Review on Deep Learning for Detection Psychological Disorder

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ABSTRACT

Early detection is a way to control the maximum loss. There are many cases that are handled by the early detection and decrease the further complex mental issues . Many research works have been done on the detection of psychological disorder. The Most common technique that is used in research is machine learning. There are many previous researches that conducted through the machine learning. Machine learning algorithms like decision tree, KNN, SVM, na¨ıve bays etc. gives the better performance in their own field. But now days, a new developed technique is used to predict the illness. The new developed technique is deep learning. Deep learning is used to overcome the drawbacks of machine learning. A deep learning technique that is mostly used in data science is Convolution neural network, Recurrent neural network, deep network etc. Deep learning algorithms gives the better results as compared to machine learning. In our research, CNN is used to classify the images. Basically our research is based on the CNN which is most popular technique for the data which is collected from medical surveys, patient's interview, clinical data and social media post, signs. Analysing this all will make better prediction about the illness of psychological health, based on that accuracy of the diagnosis will be paramount.

Index Terms—Mental illness, Convolutional Neural Net- work,Detection,Data sets.

I. INTRODUCTION

Mental illness is highly prevalent nowadays, constituting a major cause of distress in people's life with impact on society's health and well-being. Mental illness is a complex multi- factorial disease associated with individual risk factors and a variety of socioeconomic, clinical associations. it is crucial to predict and analyze the various psychological disorders to find their treatment as soon as possible. In modern times, advancement in technology has created a need for evolution in the medical sector.in this paper we explored the various machine learning techniques and their implementation for pre- diction and analysis of various psychological disorder. During the study of these research papers, it has been observed that although many learning methods have been used on various datasets, high accurate results

have been achieved using KNN LSTM technique. In order to capture these complex associa- tions expressed in a wide variety of textual data, including social media posts, interviews, and clinical notes, natural language processing (NLP) methods demonstrate promising improvements to empower proactive mental healthcare and assist early diagnosis. This manuscript provides an overview of how different machine learning techniques used to predict and analyze various psychological disorders. The research work mentioned here depicts how machine learning techniques used to achieve effective and economic results on various datasets irrespective of content i.e. data like clinical data,medical surveys data,social media post.

Deep learning (DL) methods have been increasingly applied to neurological data to identify patients with psychiatric and neurological disorders. This review provides an overview of the different deep learning applications. We provide a narrative review of mental illness detection using NLP in the past decade, to understand methods, trends, challenges and future directions. The review reveals that there is an upward trend in mental illness detection NLP research. Deep learning methods receive more attention and perform better than traditional machine learning methods.

II. LITERATURE SURVEY

In paper1, the key objective of their study is to examine social media posts to detect any factors that may reveal the depression attitudes of relevant online users. For such purpose, they employ the Natural Language Processing (NLP) tech- niques and machine learning approaches to train the data and evaluate the efficiency of their proposed method. They identify a lexicon of terms that are more common among depressed accounts. The results show that their proposed method can significantly improve performance accuracy. The best single feature is bigram with the Support Vector Machine (SVM) classifier to detect depression with 80% accuracy and

0.80 F1 score. The strength and effectiveness of the combined features (LIWC+LDA+bigram) are most successfully demonstrated with the Multilayer Perceptron (MLP) classifier resulting in the top performance for depression detection reaching 91% accuracy and 0.93 F1 score. According to their study, better performance improvement can be achieved by proper feature selections and their multiple feature combinations.

In paper2, they studied the mental illnesses through people's choice of words in expressing themselves on two popular social media platforms, Reddit and Twitter. Their goal is to develop an empirical model to detect and diagnose major men- tal disorders in individuals. They build a substantial dataset of posts made by people suffering from mental illnesses and the control ones, and in order to generate numerical feature from text they apply text cleaning and Word2Vec language modeling, and then for classification we used SVM machine which classifies posts and users with high accuracy. they achieve an accuracy of 95% on Twitter users and an accuracy of 73% on the social media challenge.

