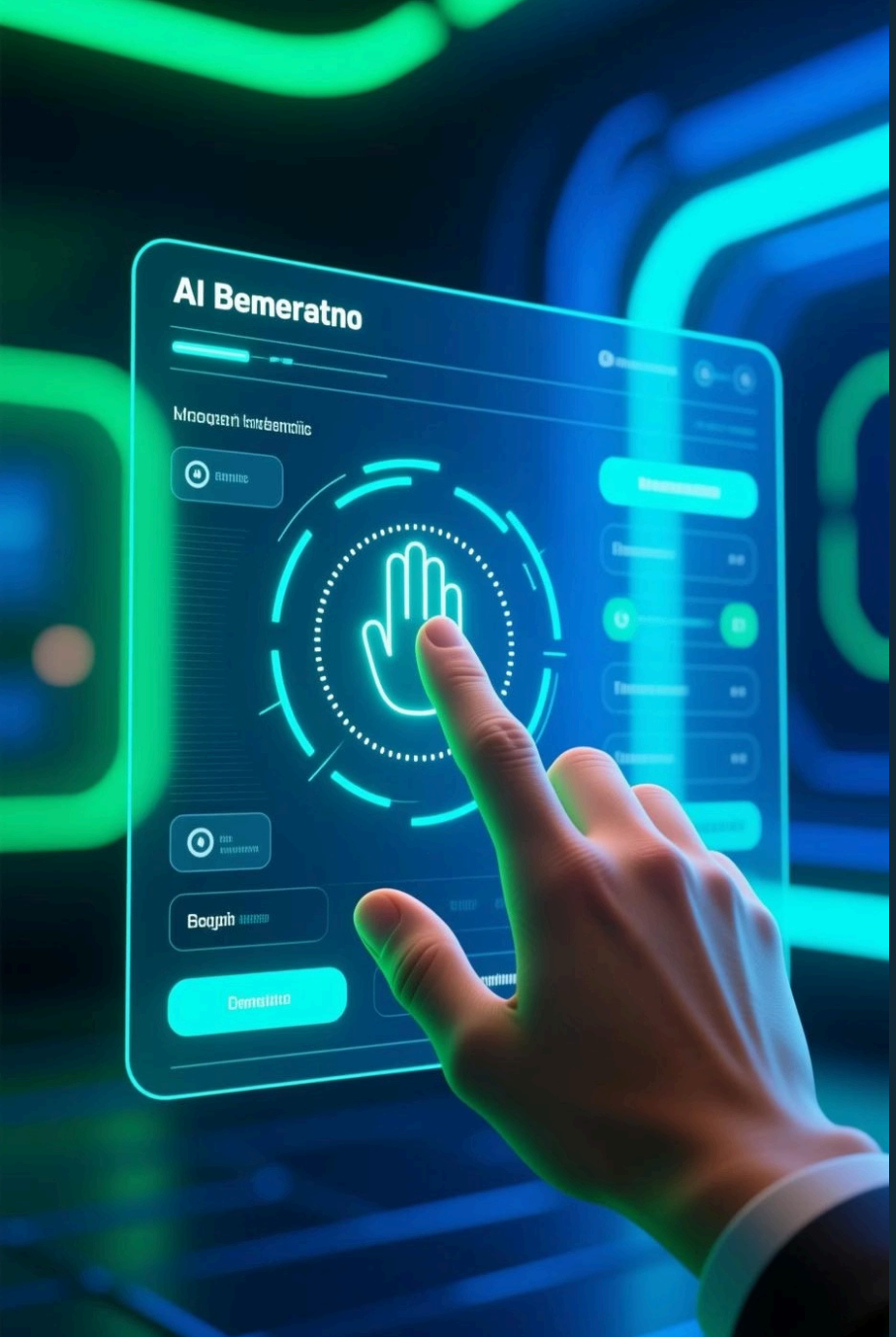


SignSpeak AI

Real-Time Sign Language Alphabet Gesture to Voice Translator Using Deep Neural Networks

Developer: Dr. Subramani

Domain: Ai | Computer Vision | Deep Learning | NLP

Mentored By: Ramisha Rani K and Ramya Dinesh

Problem Statement

Basic Human Right

Communication is fundamental to human connection and daily life.

Daily Challenges

Deaf and mute individuals face barriers communicating with non-signers.

Limited Understanding

Most people do not understand sign language, creating isolation.

