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Mood Analysis and Enhancement using Deepface

Bhakti Aher[1],Malcolm Raj[2],Jonathan Ramengmawia[3], Savio Winson[4],Advika Sawant[5]

[1] Computer Department Fr. C. Rodrigues Institute of Technology
[2] Computer Department Fr. C. Rodrigues Institute of Technology, 1022237
[3] Computer DepartmentFr. C. Rodrigues Institute of Technology, 1022238
[4] Computer DepartmentFr. C. Rodrigues Institute of Technology, 1022247
[5] Computer DepartmentFr. C. Rodrigues Institute of Technology, 1022248

ABSTRACT –

The ever-increasing prevalence of mental health issues poses significant challenges to global public health. In response, innovative approaches to support emotional well-being have emerged, including developing mood-enhancing software. This abstract explores the transformative potential of digital interventions in revolutionizing mental health care. Our mood-enhancing software leverages cutting-edge technologies, such as artificial intelligence, and natural language processing, to provide personalized and accessible mental health support. These applications aim to uplift users' moods, alleviate stress, and enhance emotional resilience through diverse features and functionalities. For this project, we will be taking the facial expression of the user as input using OpenCV and detecting the mood using Deepface API. It would classify users' moods into the following moods: - Happy, Sad, Angry, Tired. According to that, the program would enhance the mood by playing songs accordingly and suggesting any media (calming exercise, funny video, anecdotes, motivational quotes, etc.) to the user. Further, we will be using Django to create a user-friendly GUI.

I. Introduction

The escalating global concern regarding mental health has become a pressing issue affecting people across diverse demographics. Mental health issues, ranging from common conditions like anxiety and depression to more severe disorders such as schizophrenia and bipolar disorder, are on the rise globally. This phenomenon is attributed to various factors, including modern lifestyles, heightened stressors, and evolving social dynamics. Compounding the challenge is the pervasive stigma surrounding mental health, which often impedes individuals from seeking the necessary help, thereby exacerbating the problem. It is imperative for societies to proactively prioritize mental well-being by fostering awareness, ensuring the availability of accessible and effective mental health services, and cultivating supportive environments that encourage open discussions about mental health challenges.

Motivation for addressing mental health concerns is underscored by World Health Organization (WHO) statistics, revealing that in 2019, 1 in every 8 people, or 970 million individuals globally, were living with a mental disorder, with anxiety and depressive disorders being the most prevalent. Notably, the COVID-19 pandemic in 2020 significantly intensified these challenges, with a reported 26% increase in anxiety disorders and a 28% increase in major depressive disorders within just one year. Remote work became a necessity, posing challenges in balancing work responsibilities with home life and caregiving. Furthermore, extended closures of schools and universities left young people vulnerable to social isolation, contributing to feelings of anxiety, uncertainty, and loneliness, potentially leading to affective and behavioral problems. The situation also exacerbated risks such as family stress or abuse for some children and adolescents forced to stay at home.

These challenges were further compounded by increased screen time, especially on digital devices like smartphones, tablets, computers, and televisions, with both direct and indirect effects on mental health. The lack of in-person interactions and support networks further negatively impacted mental well-being. Against this backdrop, the aim of our project is to enhance users' mental well-being by detecting their mood through a webcam, creating a user-friendly interactive UI with visually appealing elements, and offering a customizable database of therapeutic audio and video content. The overarching objective is to leverage technology to capture and uplift users' moods, using music as a therapeutic tool to alleviate symptoms associated with various mental health conditions. This report comprehensively outlines the intersection of technology and mental health, emphasizing how our project addresses these critical issues by utilizing innovative approaches to enhance users' emotional well-being.

II. Related Work

1. FaceNet[1]:

The 2015 paper "FaceNet: A Unified Embedding for Face Recognition and Clustering" by Florian Schroff, Dimitri Kalenichenko, and James Philbin made a significant impact on the fields of face recognition and clustering. Their pioneering work introduced a novel paradigm by creating a unified embedding space where face images are mapped into a compact Euclidean space, with distances in this space representing the similarity of faces. This breakthrough allows for both face recognition and clustering tasks to utilize the same feature vectors, streamlining the overall architecture and training process. However, it is essential to acknowledge the gaps and challenges identified in this research. FaceNet exhibits limited robustness in the face of variations in lighting, pose, and expression, which are common in real-world scenarios, and its performance is highly dependent on the quality of the training data, limiting its accessibility in certain applications. Furthermore, the sensitivity to image quality poses a significant challenge, as low-quality or noisy images can lead to suboptimal embeddings.

