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DEPARTMENT OF COMPUTER SCIENCE

MASTER OF COMPUTER APPLICATION

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SPEECH EMOTION RECOGNITION

By

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Project report submitted in partial fulfilment of the requirements for the award of the degree of

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DEPARTMENT OF COMPUTER SCIENCE

SCHOOL OF ENGINEERING & TECHNOLOGY

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BONAFIDE CERTIFICATE

This is to certify that this project work entitled "**SPEECH EMOTION RECOGNITION**" is a bonafide record of work done by **Mr. DHEEPAN G** (Reg. Number 22352018) in the partial fulfilment for the degree of **Master of Computer Applications** of Pondicherry University.

This work has not been submitted elsewhere for the award of any other degree to the best of our knowledge.

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Finally, I would like to express my regards for all the faculty members of Department of Computer Science and others involved in this project, directly or indirectly

(DHEEPAN G)

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ABSTRACT

The Speech Emotion Recognition (SER) project aims to develop an intelligent system capable of recognizing human emotions from speech signals. Emotion recognition from speech plays a crucial role in various applications such as human-computer interaction, sentiment analysis and psychological research.

In this project, we leverage machine learning techniques and signal processing methods to analyse speech signals and extract features that capture the emotional content of the speech. The project involves several key steps, including data collection, preprocessing, feature extraction, model training and evaluation.

We utilize techniques such as Mel-Frequency Cepstral Coefficients (MFCCs), low-pass filtering, machine learning models like Support Vector Machine(SVM) and deep learning models such as Convolutional Neural Networks (CNNs) and Long Short-Term Memory (LSTM) networks for emotion classification. The system aims to accurately classify emotions such as happiness, sadness, anger and neutral states from speech signals. Through experimentation and evaluation, the effectiveness of the proposed approach in recognizing emotions from speech is demonstrated.

The SER project holds the potential to contribute to various domains such as human-computer interaction, mental health assessment and affective computing, thereby enhancing our understanding and interaction with human emotions.

1. INTRODUCTION

1.1 ABOUT THE PROJECT

The Speech Emotion Recognition (SER) project attempts to create a sophisticated system capable of effectively detecting and categorizing emotions conveyed through human speech captured in audio recordings. Emotion recognition holds immense promise across diverse domains, including but not limited to human-computer interaction, customer service and healthcare. Leveraging a fusion of machine learning algorithms and advanced signal processing techniques, this project aims to meticulously extract pertinent features from speech signals. These features are then employed to train robust models that can discern and classify emotions with a high degree of accuracy. By accurately discerning the emotional nuances within spoken language, the system stands to offer invaluable insights, thereby elevating user experiences and fostering enhanced communication dynamics.

1.2 PROJECT PLAN

Our project aims to develop an advanced system for emotion recognition in human speech using machine learning techniques. Similar to human perception of emotions through voice, we are training computers to achieve this capability. Initially, we collect speech recordings and apply noise reduction techniques to ensure clear data. Subsequently, we employ sophisticated algorithms to analyse various aspects of the recordings, such as speech rate and tone, to extract emotional cues. Leveraging this information, our system learns to classify different emotions, including happiness, sadness and neutral. We utilize a range of techniques to train the system effectively. Following training, rigorous testing is conducted to evaluate the system's ability to accurately identify emotions in new recordings. Ultimately, our objective is to enhance the computer's proficiency in understanding emotions in speech, which holds significant potential for applications such as improving the empathetic capabilities of virtual assistants and assisting therapists in better understanding their clients.

2. PROBLEM DEFINITION & FEASIBILITY ANALYSIS

2.1 PROBLEM DEFINITION

The problem we aim to address is the accurate recognition of emotions conveyed through human speech. Emotions play a crucial role in communication and being able to detect them accurately can enhance various applications, including virtual assistants, customer service systems and mental health monitoring tools. However, recognizing emotions solely based on audio data poses significant challenges due to the complexity and variability of human speech.

2.2 EXISTING SYSTEM

Currently, emotion recognition systems primarily rely on manual analysis or basic rule-based approaches, which often lack accuracy and scalability. These systems struggle to capture subtle nuances in speech that convey different emotions. Additionally, they may require extensive human intervention for training and customization, limiting their practicality and efficiency.

2.3 PROPOSED SYSTEM

Our system automates speech emotion recognition using Python and machine learning techniques. It begins by preprocessing audio data to remove noise and extract features like MFCCs. These features are then scaled and used to train SVM, LSTM and CNN classifiers for emotion classification. Evaluation metrics and confusion matrices are generated to assess classifier performance. The system aims to provide accurate emotion detection in real-time, with potential applications in human-computer interaction and mental health monitoring.

MFCC

MFCC is a feature extraction technique widely used in speech and audio processing. MFCCs are used to represent the spectral characteristics of sound in a way that is well-suited for various machine learning tasks, such as speech recognition and music analysis.

In simpler terms, MFCCs are a set of coefficients that capture the shape of the power spectrum of a sound signal.

In our speech emotion recognition system, we employ three different classifiers: Support Vector Machine (SVM), Long Short-Term Memory (LSTM), and Convolutional Neural Network (CNN). Each classifier utilizes different techniques for emotion classification and has its own strengths and weaknesses.

1. **Support Vector Machine (SVM):**
    - SVM is a supervised learning model that analyzes data for classification and regression analysis.
    - It works by finding the hyperplane that best separates different classes in the feature space.
    - SVM is effective in high-dimensional spaces and is robust against overfitting.
    - However, it may not perform well with large datasets and complex nonlinear relationships between features.
2. **Long Short-Term Memory (LSTM):**
    - LSTM is a type of recurrent neural network (RNN) architecture designed to model sequential data.
    - It is well-suited for analyzing time-series data and has memory cells that can maintain information over time steps.
    - LSTM is effective in capturing long-term dependencies in sequential data, making it suitable for analyzing audio signals.
    - However, training LSTM models can be computationally expensive and requires careful tuning of hyperparameters.

3. **Convolutional Neural Network (CNN):**
    - CNN is a deep learning model commonly used for image recognition tasks.
    - It consists of convolutional layers that extract spatial features from input data.
    - CNN can be adapted for analysing one-dimensional data like audio signals by treating them as spectrograms or time-frequency representations.
    - While CNN is efficient in learning hierarchical representations from data, it may require larger datasets for training and can be sensitive to variations in input data.

2.4 FEASIBILITY STUDY

2.4.1 TECHNICAL FEASIBILITY

From a technical standpoint, our project is feasible as it leverages well-established machine learning frameworks and libraries such as TensorFlow, Keras and scikit-learn. These tools provide comprehensive support for building, training, and evaluating complex models for emotion recognition. Additionally, the availability of open-source datasets and pre-trained models further enhances the technical feasibility of our project.

2.4.2 OPERATIONAL FEASIBILITY

Operationally, our system can be integrated into various applications and platforms with ease. Once trained, the emotion recognition model can be deployed as a standalone service or integrated into existing systems through APIs. The system's user-friendly interface allows for seamless interaction, making it accessible to both developers and end-users.

2.4.3 ECONOMIC FEASIBILITY

Economically, our project offers significant potential for cost savings and efficiency improvements in various domains. By automating the process of emotion recognition, organizations can reduce the need for manual analysis and intervention, leading to lower operational costs and increased productivity. Additionally, the scalability of our system allows for widespread adoption across different industries, further enhancing its economic feasibility.

3. SOFTWARE REQUIREMENTS SPECIFICATION

3.1 HARDWARE REQUIREMENTS

1. **Processor (CPU)**
   - Dual-core processor or higher.
   - Recommended: Intel Core i5 or Ryzen 5.
2. **Memory (RAM)**
   - Minimum: 4 GB RAM.
   - Recommended: 8 GB RAM or higher for better performance.
3. **Storage Space**
   - At least 3 GB of free disk space for storing datasets, audio files, and project files.
   - Additional space may be required depending on the size of datasets and generated files.

3.2 SOFTWARE REQUIREMENTS

1. **Operating System**

   Windows 10, macOS, or Linux-based operating system.

2. **Python**

   Ensure you have Python installed on your system. You can download and install Python from the official Python website https://www.python.org/downloads/

3. **Text editor**

   Vs code

3.3 SYSTEM REQUIREMENTS

PYTHON LIBRARIES

pandas

For data manipulation and handling Excel files.

scikit-learn

For machine learning algorithms and evaluation metrics.

NumPy

For numerical operations.

librosa

For audio feature extraction.

pydub

For audio processing and manipulation.

SciPy

For signal processing and filtering.

Keras with TensorFlow backend

For building and training deep learning models.

seaborn

For statistical data visualization based on matplotlib.

matplotlib

For creating static, animated, and interactive visualizations in Python.

