SIGN LANGUAGE DETECTION

USING ACTION RECOGNITION USING PYTHON

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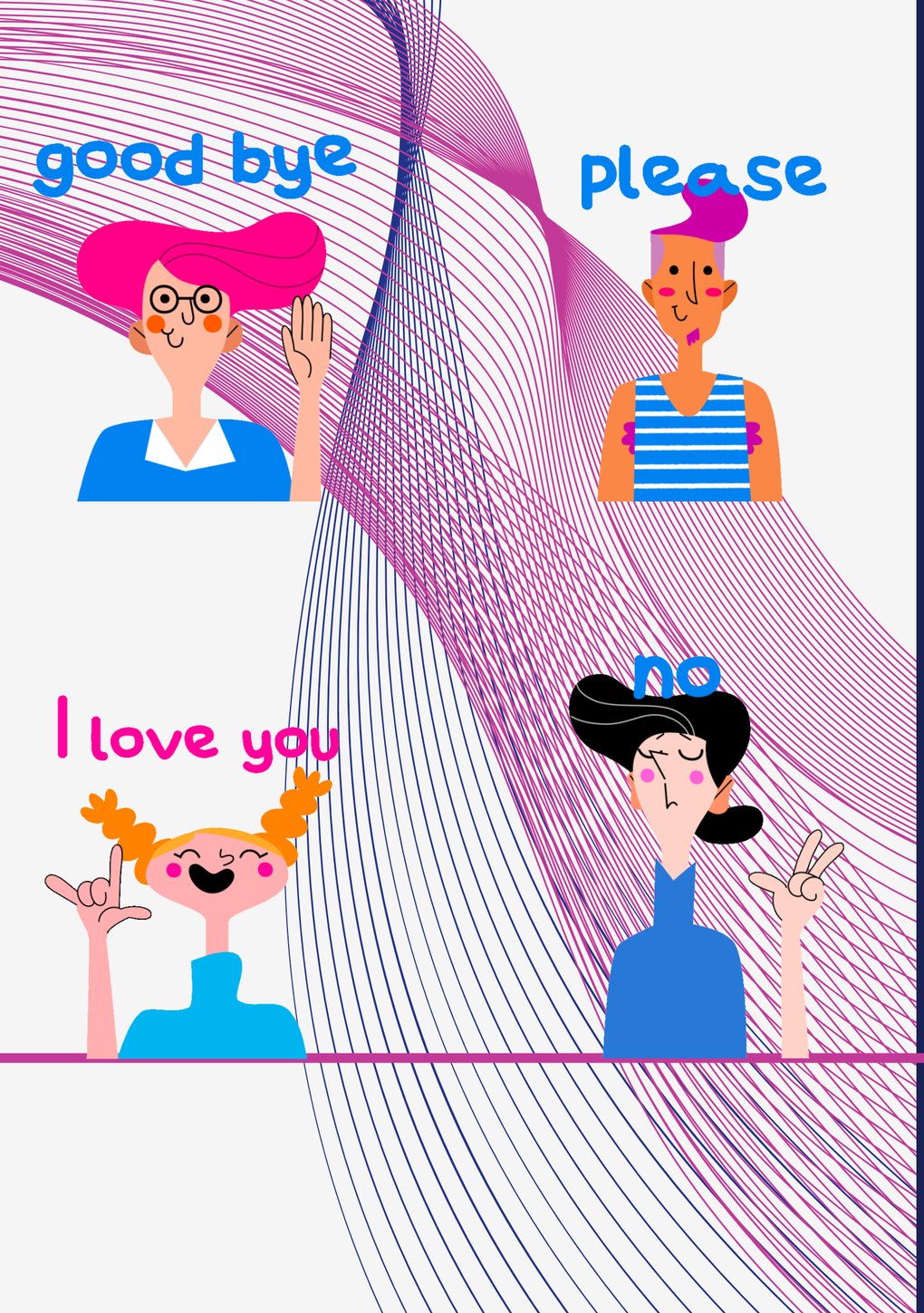
Table of CONTENTS



INTRODUCTION

This project aims to bridge the communication gap between sign language users and non-signers by developing a real-time detection and interpretation system using Python and LSTM models, promoting inclusivity for the hearing-impaired community. The website for this project includes a Home page introducing the system, an About section with downloadable resources like a presentation and report, a Sign Language Recognition Interface for real-time gesture detection, and a Demo Video Interface that showcases the system’s functionality in action.

