### 1. Design of a Low-Cost Personal Identification System Using Combined Palm Vein and Palmprint Biometric Features

This project aims to develop a cost-effective biometric identification system by integrating palm vein and palmprint features. Palm vein recognition uses near-infrared imaging to capture unique vascular patterns beneath the skin, while palmprint recognition analyzes surface textures and patterns. The combination enhances security and accuracy by leveraging complementary biometric modalities. The system design involves capturing high-resolution palm images, preprocessing them to remove noise, and extracting features using algorithms like Local Binary Patterns (LBP) or Gabor filters. The extracted features are fused using techniques such as feature-level or score-level fusion to create a composite biometric signature. A classification algorithm, such as Support Vector Machines (SVM) or a convolutional neural network (CNN), is employed for identity verification. The system is tested on diverse datasets to assess performance metrics like accuracy, precision, recall, and Equal Error Rate (EER). By focusing on affordable hardware and efficient algorithms, this project offers a scalable solution for secure personal identification applications in banking, healthcare, and access control, particularly in resource-constrained environments.

### 2. End-to-End Car License Plate Detection and Recognition Using Deep Neural Networks

This project involves developing an end-to-end system for car license plate detection and recognition using deep learning. The system automates the process of identifying and interpreting vehicle license plates from images or video feeds, making it applicable for traffic management, toll collection, and law enforcement. The pipeline begins with license plate detection using object detection models such as YOLO (You Only Look Once) or Faster R-CNN. After detecting the plate region, image preprocessing steps like resizing, denoising, and contrast enhancement are applied. For recognition, a Convolutional Neural Network (CNN) or a hybrid deep learning model is used to extract characters from the plate. The Optical Character Recognition (OCR) module converts these characters into text format. The system is trained and tested on diverse datasets to ensure robustness against variations in lighting, angles, and plate designs. Performance metrics like Intersection over Union (IoU), accuracy, and inference time are evaluated. This end-to-end approach provides a highly accurate and efficient solution for real-world applications.

### 3. Human Action Recognition Using Deep Convolutional Neural Networks with Depth Maps

This project focuses on recognizing human actions using deep convolutional neural networks (CNNs) with depth map data. Depth maps, obtained from 3D sensors like Microsoft Kinect or LiDAR, provide additional spatial information, making the system more robust to variations in lighting and occlusions compared to traditional RGB video-based approaches. The process begins with capturing depth sequences of human movements. Preprocessing includes noise filtering, normalization, and frame alignment. Features are extracted using a CNN, which is specifically designed to handle spatial and temporal aspects of depth data. Models like 3D-CNNs or spatiotemporal networks are employed to analyze the depth sequences. The system is trained on annotated datasets containing various actions such as walking, waving, or sitting. Evaluation metrics like accuracy, precision, recall, and F1-score are used to measure performance. The project’s outcomes have applications in video surveillance, healthcare monitoring, and human-computer interaction, offering a robust and scalable solution for action recognition tasks.