Install these libraries using:

pip install pandas scikit-learn numpy librosa pydub scipy keras tensorflow seaborn matplotlib

DATASET

(RAVDESS) Ryerson Audio-Visual Database of Emotional Speech and Song is used as dataset for this

INTERNET

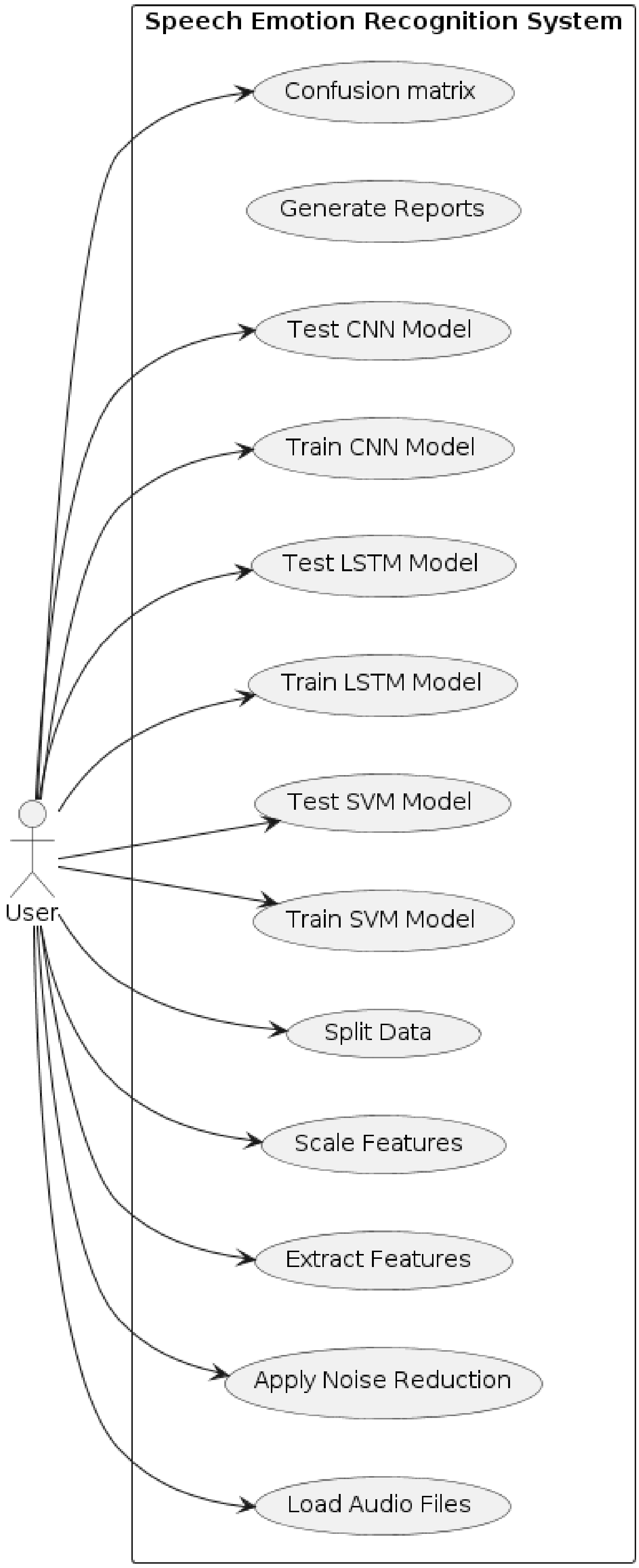
This software will require good internet connection to connect with servers and a good processing system to give best performance

4. SYSTEM DESIGN

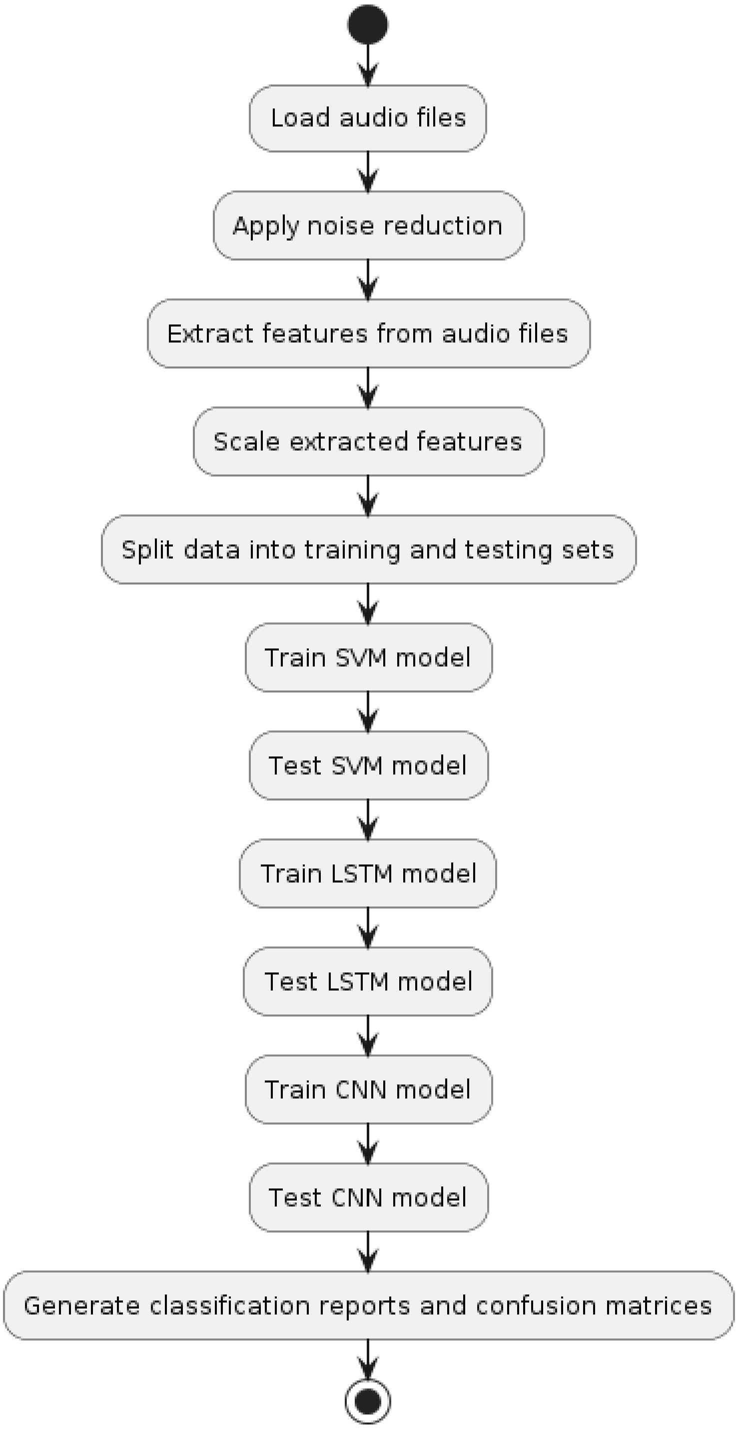
4.1 MODULE DESCRIPTION

1. **Data Loading and Preprocessing:**
    - This module handles the loading of audio data from the dataset folder and performs noise reduction to enhance the quality of audio files.
2. **Feature Extraction:**
    - Responsible for extracting relevant features from the audio files using libraries like librosa and pydub.
3. **Feature Scaling:**
    - Scales the extracted features to ensure uniformity and improve model performance during training.
4. **Data Splitting:**
    - Splits the dataset into training and testing subsets for model evaluation.
5. **Audio Classification:**
    - This module comprises three sub-modules:
        - SVM: Utilizes Support Vector Machine classifier for audio classification.
        - LSTM: Implements Long Short-Term Memory neural network for audio classification.
        - CNN: Employs Convolutional Neural Network for audio classification.
6. **Evaluation and Reporting:**
    - Generates classification reports and confusion matrices to evaluate the performance of each classification model.

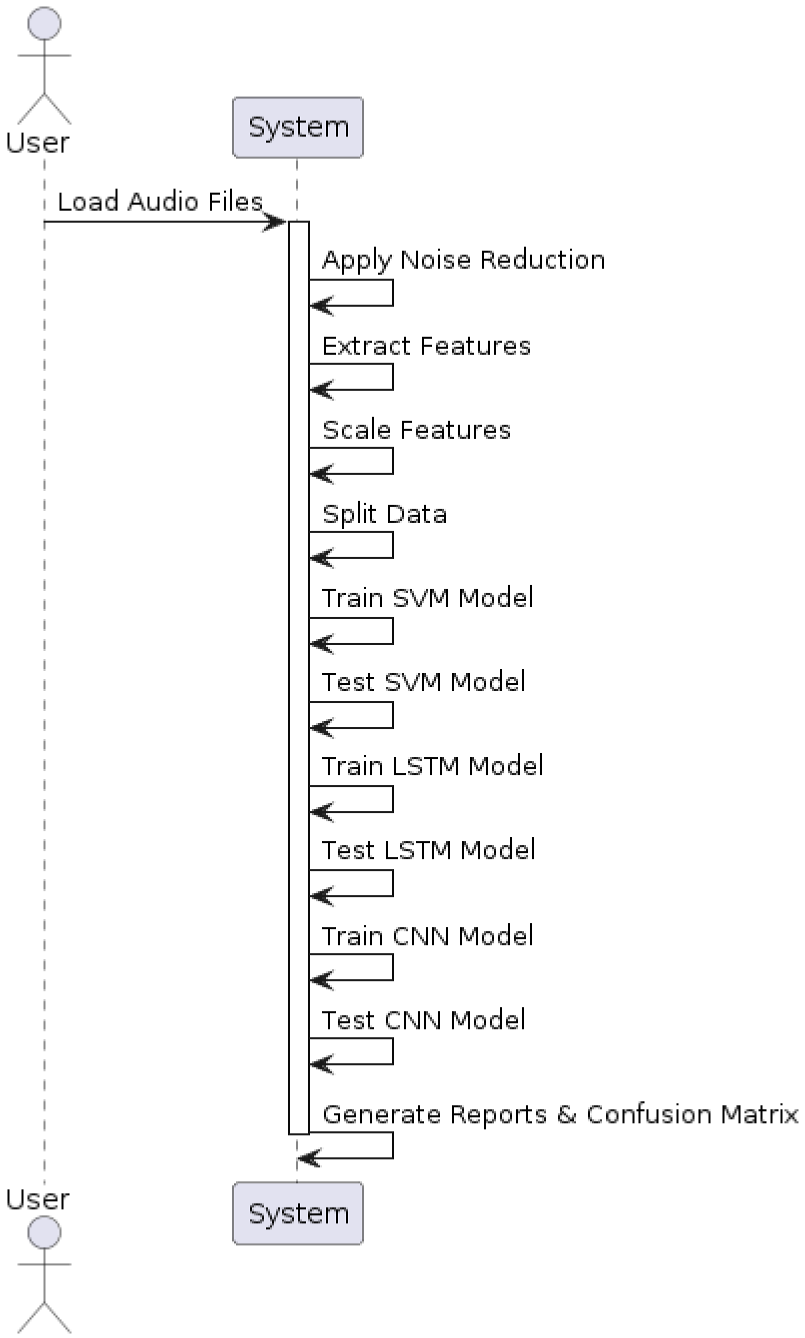
4.2 USE CASE DIAGRAM



4.3 ACTIVITY DIAGRAM



4.4 SEQUENCE DIAGRAM



5. IMPLEMENTATION

5.1 NOISE REDUCTION

This module preprocesses audio data by applying a low-pass filter to reduce background noise, improving the quality of audio recordings.

