DAYANANDA SAGAR UNIVERSITY

SCHOOL OF ENGINEERING

HAROHALLI, KANAKAPURA ROAD – 562112

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
(DATA SCIENCE)

FODS PROJECT REPORT

ON

"SIMPLE V/S COMPLEX EMOTION RESPONSE DETECTION IN VIDEO STIMULI"

2025-2026

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

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CERTIFICATE

It is certified that the mini project work entitled "Simple v/s Complex Emotion Response Detection in Video Stimuli" has been carried out at *Dayananda Sagar University*, Bangalore, by *Sanjana - ENG23DS0031, SudhanyaAthriKS - ENG23DS0039, UllasT-ENG23DS0043*, Bonafide student of fourth Semester, B.Tech in partial fulfilment for the award of degree in *Bachelor of Technology in Computer Science & Engineering (Data Science)* during academic year *2025-26*. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the report deposited in departmental library.

The project report has been approved as it satisfies the academic requirements in respect of project work for the said degree.

Signature of the Guide **Signature of the Chairperson**

ACKNOWLEDGEMENT

A project's successful completion offers a sense of satisfaction, but it is never finished without expressing gratitude to everyone who contributed to its accomplishment. We would like to convey our sincere gratitude to our esteemed university, Dayananda Sagar University, for offering the first-rate facilities.

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We would want to thank everyone who has assisted us in successfully completing this project work, both directly and indirectly. The staff has provided us with a great deal of direction and cooperation.

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DECLARATION

We hereby declare that the project entitled **" Simple v/s Complex Emotion Response Detection in Video Stimuli "** submitted to Dayananda Sagar University, Bengaluru, is a bona fide record of the work carried out by me under the guidance of Prof. Sindhu A., Assistant Professor in the Dayananda Sagar University School of Engineering's Department of Computer Science and Engineering (Data Science). This work is submitted toward the partial fulfillment of the requirements for the award of a Bachelor of Technology in Computer Science and Engineering (Data Science).

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ABSTRACT

Emotions play a vital role in how humans perceive and react to the world around them. This research focuses on distinguishing between simple emotions, such as joy and anger, and complex emotions, such as guilt and pride, in response to video-based stimuli. By collecting data through electroencephalogram (EEG) signals and eye gaze tracking, we aim to understand how the human brain and eye movement patterns respond differently to these two categories. The study involves presenting selected video clips to participants and recording their physiological responses. Using signal processing techniques and machine learning models, we extract meaningful patterns to classify emotional states. The findings suggest that while simple emotions tend to produce more immediate and clear responses, complex emotions involve deeper cognitive processing, reflected in both neural activity and gaze behavior. This work provides insights into the emotional processing of the human brain and supports the development of more emotionally intelligent systems.

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INTRODUCTION

Emotions are a fundamental aspect of human perception and decision-making, particularly when interacting with multimedia content. Traditional approaches to tagging videos rely heavily on explicit user input, which may not accurately capture the emotional responses due to subjective biases or memory limitations. This paper explores an implicit tagging system based on physiological and behavioral signals, providing a more objective and scalable alternative for emotion recognition. By analyzing electroencephalogram (EEG) signals and eye-tracking data, including pupil diameter and gaze behavior, this study aims to recover affective labels with high accuracy in a user-independent manner. The growing field of affective computing provides the foundation for this work, which contributes to more intuitive and emotionally aware multimedia systems.

OBJECTIVE AND SCOPE OF WORK

The main objective of human-based emotion recognition is to accurately identify emotional states through observable cues such as facial expressions, voice, physiological signals (e.g., EEG, heart rate), or behavior. This technology aims to enable machines to better understand, respond to, or adapt based on human emotional conditions, particularly in applications like:

- Personalized content delivery
- Mental health monitoring
- Adaptive learning systems
- Human-computer interaction

The scope includes recognizing emotions in real-time, across cultures and individuals, and using multiple data sources (multimodal recognition). It also involves challenges like managing subjectivity, context, and user diversity.

DESCRIPTION OF WORK

This study focuses on the development of a multimodal emotion recognition system that processes human responses to emotion-evoking video stimuli. The primary aim is to differentiate and recognize simple and complex emotions by analyzing viewer reactions—such as EEG signals and eye gaze behavior—triggered during video playback.

Video stimuli were carefully selected to elicit a range of emotions. These included clips designed to provoke simple emotions, such as fear or joy, through immediate and clear visual or auditory cues, as well as clips intended to trigger complex emotions, such as guilt or pride, which often arise from narrative context, moral judgment, or interpersonal relationships depicted in the content.

