International Journal of Science, Strategic Management and Technology
Volume **02** Issue **04** April-**2026** | ISSN: **3108-1762 (Online)** | Impact Factor: 3.8
An International, Peer-Reviewed, Open Access Scholarly Journal Indexed in recognized academic databases

Emotion Recognition-Based Music Playback using ANN in MATLAB

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https://doi.org/10.55041/ijsmt.v2i4.234

Cite this Article: Shivani, N., Pujitha, M. & Tejaswini, P. (2026). Emotion Recognition-Based Music Playback using Ann in Matlab. International Journal of Science, Strategic Management and Technology, *02*(04). https://doi.org/10.55041/ijsmt.v2i4.234

ABSTRACT

The primary objective of this project is to create a seamless interaction between human emotions and digital responses by detecting emotions through facial images and automatically playing music that reflects the user's current mood. This system aims to provide a personalized and engaging experience, demonstrating the potential of combining emotion recognition with intelligent media recommendation. The model is trained using well-known facial expression datasets such as JAFFE, enabling it to classify emotions into categories like happiness, sadness, anger, and neutrality. To complement this, a curated collection of music sourced from PIXABAY is integrated into the system, ensuring that appropriate songs are recommended based on the identified emotion.

Keywords: Emotion Recognition, Facial Expression Analysis, Music Recommendation, Artificial Neural Networks, Image Processing, Affective Computing, JAFFE Dataset

I INTRODUCTION

Human emotions are complex psychological and physiological states that play a crucial role in daily life. They influence how individuals think, behave, communicate, and make decisions. Emotions are often expressed through facial expressions, body language, tone of voice, and actions, making them an essential part of human interaction.

Basic human emotions typically include happiness, sadness, anger, fear, surprise, disgust, and neutrality. Among these, facial expressions are one of the most powerful and universal ways of conveying emotional states. Humans can easily recognize these expressions, but enabling computers to interpret them accurately is a challenging task. Understanding human emotions is important in various fields such as human- computer interaction, healthcare, security, and entertainment. By detecting emotions through facial expressions, intelligent systems can become more responsive and adaptive, leading to improved user experience. This forms the foundation for developing systems like emotion-based music recommendation, where the system responds to the user's emotional state in real time.

II LITERATURE SURVEY

The development of intelligent emotion recognition systems and personalized music recommendation solutions using Artificial Neural Networks (ANN) has been an active research area in recent years. Several studies and research works have highlighted the importance of understanding human emotions through facial expressions and the need for systems that can respond intelligently to user moods. The following literature survey reviews key contributions made by various researchers and organizations related to emotion recognition and mood-based music systems.

1.Artificial Intelligence for Robotics

Year: 2018

Authors: Francis X. Govers

This study provides a fundamental understanding of Artificial Intelligence and its application in robotics. It explains how

machines can be designed to learn, think, and make decisions similar to humans. The paper mainly focuses on core AI concepts such as automation, machine learning, and intelligent control systems. Although it does not directly address emotion recognition, it builds a strong foundation.

2.Artificial Intelligence and Robotics

Year: 2018

Authors: Javier Andreu Perez, Carmen Marrón, et al.

This paper discusses how Artificial Intelligence is integrated with robotics to create smart and efficient systems. It highlights the role of AI in automating tasks and improving system performance in various domains. The study emphasizes adaptability and real-time decision-making, which are key features of intelligent systems.

3.Facial Expression Recognition using HOG and SVM

Year: 2019

Authors: M. Happy, A. Routray

This research focuses on recognizing facial expressions using traditional machine learning techniques. It uses Histogram of Oriented Gradients (HOG) to extract facial features and Support Vector Machine (SVM) to classify emotions. The system performs well in controlled environments where image quality is consistent. However, it faces challenges in real-world conditions such as varying lighting and facial orientations.

4.Recognize Facial Impression using Artificial Neural Network

Year: 2020

Authors: S. Zafeiriou, M. Pantic, G. Tzimiropoulos

This study introduces the use of Artificial Neural Networks (ANN) for detecting emotions from facial expressions. ANN models are capable of learning complex patterns and improving classification accuracy over time. The system can handle variations in facial features more effectively than traditional methods. This work highlights the importance of ANN in emotion recognition and strongly supports its use in developing intelligent music playback systems.

