

## **PYTHON MINI-PROJECT REPORT**

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### **HandWave: A Django Website for Indian Sign Language to English Conversion**

#### **Introduction**

HandWave is a Django-based web application designed to bridge communication barriers by converting Indian Sign Language (ISL) into English text. Developed with the aim of enhancing accessibility for the hearing-impaired community, HandWave integrates various Python libraries such as OpenCV, MediaPipe, and TensorFlow to achieve accurate hand gesture recognition and translation.

#### **Features**

1. Real-time Hand Gesture Detection: HandWave utilizes the OpenCV and MediaPipe libraries to capture video from the user's webcam in real-time. The application employs advanced computer vision techniques to detect and track hand gestures accurately, allowing users to communicate seamlessly using ISL.
2. Machine Learning-based Translation: HandWave leverages machine learning techniques, specifically Keras and TensorFlow, to recognize hand gestures and translate them into English text. Trained on a dataset of ISL gestures, the model accurately predicts the corresponding English text for each detected gesture, enabling effective communication between ISL users and individuals proficient in English.
3. User-friendly Interface: The website features an intuitive user interface that makes it easy for users to interact with the application. With a simple design and clear instructions, HandWave ensures a seamless user experience for both ISL users and those unfamiliar with sign language.

#### **How it Works**

Upon accessing the HandWave website, users are prompted to enable their webcam to begin communication. The application then captures live video feed and employs computer vision algorithms to detect hand gestures in real-time. Once a gesture is recognized, the machine learning model processes the data and generates the corresponding English text, which is displayed to the user on the interface.

## **Benefits**

1. Enhanced Accessibility: HandWave eliminates communication barriers for the hearing-impaired community by providing a platform for easy and effective communication in real-time.
2. Educational Tool: The application serves as an educational resource for individuals interested in learning ISL or understanding the basics of sign language communication.
3. Community Engagement: HandWave fosters community engagement and inclusivity by promoting awareness of ISL and facilitating communication between individuals with diverse linguistic backgrounds.