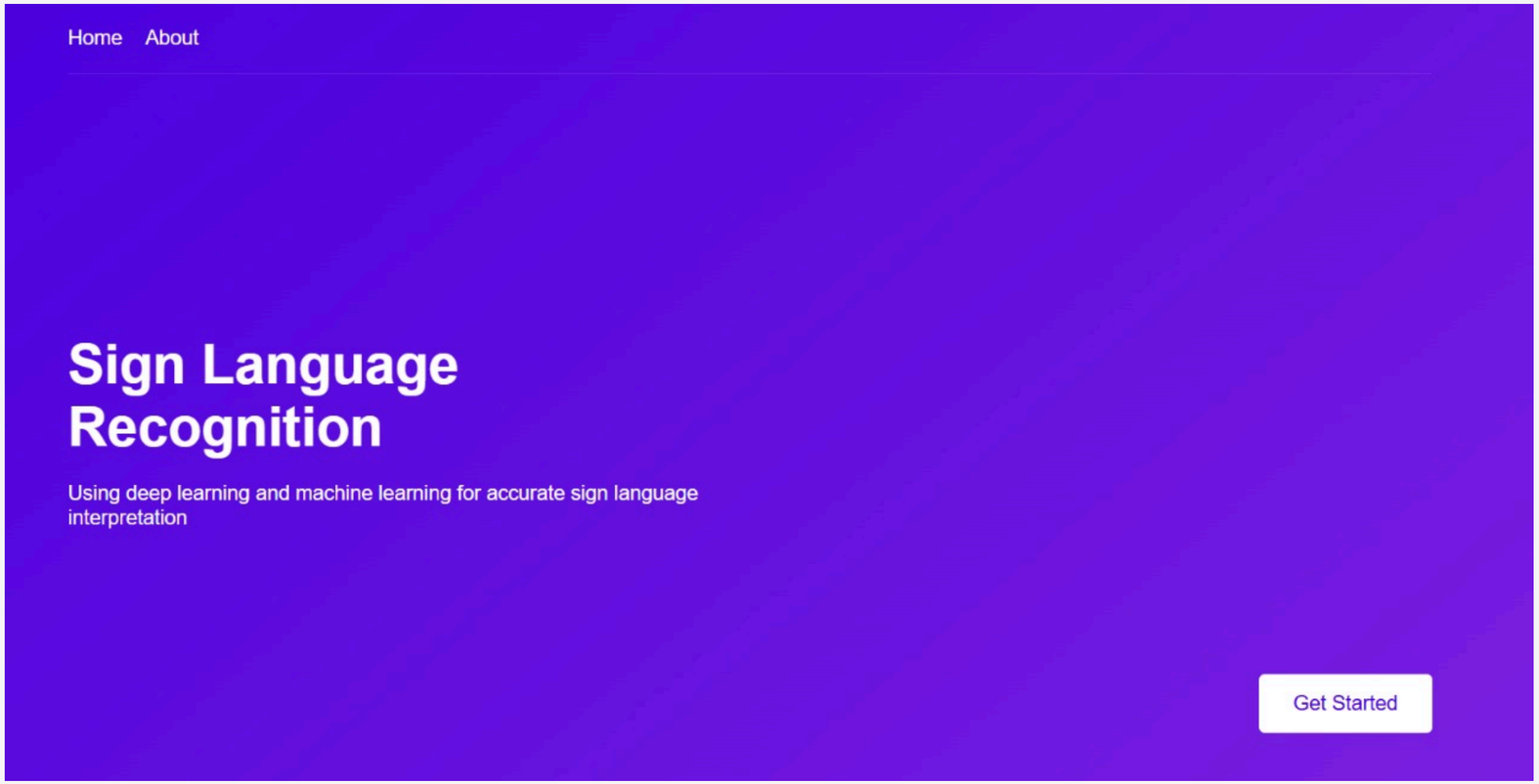
THE NEED FOR DETECTION TECHNOLOGIES

As the world becomes more digital, the demand for accessible communication grows. Sign language detection technologies can bridge the gap between hearing and deaf communities, enabling