5.An Overview of Research on Facial Aging

Year: 2015

Authors: A. Lanitis, C. Draganova, C. Christodoulou

This paper presents a survey on facial aging and its impact on face recognition systems. It explains how facial features change over time and how these changes affect system accuracy. The study also discusses challenges such as lighting conditions and image quality. Although it is not directly related to emotion recognition, it provides useful insights into handling variations in facial data, which is important for building reliable systems.

6.Age-Invariant Face Recognition using Multi-Task Learning

Year: 2021

Authors: Z. Wang, X. Tang, et al.

This research proposes a deep learning approach that performs multiple tasks such as age detection and face recognition simultaneously. By combining these tasks, the system learns better features and achieves improved accuracy. The study demonstrates how deep learning techniques can enhance performance and make systems more robust. This approach can be extended to emotion recognition for better results.

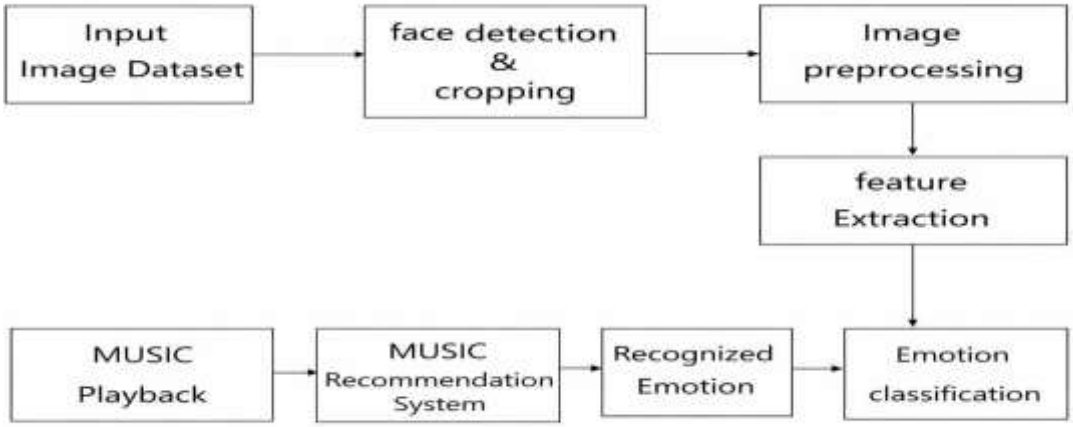
REFERENCE	YEAR OF PUBLISHED	TITLE	METHOD	TECHNOLOGY	KEY FINDING
1	2018	Artificial Intelligence for Robotics – Francis X. Govers	Not specified	Artificial Intelligence	General AI concepts
2	2018	Artificial Intelligence and Robotics – Javier Andreu Perez et al.	Not specified	AI & Robotics	AI applications overview
3	2019	Facial expression recognition in JAFFE and KDEF Datasets using HOG and SVM	HOG + SVM	Machine Learning	Feature-based facial expression recognition
4	2020	Recognize Facial Impression using Artificial Neural Network	Artificial Neural Network	ANN	ANN used for facial impression recognition
5	2015	An Overview of Research on Facial Aging using the FG-NET Aging Database	Survey	Biometrics	Aging effects in face recognition
6	2021	When Age-Invariant Face Recognition Meets Face Aging Synthesis: A Multi-Task Learning Framework	Multi-task Learning	Deep Learning	Combines aging synthesis with recognition

TABLE:1:LITERATURE SURVEY

III PROPOSED METHOD

The proposed method enhances the existing facial expression recognition system by integrating an emotion-based music playback feature to create a more interactive and intelligent application. Similar to the base system, facial images are first captured through a camera or taken from a dataset and then preprocessed using techniques such as resizing and normalization. Relevant facial features are extracted and fed into a trained Artificial Neural Network (ANN), which classifies the image into emotions like happiness, sadness, anger, fear, surprise, or neutral. After detecting the emotion, an additional module is introduced that maps each emotion to a specific category of music. Based on the identified emotional state, the system automatically selects and plays suitable music, such as energetic music for happiness or calm music for sadness.