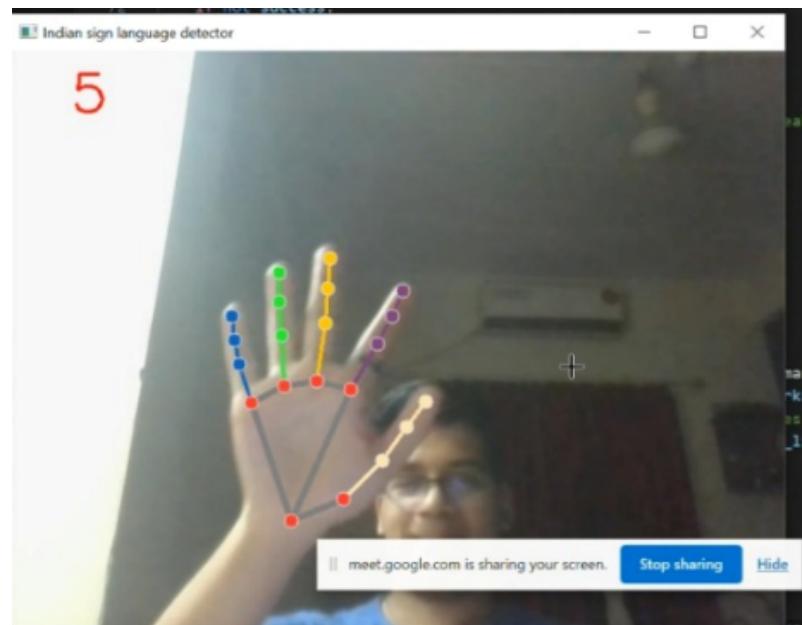
## **TECH STACK/TOOLS USED**

The project utilized a combination of cutting-edge technologies to achieve its objectives. OpenCV and MediaPipe, renowned for their robust computer vision capabilities, formed the foundation of the gesture recognition system, enabling real-time capture and analysis of hand movements. These tools were instrumental in accurately detecting and tracking hand gestures, crucial for effective communication in sign language. Additionally, machine learning techniques powered by Keras and TensorFlow were integrated to enhance the system's intelligence. Leveraging these frameworks, the project implemented a sophisticated machine learning model capable of translating Indian Sign Language gestures into English text. Moreover, the website's frontend was developed using HTML and CSS, providing a user-friendly interface for seamless interaction with the application. Lastly, the backend was built on the Django framework, facilitating smooth integration of the various components and ensuring the website's robustness and scalability. Overall, the project employed a diverse array of tools and technologies to create an innovative solution for converting Indian Sign Language to English, thereby enhancing accessibility and inclusivity for the hearing-impaired community.

