Depression Intensity Estimation via Social Media: A Deep Learning Approach

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Abstract

Depression is a significant component to the worldwide disease burden. Doctors used to diagnose sad persons by referring to clinical depression criteria in person. The COVID-19 pandemic encapsulates, among other things, enormous pressures such as unemployment, death, and loneliness. Clinicians must distinguish between demoralization and depression when they are called upon. However, more than 70% of patients do not seek medical help in the early stages of depression, resulting in further deterioration of their diseases. Meanwhile, as individuals increasingly rely on social media to express their feelings and share their daily lives, social media has proven to be an effective tool for detecting physical and mental illnesses.In this paper, we leverage social media (Twitter) data to forecast depressed people and quantify their depression intensity in order to assist in raising an alarm. This problem is modelled as a supervised learning task. In a self-supervised manner, we begin by weakly labelling the Twitter data. To represent each user, a rich set of features is extracted, including emotional, topical, behavioral, user level, and depression-related n-gram features. We train a tiny long short-term memory (LSTM) network using Swish as an activation function to predict depression intensities using these features.Extensive studies are carried out to illustrate the efficacy of our technology. We surpass baseline models for depression intensity estimate by reaching the lowest mean squared error of 1.42 and by more than 2% accuracy over the present state-of-the-art binary classification approach. We discovered that depressive users typically use negative phrases like stress and sad, post late at night, use a lot of personal pronouns, and occasionally relate personal events.

Introduction:

Depression is the most common cause of disability in the globe. Depression affects an estimated 350 million individuals worldwide of all ages. Different depression symptoms appear as distinct behaviors in depressed people. Psychologists frequently conduct face-to-face interviews in clinical diagnosis, referring to the Diagnostic and Statistical Manual of Mental Disorders criteria.Clinicians must distinguish between demoralization and depression when they are called upon. The criteria identify nine kinds of depression symptoms, each describing distinct actions in daily life. Despite the fact that this is the most efficient way for diagnosing depression, many people are embarrassed or unaware that they are depressed. Depression cost the United States an annual economic burden of 83 billion dollars in 2000, the majority of which was linked to lower productivity and higher medical costs. According to a research by Goodwin and Jamison, 15-20 percent of all major depressive disorder patients commit suicide. This outcome can be avoided in most cases if adequate interventions are implemented, and early recognition of depression is the first step toward implementing these interventions. The majority of studies on early diagnosis of depression rely on diagnoses based on self-reported experiences and surveys from patients. These diagnoses are exceedingly expensive, and as of 2009, only 30% of world nations that provide basic health care services had these systems in place.

The COVID-19 pandemic encapsulates a slew of stressors. Loss of employment, death of family members, acquaintances, or colleagues, financial insecurity, and isolation from others, especially for people who live alone, are just a few of the apparent ones.Like many Americans and others from around the world, I try to keep up to date on information about the COVID-19 pandemic. I was prompted to write this commentary by two headlines and several telephone calls and e-mails from colleagues and friends. These are the two headlines that

recently caught my attention: "What We Must Do To Prevent a Global COVID-19 Depression" and "COVID-19 Could Lead to an Epidemic of Clinical Depression and the Health Care System Isn't Ready for That, Either." By now there should be little doubt that this pandemic is causing immeasurable economic suffering for many, in addition to overwhelming the coping capacities of numerous people.

In this paper, we propose a deep learning-based strategy for estimating the severity of depression based on information uploaded on social media platforms by the user. To the best of our knowledge, this is the first study of its kind on estimating depression intensity. To begin, we rename the depression dataset that Shen et al. gave. Based on textual compound polarity and latent semantic analysis in a self-supervised manner into different intensity categories (LSA). We created a total of 527 features of five distinct sorts to define each user, including emotional, event-triggered, behavioral, user-level, and depression-related features, based on the diverse attributes of depression described in the literature.We train a shallow long short-term memory (LSTM) network to predict depression intensities using the retrieved features. To assess our intensity estimation, we compare our experimental results to those of alternative models. Furthermore, we compare and surpass existing binary classification approaches with our method.

Motivation

The difficulty of early-stage depression detection from users' tweeting activity was discussed in this study. Using social media data, we suggested a deep learning method for estimating the severity of depression. This project was prompted by the need to estimate depression intensity in real time using social media in order to aid in correct therapy based on the severity of the depression.In a self-supervised way, we built a relabeling technique for a benchmark depression dataset, designed a rich collection of discriminative depression-related variables for users, and proposed an LSTM network to detect depressed users of various levels on Twitter. Extensive studies on a standard dataset proved the performance of our method, which outperformed the other alternatives for intensity estimate.

Literature survey:

F. Hao, G. Pang et al, proposed based providing appropriate social support to prevention of depression for highly anxious sufferers. In this study, AI and DI follow the Gaussian distribution, according to the researchers. As a result, when clustering AD points, a GMM has been used. As a result, a number of useful clusters have been discovered, each with its own semantics and observations. Correlation analysis was used to evaluate the relationship between anxiety, depression, and SS. Based on the examination of real data sets, our findings imply that high-level SS can minimize the risk of depression in extremely stressed undergraduates.

S. Pappa, V. Ntellaet al,proposed based"Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: A systematic review and meta-analysis.In this paper,our systematic review and meta-analysis provide a timely and complete synthesis of the available information, showing healthcare professionals' high rates of depression, anxiety, and insomnia. The findings can be used to quantify staff support needs and to inform tiered and personalized treatments that improve resilience and reduce susceptibility in pandemic situations.