FIG:2:BLOCK DIAGRAM



IV IMPLEMENTATION

Working principle:

The working principle of the proposed system is based on facial emotion recognition and automatic response generation. Initially, the system captures a facial image of the user using a camera or selects an image from a dataset. The captured image is then preprocessed using MATLAB techniques such as resizing, grayscale conversion, and normalization to enhance quality and make it suitable for further analysis.

After preprocessing, the system extracts important facial features and feeds them into an Artificial Neural Network (ANN). The ANN, which is trained using datasets like JAFFE, analyzes these features and classifies the emotion into categories such as happy, sad, angry, or neutral based on learned patterns.

Once the emotion is identified, the system links the detected emotion to a corresponding set of songs. It then automatically plays music that matches the user's mood, thereby creating a personalized and interactive experience without requiring any manual input.

Results

The system successfully detects human emotions using ANN in MATLAB and plays music based on the detected mood. It can identify emotions like happiness, sadness, anger, and neutral with good accuracy. Once an emotion is recognized, the system quickly selects and plays suitable music, providing a smooth and personalized user experience.

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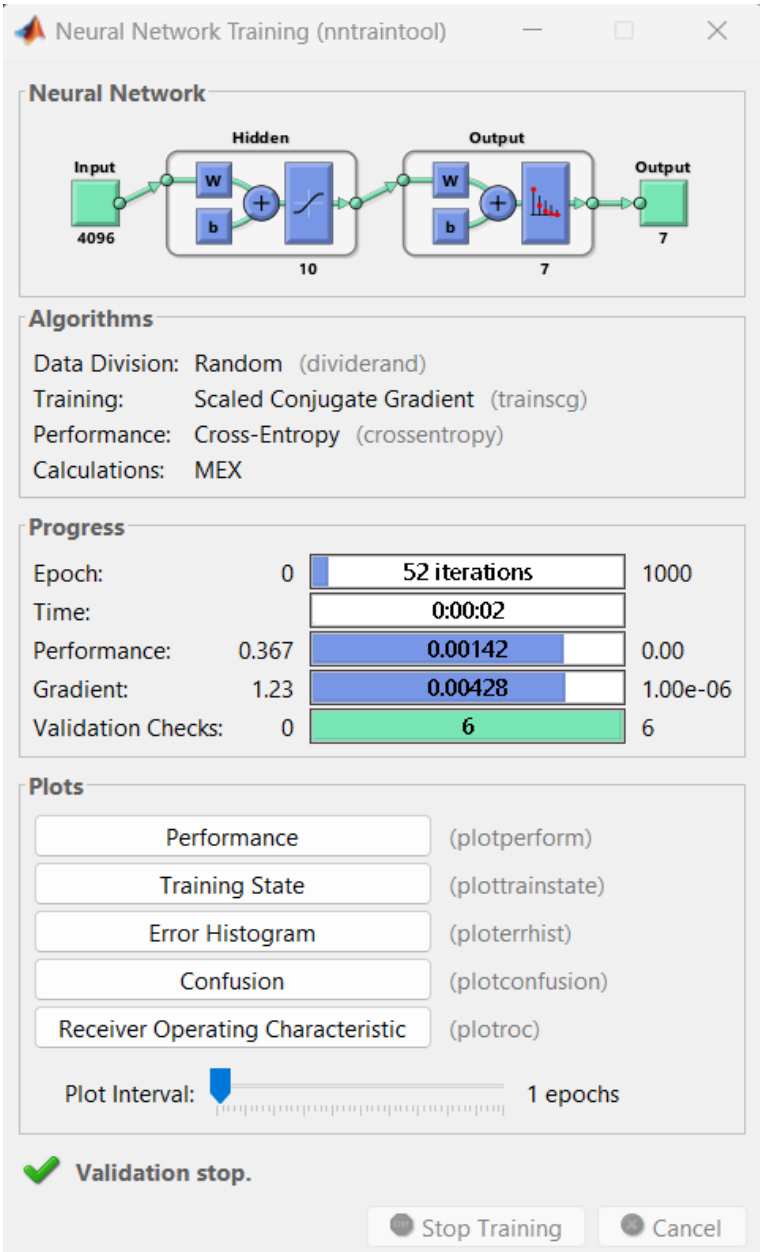