5.2 FEATURE EXTRACTION

Extracts relevant features from audio signals, such as Mel-Frequency Cepstral Coefficients (MFCCs), which are used as input for emotion classification.

5.3 FEATURE SCALING

Normalizes or scales extracted features to ensure consistency and improve the performance of machine learning models.

5.4 DATA SPLITTING

Splits the dataset into training and testing sets to evaluate model performance.

5.5 CLASSIFIER SELECTION

Chooses appropriate classifiers such as Support Vector Machines (SVM), Convolutional Neural Networks (CNNs), or Long Short-Term Memory (LSTM) networks for emotion classification.

5.6 MODEL TRAINING

Trains the selected classifier using the training data to learn patterns and relationships between input features and emotion labels.

5.7 MODEL EVALUATION

Evaluates the trained model's performance using the testing data, calculating metrics such as accuracy, precision, recall and F1-score.

6. SYSTEM TESTING

6.1 SYSTEM IMPLEMENTATION

- Implement each module of the project according to the design specifications.
- Ensure that the modules are developed using appropriate programming languages and libraries.
- Perform rigorous testing during the implementation phase to catch any bugs or errors early on.

6.2 TESTING

6.2.1 UNIT TESTING

- Conduct unit testing for each module individually to ensure that they perform as expected.

- Verify the correctness of functions and methods within each module.

- Test boundary cases and edge conditions to check for robustness.

- Use testing frameworks like pytest or unittest to automate the testing process.

6.2.2 VALIDATION TESTING

- Validate the system against the user requirements and specifications.

- Ensure that the system meets the intended objectives and functionalities.

- Verify that the system accurately detects and classifies emotions from speech recordings.

- Evaluate the system's performance in terms of accuracy, speed, and resource utilization.

6.2.3 FUNCTIONAL TESTING

- Perform functional testing to validate the end-to-end functionality of the system.

- Test each feature and functionality to ensure they work as intended.

- Conduct scenario-based testing to simulate real-world usage scenarios.

- Verify the integration of different modules and components within the system.

- Identify and address any discrepancies or deviations from the expected behavior.

7. CONCLUSION

In our scenario, the accuracy of SVM is 0.75, LSTM is 0.25, and CNN is 0.5. Based on these results, SVM appears to be the most accurate classifier for your speech emotion recognition task. SVM's high accuracy indicates that it effectively separates different emotional states in the feature space and performs well on our dataset. However, it's essential to consider other factors such as computational efficiency and scalability when choosing the best classifier for your application.

APPENDIX I: SCREENSHOTS

CLEANED AUDIO SAVED IN ACTOR_01

```
Cleaned audio saved to D:/MCA/4th sem/SER3/output/Actor_01\cleaned_03-02-05-02-01-01-01_angry.wav
Cleaned audio saved to D:/MCA/4th sem/SER3/output/Actor_01\cleaned_03-02-05-02-01-02-01_angry.wav
Cleaned audio saved to D:/MCA/4th sem/SER3/output/Actor_01\cleaned_03-02-05-02-02-01-01_angry.wav
Cleaned audio saved to D:/MCA/4th sem/SER3/output/Actor_01\cleaned_03-02-05-02-02-02-01_angry.wav
Cleaned audio saved to D:/MCA/4th sem/SER3/output/Actor_01\cleaned_03-02-06-01-01-01-01_fear.wav
Cleaned audio saved to D:/MCA/4th sem/SER3/output/Actor_01\cleaned_03-02-06-01-01-02-01_fear.wav
Cleaned audio saved to D:/MCA/4th sem/SER3/output/Actor_01\cleaned_03-02-06-01-02-01-01_fear.wav
Cleaned audio saved to D:/MCA/4th sem/SER3/output/Actor_01\cleaned_03-02-06-01-02-02-01_fear.wav
Cleaned audio saved to D:/MCA/4th sem/SER3/output/Actor_01\cleaned_03-02-06-02-01-01-01_fear.wav
Cleaned audio saved to D:/MCA/4th sem/SER3/output/Actor_01\cleaned_03-02-06-02-01-02-01_fear.wav
Cleaned audio saved to D:/MCA/4th sem/SER3/output/Actor_01\cleaned_03-02-06-02-02-01-01_fear.wav
Cleaned audio saved to D:/MCA/4th sem/SER3/output/Actor_01\cleaned_03-02-06-02-02-02-01_fear.wav
```

FEATURE SCALING

```
PS D:\MCA\4th sem\SER3> & "C:/Program Files/Python312/python.exe" "d:/MCA/4th sem/SER3/3_feature_scaling.py"
                                        Audio File    MFCC_1    MFCC_2    MFCC_3    MFCC_4    MFCC_5  ...    MFCC_9   MFCC_10   MFCC_11   MFCC_12   MFCC_13  Emotion
0  D:/MCA/4th sem/SER3/output/Actor_01\cleaned_01... -1.402856  1.196844  1.128203  1.235225  0.276047  ... -0.330737  0.462209  1.852550  1.867828  0.138462  disgust
1  D:/MCA/4th sem/SER3/output/Actor_01\cleaned_01... -0.662524 -0.514808  1.537641  2.051415  2.032518  ...  1.688295  1.630015  1.995256  2.276237  1.156577     fear
2  D:/MCA/4th sem/SER3/output/Actor_01\cleaned_01... -1.313647 -1.633121  0.927738  1.558148  0.322233  ...  1.207835  1.275419  1.399727  1.085798  0.268260  neutral
3  D:/MCA/4th sem/SER3/output/Actor_01\cleaned_01... -1.116778 -0.902882  0.885017  1.333164  0.497132  ...  0.789694  0.712723  1.348356  1.469034  0.475289       ps
4  D:/MCA/4th sem/SER3/output/Actor_01\cleaned_01... -1.923467 -0.926845  0.739330  1.267543  0.862896  ...  1.233841  0.998790  1.116378  1.136657  0.579251      sad

[5 rows x 15 columns]
```

DATA SPLITTING

```
PS D:\MCA\4th sem\SER3> & "C:/Program Files/Python312/python.exe" "d:/MCA/4th sem/SER3/4_split_data.py"
Data split and saved successfully.
```

AUDIO CLASSIFICATION SVM

```
PS D:\MCA\4th sem\SER3> & "C:/Program Files/Python312/python.exe" "d:/MCA/4th sem/SER3/5_audio_classification_svm.py"
Classification report saved successfully.
PS D:\MCA\4th sem\SER3>
```

AUDIO CLASSIFICATION LSTM

```
PS D:\MCA\4th sem\SER3> & "C:/Program Files/Python312/python.exe" "d:/MCA/4th sem/SER3/5_audio_classification_lstm.py"
C:\Users\dheep\AppData\Roaming\Python\Python312\site-packages\keras\src\layers\rnn\rnn.py:204: UserWarning: Do not pass an `input_shape`/
`input_dim` argument to a layer. When using Sequential models, prefer using an `Input(shape)` object as the first layer in the model inst
ead.
  super().__init__(**kwargs)
Epoch 1/10
4/4 ━━━━━━━━━━━━━━━━━━━━ 1s 6ms/step - accuracy: 0.1015 - loss: 2.0730
Epoch 2/10
4/4 ━━━━━━━━━━━━━━━━━━━━ 0s 5ms/step - accuracy: 0.2263 - loss: 2.0298
Epoch 3/10
4/4 ━━━━━━━━━━━━━━━━━━━━ 0s 6ms/step - accuracy: 0.2222 - loss: 1.9924
Epoch 4/10
4/4 ━━━━━━━━━━━━━━━━━━━━ 0s 6ms/step - accuracy: 0.2581 - loss: 1.9623
Epoch 5/10
4/4 ━━━━━━━━━━━━━━━━━━━━ 0s 6ms/step - accuracy: 0.2971 - loss: 1.9130
Epoch 6/10
4/4 ━━━━━━━━━━━━━━━━━━━━ 0s 5ms/step - accuracy: 0.2602 - loss: 1.8493
Epoch 7/10
4/4 ━━━━━━━━━━━━━━━━━━━━ 0s 6ms/step - accuracy: 0.2456 - loss: 1.8092
Epoch 8/10
4/4 ━━━━━━━━━━━━━━━━━━━━ 0s 6ms/step - accuracy: 0.3226 - loss: 1.7953
Epoch 9/10
4/4 ━━━━━━━━━━━━━━━━━━━━ 0s 4ms/step - accuracy: 0.3564 - loss: 1.7425
Epoch 10/10
4/4 ━━━━━━━━━━━━━━━━━━━━ 0s 5ms/step - accuracy: 0.3793 - loss: 1.7236
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 91ms/step
```