Simple emotions, like happiness or anger, are typically automatic, short-lived, and universally recognized. They can be reliably evoked by vivid sensory input—such as a jump scare to induce fear or a humorous scene to evoke amusement. Recognition of these emotions is often achievable through basic physiological responses like increased heart rate or facial expressions..

METHODOLOGY

This study used a human-centered approach to recognize emotions based on responses to video stimuli. A group of 24 participants watched 20 emotionally diverse video clips while their brain signals and eye movements were recorded. EEG data were captured using a 32-channel headset, while gaze behavior and pupil size were tracked with an eye tracker.

Each session included a short neutral clip followed by an emotional video, after which participants rated their feelings using a standard self-assessment scale. Features were extracted from EEG and gaze data, then normalized to reduce individual differences. A support vector machine classifier was used to detect emotional states, and performance was evaluated using cross-validation to ensure user-independent results.

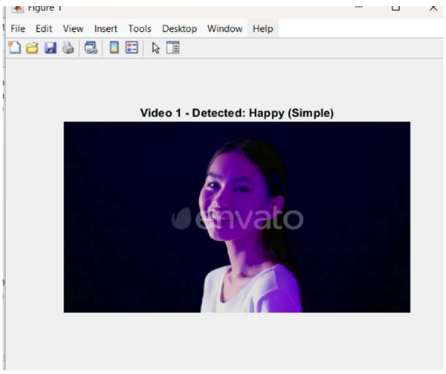
SOURCE CODE

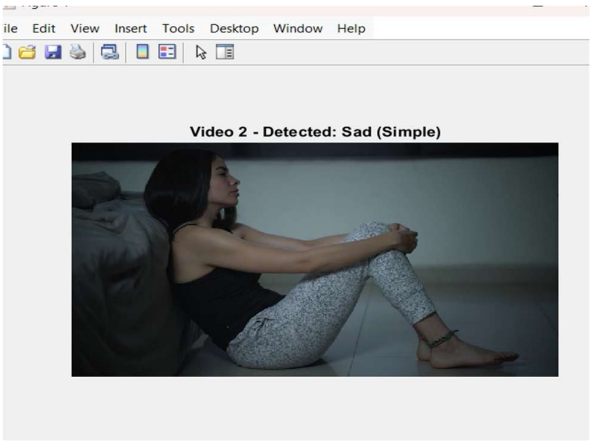
```
simple_emotions = {'Happy', 'Sad', 'Angry'};

complex_emotions = {'Pride', 'Guilt'};

all_emotions = [simple_emotions, complex_emotions];

video_files = {'Happy.mp4', 'Sad.mp4', 'Angry.mp4', 'Pride.mp4', 'Guilt.mp4'};

expected_emotions = {'Happy', 'Sad', 'Angry', 'Pride', 'Guilt'};

load('detected_emotions.mat');

fprintf('Performing EDA: Cleaning and validating detected emotions...\n');

valid_emotions = all_emotions;

cleaned_emotions = cell(size(detected_emotions));

for i = 1:length(detected_emotions)

    emotion = strtrim(detected_emotions{i});

    emotion = lower(emotion); % Normalize case

    emotion = regexprep(emotion, '[^a-z]', '');

    if ~isempty(emotion)

        emotion = [upper(emotion(1)) emotion(2:end)];

    end

    if ismember(emotion, valid_emotions)

        cleaned_emotions{i} = emotion;

    else

        fprintf('Warning: Noisy/Invalid emotion detected at index %d: "%s"\n', i, detected_emotions{i});

        cleaned_emotions{i} = 'Unknown'; % Tag as unknown

    end

end

detected_emotions = cleaned_emotions;

correct_count = 0;
```