2. DeepID3[2]:

The paper "DeepID3: Face Recognition with Very Deep Neural Networks" (2015), authored by Yi Sun, Ding Liang, Xiaogang Wang, and Xiaoou Tang, introduces the DeepID3, a significant advancement in the field of face recognition. DeepID3 leverage's two deep neural network architectures inspired by VGG net and GoogLeNet, aiming to improve the accuracy of facial feature extraction and recognition. However, DeepID3 is not without its challenges. Firstly, it heavily relies on a substantial amount of high- quality training data, which can be a barrier for organizations or applications with limited access to diverse and labelled face image datasets. Moreover, the computational demands of DeepID3's deep neural architectures are notable during both the training and inference stages, posing challenges for real-time applications or resource-constrained environments.

3. CosFace[3]:

The 2018 paper "CosFace: Large Margin Cosine Loss for Deep Face Recognition" by Hao Wang, Yitong Wang, Zheng Zhou, Jingchao Zhou, and Dihong Gong introduces a ground breaking loss function, the large margin cosine loss, designed to elevate the performance of deep face recognition systems. This loss function's central innovation is the introduction of a cosine margin term, which significantly increases the angular distance between feature representations, thereby refining the model's ability to distinguish between facial identities. Nonetheless, CosFace encounters certain challenges and limitations.

4. Real-time Non-intrusive Detection of Driver Drowsiness[4]:

The paper "Real-time Non-intrusive Detection of Driver Drowsiness" (2009) by Xun Yu offers a significant advancement in driver safety by introducing a real-time, non- intrusive system for drowsiness detection, relying on the monitoring of drivers' heartbeat signals as an indicator of their alertness. This novel approach provides the foundation for an in-vehicle solution that can promptly identify drowsiness, contributing to enhanced safety on the road.

III. Proposed System

Our project focuses on enhancing image quality through advanced techniques, allowing our face recognition model to perform effectively with low-resolution input images. We integrate Deepface, a highly accurate and reliable face recognition tool, ensuring consistent performance across various environmental conditions, such as lighting variations and facial expressions. Despite being a smaller-scale project, our system maintains low computational demands, emphasizing accessibility and compatibility across platforms, including desktop computers, mobile devices, and embedded systems. This approach ensures efficiency and user-friendliness, making our solution versatile and deployable in a wide range of real-world applications. By combining image enhancement, a robust recognition tool, and a commitment to accessibility, we aim to provide an adaptable, reliable, and efficient system that excels under diverse conditions and meets the needs of different users and environments.
In this project, our core objective is to harness the escalating interest in mental health tools by providing an innovative and personalized user experience. Through sophisticated algorithms, our app will offer mood-based content recommendations, tailoring mental health resources to individual emotional states. Additionally, the app will function as a sanctuary, catering to users' entertainment and relaxation needs with a diverse range of activities designed to unwind and engage the mind. To maximize our outreach, we are committed to ensuring cross-platform compatibility, enabling users to access our resources seamlessly across various devices. Central to our strategy is fostering user engagement and loyalty by consistently delivering diverse and captivating content recommendations. In our project, we're using advanced techniques to enhance the quality of input images before the model processes them. This pre-processing step ensures the model can handle even low-resolution images effectively. We're relying on Deepface, a highly accurate face recognition tool, which remains reliable in various environmental conditions. Despite our project's modest scale, it's designed to be lightweight, requiring minimal computational resources.

These are the steps for our model working:-

1.Capture: The system captures a live image of the user's face via webcam.

2.Preprocess: Automatically preprocess the captured image to meet the input requirements of the DeepFace model. This might include resizing, normalization, and possibly detecting and cropping the face from the image.
3.Analyze: Use the DeepFace library to analyze the preprocessed image. DeepFace provides a straightforward interface for accessing various pre-trained deep learning models. For mood detection, you would likely utilize the model's ability to analyze facial expressions.
4.Interpret: The output from DeepFace is interpreted in terms of the user's mood. DeepFace can identify key facial expressions that correspond to different moods or emotional states.
5.Response: Based on the detected mood, the system selects and presents appropriate therapeutic audio or video content from a pre-curated database. This selection aims to uplift or stabilize the user's mood.
6.User Feedback: Optionally, the system can incorporate a feedback loop where users rate the effectiveness of the suggested content, allowing for improved future recommendations

