**IEEE Title of the Project:**

Smart Gesture-Based Communication System for Non-Verbal Patient Assistance

**Abstract**

Non-verbal and bedridden patients often face challenges in effectively communicating their needs, leading to delays in caregiver response and discomfort. While past research has explored gesture-based communication, existing solutions lack real-time integration with IoT-based healthcare systems. This study addresses this gap by developing an AI-driven Smart Gesture-Based Communication System that leverages ESP32 camera-based hand gesture recognition to enable patients to communicate essential needs through simple finger-count gestures.In this system, each gesture (one to five fingers) is mapped to a specific request—water, food, medicine, emergency, or happiness—ensuring intuitive interaction. The real-time detection mechanism utilizes MediaPipe Hand Tracking for accurate gesture recognition, and a Firebase Realtime Database is used to store and transmit recognized gestures to caregivers. Additionally, colored light bulbs, an LCD display, and a buzzer provide immediate visual and auditory feedback.A comprehensive evaluation of the system shows a feature extraction approach that improves both processing speed and detection efficiency. By employing machine learning-based feature selection, the system ensures high reliability and minimizes false gesture detections. The integration of real-time IoT components significantly enhances patient-caregiver communication, reducing response times and improving overall patient assistance.

**Software Tools:**

* Visual Studio Code, Arduino IDE

**Programming Language:**

* Python, Arduino language