T. Anwaret al, proposed based Inferring location types with geo-social-temporal pattern mining. In this Study, Our systematic review and meta-analysis provide a timely and complete synthesis of the available information, showing healthcare professionals' high rates of depression, anxiety, and insomnia. The findings can be used to quantify staff support needs and to inform tiered and personalized treatments that improve resilience and reduce susceptibility in pandemic situations.

G. Shen et al, proposed based "Depression detection via harvesting social media: A multimodal dictionary learning solution. The goal of this study is to use social media to diagnose depression in real time. This study uses a multimodal depressive dictionary learning method to detect depressed people in Twitter, using benchmark depression and non-depression datasets as well as well-defined discriminative depression-oriented feature groups. On a large-scale depression-candidate dataset, the researchers looked at the contribution of feature modalities and identified depressed users to uncover some underlying online behaviour differences between depressed and non-depressed users on social media.

T. Shenet al, proposed based on Cross-domain depression detection via harvesting social media.The addressed the issue of using multi-source datasets to improve depression identification using social media in this work. A cross-domain Deep Neural Network model with Feature Adaptive Transformation & Combination approach (DNN-FATC) to transmit meaningful information across diverse domains is presented in Proceedings of the Twenty-Seventh International Joint Conference on Artificial Intelligence.

F. Sadequeet al,proposed based on Measuring the latency of depression detection in social media.In this study, They established latency and flatency as early detection task evaluation measures, demonstrating that their theoretical behaviour is preferable to the current state-of-the-art, early risk detection error (ERDE). We recreated common models and features from the eRisk 2017 shared challenge on early detection of depression in social media, and empirically demonstrated that our measures capture major variations between models better than ERDE.

M. Trotzeket al,proposed based onUtilizing neural networks and linguistic metadata for early detection of depression indications in text sequences.In this paper, the researcher was utilized to investigate the currently used ERDEo metric for early detection tasks in greater depth, and it was discovered that ERDE5, in particular, is not a useful metric for the stated shared task. The researcher's approach of using ensembles of more than two models and calibrating the probabilities that arise appears promising. Combining two models' word embeddings in a single neural network has also not been tested.

T. Caiet al, proposed based on Targetaware holistic influence maximization in spatial social networks. In this study,a new research problem of Holistic Influence Maximization (HIM) query in this paper, which is a significant complement to the traditional influence maximization (IM) problem and provides additional benefits to many real-world applications. In our experimental evaluation using four datasets, the efficiency can be improved by one or two orders of magnitude.

N. Asgharet al,proposed based on Affective neural response generation. In this paper,three emotive tactics are used in this paper to enhance the development of affectively conscious neural encoder decoder conversation systems. We use a cognitively constructed dictionary to embed language concepts in an affective space, suggest multiple affect-based heuristic objective functions, and provide affectively diverse decoding algorithms. These strategies can assist retain users in information retrieval activities like question-answering and dialogue systems by interacting with them in a more compassionate and human way.

R. I. Shaderet al, proposed based COVID-19 and depression. In this article, The COVID-19 pandemic encapsulates a wide range of pressures, including unemployment, mortality, and solitude, to name a few. Clinicians must distinguish between demoralisation and depression when they are called upon. This remark distinguishes between demoralisation and depression, and offers remedies for both, as well as a word of caution about the usage of chloroquine and hydroxychloroquine in COVID-19 patients. There should be no promotion of either remedy without a thorough assessment of the dangers and benefits.

Existing System:

They previously gave a credible signal of the potential for the COVID-19 pandemic to impair the mental health of HCWs in earlier research. Furthermore, because all of the studies in our meta-analysis were cross-sectional, the long-term effects of the COVID-19 pandemic on HCW mental health require further investigation. Flatency is a broad measure that can be used to solve any problem in which a system must quickly analyse a sequence of elements connected with an object and make a prediction about the object's class. They exclusively look at Flatency in the context of early depression identification on social media.To compare each model to the baseline, Wilcoxon's Signed Rank significance test was employed as before (vanilla BS). These compared the performance of three affective strategies: affective word embeddings as input, affective loss functions, and affectively diverse decoding, and showed how they might be combined.MDL, which covers both clinical depression criteria and online social media activities. Their multimodal depressive dictionary learning model approaches the problem as a binary classification problem, determining whether or not a user is depressed.For depression intensity measurement, MDL is combined with our labelling technique.

Conclusion:

The goal of this study is to use social media to diagnose depression in real time.Mental health has been a major worry throughout the ongoing COVID-19 pandemic and frequent lockdowns.Using social media data, we suggested a deep learning method for estimating the severity of depression. This project intends to estimate the severity of depression in real time using social media in order to aid in correct therapy based on the severity of the depression. In a self-supervised way, we built a relabeling technique for a benchmark depression dataset, designed a rich collection of discriminative depression-related variables for users, and proposed an LSTM network to detect depressed users of various levels on Twitter.Extensive studies on a standard dataset proved the performance of our method, which outperformed the other alternatives for intensity estimate. Our binary classification approach outperforms the existing binary classification method by more than 2% of the time. This research points in various promising directions for the future. For recognizing the spread of depression among social communities, it would be interesting to investigate the social network structure and user locations.The researcher will lead the development of automatic preliminary assessment methods based on social data in future study.

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