A System to Monitoring and Managing the Anxiety Among the Young People Using Machine Learning

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Abstract— In the modern world, young people face several challenges in their personal life like the workplace, and social life, among which Covid-19 has had an adverse effect on the physical and mental health of young people. On the other hand, with the exhibitive increase in population, the use of traditional methods in the treatment of many diseases such as anxiety no longer seems possible. However, controlling and monitoring patients' anxiety status in the context of intelligent systems can be of higher accuracy, velocity, and quality. In this study, we proposed a system for monitoring and managing anxiety theoretically using machine learning technology. Examining machine learning (ML) techniques have high accuracy, speed, and flexibility. Hence, a pattern was presented, as well as the tools, how to prepare the data collection, and how to obtain the desired output. Highly-accurate detection of anxiety is the first effective step for treatment, for this purpose, supervised learning algorithms have been chosen. Finally, this study has presented a framework to find gaps in this regard

Keywords—.Smart Healthcare, Anxiety, Machine Learning Technology

I. INTRODUCTION

Smart health is a new concept that has attracted a lot of attention in the modern world. Basically, smart health is the use of new technologies in the field of health or healthcare and in the context of the Internet of Things (IoT) to diagnose, control, and treat a lot of diseases [1, 2]. For example, one of the applications of smart health is to detect and monitor stress and anxiety. Wearable technologies with health can be an excellent option for monitoring anxiety. Modern technologies also are more widely accepted among young people [3]. Anxiety is a disease that can be caused by persistent stress and if it persists, it can pose serious risks for individuals. Some illnesses appear in adulthood, but in the case of anxiety, it must be acknowledged that it can occur in childhood and can be dangerous for the people and society [4, 5]. Anxiety can have an adverse effect on as much as a third of the population, according to a survey.

Thus, according to WHO, An estimated 450 million people worldwide suffer from problems such as stress and anxiety [6]. Many factors can cause people to become anxious in the workplace, inability to perform job duties, avoid accepting responsibility in the workplace, and so on [7]. However, the analysis of stress and anxiety data by machine learning techniques have become popular and successful patterns that have been discovered in this field [8]. This study also provides a model for monitoring and detecting anxiety by machine learning technology. For instance, nowadays, academic individuals face many issues such as education and student life, and so on, so that anxiety can have a greater impact on young people. It goes without saying that the Covid-19 pandemic has exacerbated this issue in recent years [9]. For example, in study [10], the factors of formation and exacerbation of anxiety were monitored over a period of 8 months by machine learning techniques, and finally a favourable pattern was extracted for it. It is also stated elsewhere that optimal performance in the academic and industrial fields requires relaxation and a stress-free environment. Machine learning has provided models and patterns that can predict anxiety and stress among the people in real-time [11]. Therefore, it has sometimes been observed that the presence of some diseases can cause anxiety [12]. However, studies have shown that monitoring, controlling, and detecting anxiety in the smart context can have several benefits for the society [13]. Finally, because some important cases were mentioned, and the scope of the data can be very wide, the suggestion of machine learning seems to be a good solution. In this study, a conceptual model for monitoring and detecting anxiety is presented. To collect data through a standard questionnaire via Google Forms and analyse it by machine learning techniques such as supervised learning algorithms have been mentioned. Although, the methods and models of detecting anxiety by artificial intelligence (AI) are varied. In the framework of this research, supervised learning has been selected to analyse anxiety data. Finally, the second part of this study is named background, the third section is called framework, in the fourth chapter of the implementation, and in the 5th part, conclusion is presented.

II. BACKGROUND

A. Smart Healthcare

Technological advances, meta-analysis, and big data in the health industry have led to a revision of the health perspective. The important issue in the healthcare industry is real-time responsiveness to the patients. In fact, the efficiency of intelligent systems in the field of health and treatment is very important because the analysis of big data in health with intelligent systems is possible. Smart health is able to remotely control and manage some diseases, and in this system, the patient's health status is sent to medical centres and physicians, and several patients can receive the desired feedback. On the other hand, electronic devices, wearables, and mobile health with the possibility of monitoring, receiving health data from the patient, and controlling the patient's condition have played a vital role [1, 3]. Hence, smart healthcare has created a new definition for the health industry. However, in this study, a framework for analysing anxiety using machine learning techniques is presented. In general, the use of ML technology on health data like anxiety seems a key methodology [14].

B. Using Wearable Devices To Monitoring The Anxiety

The use of smart devices such as smart mobile phones as well as wearables like smartwatches is constantly increasing. Health data is prepared to analysis by these wearable technologies, using smart mobile phones, tablets, PCs, and so on. In addition, mobile health has also been accepted as one of the most important technologies for monitoring and controlling many diseases [15]. Anxiety is a kind of disease that can be monitored and controlled by these smart wearables. Also, today, AI has been able to play an effective role in promoting smart health through useful programmes [16]. Today, smart health has had a positive impact on many diseases such as anxiety and stress. For example, in the results of the study [3], it has been argued that the use of smart wearables and associated health in medical clinics can significantly reduce the percentage of stress and anxiety of patients.

Smart wearables such as smartwatches and the like are able to send some vital signs such as body temperature, blood pressure, different types of diabetes, heart rate, and so on to mobile health applications for analysis. Therefore, one of the strong ways that people can measure their anxiety today is the same mobile wearables under the health system [3, 17].

Studies have shown that managing anxiety through the use of wearable technologies is very beneficial, but on the other hand, in some cases, its use is prohibited [18].