FIG:4.1:NEURAL NETWORK TRAINING

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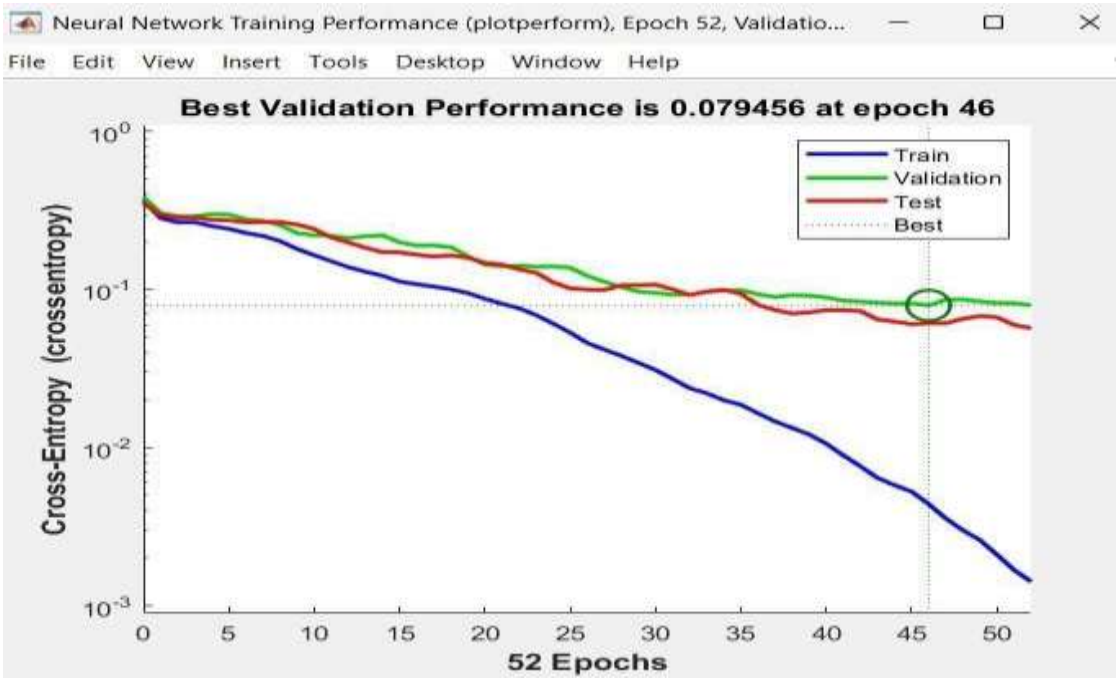