smoother interactions in various settings like education, healthcare, and entertainment.

WEBSITE OVERVIEW

- **Home Page**

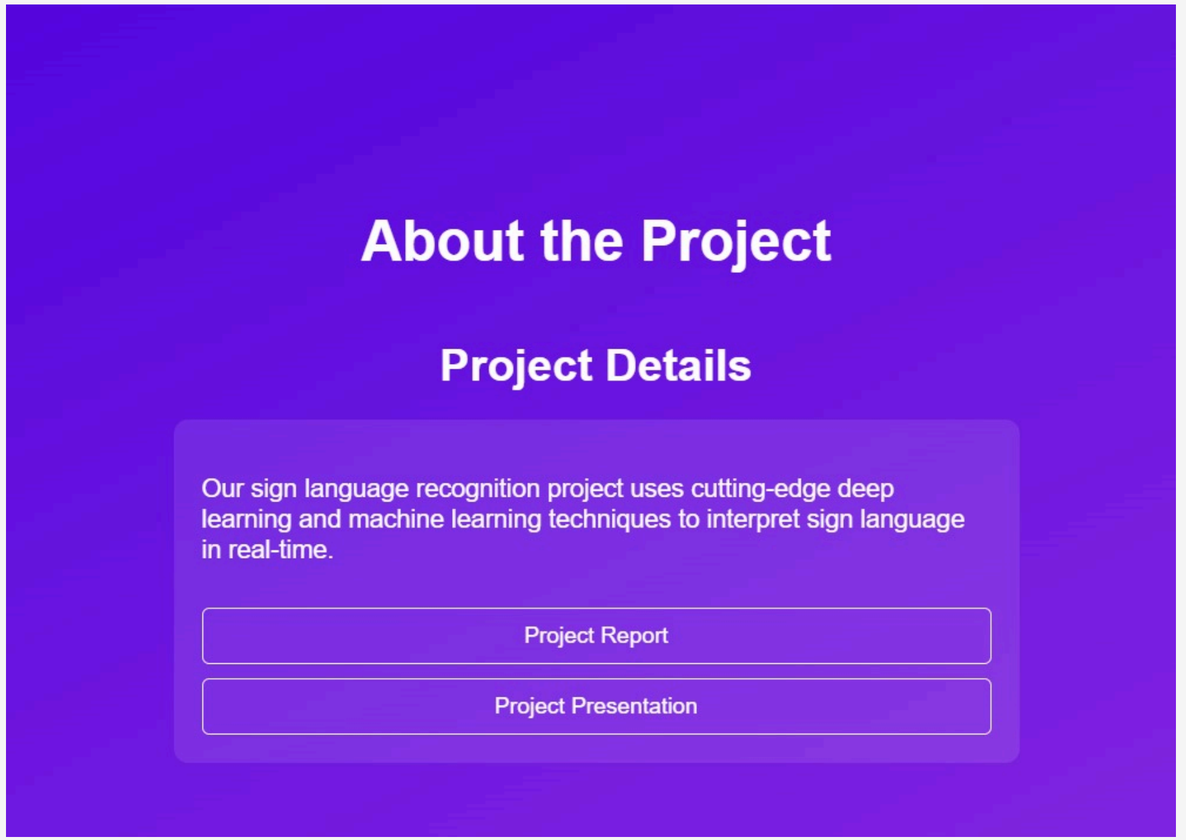
1. Introduces the face recognition project.
2. Outlines the project’s main goals and features.



