

## Project Title: Emotion Detection from Uploaded Images

### Objective:

You will develop a comprehensive system that enables users to upload an image through a Streamlit application and accurately detect and classify the emotion present in the image using Convolutional Neural Networks (CNNs). This project aims to develop and design, implement, and optimize a complete solution that integrates machine learning, computer vision, and user interface design.

### Project Scope:

- **End-to-End Development:** You will be responsible for all aspects of the project, from setting up the image upload interface to training the CNN model and delivering a polished, user-friendly application.
- **Real-World Relevance:** The project should address potential applications in areas such as healthcare, education, and customer service, where emotion detection is valuable.

### Key Components:

1. **User Interface Development:**
  - Design a Streamlit application that allows users to easily upload images. Do not allow user to upload any other file except image. (Check format, size)
  - Focus on creating an intuitive, responsive interface with clear instructions for the user.
2. **Facial Detection Implementation:**
  - **Resize the image:** Implement facial detection in the uploaded images using pre trained models and your own model.
  - Explore options to enhance detection accuracy, precision, recall and F1 score, such as refining detection thresholds or combining methods.
3. **Facial Feature Extraction:**
  - Use tools like Dlib or Mediapipe to extract key facial landmarks.
  - Analyze how the accuracy of landmark detection impacts the emotion classification process.
4. **Emotion Classification:**
  - Train and fine-tune a CNN model using datasets such as FER-2013 available in the Kaggle
  - Experiment with different CNN architectures and training techniques to maximize the model's accuracy.
5. **Performance and Optimization:**
  - Evaluate the model's performance with metrics like accuracy, precision, and recall.
  - Implement optimizations to ensure the system runs efficiently and delivers results in real-time.

### Expected Results:

- A fully functional application where users can upload images and receive accurate emotion classifications.
- A detailed report covering the system's design, implementation, performance analysis, and potential applications.
- An exploration of the ethical considerations related to emotion detection, including privacy concerns and bias mitigation.

### Tools and Technologies:

- **Programming Language:** Python
- **Frameworks and Libraries:** Streamlit, OpenCV, TensorFlow/Keras or PyTorch
- **Datasets:** FER-2013

### Deliverables:

1. **Application:** A Streamlit-based web application for emotion detection.

2. **Codebase:** Well-documented Python scripts for all components of the project.
3. **Trained Models:** Pre-trained and fine-tuned CNN models for emotion classification.
4. **Project Report:** A detailed document covering system design, methodology, experimental results, and conclusions.
5. **Ethical Analysis:** A discussion on the ethical implications of emotion detection technology, including user privacy and bias mitigation strategies.

Project Guidelines:

- **Independent Work:** You are expected to complete all project components independently, demonstrating a strong understanding of the underlying technologies.
- **Regular Milestones:** The project will be divided into milestones with regular progress checks to ensure steady advancement.
- **Final Presentation:** You will present your project to faculty members, showcasing the application and discussing your approach, findings, and any challenges faced during development.