C. Detecting Anxiety Using Machine Learning

Today, machine learning technology has been able to play an effective role in improving mental health systems, especially in adults, by applying applications [16]. However, analysing anxiety using machine learning techniques is one of the new and reliable methodologies. Analysis of anxiety data in the context of ML has been used to discover good criteria for high-accuracy prediction [19]. However, among machine learning algorithms for detecting anxiety, supervised learning algorithms in most cases have shown a significant and positive effect compared to unsupervised learning algorithms, and so on [20]. Today, machine learning algorithms have the ability to analyse health data such as mental health with the utmost accuracy [21]. For example, in one study with 632 participants (N = 632), anxiety data were analysed with 95% accuracy. In addition, the results showed that participants were more compatible with digital-based therapies [22]. Finally, it should be pointed that today, in order to accurately discover the behavioural patterns of anxiety, deep learning technology has made study easier and more accurate for researchers working in this field [23].

III. FRAMEWORK

A. Data Collection

This study recommends the State-Trait Anxiety Inventory (STAI) and wearable data to measuring anxiety. Twenty questions for state anxiety and twenty questions for trait anxiety, participants also have 4 types of ratings ("Not at all" to "Very much") to answer the questions [24, 25]. Also, for ease of work during data analysis, the answers can be encoded and defined with values (0 to 3), this technique is necessary for data analysis. However, for this purpose, a standard questionnaire form can be prepared via "Google Forms" and distributed among the young people on social media. For instance, a questionnaire form could be sent to a limited number of young people and then distributed widely after the problems were discovered. Some of the information like age, sex, marital status, and educational levels are needed to developing this research. Also, examining wearable data besides anxiety questionnaires can have a positive impact on results. Wearable devices data can be collected using smart devices such as sensors, smartwatches, and so on. Extracting data such as smoking, alcohol consumption, and etc. can also be useful for more accurate analysis.

B. Proposed Pattern

In the previous part, it was mentioned to collect anxiety data and eliminate possible problems, which can be clearly seen in the following pattern. Wearable data can collect from electronic devices, and data cleaning process can be applied to this data.

As shown in Figure 1, the data collection can be shifted to apply machine learning algorithms, and after normalisation, data fusion as the process of integrating multiple data sources to produce more consistent has been presented in this pattern, and then, a comparative analysis between the algorithms can be performed. Finally, a successful decision-making and evaluation can be extracted from the patterns and results obtained. It has been mentioned that this model can be developed in more details and presented. It should also be noted that some data collected from the user, like age, sex, educational levels, smoking rate, and so on., can help complete the evaluation and decision-making.

IV. IMPLEMENTATION

After receiving and classifying the information and extracting the questionnaire diagrams, the data can be prepared for the analysis of machine learning. To this purpose, the data can be analysed using the programming language (Python 3.6) and on the Jupyter platform. Supervised learning algorithms have the most desirable output for analysing anxiety. In Supervised Learning, "Classification" is the task of predicting a discrete class label, and "Regression" is focused on predicting a continuous quantity. Algorithms of classification like "Naive Bayes Classifier", "Decision Trees", "Support Vector Machines", "Random Forest", and "k - Nearest Neighbours" have mentioned in this study. Algorithms of regression such as "Liner Regression", "Neural Network Regression", "Support Vector Regression", and "Decision Tree Regression", "Lasso Regression", and "Ridge Regression" have been proposed to detecting the anxiety [23, 26, 27]. After analysing both data sets by machine learning technology (wearable data & STAI questionnaire), the accuracy of the algorithms for each of the data collection is determined. Finally, the most important cause of anxiety in each branch are determined with the highest accuracy of estimation.

V. CONCLUSION

Studies have shown that the anxiety is more common in elderly people [28]. It is much easier to accept new technologies among the young people and highly-educated. Therefore, it should be pointed that using machine learning technology to monitor and control mental health can have many benefits and also inform them about the many risks ahead. Research findings have shown that the collection of health data like anxiety and analysis of this data using ML algorithms, which have been done in previous studies with high accuracy, can clear the way for further entry and analysis in the branch of deep learning [29]. Successful models can also be used in hospitals and various industries such as robotics, etc. Research findings have shown that models of detecting anxiety among the youth of today with higher impact were presented.

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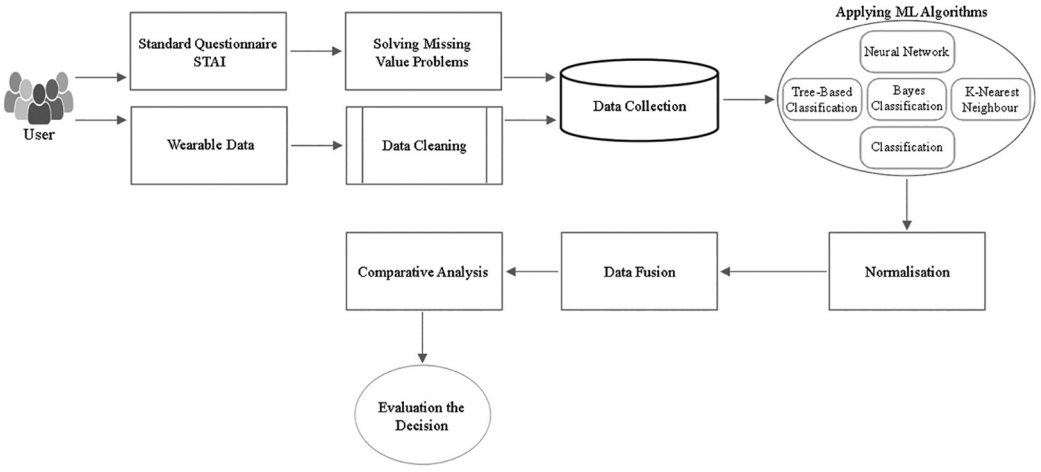

Fig. 1. Proposed pattern to analysing anxiety by machine learning

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