WEBSITE OVERVIEW

About Page

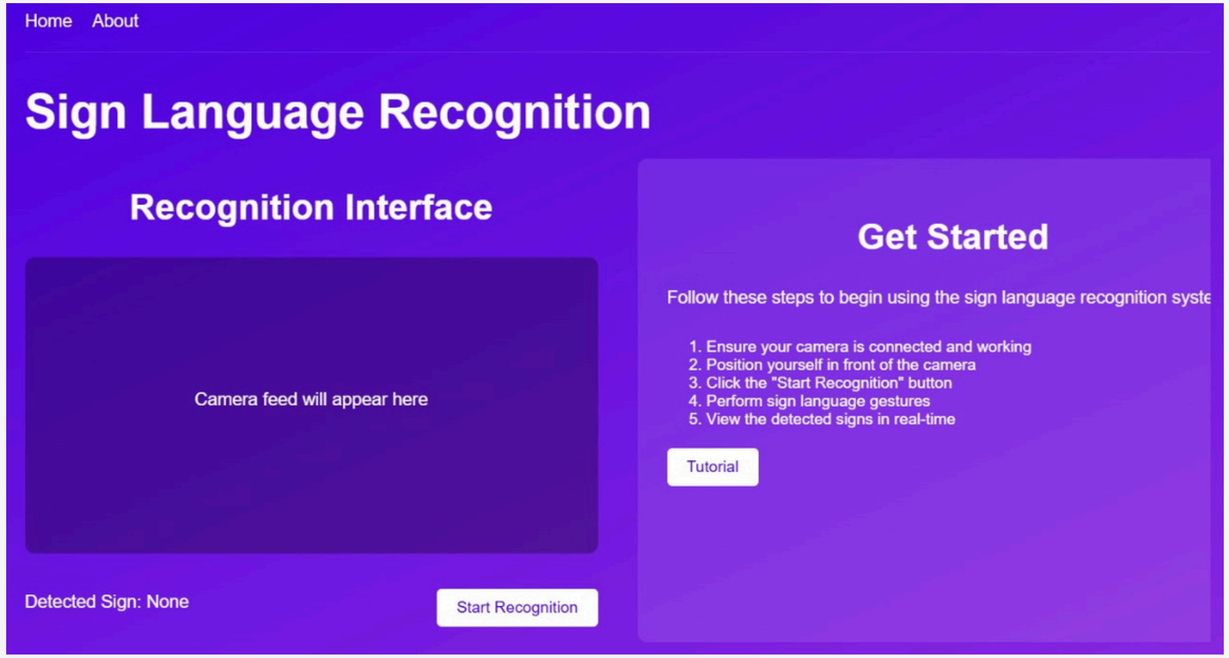
- Provides detailed information about the project.
- Includes downloadable resources (PowerPoint presentation and report) for deeper insights into methodology and findings.



FACE RECOGNITION AND DEMO INTERFACE

Face Recognition Interface

- Main interactive feature of the website.
- Allows real-time face detection and person identification.
- Enables users to test the system’s functionality easily.



