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Real-Time Mental Health Analysis Using Machine Learning Algorithm

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A B S T R A C T

Mental Health plays an important role in every stage of life from childhood and adolescence through adulthood, it includes our psychological emotional, and social well-being. It helps us to identify how we handle stress, relate to others and make healthy choices. It also affects how we think feel and act. Both mental and physical health equally plays an important role in our overall health. Several factors can contribute to risk to our mental health like early life experiences, ongoing medical conditions, biological factors or chemical imbalances in the brain, use of alcohol or drugs, having feelings of loneliness or isolation. Analyzing and diagnosing mental health is a multi-step process there is no medical test available that can diagnose mental disorders. Doctors ask about a person's symptoms, and experiences and also may order a series of laboratory tests to diagnose his/her mental health. In this project, we are giving music recommendations, which recommends music based on the real-time expression of the user along with the doctor consultation.

1. Introduction

Analysis and diagnosis are really important in maintaining mental health. This project helps in aiding the phases mention using deep learning algorithms. We analyze the emotions, and facial expressions and provide the proper guidance and consultation of the doctor. For facial expressions and emotion detection, the techniques of machine learning were used. In this mental health analysis, we are analyzing the facial expression and the emotions they are showing and based on which mental illness will be analyzed. Mental sickness is a type of health condition that changes a person's mind, emotions, or behavior and also sometimes physical health too. Machine learning provides a platform for doctors to analyze a large number of patient data and create personalized treatment according to the patient medical situation.

The emotions detected on the face can affect and communicate individual feelings. Based on the facial expressions and the emotions shown on the face an analysis of the mental health will be done and also, we provide a doctor consultation facility and also music recommendation based on their current mood. This project was built to detect the mental health problems like stress, Depression, Anxiety, etc.

Mental health detection was also investigated by identifying its data analysis method, comparison, and challenges. The extracted data were examined using statistical analysis or machine learning techniques. The algorithm which is being used here is CNN (Convolutional Neural Network)

CNN is a deep-learning algorithm that is used for image classification and processing. CNN consists of different layers like convolutional layers, pooling layers, and fully connected layers. Out of these convolutional layer plays an important role where we will be extracting the features such as textures, edges, and shapes. Convolutional layer output will be passed through pooling layers. While retaining the important information, the pooling layer will be passed to the fully connected layer which will be more helpful in the prediction and classification of the image.

CNN has multiple layers due to which it can deliver more accurate results. CNNs can be trained again for new recognition tasks and built on promising networks. Compared to regular neural networks CNN is computationally efficient.

2. Literature Review

Rohiza Abd Rahman this paper presents the analysis of mental health detection in online social networks. The analysis is done using machine learning techniques data sources and the features extraction method The comparison, challenges, and limitation of mental health detection were also investigated using the data analysis method the data sets for this project are chosen from the articles which is being published in major databases. The extracted data were examined using machine learning techniques and statistical data analysis This proposed method helps to identify and detect mental sickness faster compared to the traditional methods. The user's data which is posted in the online social networks will be analyzed using the dictionary and machine learning methods.

Enrique's Graciela Michael Riegler, Tine Nordgreen Peter, Jakobsen, Ketil J ocedegaard, Jim Torresen in this project the machine learning methods have been using to continuously sensor data to predict user contextual information such as location, mood, physical activity, etc. Personal and ubiquitous have allowed the continuous collection of data unobtrusively. The growth of ubiquitous sensor technologies increased mental health care applications in recent years, which helps in the automatic and continuous monitoring of different mental health conditions such as recent research works in mental health

monitoring systems using sensor data and machine learning. This paper focused on the researcher's works about mental disorders/conditions such as depression, anxiety, bipolar, disorder, stress, etc.

M Srividya S. Mohan Valli, N Balaji in this research paper determines how an individual thinks feels, and handles situations. Mental health is an indication of the social well-being, psychological, and emotional of an individual. Positive mental health will be helping one to work productively and realize their full potential. There are many factors at each stage of the mental health problem which may further lead to disorders, to maintain the proper life balance should be maintained to determine the onset of mental health early. Machine learning algorithms and artificial intelligence can be fully harnessed for predicting mental health. It uses machine algorithms such as support vector machines, decision trees, Naïve Bayes classifier, K-Nearest neighbor classifier, and logistic regression to identify the state of mental health.