in paper3, it intends to provides a brief overview of existing research being carried out in the field of machine learning and diagnosis, classification and prediction of psychological disorders and will present a sample framework which uses the data from the electronic health records to extract different text-based documents and reports to produce a tagged list of words relevant to disorder which is matched against the symptoms and signs of different psychological disorders to predict the disorder. To validate this prediction, it is further checked against the output of the machine learning models that will predict the psychological disorder based on the patient's fMRI image and PET images extracted from the patient's EHR. Through this paper, readers will be able to get an overview of the recent developments in the field of diagnosis of mental disorders by utilizing the machine learning algorithms and techniques to process the relevant unstructured data for improving

the accuracy of the diagnosis to reduce the risk of mis diagnosis.

in paper4, they use the wearable device to get medical data. Heart rate variability (HRV), a stressrelated vital-sign, was derived from wearable device data to reliably determine stress-levels. In order to build and train a deployable stress- detector, they collect labeled HRV data in controlled environ- ments, where subjects were exposed to physical, psychological and combined stress.Then they applied machine learning to separate and identify the different stress types and understand the relationship with HRV data. The resulting C5 decision tree model is capable of identifying the stress type with 88% accuracy, in a 1-minute time window. For the first time physical and psychological stress can be distinguished with a 1-minute time resolution from smokedivers, firefighters, who enter high-risk environments to rescue people, and experience intense physical and psychological stress. To improve their model, they created an integrated system to acquire expert labels in real-time from firefighters during their training in a Rescue Maze.

in paper5, they discover that user's disorder state is closely associated with his/her friends in social media and that they use a large-set data set from actual-cosmos social platforms to consistently study the correlation of users' disorder status and societal interactions. they have a tendency to first outline a collection of mental disorder-related matter, optical, and societal attributes from numerous aspects. Users' societal in- teractions on societal networking contain helpful indication for tension detection. The advancement of societal networks like Facebook, and an ever-increasing number of people will share everyday programs and moods, and interaction with friends through societal networks. This system develops a machine learning framework for detecting the Social Network Mental Disorder Detection (SNMDD). Specially, system formulates the semisupervised classification to detect three types of SN- MDs. 1)Cyber net-Relationship (CR), which

incorporates the dependence on the person-to-person communication, checking and informing to indicate the virtual social connections and online companions turn out to easily compare the genuine ones with loved ones, 2) Network compulsive (NC), which incorporates the urgent on-line societal gaming or betting, frequently bringing the budgetary and work related issues; and 3)Informative overloading (IO), which incorporates ad- dicte surfing of client states and message sources prompting with a less work profitability and societal collaborations with family and the companions are disconnected. After getting the disorder level, system can also show the hospital on map. System also recommends the precaution to avoid stress.

III. STEPS

A. DATA PRE-PROCESSING

First they use the NLP tools to pre-process the dataset before it is proceeded to the feature selection and training stage. They use tokenization to divide the posts into individual tokens. Next, remove all the URLs, punctuations and stop words which could lead into erratic results if stay ignored. Then apply stemming in order to reduce the words to their root form and group similar words together.

B. FEATURE EXTRACTION

After data pre-processing, they feed their models with the features that reflect users' language habits in multiforums. To explore the users' linguistic usage in the posts,mediccal data,medical surveys they employ the LIWC dictionary and N-gram features. These text encoding methods are applied to encode the words to be proceeded by different classifiers. N-gram modeling is used to examine the features from the text. It is widely used in text mining and NLP as a feature for depression detection to calculate the probability of co- occurrence of each input sentence as a unigram and bigram. For n-gram modelling they use the Term frequency-inverse document frequency

(TF-IDF) as a numeric statistic where the importance of a word with respect to each document in corporate is highlighted. The main goal of its usage is to scale down the impact of empirically less informative tokens, which occur frequently to give a space for the more informative words occurring in a small fraction. The word is ranked with greater TF-IDF value if it is present in a particular text and absent in other text. Word Count dictionary, is widely used in computational linguistics as a source of features for psychological and psycholinguistic analysis. It works as a baseline measure with a set of words and a behavioral link. It is often presented in several mental health projects. The standard linguistic processes are one of the largest parts of the LIWC psycholinguistic vocabulary package. It was intended to quan- tify the words' usage in mentally significant classifications as well as for recognizing the connection between individuals in social co-operation. In this, they choose 9 linguistic features (articles, auxiliary verbs, adverbs, conjunctions, impersonal and personal pronouns, negations, prepositions and verbs) to characterize the users' text. Then divide the Psychological processes into subcategories from which they used effective processes (anxiety, sadness, positive or negative emotion), bi- ological processes (sexual, body, ingestion and health), social processes (family, friend, male, female), cognitive processes (cause, always, never, because), personal concerns (job, cook, cash, bury, kill), and time orientations (present, past, season). To examine the users' linguistic usage, Through the unsu- pervised text mining approach, hidden topics such as topics connected with anxiety and depression can be extracted from the selected documents. In comparison to LIWC, it is not created by a fixed set of pre-established words. However, it automatically generates the group of non-labelled words. The choice of words is based on a probability. As a result, each generated document deals with different topics that keep some link among each other.

