Title:

AI-Powered Hand Gesture Recognition for System Control Using Deep Learning

Abstract:

Hand gesture recognition has emerged as a revolutionary interface for seamless human-computer interaction. This project presents an AI-based hand gesture control system that enables users to perform system operations using predefined hand gestures. By leveraging MediaPipe for real-time hand tracking and a Deep Learning model (TensorFlow & Keras) for gesture classification, the system accurately detects user hand movements and translates them into system commands.

The proposed model is trained on a dataset of ten distinct gestures, including brightness control, volume adjustment, task manager access, screen minimization, page refresh, and zooming functions. The system captures hand landmark positions, preprocesses them into structured input, and classifies gestures with a Convolutional Neural Network (CNN). Once recognized, the system executes corresponding system commands using PyAutoGUI, allowing users to control essential functions without a keyboard or mouse.

To enhance accuracy, data augmentation, optimized training parameters, and confidence thresholding techniques are applied. Additionally, frame rate control reduces system lag and ensures smooth real-time recognition. This work demonstrates a practical, hands-free solution for gesture-based system interaction, paving the way for applications in accessibility, smart environments, and touchless interfaces.

Keywords: Hand Gesture Recognition, Deep Learning, Computer Vision, Human-Computer Interaction, AI, TensorFlow, MediaPipe, PyAutoGUI