FACE RECOGNITION AND DEMO INTERFACE

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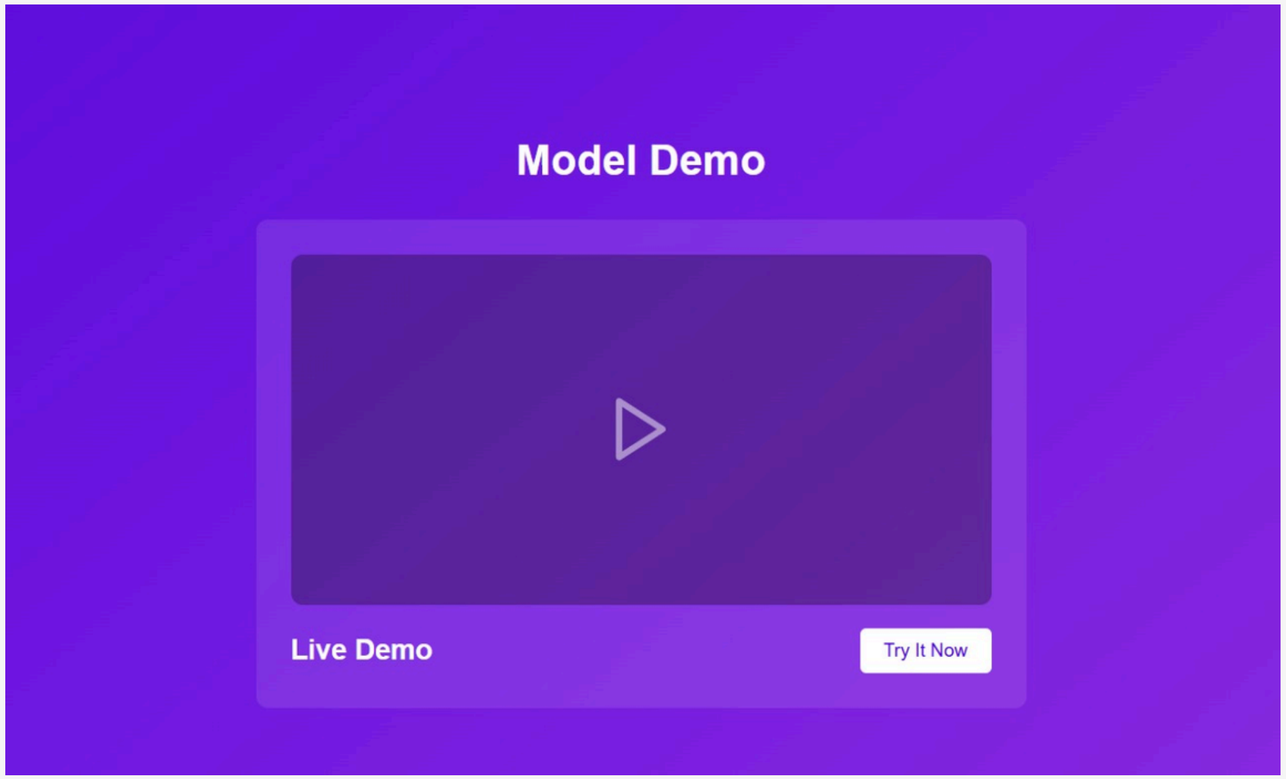
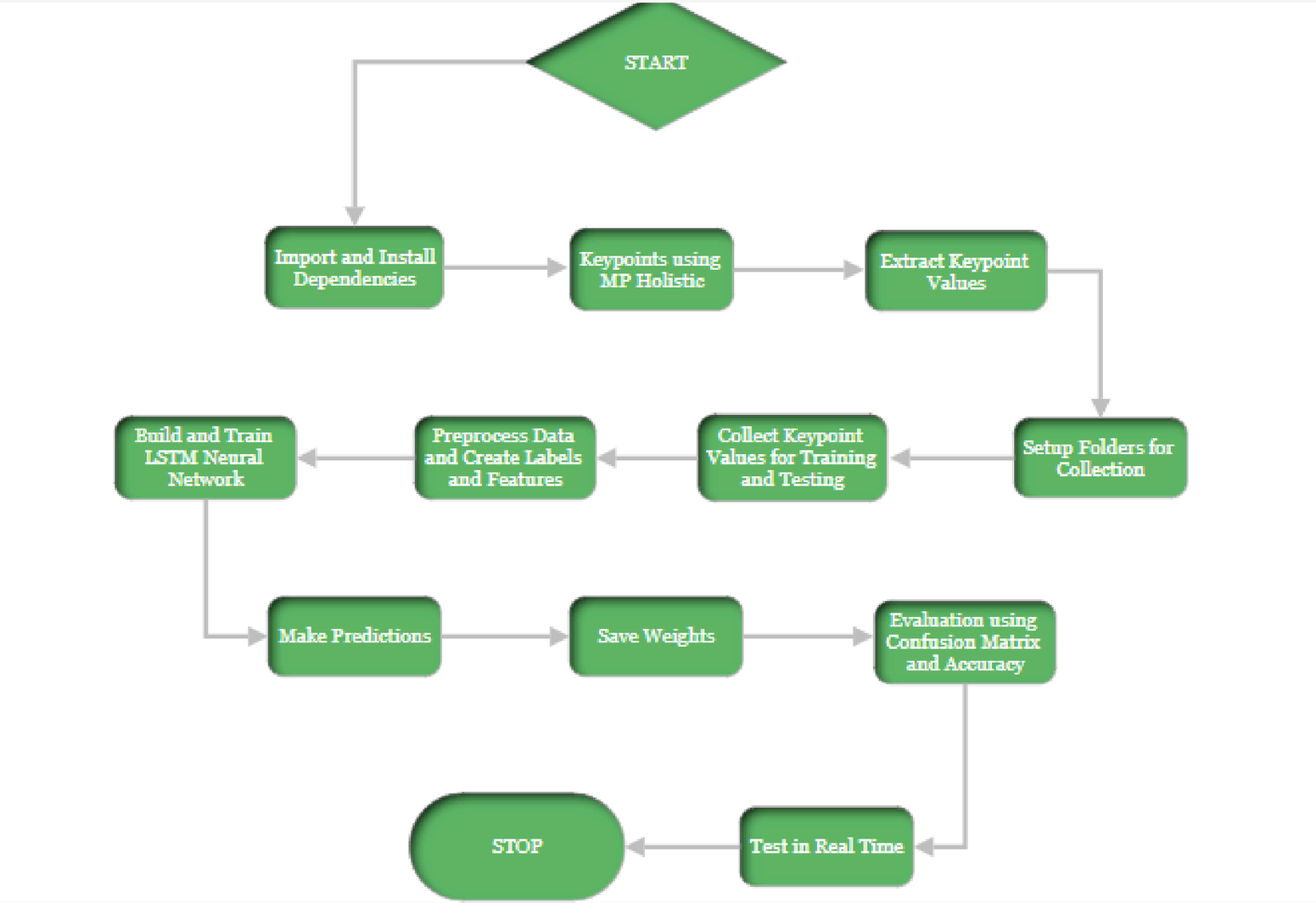


