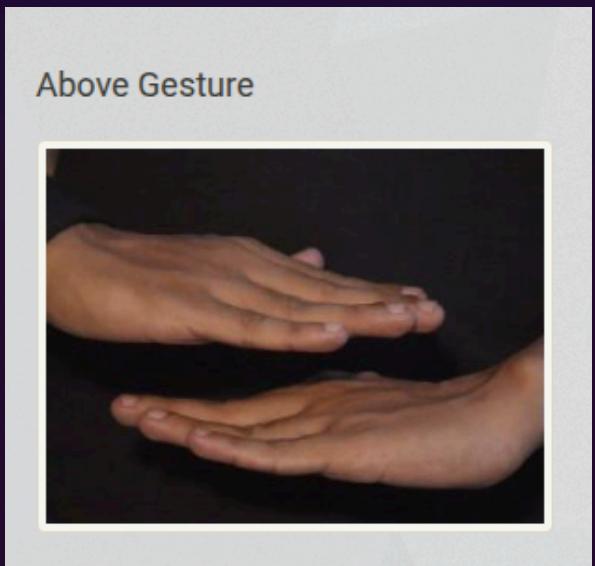


# SIGN LANGUAGE DETECTION USING CNN



# ABSTRACT:

WE PROPOSE A CNN-BASED SYSTEM FOR RECOGNIZING 23 INDIAN SIGN LANGUAGE (ISL) GESTURES USING THE IIT ALLAHABAD ROBITA DATASET. THE MODEL AUTOMATICALLY EXTRACTS FEATURES FROM HAND GESTURE IMAGES AND CLASSIFIES THEM WITH HIGH ACCURACY. PREPROCESSING TECHNIQUES LIKE RESIZING AND AUGMENTATION ARE APPLIED TO IMPROVE PERFORMANCE. THIS SYSTEM SUPPORTS REAL-TIME ISL RECOGNITION AND AIMS TO ENHANCE COMMUNICATION FOR INDIVIDUALS WITH HEARING OR SPEECH IMPAIRMENTS.



# DATASET OVERVIEW:

- Source: Robotics and Artificial Intelligence Lab (ROBITA), IIIT Allahabad
- Dataset Type: Indian Sign Language (ISL) gesture images
- Classes: 23 static gesture categories
- Data Format: RGB images of hand gestures
- Image Size: Standardized (e.g., 128×128 pixels)
- Variations: Multiple subjects, lighting, and orientations
- Application: Training CNNs for ISL gesture recognition

## Gesture Labels (23 Classes):

ABOVE, ACROSS, ADVANCE, AFRAID, ALL, ALONE, ARISE, BAG, BELOW, BRING, YES,  
ABOARD, ANGER, ASCEND, BESIDE, DRINK, FLAG, HANG, MARRY, MIDDLE, MOON,  
PRISONER, ALL GONE

## Website:

 **Real-Time Sign Language Detection (Dual Hand Support)** [Go](#)

Detects gestures from both hands using MediaPipe, bounding boxes, and MLP/CNN-based prediction.

**Start Webcam**



# WORKING:

- Data Preprocessing
- CNN Model Training
- Real-Time Prediction using Webcam
- GUI with Streamlit

# WORKFLOW:



## 1 Data Preparation:

- Extract images from nested folders
- Resize, normalize, label



## 2 Train-Test Split:

- 80% for training, 20% for testing



## 3 Model Training:

- 30 epochs using fit() with validation



## 4 Prediction:

- Preprocess new image
- Predict using .predict() from trained model



## 5 Model Saving/Loading:

- Trained model saved as gesture\_recognition\_model.h5
- Loaded for future use

# CNN ARCHITECTURE

## Model Summary:

- 1 • Input: (64, 64, 1)
- 1 • 3 Convolutional Blocks with:
  - Conv2D → ReLU → BatchNorm → MaxPooling → Dropout
- 1 • Fully Connected:
  - Dense(256) → Dropout → Dense(Num\_classes, Softmax)

## Training:

- 2 • Optimizer: Adam ( $lr=0.0001$ )
- 2 • Loss: Categorical Crossentropy
- 2 • Epochs: 30, Batch size: 32

