# **Liveness Detection and Face Recognition Project**

## **Objective**

The objective of this project is to develop a comprehensive liveness detection and face recognition system using machine learning techniques. This task aims to evaluate your ability to design, implement, and assess models that can distinguish between real and spoofed faces and accurately identify individuals in real-world applications.

## **Project Overview**

You are required to build a system that integrates liveness detection and face recognition to identify individuals from images or video frames while ensuring the detected faces are real and not spoofed. The system should handle variations in lighting conditions, facial expressions, and angles, and be robust against different spoofing attacks.

## **Instructions**

1. **Data Acquisition**
   * Obtain or select datasets suitable for face recognition and liveness detection tasks. Recommended sources include the "Labeled Faces in the Wild" (LFW) dataset for face recognition and the "CelebA-Spoof" or "CASIA-FASD" datasets for liveness detection.
2. **Data Preprocessing**
   * Preprocess the datasets as needed, including cleaning, normalization, and resizing of images.
   * Perform data augmentation to increase the diversity of the training data.
   * Split the datasets into training, validation, and testing sets.
3. **Feature Extraction and Model Training**
   * Use various CNNs architectures such as ResNet, FaceNet, or MobileNet for feature extraction and fine-tune them on the face recognition and liveness detection dataset.
   * Train the models, ensuring to validate them using separate validation sets.
4. **Model Integration**
   * Integrate the face recognition and liveness detection models into a single pipeline.
   * Ensure the liveness detection model is applied before face recognition to filter out spoofed faces.
5. **Evaluation**
   * Evaluate the model’s performance using metrics such as accuracy, precision, recall, and F1-score. Provide a confusion matrix to visualize the performance.
6. **Implementation**
   * Implement the integrated system using Python and libraries such as OpenCV, TensorFlow, or PyTorch.
   * Include functionalities for face detection, alignment (if necessary), liveness detection, and recognition.
   * Develop API Service and its interface such as swagger for testing liveness detection and face recognition system functionalities.

**Note:** You are encouraged to approach this project with creativity and flexibility. Feel free to modify or expand upon the instructions provided to best showcase your skills and insights.

## **Deliverables**

1. **Code:** Submit well-documented code in a Jupyter notebook or Python scripts.
2. **Demo:** Provide a demonstration of the face recognition system using OpenCV with webcam integration.
3. **Screen Recording:** Include a screen recording demonstrating the system API service in action.

## **Submission Guidelines**

* Upload your code, report, presentation, demo, and screen recording to a shared drive or repository (e.g., GitHub) and provide the link.
* Ensure that your submission is organized, clear, and easy to follow.
* The project must be completed within 5 days. Deadline for submission**:** **1 July 2024**

## **Evaluation Criteria**

* **Technical Skills:** Ability to implement liveness detection and face recognition techniques effectively.
* **Problem-Solving:** Approach to addressing challenges in liveness detection and face recognition tasks.
* **Implementation:** Quality and functionality of the integrated system.