AUDIO CLASSIFICATION CNN

```
Epoch 2/20
2/2 ━━━━━━━━━━━━━━━━━━━━ 0s 4ms/step - accuracy: 0.3397 - loss: 1.9800
Epoch 3/20
2/2 ━━━━━━━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3067 - loss: 1.9077
Epoch 4/20
2/2 ━━━━━━━━━━━━━━━━━━━━ 0s 3ms/step - accuracy: 0.3449 - loss: 1.8432
Epoch 5/20
2/2 ━━━━━━━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.3336 - loss: 1.7794
Epoch 6/20
2/2 ━━━━━━━━━━━━━━━━━━━━ 0s 3ms/step - accuracy: 0.3622 - loss: 1.7275
Epoch 7/20
2/2 ━━━━━━━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4229 - loss: 1.6458
Epoch 8/20
2/2 ━━━━━━━━━━━━━━━━━━━━ 0s 3ms/step - accuracy: 0.3977 - loss: 1.6398
Epoch 9/20
2/2 ━━━━━━━━━━━━━━━━━━━━ 0s 3ms/step - accuracy: 0.4472 - loss: 1.5678
Epoch 10/20
2/2 ━━━━━━━━━━━━━━━━━━━━ 0s 4ms/step - accuracy: 0.4810 - loss: 1.5203
Epoch 11/20
2/2 ━━━━━━━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.4705 - loss: 1.4767
Epoch 12/20
2/2 ━━━━━━━━━━━━━━━━━━━━ 0s 4ms/step - accuracy: 0.4775 - loss: 1.4344
Epoch 13/20
2/2 ━━━━━━━━━━━━━━━━━━━━ 0s 4ms/step - accuracy: 0.5399 - loss: 1.4056
Epoch 14/20
2/2 ━━━━━━━━━━━━━━━━━━━━ 0s 4ms/step - accuracy: 0.5459 - loss: 1.3348
Epoch 15/20
2/2 ━━━━━━━━━━━━━━━━━━━━ 0s 3ms/step - accuracy: 0.5528 - loss: 1.3064
Epoch 16/20
2/2 ━━━━━━━━━━━━━━━━━━━━ 0s 3ms/step - accuracy: 0.5762 - loss: 1.2541
Epoch 17/20
2/2 ━━━━━━━━━━━━━━━━━━━━ 0s 2ms/step - accuracy: 0.5971 - loss: 1.1866
Epoch 18/20
2/2 ━━━━━━━━━━━━━━━━━━━━ 0s 3ms/step - accuracy: 0.6248 - loss: 1.1349
Epoch 19/20
2/2 ━━━━━━━━━━━━━━━━━━━━ 0s 3ms/step - accuracy: 0.6222 - loss: 1.1055
Epoch 20/20
2/2 ━━━━━━━━━━━━━━━━━━━━ 0s 3ms/step - accuracy: 0.6612 - loss: 1.0356
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 47ms/step
```

CONFUSION MATRIX CNN

```
Confusion Matrix (CNN):
         angry  calm  disgust  fear  happy  neutral  ps  sad
angry        3     0        0     0      0        0   1    0
calm         0     2        0     0      0        0   0    2
disgust      0     0        1     0      1        0   0    0
fear         0     0        0     2      0        0   0    0
happy        0     0        0     1      4        0   0    0
neutral      0     0        0     1      0        0   1    0
ps           0     0        0     1      0        0   1    0
sad          0     1        0     3      1        1   0    1

Accuracy: 0.5
Misclassification Rate: 0.5

Mean Precision: 0.53125
Mean Sensitivity (Recall): 0.5241071428571429
Mean Specificity: 0.9304292929292929
```

CONFUSION MATRIX LSTM

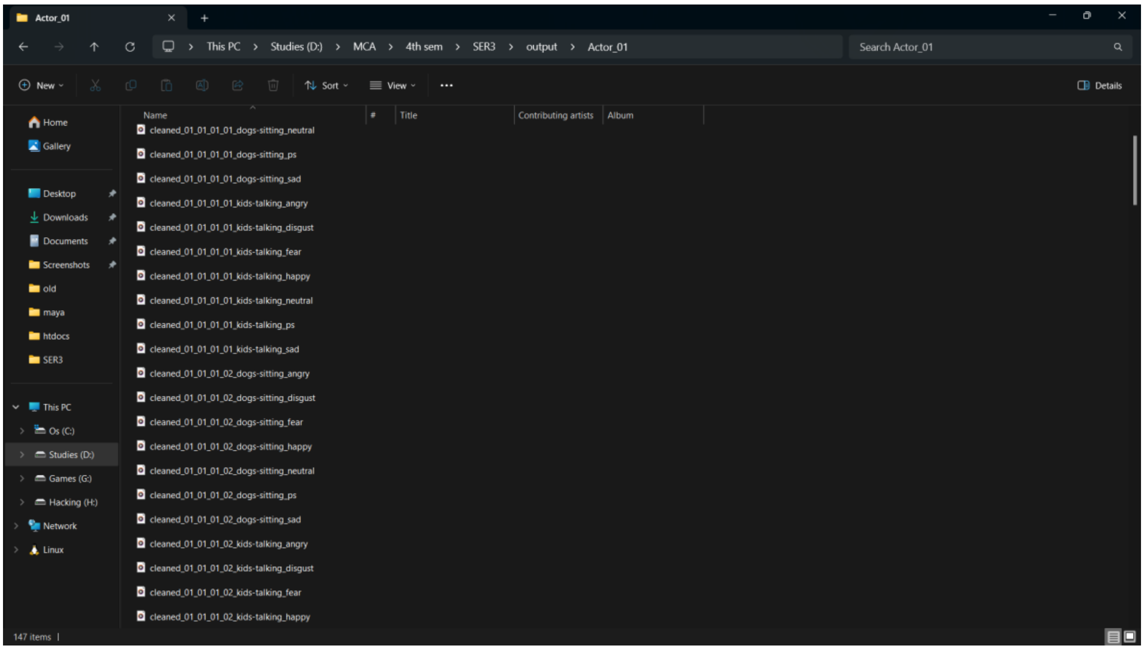
```
Confusion Matrix (LSTM):
         angry  calm  disgust  fear  happy  neutral  ps  sad
angry        3     0        0     0      0        0   1    0
calm         0     2        0     0      0        0   0    2
disgust      2     0        0     0      0        0   0    0
fear         0     0        0     2      0        0   0    0
happy        2     0        0     3      0        0   0    0
neutral      1     1        0     0      0        0   0    0
ps           1     1        0     0      0        0   0    0
sad          0     3        0     4      0        0   0    0

Accuracy: 0.25
Misclassification Rate: 0.75

Mean Precision: 0.10515873015873016
Mean Sensitivity (Recall): 0.28125
Mean Specificity: 0.8984246138851402
```

CONFUSION MATRIX SVM

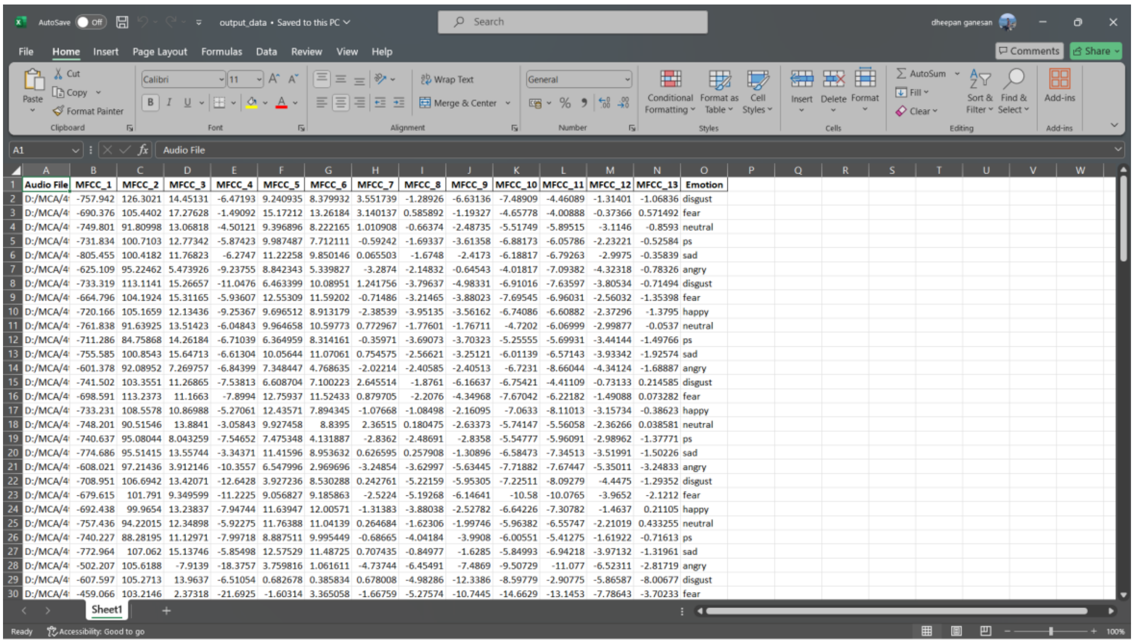
```
Confusion Matrix (SVM):
         angry  calm  disgust  fear  happy  neutral  ps  sad
angry        2     0        0     0      0        0   2    0
calm         0     4        0     0      0        0   0    0
disgust      0     0        2     0      0        0   0    0
fear         0     0        0     1      1        0   0    0
happy        0     1        0     0      4        0   0    0
neutral      0     0        0     0      1        1   0    0
ps           0     0        0     0      0        0   2    0
sad          0     0        0     0      0        2   0    5

Accuracy: 0.75
Misclassification Rate: 0.25

Mean Precision: 0.7875
Mean Sensitivity (Recall): 0.7517857142857143
Mean Specificity: 0.9642036023557762
```

