**EmoCam: Real-Time Facial Emotion Recognition**

**Team Members –** Saikumar Soma(110605263) Saisanthosh belide(110588793)

**Project Description:**

Facial expression recognition aims to automatically analyse facial images and video to interpret human emotions and nonverbal cues. Machine learning techniques, especially deep neural networks, enable computers to recognize subtle facial muscle movements and map them to categorical emotions or continuous dimensions like valence and arousal. Despite significant progress in developing automated facial expression recognition, challenges remain in improving accuracy across diverse use cases and real-world conditions. Key applications exist in human-computer interaction, mental health treatment, education, automotive safety, and security. Further research is focused on enhancing robustness, reducing bias, and understanding context when interpreting fleeting micro expressions. Automated facial expression recognition has potential to enable more natural and interpretable interaction across various human-centric systems.

A diagram of a computer network

Description automatically generated

**Libraries’ used:**

**OpenCV (cv2)**: It captures video frames, manipulates images, detects faces using Haar Cascade classifiers, and draws bounding boxes.

**NumPy**: It handles numerical and array operations, essential for working with image data.

**TensorFlow and Keras**: These libraries are used to load a pre-trained deep learning model for emotion recognition.

**Matplotlib**: It's employed to display images with bounding boxes and emotion labels.

**PIL (Python Imaging Library)**: Though not directly used, it may be utilized for image-related tasks.

**Code Description and Tutorials:-**

I plan to extend the facial emotion recognition code by integrating advanced deep learning models like CNNs, optimizing real-time performance through techniques such as model quantization.

import cv2

face\_cascade = cv2.CascadeClassifier(cv2.data.haarcascades + 'haarcascade\_frontalface\_default.xml')

**Tutorials:**

1.Face detection: <https://www.youtube.com/watch?v=LopYA64KmdE>

**Conclusion:**

This project provides a solution for automated facial expression recognition using advanced computer vision and deep learning techniques. The approach of detecting face regions and applying a CNN model helps recognize expressions in real-world settings. Further work is focused on improving model accuracy and robustness for practical applications in human-computer interaction, healthcare, and other domains. The project demonstrates the potential of deep learning for automated understanding of human facial expressions.

**References:**

[1] Jaiswal, S., & Valstar, M. (2016). Deep learning the dynamic appearance and shape of facial action units. <https://doi.org/10.1109/wacv.2016.7477625>

[2] Li, J., Mi, Y., Li, G., & Ju, Z. (2019). CNN-Based Facial Expression Recognition from Annotated RGB-D Images for Human–Robot Interaction. International Journal of Humanoid Robotics, 16(04), 1941002.

[3] <https://doi.org/10.1142/s0219843619410020>

[4] Singh, S., & Nasoz, F. (2020). Facial Expression Recognition with Convolutional Neural Networks. In 2020 10th Annual Computing and Communication Workshop and Conference (CCWC). <https://doi.org/10.1109/ccwc47524.2020.9031283>

[5] Begaj, S., Topal, A., & Ali, M. (2020). Emotion Recognition Based on Facial Expressions Using Convolutional Neural Network (CNN)