Our Solution – SignSpeak AI

Real-Time ASL Alphabet Recognition (A–Z)

Capture

Webcam captures hand gesture in real-time

Detect

AI detects and classifies alphabet

Convert

Alphabet converted to voice output

System Workflow

01

Hand Detection

MediaPipe extracts 21 hand landmarks with precision tracking

02

Classification

Deep Learning model classifies alphabets from landmark data

03

Voice Output

Text-to-Speech generates natural voice output instantly

Technlogy Stack

- **Programming Language:** Python 3.10+
- **Computer Vision:** OpenCV, MediaPipe
- **Deep Learning:** TensorFlow, Keras
- **Model Optimization:** TensorFlow Lite (TFLite)
- **Backend Framework:** Flask
- **Frontend:** HTML5, CSS3 (Glassmorphism & Cyber-Aesthetic UI), JavaScript
- **Data Handling:** NumPy, Pandas

The system combines MediaPipe's robust hand tracking with neural networks for accurate classification.

AI Model & Dataset

25,192

Total Samples

Comprehensive training dataset from Kaggle **American Sign Language (ASL)** Alphabet

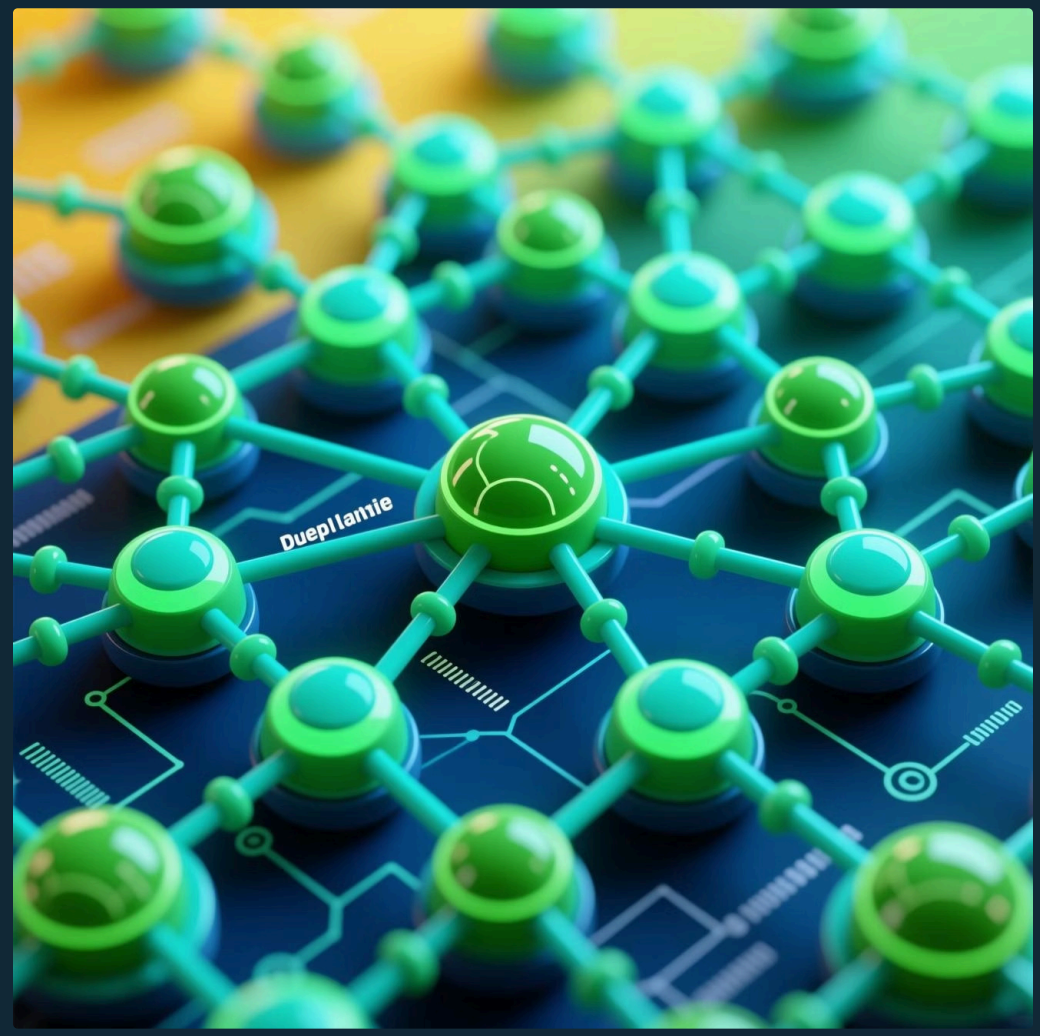
29

Total Classes

Complete alphabet coverage for ASL recognition

Multi-Layer Perceptron (MLP)

Advanced deep neural network architecture trained on extensive **American Sign Language (ASL)** alphabet dataset, achieving exceptional accuracy through optimized layer configuration and training methodology.