APPENDIX II: OUTPUTS

CLEANED AUDIO IS SAVED IN AUDIO_01 FOLDER

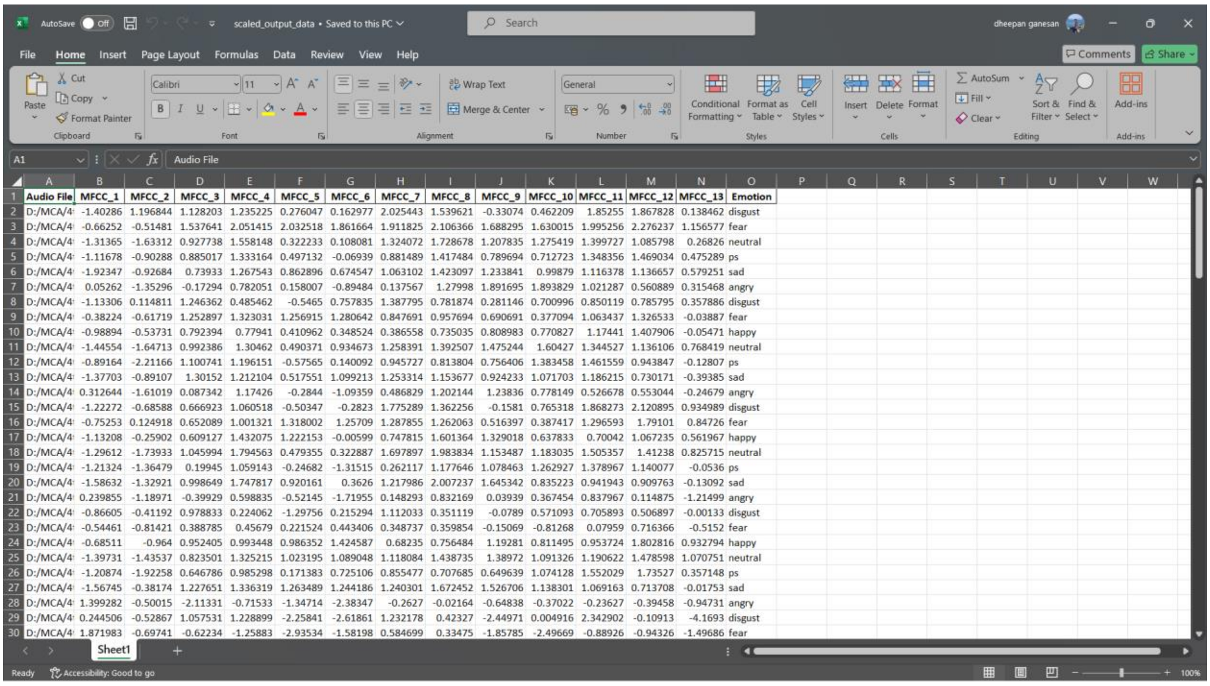


FEATURES EXTRACTED AND SAVED AS OUTPUT_DATA.XLSX



Audio File	MFCC_1	MFCC_2	MFCC_3	MFCC_4	MFCC_5	MFCC_6	MFCC_7	MFCC_8	MFCC_9	MFCC_10	MFCC_11	MFCC_12	MFCC_13	Emotion
D:/MCA/4	-757.942	126.3021	14.45131	-6.47193	9.240935	8.379932	3.551739	-1.28926	-6.63136	-7.48909	-4.46089	-1.31401	-1.06836	disgust
D:/MCA/4	-690.376	105.4402	17.27628	-1.49092	15.17212	13.26184	3.140137	0.585892	-1.19327	-4.65778	-4.00888	-0.37366	0.571492	fear
D:/MCA/4	-749.801	91.80998	13.06818	-4.50121	9.396896	8.222165	1.010908	-0.66374	-2.48735	-5.51749	-5.89515	-3.1146	-0.8593	neutral
D:/MCA/4	-731.834	100.7103	12.77342	-5.87423	9.987487	7.712111	-0.59242	-1.69337	-3.61358	-6.88173	-6.05786	-2.23221	-0.52584	ps
D:/MCA/4	-805.455	100.4182	11.76823	-6.2747	11.22258	9.850146	0.065503	-1.6748	-2.4173	-6.18817	-6.79263	-2.9975	-0.35839	sad
D:/MCA/4	-625.109	95.22462	5.473926	-9.23755	8.842343	5.339827	-3.2874	-2.14832	-0.64543	-4.01817	-7.09382	-4.32318	-0.78326	angry
D:/MCA/4	-733.319	113.1141	15.26657	-11.0476	6.463399	10.08951	1.241756	-3.79637	-4.98331	-6.91016	-7.63597	-3.80534	-0.71494	disgust
D:/MCA/4	-664.796	104.1924	15.31165	-5.93607	12.55309	11.59202	-0.71486	-3.21465	-3.88023	-7.69545	-6.96031	-2.56032	-1.35398	fear
D:/MCA/4	-720.166	105.1659	12.13436	-9.25367	9.696512	8.913179	-2.38539	-3.95135	-3.56162	-6.74086	-6.60882	-2.37296	-1.3795	happy
D:/MCA/4	-761.838	91.63925	13.51423	-6.04843	9.964658	10.59773	0.772967	-1.77601	-1.76711	-4.7202	-6.06999	-2.99877	-0.0537	neutral
D:/MCA/4	-711.286	84.75868	14.26184	-6.71039	6.364959	8.314161	-0.35971	-3.69073	-3.70323	-5.25555	-5.69931	-3.44144	-1.49766	ps
D:/MCA/4	-755.585	100.8543	15.64713	-6.61304	10.05644	11.07061	0.754575	-2.56621	-3.25121	-6.01139	-6.57143	-3.93342	-1.92574	sad
D:/MCA/4	-601.378	92.08952	7.269757	-6.84399	7.348447	4.768635	-2.02214	-2.40585	-2.40513	-6.7231	-8.66044	-4.34124	-1.68887	angry
D:/MCA/4	-741.502	103.3551	11.26865	-7.53813	6.608704	7.100223	2.645514	-1.8761	-6.16637	-6.75421	-4.41109	-0.73133	0.214585	disgust
D:/MCA/4	-698.591	113.2373	11.1663	-7.8994	12.75937	11.52433	0.879705	-2.2076	-4.34968	-7.67042	-6.22182	-1.49088	0.073282	fear
D:/MCA/4	-733.231	108.5578	10.86988	-5.27061	12.43571	7.894345	-1.07668	-1.08498	-2.16095	-7.0633	-8.11013	-3.15734	-0.38623	happy
D:/MCA/4	-748.201	90.51546	13.8841	-3.05843	9.927458	8.8395	2.36515	0.180475	-2.63373	-5.74147	-5.56058	-2.36266	0.038581	neutral
D:/MCA/4	-740.637	95.08044	8.043259	-7.54652	7.475348	4.131887	-2.8362	-2.48691	-2.8358	-5.54777	-5.96091	-2.98962	-1.37771	ps
D:/MCA/4	-774.686	95.51415	13.55744	-3.34371	11.41596	8.953632	0.626595	0.257908	-1.30896	-6.58473	-7.34513	-3.51991	-1.50226	sad
D:/MCA/4	-608.021	97.21436	3.912146	-10.3557	6.547996	2.969696	-3.24854	-3.62997	-5.63445	-7.71882	-7.67447	-5.35011	-3.24833	angry
D:/MCA/4	-708.951	106.6942	13.42071	-12.6428	3.927236	8.530288	0.242761	-5.22159	-5.95305	-7.22511	-8.09279	-4.4475	-1.29352	disgust
D:/MCA/4	-679.615	101.791	9.349599	-11.2225	9.056827	9.185863	-2.5224	-5.19268	-6.14641	-10.58	-10.0765	-3.9652	-2.1212	fear
D:/MCA/4	-692.438	99.9654	13.23837	-7.94744	11.63947	12.00571	-1.31383	-3.88038	-2.52782	-6.64226	-7.30782	-1.4637	0.21105	happy
D:/MCA/4	-757.436	94.22015	12.34898	-5.92275	11.76388	11.04139	0.264684	-1.62306	-1.99746	-5.96382	-6.55747	-2.21019	0.433255	neutral
D:/MCA/4	-740.227	88.28195	11.12971	-7.99718	8.887511	9.995449	-0.68665	-4.04184	-3.9908	-6.00551	-5.41275	-1.61922	-0.71613	ps
D:/MCA/4	-772.964	107.062	15.13746	-5.85498	12.57529	11.48725	0.707435	-0.84977	-1.6285	-5.84993	-6.94218	-3.97132	-1.31961	sad
D:/MCA/4	-502.207	105.6188	-7.9139	-18.3757	3.759816	1.061611	-4.73744	-6.45491	-7.4869	-9.50729	-11.077	-6.52311	-2.81719	angry
D:/MCA/4	-607.597	105.2713	13.9637	-6.51054	0.682678	0.385834	0.678008	-4.98286	-12.3386	-8.59779	-2.90775	-5.86587	-8.00677	disgust
D:/MCA/4	-459.066	103.2146	2.37318	-21.6925	-1.60314	3.365058	-1.66759	-5.27574	-10.7445	-14.6629	-13.1453	-7.78643	-3.70233	fear

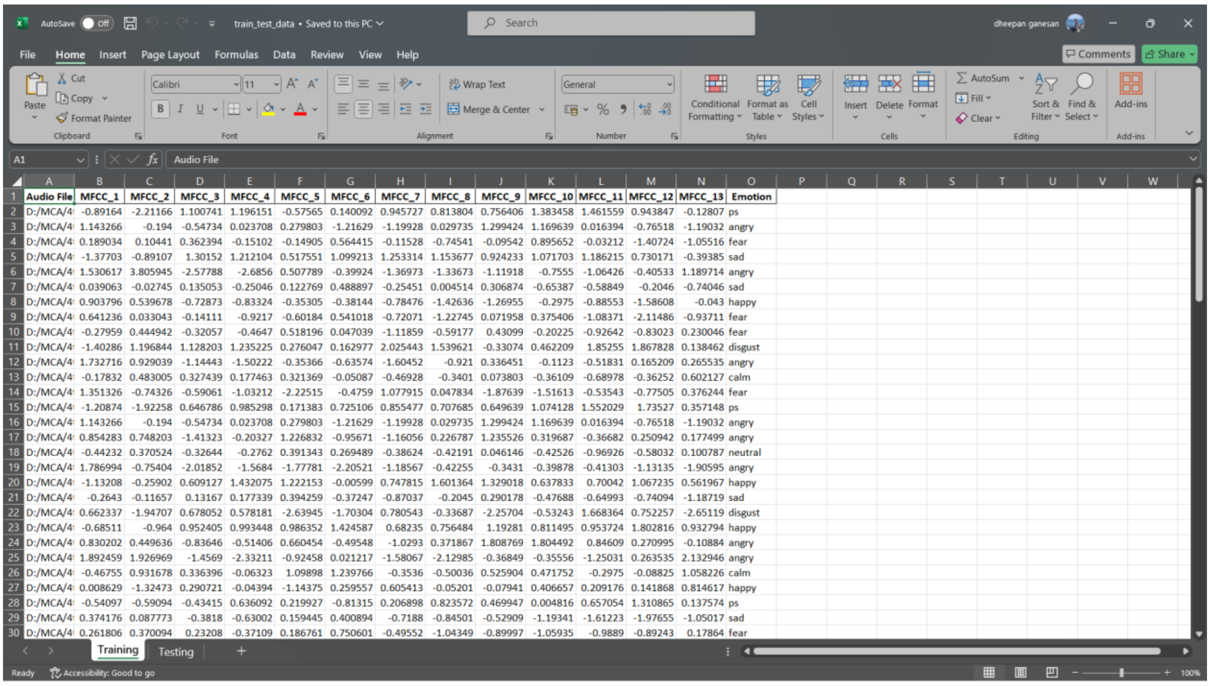
FEATURE SCALING DONE AND SAVED AS SCALED_OUTPUT_DATA.XLSX