CURRENT TECHNOLOGIES OVERVIEW

Today, various technologies such as machine learning, computer vision, and natural language processing are being explored for sign language detection. These tools help in recognizing signs and translating them into spoken language, enhancing communication across communities.

FLOWCHART OF THE PROPOSED ALGORITHM



Research APPROACH

- Core Methodology:
- Use of Action Recognition combined with LSTM (Long Short-Term Memory) deep learning models.
- Real-time detection of sign language gestures.
- Why LSTM: LSTM captures temporal dependencies in gesture sequences, making it ideal for recognizing sign language, which involves dynamic, time-dependent actions.

System PIPELINE

OBJECTIVES

LSTM Model Training

- Split dataset into training, validation, and testing sets.
- Use pre-trained weights for transfer learning (action recognition).

Evaluation

- Assess performance using accuracy, precision, recall, and F1-score.

Data Acquisition:

Diverse dataset of sign language videos (different people, lighting, and camera angles).

Preprocessing:

- Frame segmentation, noise reduction, and contrast enhancement.
- Resizing frames for uniformity.

Feature Extraction

- Optical flow algorithms (e.g., Farneback, Lucas-Kanade).
- Deep learning models (CNNs) for high-level feature extraction.

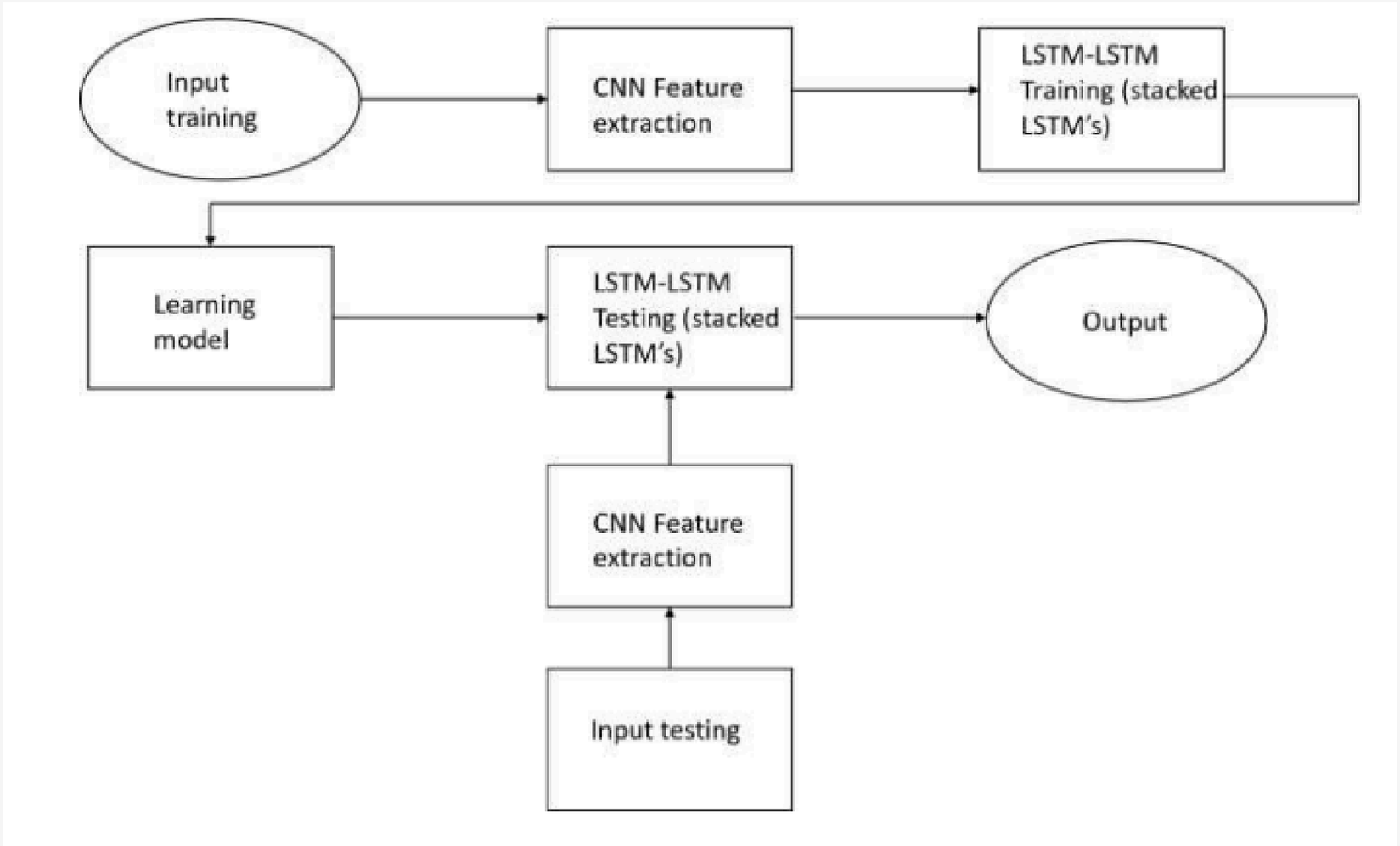
Real-time Deployment

- Deploy the model on video streams for real-time recognition.

