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LITERATURE SURVEY OF PREVIOUS WORKS ON DEPRESSION DETECTION AND ELECTROCARDIOGRAM USING DEEP LEARNING AND CLOUD BASED IOT

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Abstract: Depression is a major illness that is found in people of all the ages. It can be caused due to a various of reasons. This kind of illness needs constant supervision which is a major problem. This tends to cause multiple chronic issues that needs to be taken care of with constant monitoring of the patient. In this paper we have proposed a system which monitors the depression levels of the patients using the application that is being developed which records the video clips of the patient periodically and are processed using image processing, Deep Learning and Neural networks by this it concludes the depression levels. The ECG (Electrocardiogram) system constantly monitors the ECG graph and reads the patient's heart condition and BPM (Blood Pressure Monitoring) sensor will monitor the heartbeat rate. The location of the patient can be traced via GPS in emergency situations.

Keywords: ECG (Electrocardiogram), BPM (Blood Pressure Monitoring), GPS (Global Positioning System), Deep Learning, Neural Networks, Image Processing

I. INTRODUCTION

Millions of individuals worldwide suffer from depression, a significant mental health disease. It is a common and often debilitating condition that can cause a wide range of symptoms, including feelings of sadness, hopelessness, and loss of interest in activities that an individual used to enjoy [1]. Physical signs of depression can include changes in eating and sleep patterns, exhaustion, and trouble focusing. There are several treatment options available for depression, including therapy, medication, and a combination of the two. However, many people with depression are not receiving treatment, often because they are unaware that they have the condition or because they do not know where to seek help. Untreated depression can have serious consequences. In addition to the symptoms such as self-isolation, wild behaviour, and suicidal thoughts, depression can also lead to social isolation, relationship problems, and difficulties at work or school. It can also increase the risk of developing other physical and mental health conditions. Depression can result in lack of concentration and enthusiasm for past interests, which can lead to a decrease in productivity and overall functioning. If left untreated, depression can lead to long-term changes in the brain and body, which can have negative consequences for an individual's health.

Increase in advancements and technology, the number of users cover approximately 7.26 billion people uses the smart phones and smart gadgets [2]. Evolvement and trendsetting of smart phones among users embrace the users to share their mood, thoughts and opinion instantly. Smart phones can perform everything because it's an electrically programmed machine, and users will use the smartphone every once in half an hour by performing any task in it.

Smart phones are a media which by developing an application to record the visual data and the audio data of user's daily activity in an periodical manner we are going to get their reasons of depression in the data captured. The data which is captured contains the valuable insight. The data created by a user can provide insight into their thoughts, feelings, and behaviours, which can help researchers better understand the state of their mind [3]. With the growth of technology, people will share their mental health conditions with their family, by speaking to themselves, by showing some facial expressions, negative words while speaking to someone, these things will be captured and will be stored. The dataset which is provided in the directory can be used find out their level of depression and will provide ways to recover.

In the fields of psychology and psychiatry, there is current study into the detection of depression levels based on verbal and facial clues. Many studies have shown that certain facial expressions and vocal patterns are associated with depression. Here, the particular person, capture circumstances, and sensors make it difficult to create a system for

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encoding discriminant traits for depression identification [4]. Due to the complexity of these traits, their wide range from person to person, and their subject-specific facial variations, depression is difficult to recognise and diagnose based purely on vocal and facial clues. A large video dataset's collection and processing can be difficult because labels often contain undesired information like noise. Additionally, For detecting depression, deep learning architectures provide cutting-edge performance. These complex structures can make use of 2-dimensional-CNNs, 3-dimensional-CNNs, Recurrent neural network, etc.to utilize spatial and temporal information. The majority of these cutting-edge structures are built utilizing regression techniques, with Euclidean loss used to punish the discrepancy between the predicted and actual depression. Such loss functions, though, are founded on tagged face images. Instead, they focus on minimizing the difference between the predicted label and the true label for each image. This approach can be effective for certain tasks, but it does not take into account the underlying relationship between the labels. Using multiple channels to explore different regions of facial frames can improve the performance of the model, but it also increases the complexity of the architecture. This can make the model more difficult to train and can also increase the risk of overfitting to the training data.

In this paper, blood pressure monitoring (BPM) and electrocardiograms (ECG) are utilized to analyses user conditions with reference to chronic diseases that are brought on by mental health conditions like depression. ECG is a crucial tool for identifying cardiovascular disorders. Ischemic heart disease is indicated by an increase or reduction in the ST segment of the graph [5]. In an ECG, the ST segment is the area between the beginning of the T wave and the conclusion of the QRS complex. A reference point J—the ST segment's starting point—is taken into account in order to find a ST segment deviation.

Emergency Global Positioning System (GPS) is been used for the safety measures for the user. Users, who are highly depressed can have dangerous thoughts and decisions which leads to death.

The paper is mainly designed to detect depression based on the video and audio data by using three different techniques namely Image processing, Deep Learning algorithm and Text mining. This paper also concerns user's health condition by ECG and BPM and it concentrates on emergency situation which may cause to the user. The remainder of the paper is broken into the following sections: The literature review is described in Section II. The implementation of the proposed system is presented in Section III, and IV, the results are reported and the discussion is wrapped up.