Audio File	MFCC_1	MFCC_2	MFCC_3	MFCC_4	MFCC_5	MFCC_6	MFCC_7	MFCC_8	MFCC_9	MFCC_10	MFCC_11	MFCC_12	MFCC_13	Emotion
D:/MCA/4	-1.40286	1.196844	1.128203	1.235225	0.276047	0.162977	2.025443	1.539621	-0.33074	0.462209	1.85255	1.867828	0.138462	disgust
D:/MCA/4	-0.66252	-0.51481	1.537641	2.051415	2.032518	1.861664	1.911825	2.106366	1.688295	1.630015	1.995256	2.276237	1.156577	fear
D:/MCA/4	-1.31365	-1.63312	0.927738	1.558148	0.322233	0.108081	1.324072	1.728678	1.207835	1.275419	1.399727	1.085798	0.26826	neutral
D:/MCA/4	-1.11678	-0.90288	0.885017	1.333164	0.497132	-0.06939	0.881489	1.417484	0.789694	0.712723	1.348356	1.469034	0.475289	ps
D:/MCA/4	-1.92347	-0.92684	0.73933	1.267543	0.862896	0.674547	1.063102	1.423097	1.233841	0.99879	1.116378	1.136657	0.579251	sad
D:/MCA/4	0.05262	-1.35296	-0.17294	0.782051	0.158007	-0.89484	0.137567	1.27998	1.891695	1.893829	1.021287	0.560889	0.315468	angry
D:/MCA/4	-1.13306	0.114811	1.246362	0.485462	-0.5465	0.757835	1.387795	0.781874	0.281146	0.700996	0.850119	0.785795	0.357886	disgust
D:/MCA/4	-0.38224	-0.61719	1.252897	1.323031	1.256915	1.280642	0.847691	0.957694	0.690691	0.377094	1.063437	1.326533	-0.03887	fear
D:/MCA/4	-0.98894	-0.53731	0.792394	0.77941	0.410962	0.348524	0.386558	0.735035	0.808983	0.770827	1.17441	1.407906	-0.05471	happy
D:/MCA/4	-1.44554	-1.64713	0.992386	1.30462	0.490371	0.934673	1.258391	1.392507	1.475244	1.60427	1.344527	1.136106	0.768419	neutral
D:/MCA/4	-0.89164	-2.21166	1.100741	1.196151	-0.57565	0.140092	0.945727	0.813804	0.756406	1.383458	1.461559	0.943847	-0.12807	ps
D:/MCA/4	-1.37703	-0.89107	1.30152	1.212104	0.517551	1.099213	1.253314	1.153677	0.924233	1.071703	1.186215	0.730171	-0.39385	sad
D:/MCA/4	0.312644	-1.61019	0.087342	1.17426	-0.2844	-1.09359	0.486829	1.202144	1.23836	0.778149	0.526678	0.553044	-0.24679	angry
D:/MCA/4	-1.22272	-0.68588	0.666923	1.060518	-0.50347	-0.2823	1.775289	1.362256	-0.1581	0.765318	1.868273	2.120895	0.934989	disgust
D:/MCA/4	-0.75253	0.124918	0.652089	1.001321	1.318002	1.25709	1.287855	1.262063	0.516397	0.387417	1.296593	1.79101	0.84726	fear
D:/MCA/4	-1.13208	-0.25902	0.609127	1.432075	1.222153	-0.00599	0.747815	1.601364	1.329018	0.637833	0.70042	1.067235	0.561967	happy
D:/MCA/4	-1.29612	-1.73933	1.045994	1.794563	0.479355	0.322887	1.697897	1.983834	1.153487	1.183035	1.505357	1.41238	0.825715	neutral
D:/MCA/4	-1.21324	-1.36479	0.19945	1.059143	-0.24682	-1.31515	0.262117	1.177646	1.078463	1.262927	1.378967	1.140077	-0.0536	ps
D:/MCA/4	-1.58632	-1.32921	0.998649	1.747817	0.920161	0.3626	1.217986	2.007237	1.645342	0.835223	0.941943	0.909763	-0.13092	sad
D:/MCA/4	0.239855	-1.18971	-0.39929	0.598835	-0.52145	-1.71955	0.148293	0.832169	0.03939	0.367454	0.837967	0.114875	-1.21499	angry
D:/MCA/4	-0.86605	-0.41192	0.978833	0.224062	-1.29756	0.215294	1.112033	0.351119	-0.0789	0.571093	0.705893	0.506897	-0.00133	disgust
D:/MCA/4	-0.54461	-0.81421	0.388785	0.45679	0.221524	0.443406	0.348737	0.359854	-0.15069	-0.81268	0.07959	0.716366	-0.5152	fear
D:/MCA/4	-0.68511	-0.964	0.952405	0.993448	0.986352	1.424587	0.68235	0.756484	1.19281	0.811495	0.953724	1.802816	0.932794	happy
D:/MCA/4	-1.39731	-1.43537	0.823501	1.325215	1.023195	1.089048	1.118084	1.438735	1.38972	1.091326	1.190622	1.478598	1.070751	neutral
D:/MCA/4	-1.20874	-1.92258	0.646786	0.985298	0.171383	0.725106	0.855477	0.707685	0.649639	1.074128	1.552029	1.73527	0.357148	ps
D:/MCA/4	-1.56745	-0.38174	1.227651	1.336319	1.263489	1.244186	1.240301	1.672452	1.526706	1.138301	1.069163	0.713708	-0.01753	sad
D:/MCA/4	1.399282	-0.50015	-2.11331	-0.71533	-1.34714	-2.38347	-0.2627	-0.02164	-0.64838	-0.37022	-0.23627	-0.39458	-0.94731	angry
D:/MCA/4	0.244506	-0.52867	1.057531	1.228899	-2.25841	-2.61861	1.232178	0.42327	-2.44971	0.004916	2.342902	-0.10913	-4.1693	disgust
D:/MCA/4	1.871983	-0.69741	-0.62234	-1.25883	-2.93534	-1.58198	0.584699	0.33475	-1.85785	-2.49669	-0.88926	-0.94326	-1.49686	fear

