Mental Health Analyser Using Facial Images, Deep-CNN & IQ Tests

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***Abstract*—Approximately 280 million individuals worldwide suffer from depression, making it a widespread disorder. Deep convolutional neural networks can recognize depression automatically thanks to its distinct facial traits. A person's face is a significant component of their body and can reveal a lot about their emotional state. A person's face is where they convey all of their fundamental feelings. The current system assesses the user's mental state manually, which has several drawbacks. For example, we are unable to forecast any accurate answers based on the assessment score since we may not be aware of the user's constant emotional state. This model provides a hybrid design that invokes a facial-based emotion sequence and an IQ test in order to overcome this issue and suggest an effective approach for dynamically forecasting the mental state. The human mental status is routed through regular observation of their emotions and administration of IQ tests. For mental health and self-control, combining these methods mentioned above yields encouraging outcomes. In addition to helping individuals with mental health disorders such as anxiety, depression, and addictive behaviors by identifying them, Mental health Analyzer is a platform that supports and encourages healing while also assisting in maintaining a balanced state of mental state of an individual.**

Keywords: Convolutional Neural Network, IQ tests, Depression, anxiety, addictive behaviors.

I. INTRODUCTION

Facial expressions are a key non-verbal communication technique and are influenced by personality traits like neuroticism, which is associated with anxiety, nervousness, and hostility. Neuroticism is a risk factor for depression and is linked to conditions like dementia, attention deficit hyperactivity disorder, schizophrenia, and obsessive compulsive disorder. Dysexecutive syndrome, a brain dysfunction in the prefrontal cortex, is common in neurological patients, causing difficulties in starting and stopping activities, mental and behavioral shifts, and learning new tasks. A standardized platform for assessing neurocognitive functioning is crucial for comprehensive treatment and research. The proposed system aims to predict mental illness by integrating image processing and machine learning techniques. It uses facial emotion sequence and psychometric tests to identify mental disorders, utilizing real-time inputs. The system aims to provide promising results by recognizing emotions and measuring mental illness using IQ and PEN tests. This innovative solution addresses the growing issue of depression and mental illness.

Mental health affects people's work, health and quality of life. Early warning signs of depression or other mental disorders are difficult to detect. The proposed system uses a hybrid architecture to detect early warnings of mental illness, including depression. It uses facial-based emotion sequences, PEN and IQ tests, and a combination of these techniques to monitor a person's mental state. The system then conducts a psychology test to diagnose the severity of the mental condition, and combines these results with IQ and personality tests to provide recommendations.

II. EASE OF USE

A. Objective

Through the use of CNN models and consideration of IQ tests, the Mental Health Analyser assists in evaluating an individual's mental status based on facial segmentation, expressions, and mood. Users use a combination of facial expressions and psychometric tests to identify mental disorders. Furthermore, it attempts to balance a user's healthy well-being by offering appropriate assistance and incentive, in addition to aiding in the detection of a person's mental condition.

B. Motivation

Depression is a prevalent mental illness, causing severe symptoms such as mental discomfort, loss of interest, and suicidal thoughts. The International Classification of Diseases (ICD-10) states that severe symptoms, including mental discomfort, depression, loss of interest and pleasure, and suicidal thoughts and actions, are frequently displayed by depressed people. It significantly impacts people's functionality, health, and quality of life. Early detection of depression is challenging, and there is a shortage of psychiatrists worldwide, posing a threat to mental health diagnosis and treatment. The aetiology of depression is unclear, and objective diagnostic physiological signs are lacking. Current clinical depression diagnosis techniques rely on subjective scales, leading to high misdiagnosis rates due to patient coordination and doctor proficiency. Objective measures are needed. This inspired us to develop an innovative solution that combines machine learning and image processing methods to forecast mental disease by identifying people emotion using IQ and other psychometric tests and offering pertinent recommendations.

C. Applications

- Early Detection of Mental Health Disorders
- Support for Therapists and Clinicians
- Remote Mental Health Monitoring
- Research Studies on Mental Health
- Educational and Career Counselling
- Employee Well-being Programs
- Personal Development Applications

III. EXISTING SYSTEMS

- Existing systems for recognising user behaviour are quite complex in terms of time and storage.
- The existing method depends solely on manual assessment, which takes time and does not produce promising results because the user's emotions change based on personal and situational issues.
- The existing system does not use biometric emotion recognition to identify people.
- The existing technology does not combine psychometric test-based automatic individual criminal behaviour prediction with user facial expression.
- The existing system has the disadvantage of never detecting mental illness through system monitoring, the accuracy for emotion identification is low, and there is no evaluation of IQ and personality.