MODEL ARCHITECTURE

- LSTM Network:
- Input Layer: Takes preprocessed video frames.
- LSTM Layers: Captures the sequential nature of gestures.
- Dropout Layers: Prevents overfitting.
- Fully Connected Layers: Map LSTM output to gesture classes.
- Activation Functions:
  - ReLU (hidden layers) to mitigate vanishing gradients.
  - Softmax (output layer) to produce a probability distribution over gestures.

LSTM ARCHITECTURE



FEATURE EXTRACTION

- Motion-Based Features:
- Optical Flow techniques (Farneback and Lucas-Kanade) to track motion across frames.
- CNN-Based Features: High-level features from each frame using pre-trained CNNs.
- Temporal Features: Capture the sequence of gestures over time using LSTM

REAL-TIME SIGN LANGUAGE DETECTION

- Real-Time Workflow:
- Process video stream frame-by-frame.
- Apply preprocessing and feature extraction.
- Feed processed frames into the trained LSTM model.
- Output gesture predictions (e.g., "peace," "thanks," "high five").
- Real-time Application: Facilitates communication for people with hearing impairments.

RESULT AND EVALUATION

Performance Metrics

- Accuracy: High recognition rate of sign language gestures.
- Precision, Recall, and F1-Score: Demonstrated robustness and reliability.

RESULT AND EVALUATION

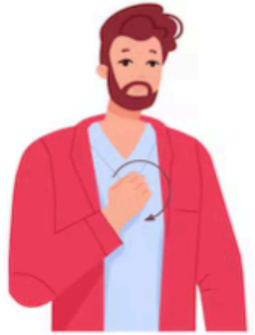
Real-time implementation .The system accurately detects and interprets gestures in real-time video streams.

RESULT AND EVALUATION

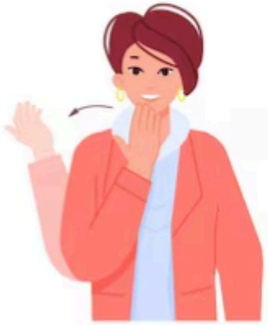
Sample Gestures
Good Luck, Peace Sign, Thanks, High Five, Rock Sign


HELLO


I LOVE YOU


SORRY


GOODBYE


THANK YOU


PLEASE


NO


YES

CHALLENGES

- Hard to capture the variety of gestures and environments, affecting accuracy.
- Ensuring fast processing for smooth detection on limited hardware.
- Differentiating subtle, similar gestures accurately.

LIMITATIONS

- .Limited vocabulary for sign language gestures (potential for expansion).
- Need for more diverse datasets (e.g., different sign language variants).

FUTURE WORK

Expanding Vocabulary:

- Include more sign language gestures to enhance system usability.

Fine-tuning for Specific Domains:

- Focus on optimizing the model for specific use cases or domain-specific signs.

Advanced Models:

- Explore attention mechanisms and 3D convolutional networks to improve model accuracy

Transfer Learning:

- Utilize transfer learning techniques to improve performance on smaller, domain-specific datasets.

CONCLUSION

THE LSTM-BASED MODEL EFFECTIVELY RECOGNIZED SIGN LANGUAGE GESTURES WITH HIGH ACCURACY. REAL-TIME IMPLEMENTATION DEMONSTRATED ITS PRACTICAL USABILITY IN FACILITATING COMMUNICATION.

PROMOTES INCLUSIVITY AND ACCESSIBILITY FOR THE HEARING IMPAIRED.CONTRIBUTES TO THE DEVELOPMENT OF ASSISTIVE TECHNOLOGIES.

THANK YOU