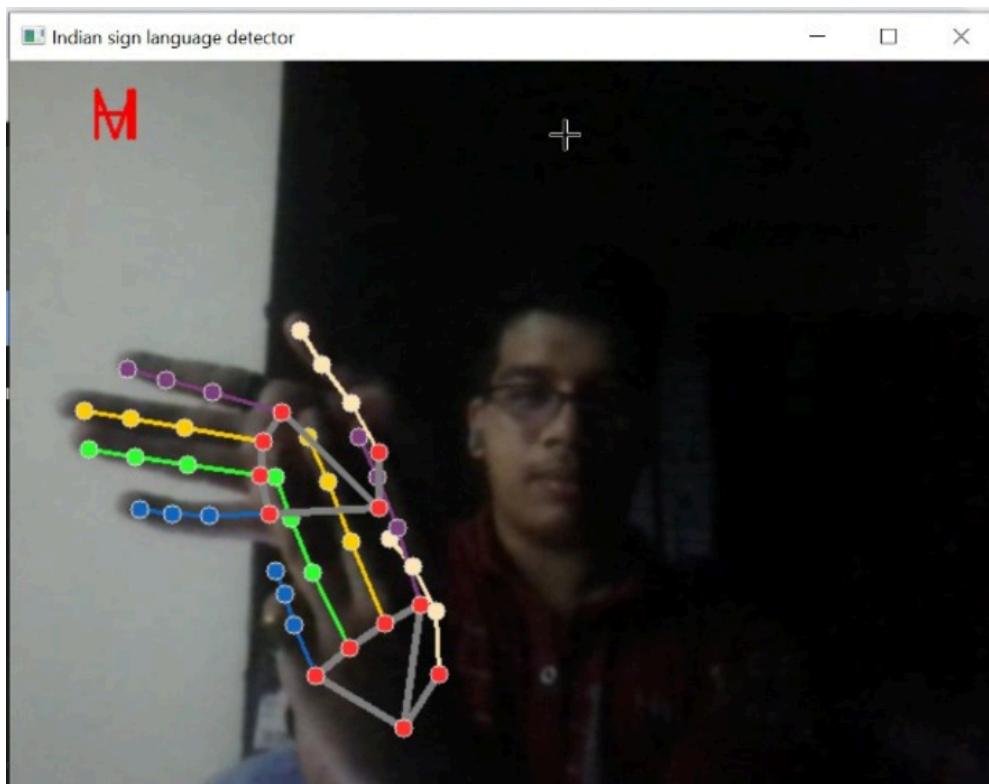
## **OUTPUT**



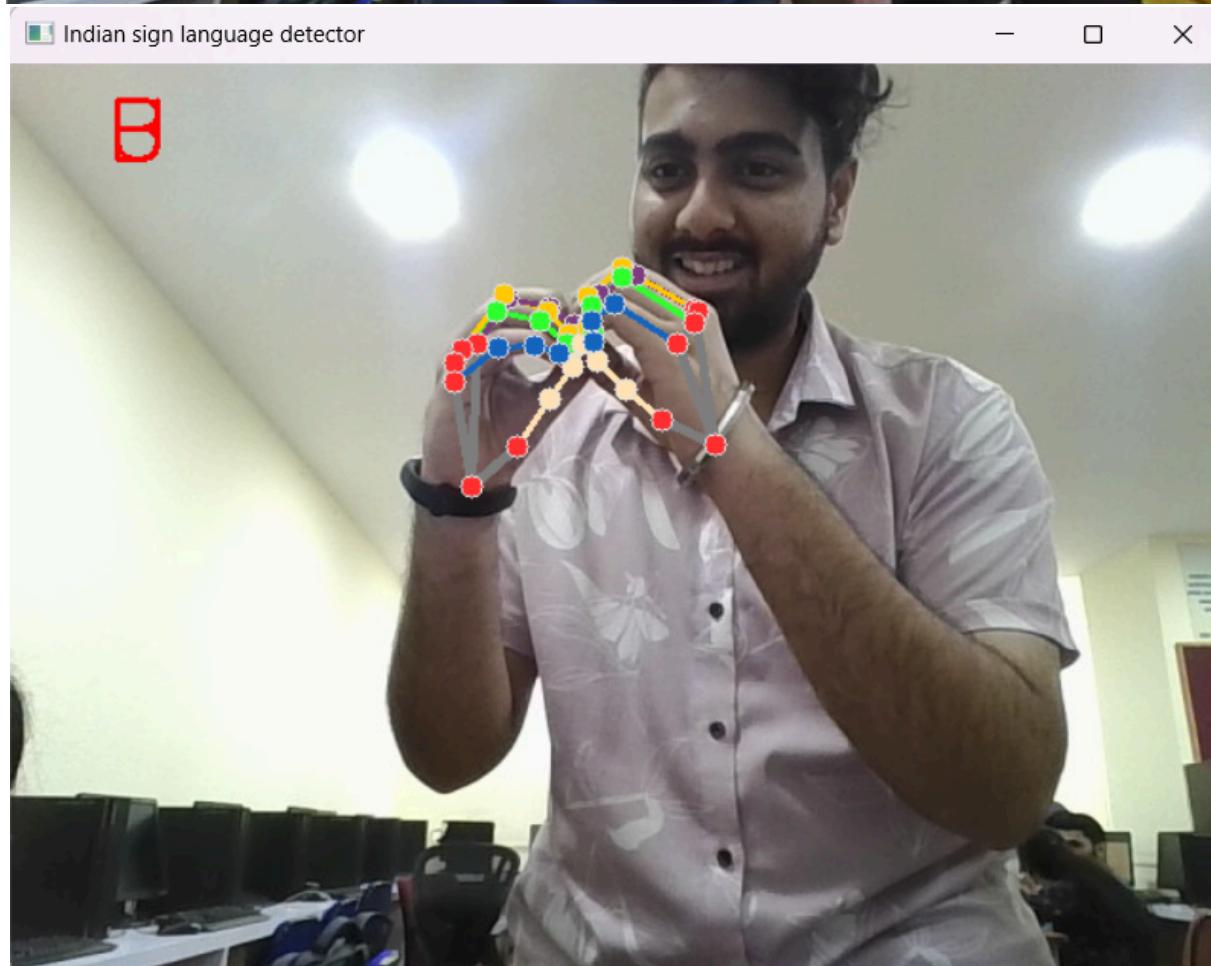