IV. PROPOSED SYSTEM

- Developing a workable approach that may yield encouraging outcomes for diagnosing depression and the mental state, is the goal of the proposed system.
- The suggested method allows users to diagnose mental health by combining psychometric tests with a hybrid architecture of facial emotion sequence. Real-time inputs are processed in this project by the user. A set of evaluation questions is included with the PEN and IQ tests in this suggested system.
- To convey the emotions of the present users, it makes use of facial images. The recommendations made to repress the user's mental state are based on the final report.

A. SCOPE

- Mental Health Analyser is an online platform that helps to assess a person's mental health and identify signs of depression in its early stages. For this purpose, it utilizes deep Convolutional Neural Networks and facial segmentation further integrating these results with the psychometric test results, further generating the final results.
- This way it considers the final results and finds the mental health state and also gives the right support and direction to keep things in check.
- It turns into a secure and encouraging community for those who struggle to talk about their issues.
- It further enhances their mental health by offering encouragement and support in this way. This way it provides support and motivation, which further develops their mental well-being

V. LITERATURE SURVEY

A. Significant field research related to the project

Depression is a prevalent mental health issue causing negative thoughts, self-blame, and self-harm. Patients lacking self-confidence may develop despair and suicidal thoughts. Treatments include medication, psychotherapy, and psychotherapy. Current diagnosis methods, like the Self-Rating Depression Scale and Beck Depression Scale, use subjective ratings.

Machine science technology could potentially diagnose depression through human face identification. In recent years, deep learning has been rapidly developing, a branch of machine learning, is a rapidly developing algorithm based on artificial neural networks for data representation learning. It offers advantages over shallow models in feature extraction, model fitting, and generalization, solving previously difficult problems. Deep learning has significantly improved target detection, computer vision, and natural language processing, promoting artificial intelligence development. It uses unsupervised or semi-supervised feature learning and hierarchical feature extraction algorithms to replace manual feature acquisition. Deep neural networks, inspired by animal visual cortex tissues, are the main form of deep learning. Convolutional neural networks (CNNs) are a classical and widely used network structure, allowing for better results in images and training using backpropagation algorithms. CNNs need fewer parameters to estimate, which makes them interesting for deep learning.

Techniques and algorithms

- CNN Models: CNN models have been developed to assist in our daily life, For example, some medical applications rely on a field of artificial intelligence known as “computer vision”. Therefore, CNN algorithms are helpful for disease detection and behaviour and psychological analysis. The tools used in this study include PyCharm, Anaconda3.8.2, and the deep learning framework for Pytorch.

Five deep CNN models were constructed for depression identification: the fully connected convolutional neural network (FCN); visual geometry group 11 (VGG11); visual geometry group 19 (VGG19); deep residual network 50 (ResNet50), and Inception version 3 (V3).

The FCN model integrates with advanced attention mechanisms and includes a feature input, convolution, activation, and full connection layer. VGGNet, a deep CNN architecture, has 8 convolution layers and 3 fully connected layers. ResNet50, a residual network with 49 convolution layers and a full connection layer, has a fast connection path between input and output. Inception-V3 decomposes large convolution into small convolution and normal convolution into asymmetric convolution to increase recognition accuracy. The total weight of the network determines its spatial complexity.

- PyTorch: PyTorch in the Anaconda software was used, and the collected datasets of patients with depression and healthy participants were imported and divided into a training set, test set, and validation set.
- Dataset acquisition and pre-processing: Image pre-processing: Using techniques such as standardization, resizing, and data enhancement to improve the quality and diversity of the facial image dataset.
- Processing of IQ test data: Standardization and pre-processing of IQ test data. Consider a process such as benchmarking.
- Feature extraction:
- Facial Feature Extraction: Leverage pre-trained face recognition models or use techniques like Haar cascades or deep feature extraction layers to capture facial features.

CNN Feature Extraction: utilise deep CNN architecture to automatically learn relevant features from facial images.

