

EMOTION DETECTION USING TRANSFER LEARNING

Objective:

This project aims to develop an end-to-end system that allows users to upload an image through a Streamlit-based web application and accurately detect emotions using Convolutional Neural Networks (CNNs). The model is optimized for grayscale images and uses transfer learning from pretrained models like VGG16, MobileNetV2, and ResNet50.

User Interface Development:

- The Streamlit application provides a simple interface for users to upload an image.
 - The system validates the uploaded file, ensuring it is an image file only by considering only .jpg, .png, .jpeg files.
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Data Sources:

- **FER-2013** dataset from Kaggle for training.
- Real-time user-uploaded images for testing in the Streamlit app.

Preprocessing Steps:

- Resize images to 48x48 pixels for model compatibility.
 - Remove Outliners.
 - Balance the dataset
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Model Selection & Transfer Learning:

Pretrained CNN Architectures Used:

- **VGG16** (Best accuracy: 59%)
- **MobileNetV2** (Accuracy: 40%)
- **ResNet50**(Accuracy: 64%)

Each model is fine-tuned by:

- ◆ Adding Dense & Dropout layers to prevent overfitting.
 - ◆ Using a softmax output layer for 7 emotion classes.
 - ◆ Freezing the base model to leverage pretrained feature extraction.
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Training & Evaluation:

- Batch Size: 32 (Balanced for memory and speed)
- Epochs: 25
- Loss Function: Categorical Crossentropy
- Optimizer: Adam

Model Performance Comparison:

Model	Accuracy
VGG16	0.5971
MobileNetV2	0.4001
ResNet50	0.6432

Best Model: ResNet50 (64% Accuracy)

Saved as: best_emotion_model.h5

Real-Time Emotion Detection in Streamlit:

- Users upload an image, which is preprocessed and fed into the best-performing model.
 - The app predicts the dominant emotion and displays it with the uploaded image.
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Ethical Considerations:

- ◆ **Data Set:** Data set must be pre-processed properly.
 - ◆ **User Privacy:** Images are stored after classification.
 - ◆ **Potential Applications:** Mental health, education, customer service.
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Deliverables:

- **Trained Models:** best motion model.
- **Codebase:** Python scripts for training, evaluation & deployment.
- **Streamlit Web App:** For real-time emotion detection.
- **Report:** Full analysis of performance, challenges & ethical concerns.

This document serves as an illustration of the emotion detection project, covering dataset preparation, model selection, training, evaluation, and deployment.