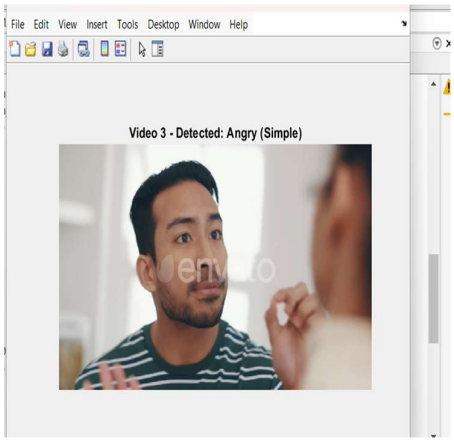
```
fprintf('\nAnalyzing videos for emotion classification...\n\n');
for i = 1:length(video_files)
    video_file = video_files{i};
    detected_emotion = detected_emotions{i};
    try
        v = VideoReader(video_file);
        fprintf('Video %d: %s\n', i, video_file);
    catch ME
        fprintf('Error reading video: %s\n', video_file);
        fprintf('MATLAB Error Message: %s\n', ME.message);
        continue;
    end
if ismember(detected_emotion, simple_emotions)
        emotion_type = 'Simple';
    elseif ismember(detected_emotion, complex_emotions)
        emotion_type = 'Complex';
    else
        emotion_type = 'Unknown';
end
    fprintf('Detected Emotion: %s\n', detected_emotion);
    fprintf('Emotion Type   : %s Emotion\n\n', emotion_type);
    if strcmpi(detected_emotion, expected_emotions{i})
        correct_count = correct_count + 1;
    end
    while hasFrame(v)
        frame = readFrame(v);
        imshow(frame, 'InitialMagnification', 'fit');
```

```
            title(sprintf('Video %d - Detected: %s (%s)', i, detected_emotion, emotion_type));
            drawnow;
            pause(1 / v.FrameRate);
        end
    end
    fprintf('\nEmotion classification completed.\n');
    accuracy = (correct_count / length(video_files)) * 100;
    fprintf('Classification Accuracy: %.2f%%\n', accuracy);
figure;
    confusionchart(expected_emotions, detected_emotions);
    title('Emotion Classification Confusion Matrix');
```

RESULT


File Edit View Insert Tools Desktop Window Help
Video 1 - Detected: Happy (Simple)


ile Edit View Insert Tools Desktop Window Help
Video 2 - Detected: Sad (Simple)


File Edit View Insert Tools Desktop Window Help
Video 3 - Detected: Angry (Simple)

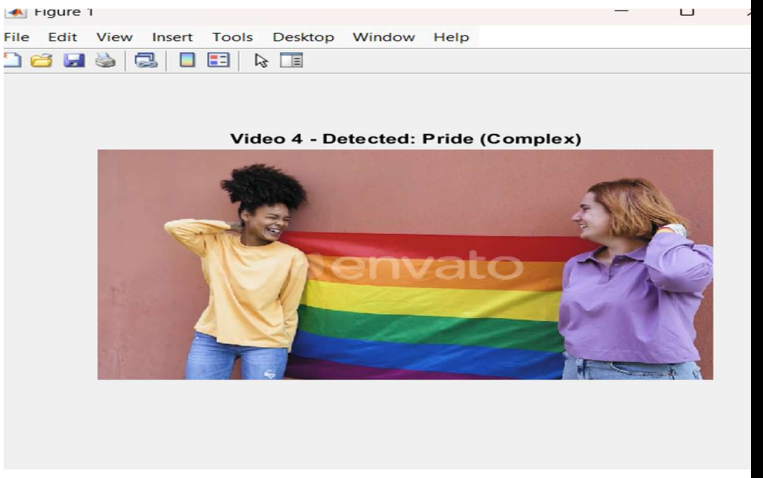


Figure 1
File Edit View Insert Tools Desktop Window Help
Video 4 - Detected: Pride (Complex)

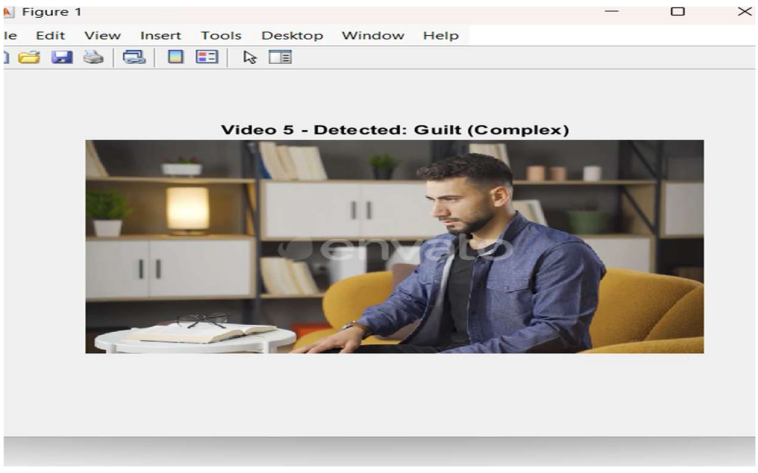


Figure 1
le Edit View Insert Tools Desktop Window Help
Video 5 - Detected: Guilt (Complex)

CONCLUSION

This study demonstrates the feasibility of multimodal, user-independent emotion recognition using EEG and eye-tracking data. Through rigorous experimental design and fusion-based classification, the system achieved superior accuracy in predicting valence and arousal levels compared to unimodal baselines and self-reports. The integration of physiological and behavioral responses enables effective implicit tagging of multimedia content, paving the way for more emotionally intelligent computing systems. These findings mark a significant step toward more natural, responsive, and user-centric multimedia experiences.

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