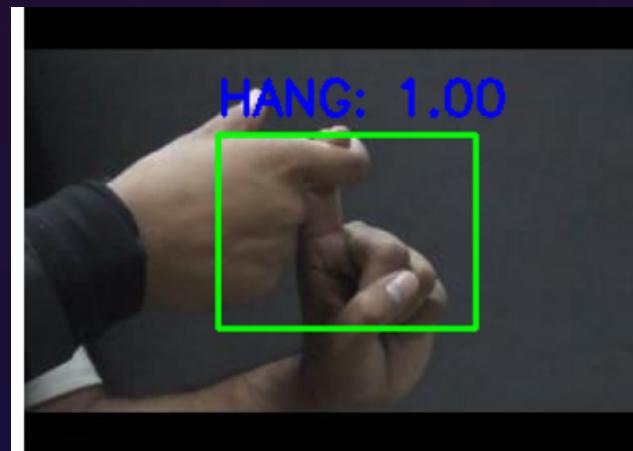
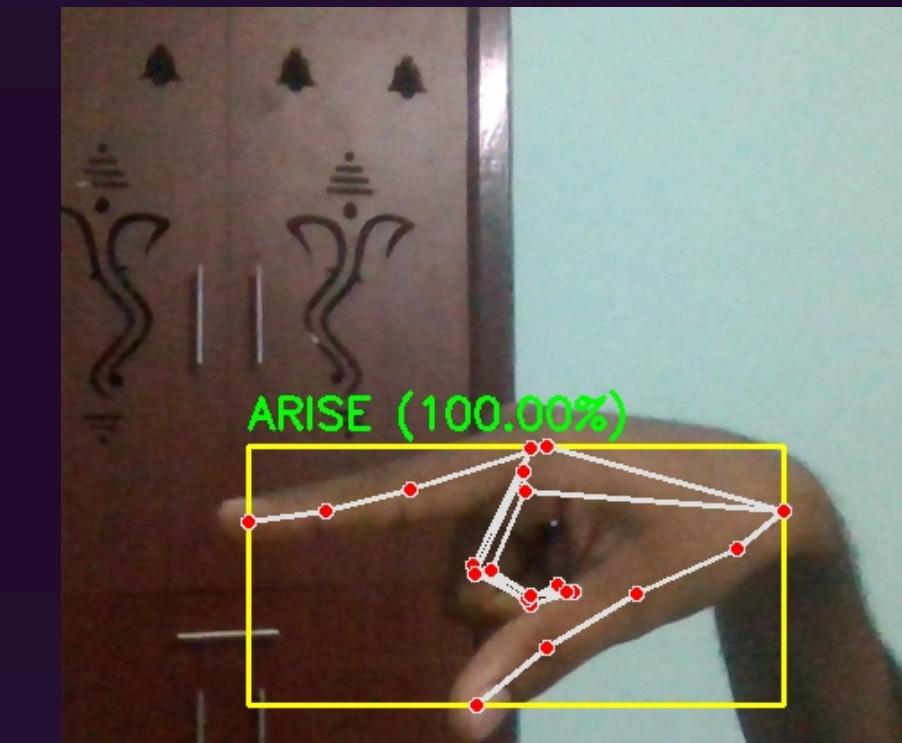
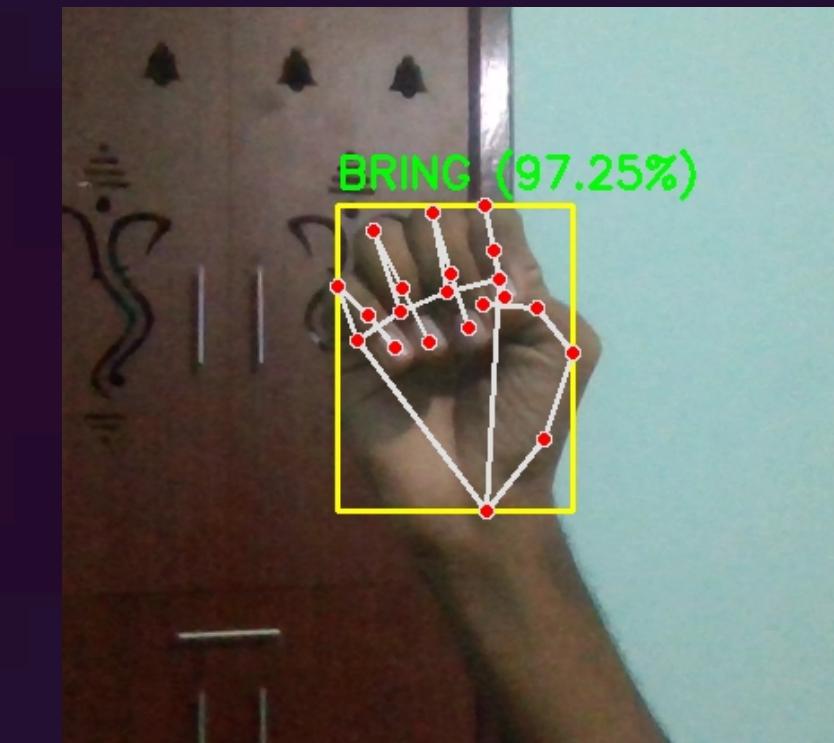
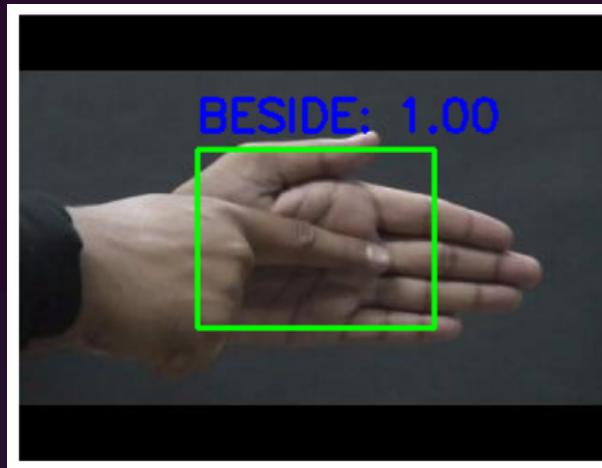
## Evaluation:

- 3 • Accuracy is printed after model evaluation on test data.

# OUTPUTS

## Webcam Predictions

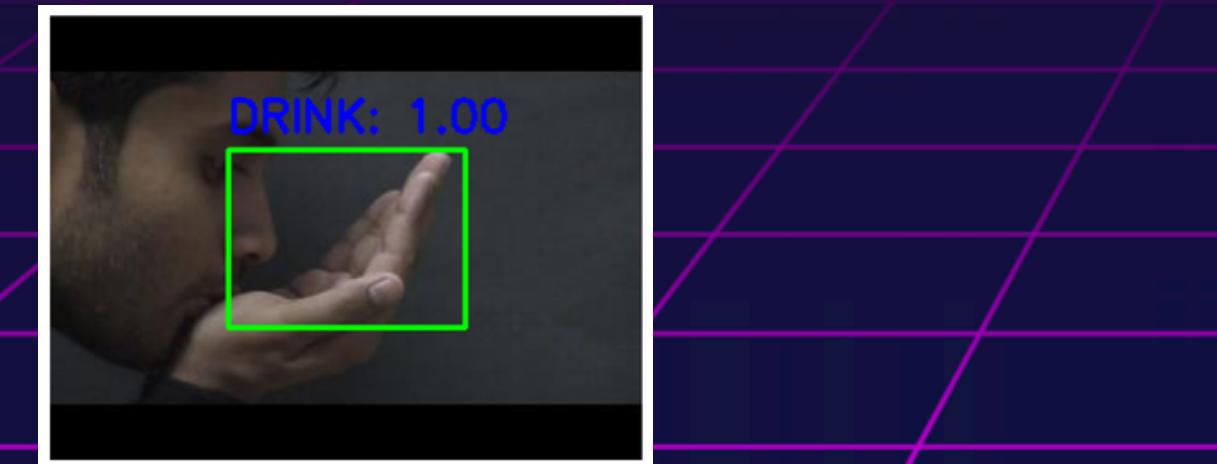
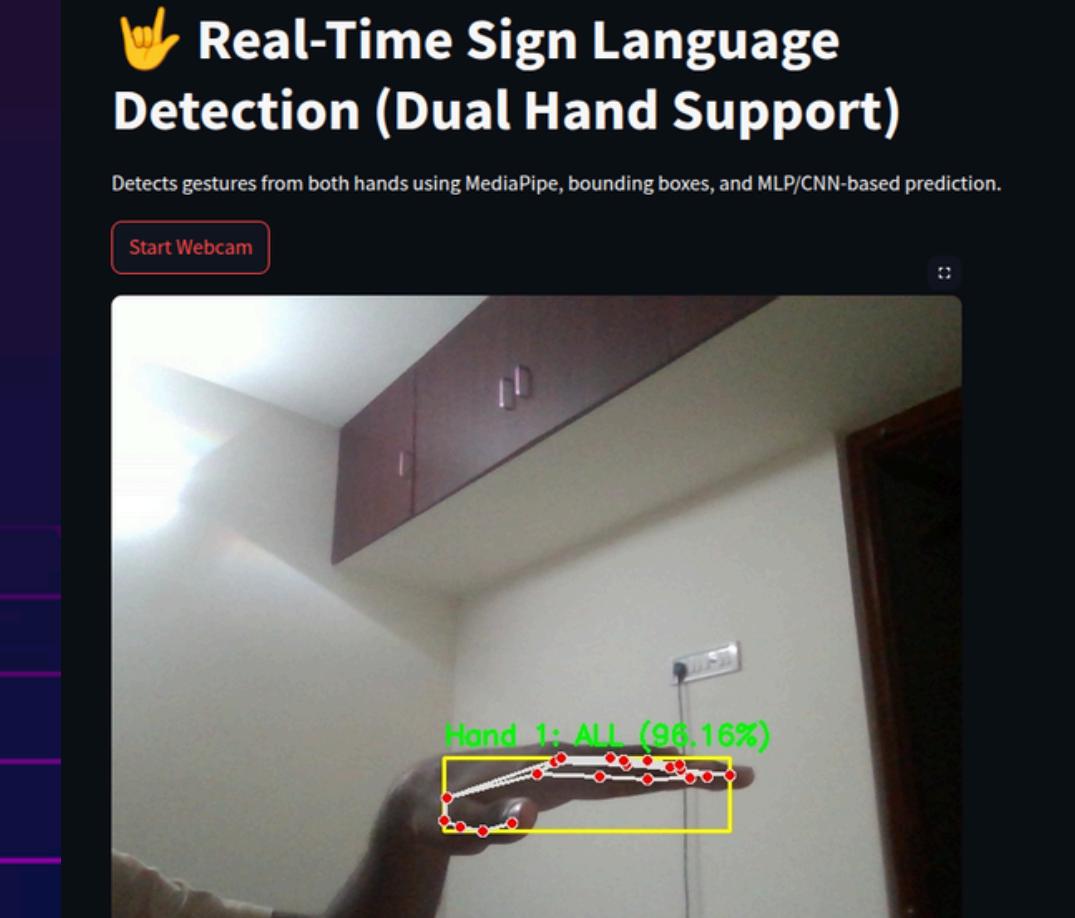
### Image Predictions



### Real-Time Sign Language Detection (Dual Hand Support)

Detects gestures from both hands using MediaPipe, bounding boxes, and MLP/CNN-based prediction.

[Start Webcam](#)



# CONCLUSION

**THIS PROJECT SUCCESSFULLY BRIDGES DEEP LEARNING AND REAL-TIME COMPUTER VISION TO CREATE AN INTERACTIVE SIGN LANGUAGE DETECTION SYSTEM USING:**

- 🧠 CNN/MLP MODELS TRAINED ON INDIAN SIGN LANGUAGE (ISL) GESTURE DATASETS
- 🎥 REAL-TIME VIDEO INPUT VIA WEBCAM USING STREAMLIT
- ✋ DUAL-HAND TRACKING USING MEDIAPIPE, ENABLING SIMULTANEOUS GESTURE DETECTION
- 📦 A SCALABLE ARCHITECTURE THAT SUPPORTS ADDITIONAL GESTURE CLASSES AND MODEL UPDATES

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**THANK YOU**