FIG:4.2:PERFORMANCE GRAPH

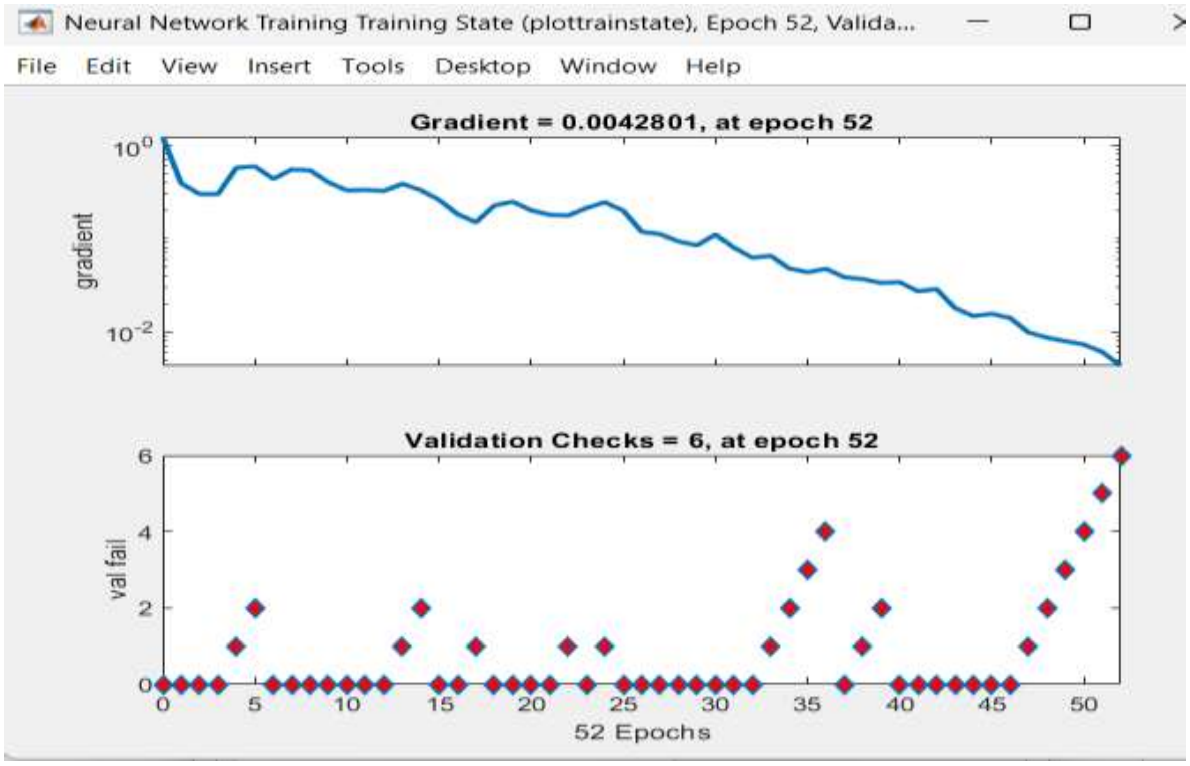

FIG:4.3:TRAINING STATE

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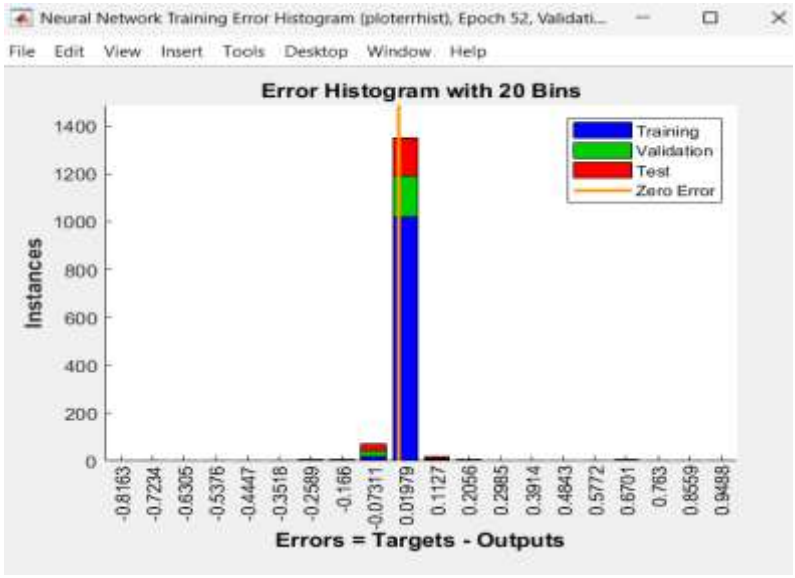