Omar Alshormal, Mahamaed Masadehz, Md Belal Bin Hayat, Fijian Akhtar, Hossam Almahsasneh, Ghulam MD Ashrat, Athanasius Alexious This paper the frontal lobes EEh spectrum analysis is applied to detect the mental stress. The classifications will be done based on support vector machine(SVM) and Naïve Bayes This method has better accuracy which is about

Classification methods

$Nb = PtpPptPt/PpN$

Performance evaluation methods

1. $S = en = (TPFN + TP)$

2. $Spe = (TNFP + TN)$

3. $Acc = (TP + TNTP + TN + FP + FN)$

4. $Pre = (TPTP + FP)$

5. $F1 = 2(Sen \times PreSen + Pre)$

Saad Awadh Alanazi, Ayesha Khaliq, Fahad Almusi Madallah Alruwaili in this research paper the dataset was collected using the guardian application programming interface and process using the support vector machine, AdaBoost, and single layer convolutional network from the guardian API, Collection of the financial text-based dataset, then the pre-processing of the textual dataset.

3. PROPOSED SYSTEM

Analyzing +Detection +Classification +Consultation

The user is expected to decide on choosing between analyzing and detecting mental health. Next, the system will analyze the user's facial expression, emotion will be captured using the webcam then it will process. The facial expressions and emotions captured will be analyzed and based on that the particular health problem will be diagnosed. After the diagnosis, we provide detailed information about the sickness and also provide a consultation facility with a doctor.

Deployment

The project attempt to build an app and a website, to ease access to the proposed platform. This model uses facial expressions and emotions as the input and based on the input analysis and diagnosis will be done.

Advantages of the Proposed System

i. Existing systems works based on the data collected from the online social networks but here we are providing a face-to-face user interaction which helps to capture emotion and facial expression based on this analysis will be done.

ii. This aims at providing both diagnosis and consultation with the doctor.

iii. Simple and user-friendly GUI.

4. IMPLEMENTATION AND PROCESS

Python:

The implementation is done using Python as it is easy to learn and powerful programming language. The following libraries are used in this project. Numpy consists of multidimensional array objects and a collection of routines for processing visualization library in Python for 2D plots of arrays. Pandas is an open-source data analysis and manipulation tool while working with Excel sheets and tabular data pandas is very useful keras is a high-level neural networks API Open CV supports many algorithms related to computer vision and machine learning Flask is a web framework that helps to develop web applications.

4.1 CNN:

- **Import required Library**. (Keras, TensorFlow)

- **Initialize CNN & add a Convolution layer**. (sequence class)

- **Filters** (feature detection)

- **Kernel_size** (filtering matrix size)

- **Activation function** (non-linear images (ReLu))

- **Padding** (output dimension=input dimension)

- **Input** (image size)

- **Pooling Operation**. (reducing dimension)

- **Adding 2 convolution layer**s. (repeat steps 2 & 3)

- **Flattening Operation**. (dataset to the 1D array)

- **Fully Connected and Output layer**. (dense-connected & soft-max-output)

4.2 VGG-16:

VGG-16 is a convolution neural network architecture that is 16 layers deep proposed by Karen Simonian & Andrew Zisserman from the University of Oxford. As a result, the network has learned rich feature representations for a wide range of images. The network has an image input size of 224-by-224. For more pre-trained networks in MATLAB, see Pretrained Deep Neural Networks.

4.3 DEVELOPMENT:

In this project, we developed an effective music recommendation system that recommends music in real time based on the user's facial expression.

5. RESULT:

The FER 2013 dataset with 7000 test data was considered for extraction of emotion detection accuracy. The model is developed using machine learning techniques like CNN. The data utilized for the trials is split into training and test data, with the model considering 80% of the data for the training set and the remaining 20% for test data.

6. CONCLUSION:

Mental health analysis helps to detect the stress, anxiety, and depression level of a person the facial expression plays an important role in mental health. This paper provides insights about mental health analysis, providing facilities with the consultation of the doctor, and also providing a music recommendation system based on the moods our work aims to achieve the highest possible accuracy while not compromising the real-time aspect to apply to the real work scenario. The entire application was developed based on a web framework and the work of the end user is easier as just by the webcam the emotion, and mental sickness of a person can be detected very accurately and also has an option for doctor consultation and music recommendation.

7. FUTURE WORK:

The future research direction will be mainly focused on user-centric music recommender systems. In the future, we would like to develop a mood-enhancing music player which starts with the user's current emotion (which may be sad) and then plays music of positive emotion thereby eventually giving a joyful feeling to the user.

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