing features. Lot of experiments must needed for additional study and growth in this area. To know the pattern of texts posted by the user the day is divided into multiple time slots. More sets, such as timely information and text embedding, may improve the accuracy of detecting suicidal contemplation.

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