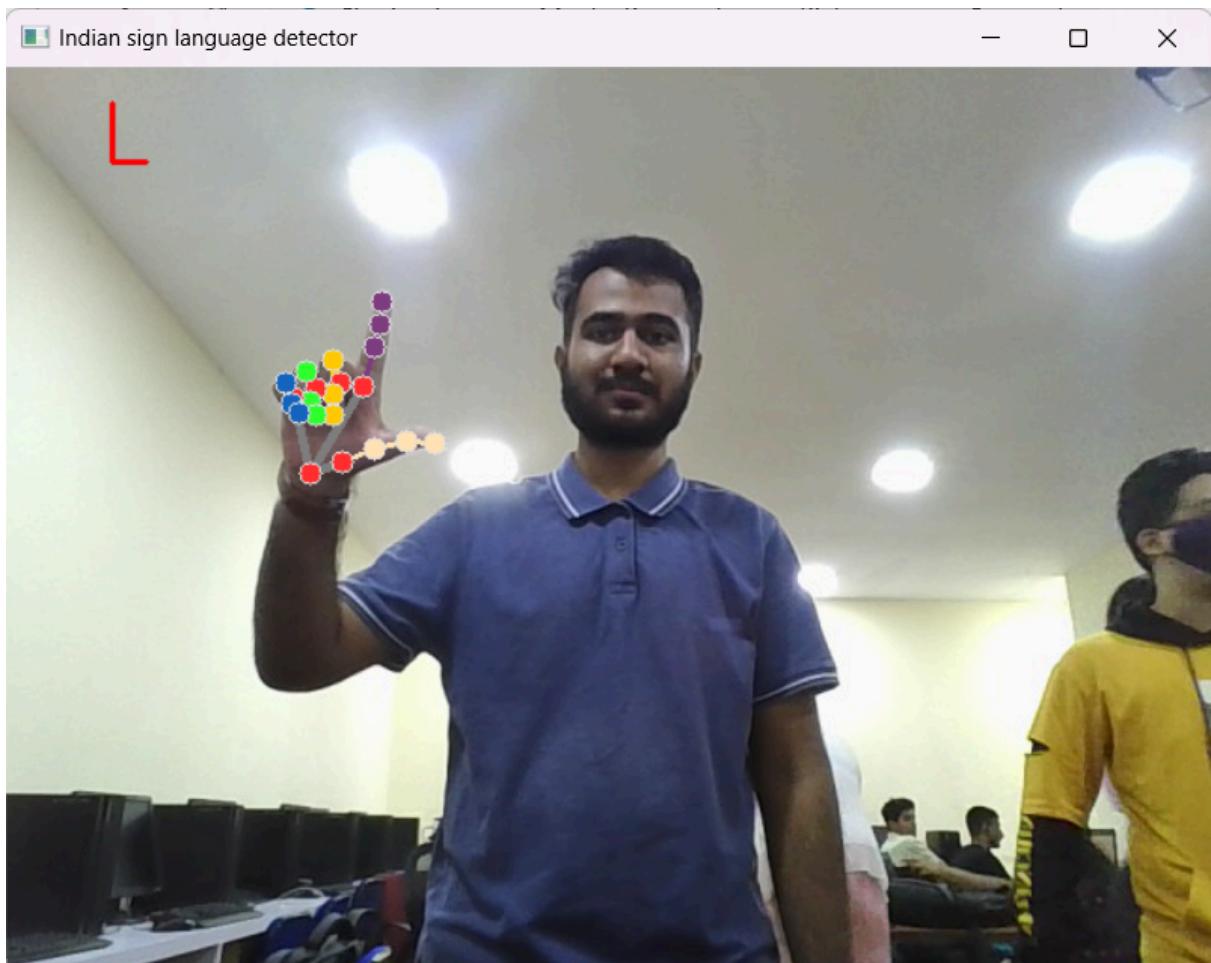
**Fig 1.1- Django Website**

