



**Chandigarh Engineering College,  
Jhanjeri, Mohali-140307  
Department of Computer Science & Engineering**

**PROJECT**  
**[ HAND GESTURE RECOGNITION SYSTEM ]**  
**[ PROJECT NO. 53 ]**

**TEAM MEMBERS:-**

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**ABSTRACT**

Gesture recognition, a fundamental component of human-computer interaction, has garnered significant attention in recent years due to its potential applications across various domains, including gaming, virtual reality, healthcare, and robotics. In this research, we present the development and evaluation of a gesture recognition application implemented using Python programming language. Leveraging computer vision techniques and machine learning algorithms, our application detects and interprets hand gestures in real-time, enabling users to interact with digital interfaces intuitively and naturally. The core of our application revolves around the utilization of convolutional neural networks (CNNs) for hand detection and gesture classification. We collected a diverse dataset of hand gesture samples, encompassing a wide range of poses, movements, and environmental conditions. This dataset was used to train and fine-tune our CNN model, enabling it to accurately identify hand regions within input images and classify them into predefined gesture categories. To facilitate real-time performance, we optimized our application using efficient data processing techniques and utilized libraries such as OpenCV and TensorFlow for accelerated computations. The application provides a user-friendly interface for capturing video input from cameras and displaying the recognized gestures in real-time, along with corresponding feedback or actions.

**INTRODUCTION**

Our Gesture Recognition System utilizes the web camera of the system to accurately identify and interpret hand gesture in real-time. The system employs cutting-edge computer vision algorithms to analyse intricate movements, providing precise recognition. Additionally, it goes beyond mere detection by generating meaningful outputs corresponding to recognized signs, making it an intuitive and interactive tool for seamless communication and control.



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#### TECHNOLOGIES USED

This task involves using machine learning models, particular libraries such as ‘open-CV’ in Python with ‘Scikit-learn’. These models are trained on pairs of images and videos from the source and target domains, learning the gestures of human body.

Open-CV is a library vastly used for capturing video frames and images by using system’s webcam.

Scikit-learn is an open source machine learning library used for machine learning using python programming it provide module for data analysis and modelling .

Media-pipe is a machine learning library used for making various perception based application it also provide module for hand tracking and gesture recognition.

#### APPLICATION

**Human-computer interaction:** Gesture recognition can enhance traditional user interfaces by allowing users to interact with devices using hand movements, providing a more intuitive and natural experience.

**Gaming:** In gaming industry gesture recognition enable players to control character and actions using hand gesture, offering a more immersive gaming experience.

**In Car-Controls:** Gesture recognition can be implemented for controlling in car systems, such as adjusting air conditioning, changing music or answering calls, minimizing distraction for drivers.

**Interactive learning:** gesture recognition can facilitate interactive learning experiences, allowing students to manipulate virtual objects or navigate through educational content using gesture.

**Access control:** It can enhance security system by incorporating gesture based access control, where authorized users are granted access based on specific gesture.