IV. Implementation

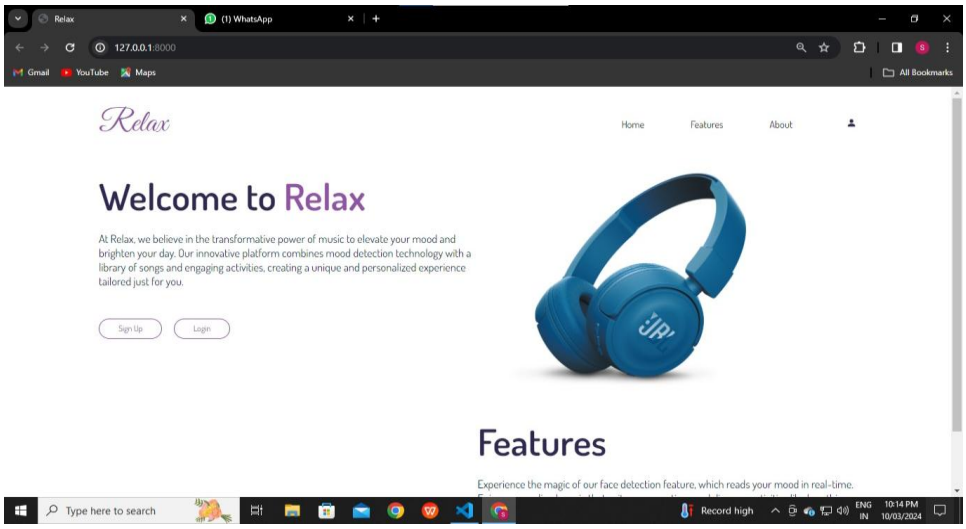

Fig 1.2 Website
This is the screenshot of our webpage made using HTML, CSS, JavaScript

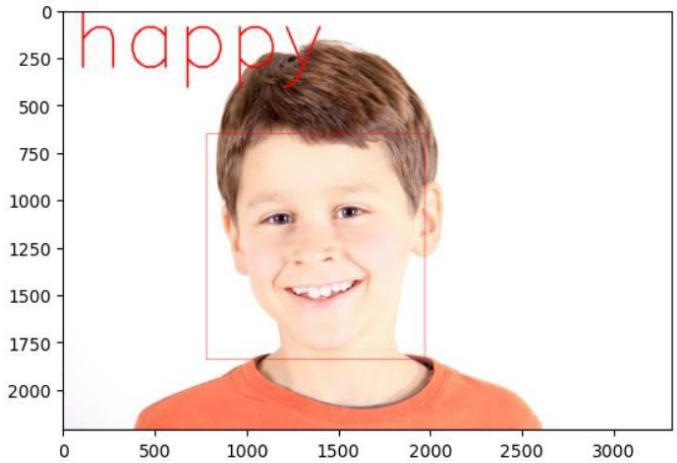

Fig 1.3 Input image

In this Figure the dominant emotion along with a frame around the face ignoring everything else in the background. The face in the image is the main focus and only the dominant emotion is displayed.

```
predictions = DeepFace.analyze(img3, actions=['emotion'],enforce_detection=False)
```

```
Action: emotion: 100%|
```

```
predictions
```

```
[{'emotion': {'angry': 21.826912084449777,
   'disgust': 1.4244409662336022e-05,
   'fear': 1.1747598185848973,
   'happy': 0.0002585218761714526,
   'sad': 53.82109925998441,
   'surprise': 2.3930749659167503e-05,
   'neutral': 23.176938078038464},
  'dominant_emotion': 'sad',
  'region': {'x': 130, 'y': 63, 'w': 187, 'h': 187}}]
```

Fig 1.4 Result

In this image the dominant emotion is being shown. The comparison between all the emotions happens on the basis of percentage and emotion having highest percentage is considered dominant.

V. Conclusion

In our project's development journey, we've achieved significant milestones. We've successfully created a functional mood detection model and gathered ample sample data crucial for our apps effectiveness. Overcoming numerous challenges in our front-end development, we have designed an intuitive and aesthetically pleasing user interface, enhancing the overall user experience.

Looking forward, our focus is on enhancing the system's adaptability to individual user preferences over time by collecting and analysing user feedback and data and adjusting content recommendation accordingly. Additionally, we aim to expand the emotional categories and broaden content options to include a diverse range of materials, thereby providing user with a richer and more personalized experience.

The successful implementation of our project" Mood Analysis and Enhancement using Deep face" enables the system to categorize user's moods accurately, paving the way for personalized content recommendations. This integration of music, songs, stories etc tailored to the user's emotional state enhances the user's mood and the overall user experience on the website.

VI. REFERENCES :

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