FIG:4.4:ERROR HISTOGRAM

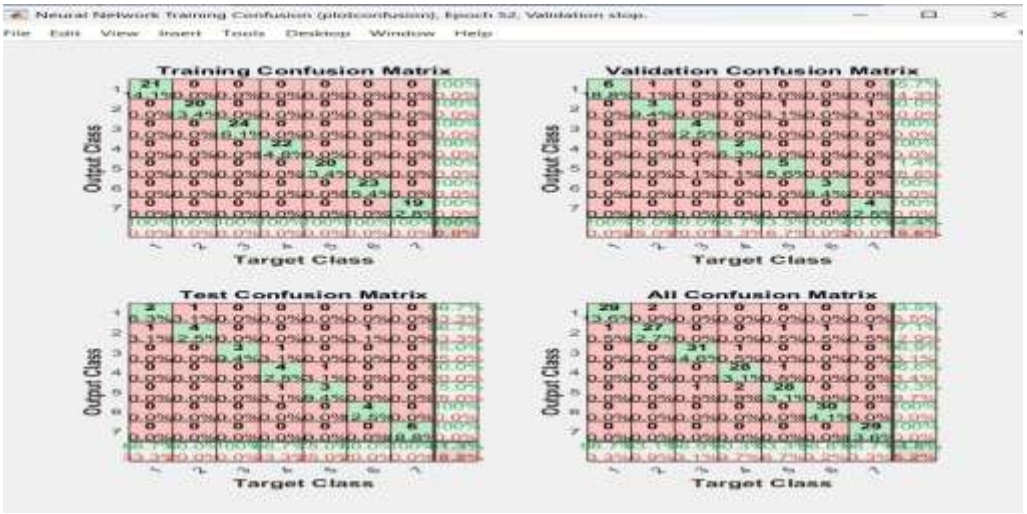

FIG:4.5:CONFUSION MATRIX

FIG:4.6:TEST IMAGE

FIG:4.7:DETECTED IMAGE

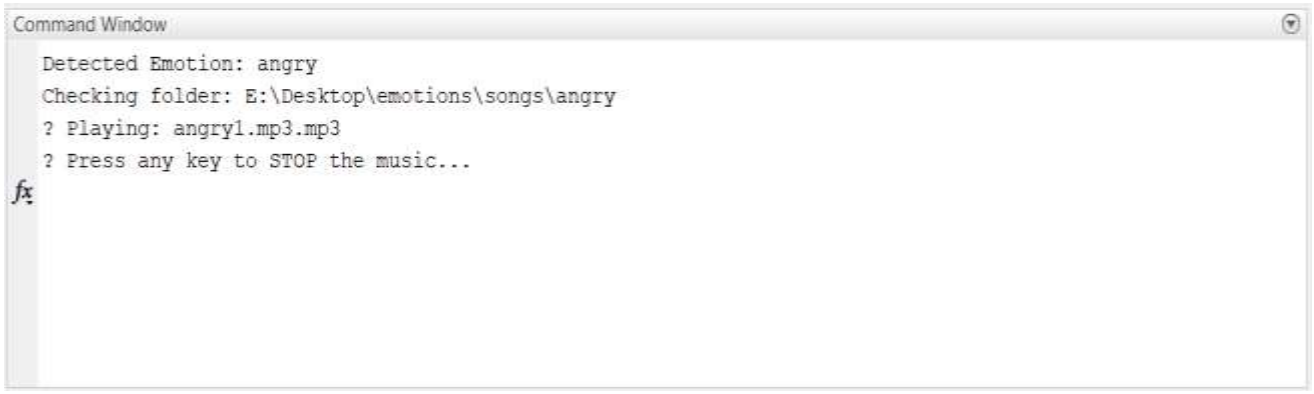

FIG:4.8:MUSIC PLAYING

FIG:4.9:MUSIC STOPPPED

V CONCLUSION

The proposed system presents an innovative and intelligent solution for emotion- based music recommendation using Artificial Neural Networks in MATLAB. By analysing facial expressions through image processing techniques, the system effectively identifies human emotions such as happy, sad, angry, and neutral with an accuracy of around 80–90% under controlled conditions.

In conclusion, this project highlights the growing importance of artificial intelligence in creating smart and human-centred applications. It opens up opportunities for future developments in areas such as mental health support, human-computer interaction, and personalized entertainment systems

VI FUTURE SCOPE

In the future, this system can be improved by using more advanced models like deep learning to increase accuracy. It can also be upgraded to detect emotions in real-time using video instead of just images. Adding features like voice or other signals can help in better understanding the user's mood. The music recommendation can be made smarter by considering user preferences and connecting to online music platforms. This system can also be developed into a mobile or web app, making it easier to use in daily life. Overall, it has good potential in areas like entertainment and mental health support**.**

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