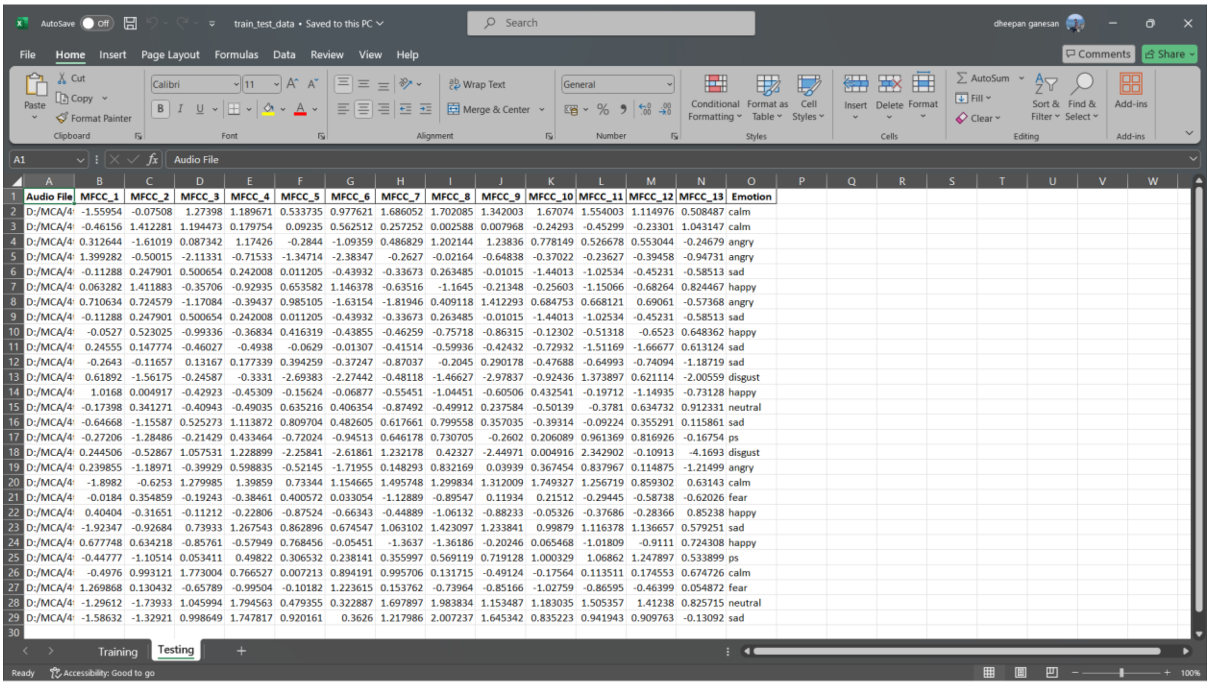
DATA SPLITTING

TRAINING DATASET



	Audio File	MFCC_1	MFCC_2	MFCC_3	MFCC_4	MFCC_5	MFCC_6	MFCC_7	MFCC_8	MFCC_9	MFCC_10	MFCC_11	MFCC_12	MFCC_13	Emotion
2	D:/MCA/4	-0.89164	-2.21166	1.100741	1.196151	-0.57565	0.140092	0.945727	0.813804	0.756406	1.383458	1.461559	0.943847	-0.12807	ps
3	D:/MCA/4	1.143266	-0.194	-0.54734	0.023708	0.279803	-1.21629	-1.19928	0.029735	1.299424	1.169639	0.016394	-0.76518	-1.19032	angry
4	D:/MCA/4	0.189034	0.10441	0.362394	-0.15102	-0.14905	0.564415	-0.11528	-0.74541	-0.09542	0.895652	-0.03212	-1.40724	-1.05516	fear
5	D:/MCA/4	-1.37703	-0.89107	1.30152	1.212104	0.517551	1.099213	1.253314	1.153677	0.924233	1.071703	1.186215	0.730171	-0.39385	sad
6	D:/MCA/4	1.530617	3.805945	-2.57788	-2.6856	0.507789	-0.39924	-1.36973	-1.33673	-1.11918	-0.7555	-1.06426	-0.40533	1.189714	angry
7	D:/MCA/4	0.039063	-0.02745	0.135053	-0.25046	0.122769	0.488897	-0.25451	0.004514	0.306874	-0.65387	-0.58849	-0.2046	-0.74046	sad
8	D:/MCA/4	0.903796	0.539678	-0.72873	-0.83324	-0.35305	-0.38144	-0.78476	-1.42636	-1.26955	-0.2975	-0.88553	-1.58608	-0.043	happy
9	D:/MCA/4	0.641236	0.033043	-0.14111	-0.9217	-0.60184	0.541018	-0.72071	-1.22745	0.071958	0.375406	-1.08371	-2.11486	-0.93711	fear
10	D:/MCA/4	-0.27959	0.444942	-0.32057	-0.4647	0.518196	0.047039	-1.11859	-0.59177	0.43099	-0.20225	-0.92642	-0.83023	0.230046	fear
11	D:/MCA/4	-1.40286	1.196844	1.128203	1.235225	0.276047	0.162977	2.025443	1.539621	-0.33074	0.462209	1.85255	1.867828	0.138462	disgust
12	D:/MCA/4	1.732716	0.929039	-1.14443	-1.50222	-0.35366	-0.63574	-1.60452	-0.921	0.336451	-0.1123	-0.51831	0.165209	0.265535	angry
13	D:/MCA/4	-0.17832	0.483005	0.327439	0.177463	0.321369	-0.05087	-0.46928	-0.3401	0.073803	-0.36109	-0.68978	-0.36252	0.602127	calm
14	D:/MCA/4	1.351326	-0.74326	-0.59061	-1.03212	-2.22515	-0.4759	1.077915	0.047834	-1.87639	-1.51613	-0.53543	-0.77505	0.376244	fear
15	D:/MCA/4	-1.20874	-1.92258	0.646786	0.985298	0.171383	0.725106	0.855477	0.707685	0.649639	1.074128	1.552029	1.73527	0.357148	ps
16	D:/MCA/4	1.143266	-0.194	-0.54734	0.023708	0.279803	-1.21629	-1.19928	0.029735	1.299424	1.169639	0.016394	-0.76518	-1.19032	angry
17	D:/MCA/4	0.854283	0.748203	-1.41323	-0.20327	1.226832	-0.95671	-1.16056	0.226787	1.235526	0.319687	-0.36682	0.250942	0.177499	angry
18	D:/MCA/4	-0.44232	0.370524	-0.32644	-0.2762	0.391343	0.269489	-0.38624	-0.42191	0.046146	-0.42526	-0.96926	-0.58032	0.100787	neutral
19	D:/MCA/4	1.786994	-0.75404	-2.01852	-1.5684	-1.77781	-2.20521	-1.18567	-0.42255	-0.3431	-0.39878	-0.41303	-1.13135	-1.90595	angry
20	D:/MCA/4	-1.13208	-0.25902	0.609127	1.432075	1.222153	-0.00599	0.747815	1.601364	1.329018	0.637833	0.70042	1.067235	0.561967	happy
21	D:/MCA/4	-0.2643	-0.11657	0.13167	0.177339	0.394259	-0.37247	-0.87037	-0.2045	0.290178	-0.47688	-0.64993	-0.74094	-1.18719	sad
22	D:/MCA/4	0.662337	-1.94707	0.678052	0.578181	-2.63945	-1.70304	0.780543	-0.33687	-2.25704	-0.53243	1.668364	0.752257	-2.65119	disgust
23	D:/MCA/4	-0.68511	-0.964	0.952405	0.993448	0.986352	1.424587	0.68235	0.756484	1.19281	0.811495	0.953724	1.802816	0.932794	happy
24	D:/MCA/4	0.830202	0.449636	-0.83646	-0.51406	0.660454	-0.49548	-1.0293	0.371867	1.808769	1.804492	0.84609	0.270995	-0.10884	angry
25	D:/MCA/4	1.892459	1.926969	-1.4569	-2.33211	-0.92458	0.021217	-1.58067	-2.12985	-0.36849	-0.35556	-1.25031	0.263535	2.132946	angry
26	D:/MCA/4	-0.46755	0.931678	0.336396	-0.06323	1.09898	1.239766	-0.3536	-0.50036	0.525904	0.471752	-0.2975	-0.08825	1.058226	calm
27	D:/MCA/4	0.008629	-1.32473	0.290721	-0.04394	-1.14375	0.259557	0.605413	-0.05201	-0.07941	0.406657	0.209176	0.141868	0.814617	happy
28	D:/MCA/4	-0.54097	-0.59094	-0.43415	0.636092	0.219927	-0.81315	0.206898	0.823572	0.469947	0.004816	0.657054	1.310865	0.137574	ps
29	D:/MCA/4	0.374176	0.087773	-0.3818	-0.63002	0.159445	0.400894	-0.7188	-0.84501	-0.52909	-1.19341	-1.61223	-1.97655	-1.05017	sad
30	D:/MCA/4	0.261806	0.370094	0.23208	-0.37109	0.186761	0.750601	-0.49552	-1.04349	-0.89997	-1.05935	-0.9889	-0.89243	0.17864	fear

TESTING DATASET



	Audio File	MFCC_1	MFCC_2	MFCC_3	MFCC_4	MFCC_5	MFCC_6	MFCC_7	MFCC_8	MFCC_9	MFCC_10	MFCC_11	MFCC_12	MFCC_13	Emotion
2	D:/MCA/4	-1.55954	-0.07508	1.27398	1.189671	0.533735	0.977621	1.686052	1.702085	1.342003	1.67074	1.554003	1.114976	0.508487	calm
3	D:/MCA/4	-0.46156	1.412281	1.194473	0.179754	0.09235	0.562512	0.257252	0.002588	0.007968	-0.24293	-0.45299	-0.23301	1.043147	calm
4	D:/MCA/4	0.312644	-1.61019	0.087342	1.17426	-0.2844	-1.09359	0.486829	1.202144	1.23836	0.778149	0.526678	0.553044	-0.24679	angry
5	D:/MCA/4	1.399282	-0.50015	-2.11331	-0.71533	-1.34714	-2.38347	-0.2627	-0.02164	-0.64838	-0.37022	-0.23627	-0.39458	-0.94731	angry
6	D:/MCA/4	-0.11288	0.247901	0.500654	0.242008	0.011205	-0.43932	-0.33673	0.263485	-0.01015	-1.44013	-1.02534	-0.45231	-0.58513	sad
7	D:/MCA/4	0.063282	1.411883	-0.35706	-0.92935	0.653582	1.146378	-0.63516	-1.1645	-0.21348	-0.25603	-1.15066	-0.68264	0.824467	happy
8	D:/MCA/4	0.710634	0.724579	-1.17084	-0.39437	0.985105	-1.63154	-1.81946	0.409118	1.412293	0.684753	0.668121	0.69061	-0.57368	angry
9	D:/MCA/4	-0.11288	0.247901	0.500654	0.242008	0.011205	-0.43932	-0.33673	0.263485	-0.01015	-1.44013	-1.02534	-0.45231	-0.58513	sad
10	D:/MCA/4	-0.0527	0.523025	-0.99336	-0.36834	0.416319	-0.43855	-0.46259	-0.75718	-0.86315	-0.12302	-0.51318	-0.6523	0.648362	happy
11	D:/MCA/4	0.24555	0.147774	-0.46027	-0.4938	-0.0629	-0.01307	-0.41514	-0.59936	-0.42432	-0.72932	-1.51169	-1.66677	0.613124	sad
12	D:/MCA/4	-0.2643	-0.11657	0.13167	0.177339	0.394259	-0.37247	-0.87037	-0.2045	0.290178	-0.47688	-0.64993	-0.74094	-1.18719	sad
13	D:/MCA/4	0.61892	-1.56175	-0.24587	-0.3331	-2.69383	-2.27442	-0.48118	-1.46627	-2.97837	-0.92436	1.373897	0.621114	-2.00559	disgust
14	D:/MCA/4	1.0168	0.004917	-0.42923	-0.45309	-0.15624	-0.06877	-0.55451	-1.04451	-0.60506	0.432541	-0.19712	-1.14935	-0.73128	happy
15	D:/MCA/4	-0.17398	0.341271	-0.40943	-0.49035	0.635216	0.406354	-0.87492	-0.49912	0.237584	-0.50139	-0.3781	0.634732	0.912331	neutral
16	D:/MCA/4	-0.64668	-1.15587	0.525273	1.113872	0.809704	0.482605	0.617661	0.799558	0.357035	-0.39314	-0.09224	0.355291	0.115861	sad
17	D:/MCA/4	-0.27206	-1.28486	-0.21429	0.433464	-0.72024	-0.94513	0.646178	0.730705	-0.2602	0.206089	0.961369	0.816926	-0.16754	ps
18	D:/MCA/4	0.244506	-0.52867	1.057531	1.228899	-2.25841	-2.61861	1.232178	0.42327	-2.44971	0.004916	2.342902	-0.10913	-4.1693	disgust
19	D:/MCA/4	0.239855	-1.18971	-0.39929	0.598835	-0.52145	-1.71955	0.148293	0.832169	0.03939	0.367454	0.837967	0.114875	-1.21499	angry
20	D:/MCA/4	-1.8982	-0.6253	1.279985	1.39859	0.73344	1.154665	1.495748	1.299834	1.312009	1.749327	1.256719	0.859302	0.63143	calm
21	D:/MCA/4	-0.0184	0.354859	-0.19243	-0.38461	0.400572	0.033054	-1.12889	-0.89547	0.11934	0.21512	-0.29445	-0.58738	-0.62026	fear
22	D:/MCA/4	0.40404	-0.31651	-0.11212	-0.22806	-0.87524	-0.66343	-0.44889	-1.06132	-0.88233	-0.05326	-0.37686	-0.28366	0.85238	happy
23	D:/MCA/4	-1.92347	-0.92684	0.73933	1.267543	0.862896	0.674547	1.063102	1.423097	1.233841	0.99879	1.116378	1.136657	0.579251	sad
24	D:/MCA/4	0.677748	0.634218	-0.85761	-0.57949	0.768456	-0.05451	-1.3637	-1.36186	-0.20246	0.065468	-1.01809	-0.9111	0.724308	happy
25	D:/MCA/4	-0.44777	-1.10514	0.053411	0.49822	0.306532	0.238141	0.355997	0.569119	0.719128	1.000329	1.06862	1.247897	0.533899	ps
26	D:/MCA/4	-0.4976	0.993121	1.773004	0.766527	0.007213	0.894191	0.995706	0.131715	-0.49124	-0.17564	0.113511	0.174553	0.674726	calm
27	D:/MCA/4	1.269868	0.130432	-0.65789	-0.99504	-0.10182	1.223615	0.153762	-0.73964	-0.85166	-1.02759	-0.86595	-0.46399	0.054872	fear
28	D:/MCA/4	-1.29612	-1.73933	1.045994	1.794563	0.479355	0.322887	1.697897	1.983834	1.153487	1.183035	1.505357	1.41238	0.825715	neutral
29	D:/MCA/4	-1.58632	-1.32921	0.998649	1.747817	0.920161	0.3626	1.217986	2.007237	1.645342	0.835223	0.941943	0.909763	-0.13092	sad