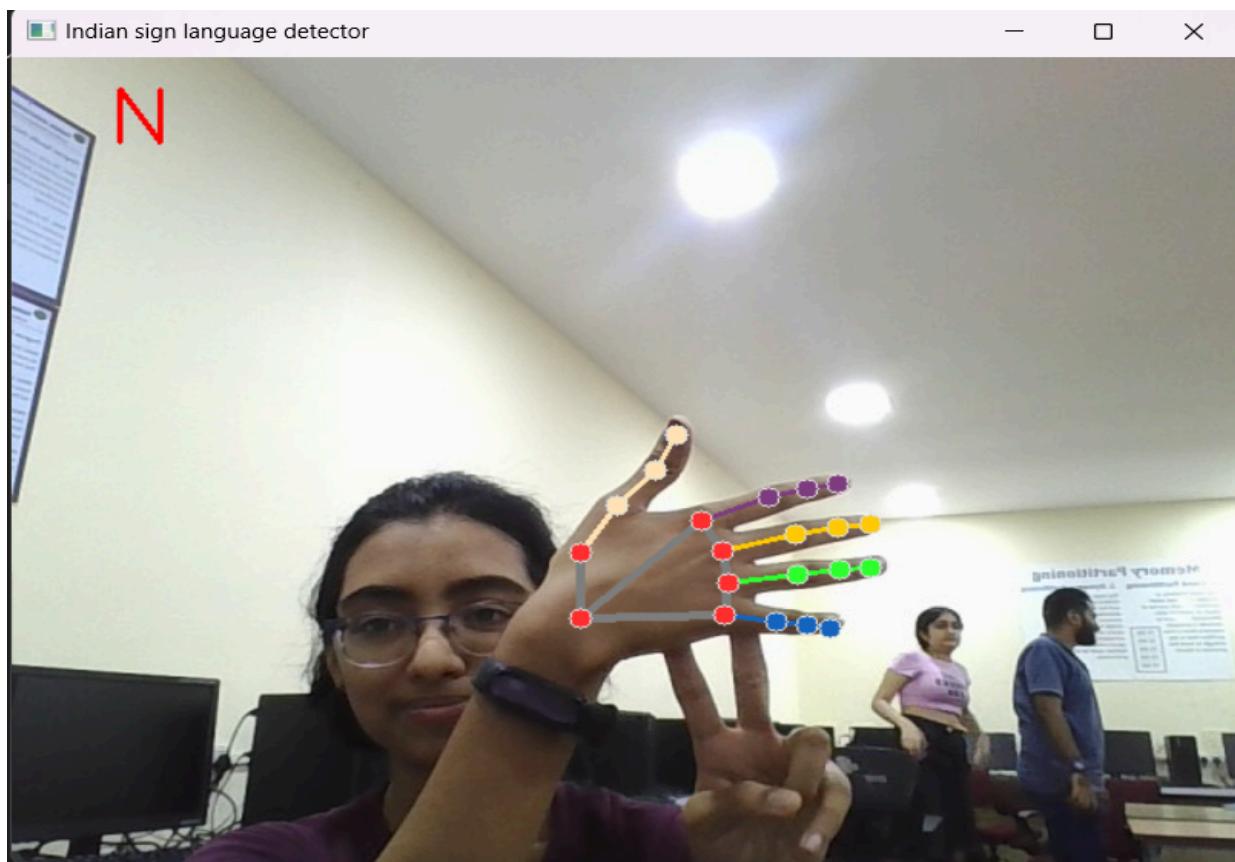


**Fig 2.1- One hand gesture detection**



**Fig 2.2- Two hand gesture detection**





**Fig 3.1,3.2,3.3,3.4- Other outputs showcasing gesture detection**

## Future Developments

Moving forward, the HandWave development team aims to enhance the application's functionality and accuracy further. Future updates may include:

- Integration of additional sign languages to cater to a broader user base.
- Improvements in gesture recognition algorithms to achieve higher accuracy and reliability.
- Implementation of user feedback mechanisms to continually refine and optimize the translation process.

## Conclusion

HandWave represents a significant advancement in leveraging technology to promote inclusivity and accessibility for individuals with hearing impairments. By combining computer vision techniques with machine learning algorithms, the application enables seamless communication between ISL users and English speakers, thereby fostering greater connectivity and understanding in society. As the development of HandWave continues, it holds the potential to make a meaningful impact on the lives of individuals with hearing

disabilities, empowering them to express themselves freely and participate fully in a world of communication.