Performance Highlights

Accuracy

Exceptional classification precision

Latency (ms)

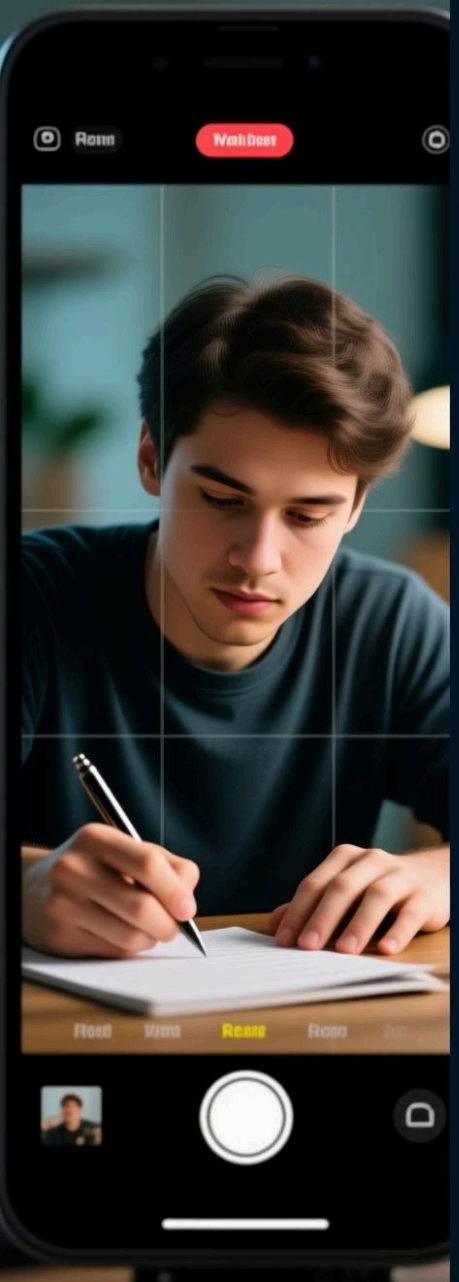
Near-instantaneous response time

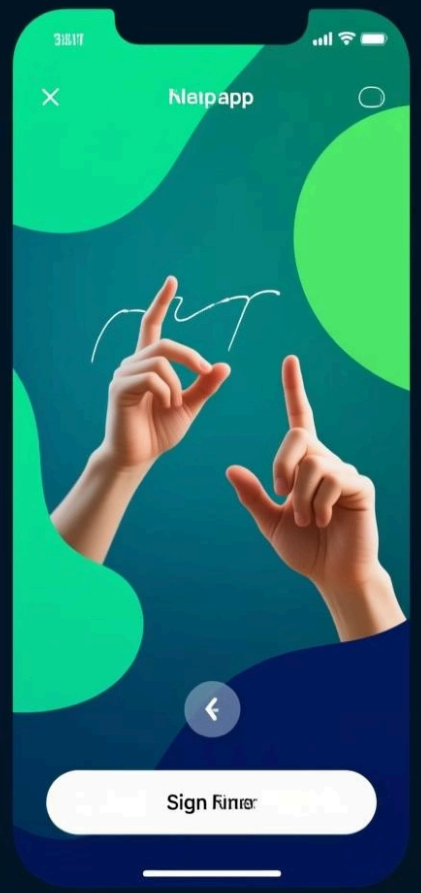
Dual Hand Support

Works with both left and right hands seamlessly

Real-Time Detection

Continuous gesture recognition without lag





Live Demo – Gesture to Voice

Show Gesture

User performs ASL alphabet gesture in front of webcam

Instant Detection

System detects alphabet with confidence score displayed

Voice Output

Detected alphabet spoken in real-time through speakers

Conclusion & Future Scope

Key Achievements

- Fast, accurate, accessible solution
- Enhances deaf community inclusion
- Foundation for advanced translation

Future Scope

- Word & Sentence Formation
- Dynamic Gestures
- Mobile Deployment

Thank You

Developed by

Dr. Subramani

Project

SignSpeak AI

A step toward inclusive communication