CLASSIFY REPORT CNN

	precision	recall	f1-score	support
angry	1	0.5	0.666667	4
calm	0.4	0.5	0.444444	4
disgust	1	0.5	0.666667	2
fear	0.285714	1	0.444444	2
happy	0.5	0.8	0.615385	5
neutral	0	0	0	2
ps	0.5	0.5	0.5	2
sad	0.333333	0.142857	0.2	7
accuracy	0.464286	0.464286	0.464286	0.464286
macro avg	0.502381	0.492857	0.442201	28
weighted avg	0.50017	0.464286	0.4337	28

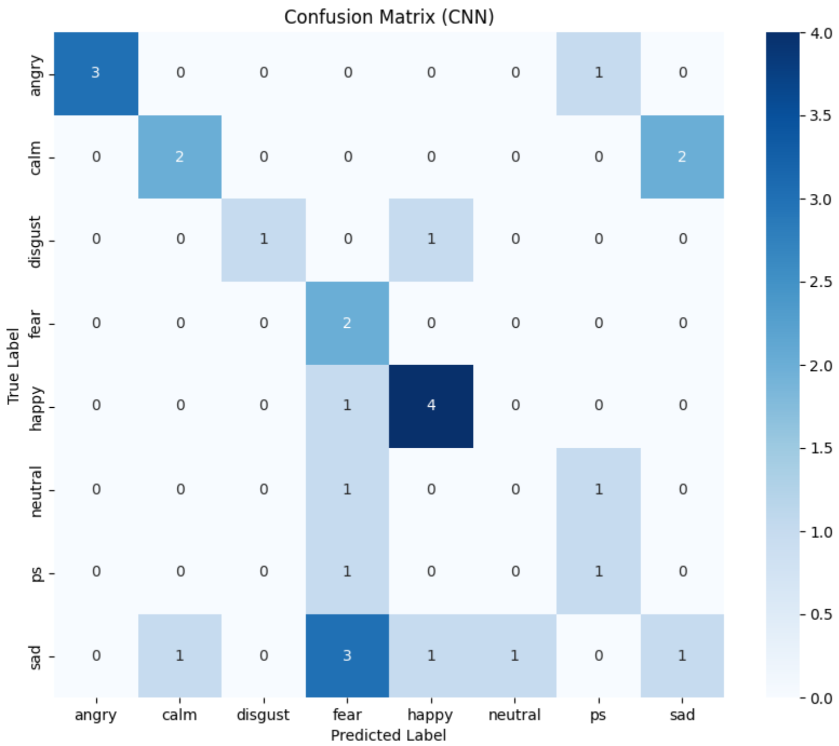
CLASSIFY REPORT LSTM

	precision	recall	f1-score	support
angry	0.5	0.25	0.333333	4
calm	0.5	1	0.666667	4
disgust	0	0	0	2
fear	0.111111	0.5	0.181818	2
happy	0.285714	0.4	0.333333	5
neutral	0	0	0	2
ps	0.5	0.5	0.5	2
sad	0	0	0	7
accuracy	0.321429	0.321429	0.321429	0.321429
macro avg	0.237103	0.33125	0.251894	28
weighted avg	0.237528	0.321429	0.251082	28

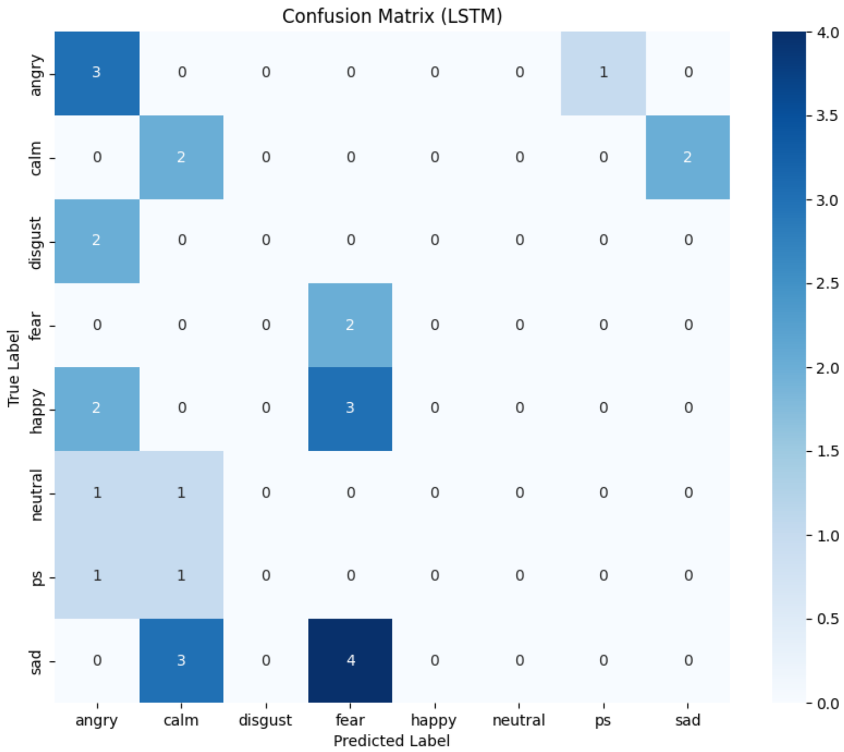
CLASSIFY REPORT SVM

	precision	recall	f1-score	support
angry	1	0.5	0.666667	4
calm	0.8	1	0.888889	4
disgust	1	1	1	2
fear	1	0.5	0.666667	2
happy	0.666667	0.8	0.727273	5
neutral	0.333333	0.5	0.4	2
ps	0.5	1	0.666667	2
sad	1	0.714286	0.833333	7
accuracy	0.75	0.75	0.75	0.75
macro avg	0.7875	0.751786	0.731187	28
weighted avg	0.828571	0.75	0.755664	28

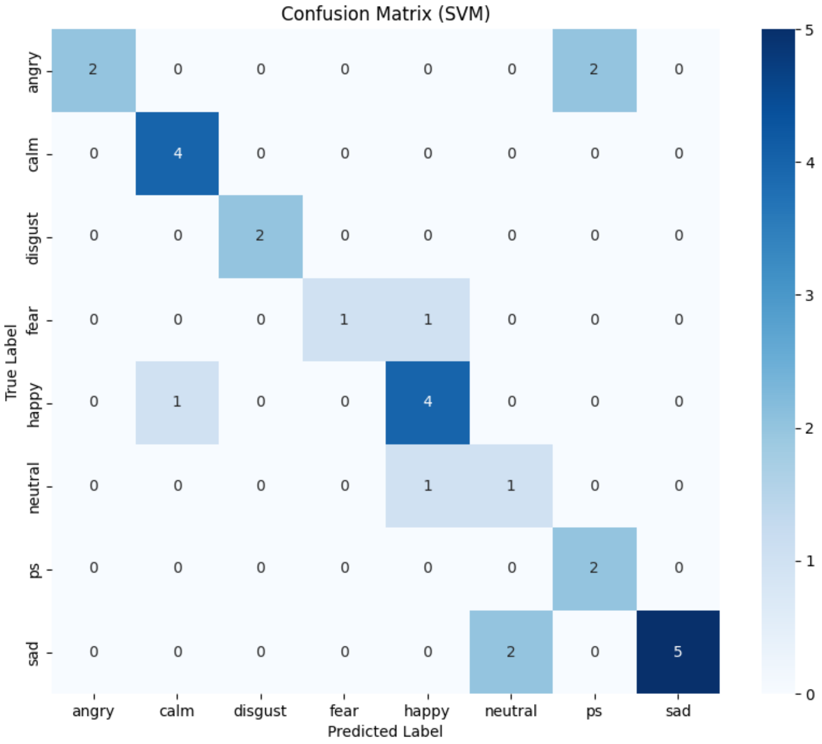
CONFUSION MATRIX CNN



CONFUSION MATRIX LSTM



CONFUSION MATRIX SVM



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