II. LITERATURE REVIEW

Here, we'll provide a summary of depression, the existing system for detecting depression using different Deep-Learning algorithms, and ECG utilizing cloud-based IoT. We'll also look for differences between the work that has already been done and update the present designing system. The following sections make up this section:

A. Depression Overview

Depression is seen as a mental health condition that is frequently brought up in conversations about general health difficulties. Depression symptoms that are ignored or left untreated might result in serious issues that endanger one's life. In its early stages, depression is caused by a complex combination of social, biological, and psychological variables. Depression may occur as a result of significant and complex issues. There are seven distinct subtypes of depression, with clinical depression and bipolar disorder serving as their principal subheadings [6]. The patient will experience symptoms of the depressive condition for about two weeks.

1. Guilt, worthlessness, and hopelessness
2. Eating less and losing weight, or eating more and gaining weight
3. Intentions to commit suicide and death-related thoughts
4. Insomnia, early morning awakenings, or excessive sleeping
5. Consistently depressed attitude virtually daily
6. Loss of interest in and disinterest in favourite pastimes

A mental health disease known as depression is characterized by mood fluctuations that can range from extreme highs to extreme lows. Manic and depressive episodes are these emotional swings, which can affect a person's ability to function and go about daily tasks. They can persist for days, weeks, or even longer. An individual may experience symptoms including increased energy, a reduced need for sleep, racing thoughts, and impulsive or reckless conduct during a manic episode. An individual may suffer symptoms including hopelessness, loss of interest in activities, changes in diet and sleep patterns, and trouble concentrating during a depressed episode.

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B. Overview of Electrocardiogram (ECG)

An ECG records the electrical activity of the heart. The procedure is common and painless, and it is used to examine the condition of the heart. Ambulances and operating rooms are typically equipped with ECG machines. Some portable electronics, like smartwatches, provide ECG monitoring; it's crucial to speak with your healthcare professional to see if it's acceptable for your particular circumstance. They may provide you advice on how to use the data correctly and interpret them, as well as explain the advantages and disadvantages of ECG monitoring [7]. The medical professional will utilize an ECG to find or identify:

1. Irregular heart rhythms (arrhythmias).
2. If chest discomfort or a heart attack are being brought on by blocked or constricted arteries in the heart (coronary artery disease). Whether you had a previous heart attack.
3. Whether you've previously suffered a heart attack.
4. The effectiveness of various cardiac disease therapies, such as pacemakers.

After having a heart attack or developing heart failure, people who have never before experienced depression become depressed. Additionally, those who have depression but no history of heart disease appears to acquire heart disease more frequently than the overall population. According to the National Heart, Lung, and Blood Institute [8], depression can raise your risk of heart problems by as much as 64%. According to the American Heart Association, significant depression affects around one in five patients with heart disease [9].

C. Deep-Learning application to detect depression via video and audio processing

Using dataset exploration, deep learning can help find fascinating patterns and knowledge. Previous researchers have conducted depression analyses using publicly accessible Facebook data. Based on the emotional content and linguistic style of the words used, the researchers conducted their study. Researchers also used alternative kernels and the SVM method to do classification, and the results reveal that the approach performs better in terms of accuracy [10].
In 2016, a different researcher by the name of Nadeem experimented with the detection of Major Depressive Disorder using Twitter data and the Nave Bayes and SVM algorithms. The final findings demonstrate that Nave Bayes performs better than SVM [11].

Utilizing data from Twitter, composite model machine learning is also used to identify depression. For the sentiment classification task, the naive Bayes-SVM hybrid model has excellent accuracy [12].

It is important to note that the results of research experiments may vary and may not be generalizable to all situations. Furthermore, the limitations of a particular study may impact the accuracy of its results. In the case of Naïve Bayes, it is possible that the algorithm may perform well in some cases, but not in others. It is also worth considering that the performance of any algorithm may be improved by fine-tuning its parameters and using it in combination with other algorithms. Ultimately, the choice of which algorithm to use depends on the specific context and goals of the problem at hand.

D. Electrocardiogram (ECG) via cloud based IoT

To store and retrieve data that is being captured and processed to determine the history and trend of the data for a specific user, a cloud-based IoT is utilized among a personal basic electrocardiogram (ECG) device and managers (ex., smartphones, personal computers, and personal health appliances).Previous researchers have implemented the ECG using non-portable machines , so we have improvised the existing model by making small and portable device by storing the in the cloud which stores the history and the existing data in the real time.

A portable ECG device was created by Tang Lili and Huang Wei, two other researchers. It employs an ADI ECG monitor to activate the front end AD8232, a 16-bit low power MSP430F5529 for the main control unit, and a local LCD display for the display unit. The limitations of not being able to preserve data and access historical data as needed [13].

The portable ECG monitor with USB host interface was created by the researchers Xin Guo, Weijie Chen, Xiao Yun Xu, and He Li. It employs the CPU C8051F021 as its controlling core and the SL811HS has a USB host interface chip. ECG signals are gathered and immediately stored in U-disk using USB mass storage and the FAT file system. The limitations include being unable to access data without a USB storage device and when you're far from home [14].

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III. CONCLUSION

This research introduces a Deep Learning framework for automatically detecting depression. When training a model to calculate a distribution of data over depression levels, it is advised to employ expectation loss, where the projected value is determined by the predicted values of the projected depression dispersion. The accuracy of the model could be increased without the need of additional streams by exploring the ordinal correlations between facial pictures and depression levels using this distribution. Tests using open-source datasets showed that, when compared to relevant research in the literature, our suggested approach produces intriguing findings. Additionally, by incorporating the ECG module and GPS tracking system, using cloud based IoT we can continuously monitor the patient's heart as well as their whereabouts to find them in an emergency.

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