C. TEXT CLASSIFICATION TECHNIQUES

To estimate the presence of depression, they employ clas- sifying approaches to estimate the likelihood of depression within the users. The proposed framework is developed by using Logistic Regression, Support Vector Machine, Random Forest, Adaptive Boosting and Multilayer Perceptron classifier. Logistic Regression (LR) is a linear classification approach used to estimate the probability occurrence of binary response based on one or more predictors and features. Support Vector Machine (SVM) model is a representation of the examples as points in a highly dimensional space utilized for classification, where the points of the separate categories are widely divided. New examples are then mapped into the same space and predicted to belong to a category based on which side of the gap they fall. Random Forest (RF) is an ensemble of decision tree classifiers trained with the bagging method where a combination of learning models increases the overall result. Adaptive Boosting (AdaBoost) is an ensemble technique that can combine many weak classifiers into one strong classifier. It is widely used for binary class classification problems.

D. FEATURE ANALYSIS

To compare the differences, they classify the entire la- belled corpus of texts. To investigate the presence of de- pression, they compute the frequencies of all the unigrams and bigrams in both depression-indicative text and standard text. They select top 100 unigrams and bigrams for each category.According to our results, the language predictors of depression in depression-indicative posts contain the words related to preoccupation with the self (I'm, I'm not), feel-ings (feel, feel like, make feel), greater discrepancies (want, wish, could), negative emotions (sad, wrong life, depression, I'm depressed, miserable), suicidal thoughts (want die, stop- stop, don't want, kill, mental illness), words of anger and hostility (shit, f***, hate), words of negation (no, not, no one, doe anyone, I'm not), interpersonal processes (lonely, feel alone), signs of hopelessness (pointless, anyone else, need

help, end), signs of meaninglessness (pointless, empty, senseless) and present tense events (I'm going). As depression often affects psychomotor functions, they can find the words (tired, I'm tired or sleep) which reflect the symptoms of low energy, fatigue or inversely insomnia and hyperactivity. It is often expressed somatically through the bodily symptoms (my head, pain, hurt). In contrary to depression-indicative posts, unigrams and bigrams in standard posts contain the words describing the events happening rather in the past (time, month ago, year ago, last year), social relations (friend, best friend, family, friendship, mom) and advice seeking words (need advice, please help).

IV. CLASSIFICATION RESULT

The task is to detect depression of each of the users in the chosen data. We start to conduct the execution of the text classifying techniques by using the entire dimension feature space extracted from the dataset. For baseline features, they use CNN LSTM categories, N-gram probabilities on training data. The aim of combining the distinct techniques is to find out what combination of the features best favours the performance accuracy for depression detection. In this section, they investigate and discuss the degree of accuracy achieved by their experiment. For estimating the presence of depression within the posts, they apply Convolutional Neural Network with Long Short Term Method. To evaluate the above-mentioned classification techniques,they apply the eval- uation metrics, such as accuracy of estimations Accuracy, and F-score, precision and recall. It relies on a confusion matrix in- corporating the information about each test sample prediction outcome. Accuracy is the rate of correct classification.F-score is a harmonic average of the precision and recall. Precision estimates how many positively identified samples are correct. Recall estimates what proportion of positive samples was correctly identified.

V. SUMMERY

The importance of various macine learning and the deep learning and word embedding thechnique is used to detect the psychological disorder as soon as early stage to avoid further complexities and serious issues, and start further priscriptions for cure it.Data were collected using standard questionnaire, surveys, interviews, social media post. Classification techniques were used such as Decision Tree, Random Forest, Support Vector Machine (SVM), Na¨ıve Bayes, K- Nearest Neighbour (K-NN), Word embedding techniques,CNN,LSTM.

VI. ACKNOWLEDGEMENTS

VII. REFERENCES

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