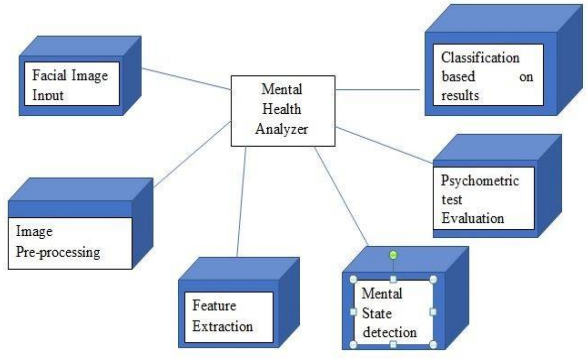
Algorithm:

Further the steps of Mental Health Monitoring system using Facial recognition and IQ test are:

1. Facial scanning
2. Feature derivation -Eyebrow Extraction, Eye Extraction and Mouth Extraction
3. Facial and Emotion configuration
4. Detection of Mental State
5. Psychometrics Evaluation
6. Final Classification

VI. MODULE -DESCRIPTION

A. Deployment Model



Objective: Examine face photos for indications of psychological discomfort.
Functionality:
Gather and prepare face photos from different sources. Recognize and evaluate eye movements, facial emotions, and other visual clues. Connect face data to recognized markers of mental health.

[1] IQ test Integration:

Objective: Use IQ tests that are widely accepted to evaluate cognitive abilities.
Functionality: Test modules should be integrated to assess memory, problem-solving skills, and logical thinking. For a more thorough examination, compare the results of an IQ test with the emotions and facial expressions displayed.

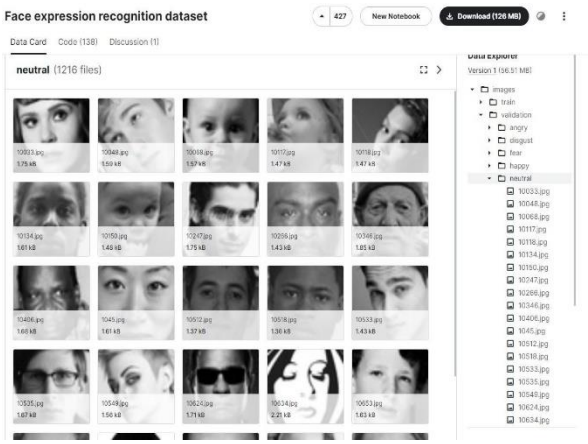
- Data Fusion and Analysis:

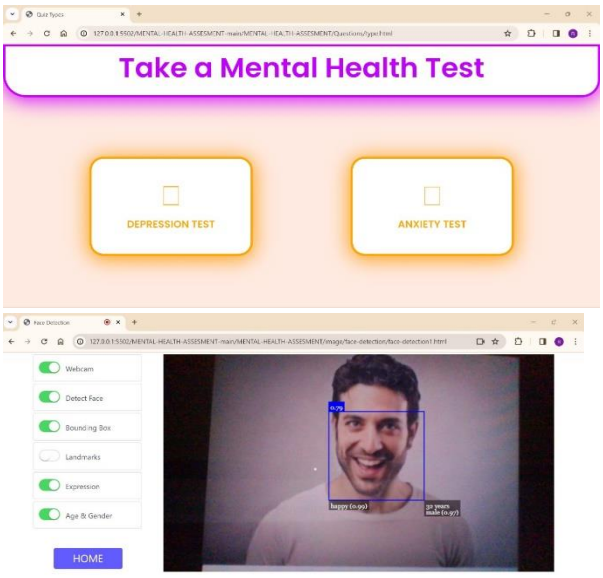
Objective: Integrate face image analysis, IQ testing, and Deep-CNN results to provide a comprehensive mental health evaluation.
Functionality:
Create algorithms that incorporate data from several sources. Determine the relevance of various elements and assign them weights and generate an overall mental health score.

- User-Interface:

Objective: Ensure that the Mental Health Analyser's interface is easy to use.
Functionality:
Gathering of input data (facial photos, answers to IQ tests).
Present the findings of each individual analysis.
Provide a comprehensive report on mental health that includes takeaways.

VII. RESULT





VIII. CONCLUSION

In this paper, we present a method to diagnose depression based on CNN. The proposed method can be used for early diagnosis of disease and prevention of disease progression. Future studies will investigate different types of depression that affect facial features. Obtaining accurate and reliable stress identification is essential and requires a solid foundation in analytical and experimental methodology. The main contribution of the proposed system is to develop an experimental model for successful detection of stress at multiple levels. The proposed system uses Python packages to produce accurate results for the study of facial emotion-based systems, the problem-solving abilities and personality of users in this world, and users with mental disabilities. If you are having trouble, we will provide you with relevant suggestions so that you can change your perspective on the situation you are facing and try to be happy in every situation. The proposed system can be improved to detect more violations. Additionally, the system can help doctors, counsellors, and therapists improve their systems to identify and detect stress in patients. The proposed system could also be developed into a full-fledged software that would allow companies to check the mental health of their employees on a daily basis.

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