Identifying PTSD Symptoms Using Machine Learning Techniques on Social Media

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Abstract— Post-traumatic stress disorder (PTSD) is a mental health illness brought on by watching or experiencing a horrific incident. Flashbacks, nightmares, acute anxiety, and uncontrolled thoughts about the unforgettable incident are the possible symptoms faced by PTSD sufferers. The PTSD diagnosis is usually done by a mental health specialist based on the symptoms that the person has, and the task is very time-consuming. Due to the widespread use of social media in recent years, it has opened up the opportunity to explore PTSD signs in users' postings on Twitter. The content-sharing feature available on this platform has allowed its users to share personal experiences, thoughts, and feelings that could reflect their psychological status. Thus, the goal of this work is to identify the PTSD symptom from text posting on Twitter. The crawled text posting is filtered and trained on selected machine learning and deep learning methods. The experiment results show that the support vector machine performed the best with 91% accuracy compared to others. This extracted model could be used in identifying PTSD symptoms on social media.

Keywords—PTSD, mental health, social media, machine learning, deep learning, health informatics

I. Introduction

Every year, around 3.5% of U.S. adults suffered from PTSD. The PTSD problem began in the brain when the hippocampal area is unable to integrate emotion and memory, causing it to shrink. Like every other organ in our body, the brain also can undergo alterations such as destruction and healing. Those resulting from life events including trauma can affect the rest of the body. Many people who experience traumatic incidents might have momentary difficulties to back to normal life and daily routine, but they usually get better over time. For example, they may have sleeping issues, such as insomnia, and have difficulty focusing. However, if the symptoms intensify and linger for months or years, the individual may suffer from PTSD and should be evaluated by a medical expert. In the worse cases, they could hurt themselves or others.

PTSD is frequently misdiagnosed or undetected, leading to ineffective medical treatment for sufferers. A study that was conducted in the U.S. states that only 2% to 11% of PTSD patients have been diagnosed in a primary care setting and very few of them properly received treatment for PTSD [1]. The diagnosis procedure for PTSD is unlike general physical illness. When diagnosing a patient, the doctor needs to perform a medical examination including blood tests, and a

psychological evaluation. That will include detailed observations of the symptoms being experienced. Making a diagnosis is a challenging task, and finding the right treatment for each PTSD patient requires time and close monitoring by the medical expert.

Thus, to better identify and recognize the PTSD sufferer, more attention and effort need to be spent to properly address this illness in practice. Finding alternatives to capture PTSD sufferers is crucial in providing forewarning so they can get help from the doctor promptly to receive treatment. Previous studies have discovered that most people with mental illnesses seem to use social media to share their anecdotes, seek information related to their mental health, and support others who are struggling with similar mental health conditions [2]. Due to this new trend, we would like to explore and capture PTSD symptoms based on their text postings on social media.

Previous research on PTSD on social media presents that the developed model for predicting a sign of depression and PTSD on Twitter can distinguish between postings containing depressed and normal sentiment [3]. The unsupervised method, Hidden Markov Model (HMM) time series is used for the experiment in a similar topic. In other previous studies, Deep Learning (DL) methods such as Long Short-Term Memory and Convolutional Neural Network (LSTM-CNN) performed the best compared to the other three baseline methods which are Naïve Bayes (NB), Random Forest (RF), and Decision Tree (DT). They scrapped the tweets from Twitter using depression search strings and analyze the linguistic style of the users to create a model for early detection [4]. These works show that social media data can provide important insight into mental health conditions.

In this work, we focused on text postings where most psychiatric populations expressed their emotions on social media including Twitter. To identify PTSD symptoms on social media, we manually crawled the tweets using PTSD-related keywords. The collection of these tweets is preprocessed and trained with three selected algorithms. The results are compared and the best-performing model is used as a model to identify PTSD symptoms on social media. Specifically, we will answer the following research questions (RQs). RQ1: How to identify tweets containing PTSD symptoms (ground truth data collection)? RQ2: Which algorithm performed best on our crawled dataset? Following these RQs, we presented a framework that can identify PTSD symptoms from text posting.