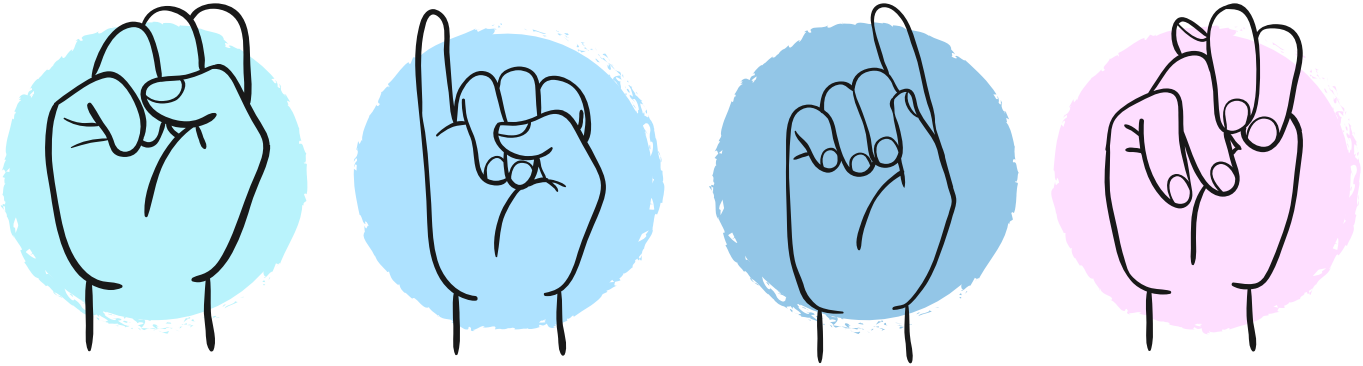
AI Based Learning System for Deaf Community using machine learning technics



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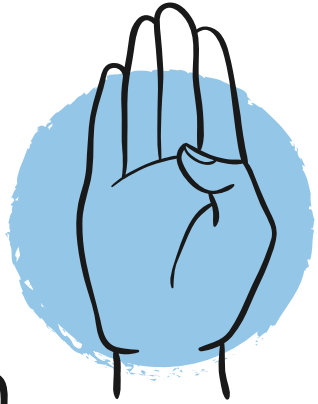

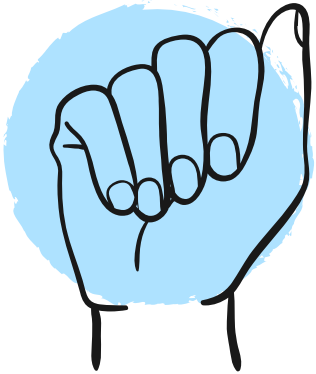

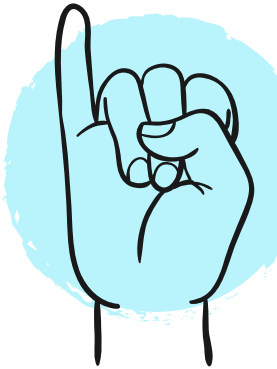

Abstract

Abstract—One project that makes use of technological breakthroughs to help people who are especially in need is sign language recognition. It was our intention to construct a sign detector for this use. Using deep learning techniques can aid in breaking down obstacles to communication. Our goal is to identify and present letters based on hand gestures. It comes to communicating with others, it can be helpful for deaf people. Since we comprehend sign languages, we can display findings using an efficient net B0 model that has never been used before. System offers a useful and engaging tool for learning sign language, with the goal of assisting the hearing-impaired community in overcoming communication hurdles.

Keywords— Sign language, American Sign Language, Deaf, Learning Plate form)

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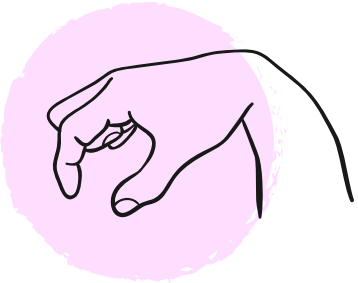
Introduction

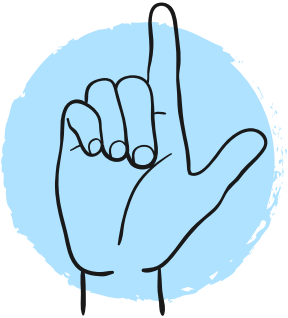
This project aims to develop an "AI Based Learning System for Deaf People" that recognizes ASL gestures using advanced machine learning techniques. The system captures gesture images through a web camera, processes them for hand detection, and classifies them with a high degree of accuracy using the EfficientNet B0 model. The project includes features like gesture-to-string conversion, an interactive quiz system, and video playback based on user input, all designed to enhance learning and communication for deaf individuals.

Problem Statement



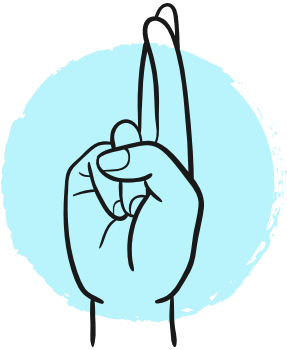
Lack of Learning Tools

Insufficient resources for practicing and learning ASL. Traditional methods lack of Realtime feedback and interactive learning.



Verification of Accuracy

Challenges in verifying the accuracy of ASL gestures. Slow learning process due to lack of real-time feedback.



Realtime Gesture Conversion

Real-Time translate ASL gestures into text, resulting in delays and misunderstandings

Paper Overview

- **Purpose:** Recognize ASL hand gestures to aid Learning system for deaf individuals.
- **Model:** EfficientNet B0 model for training and classification.
- **Accuracy:** Achieves 98% model training accuracy. Images are preprocessed for hand detection.
- **Capture Gesture:** Uses a camera to capture gesture images.

Methodology

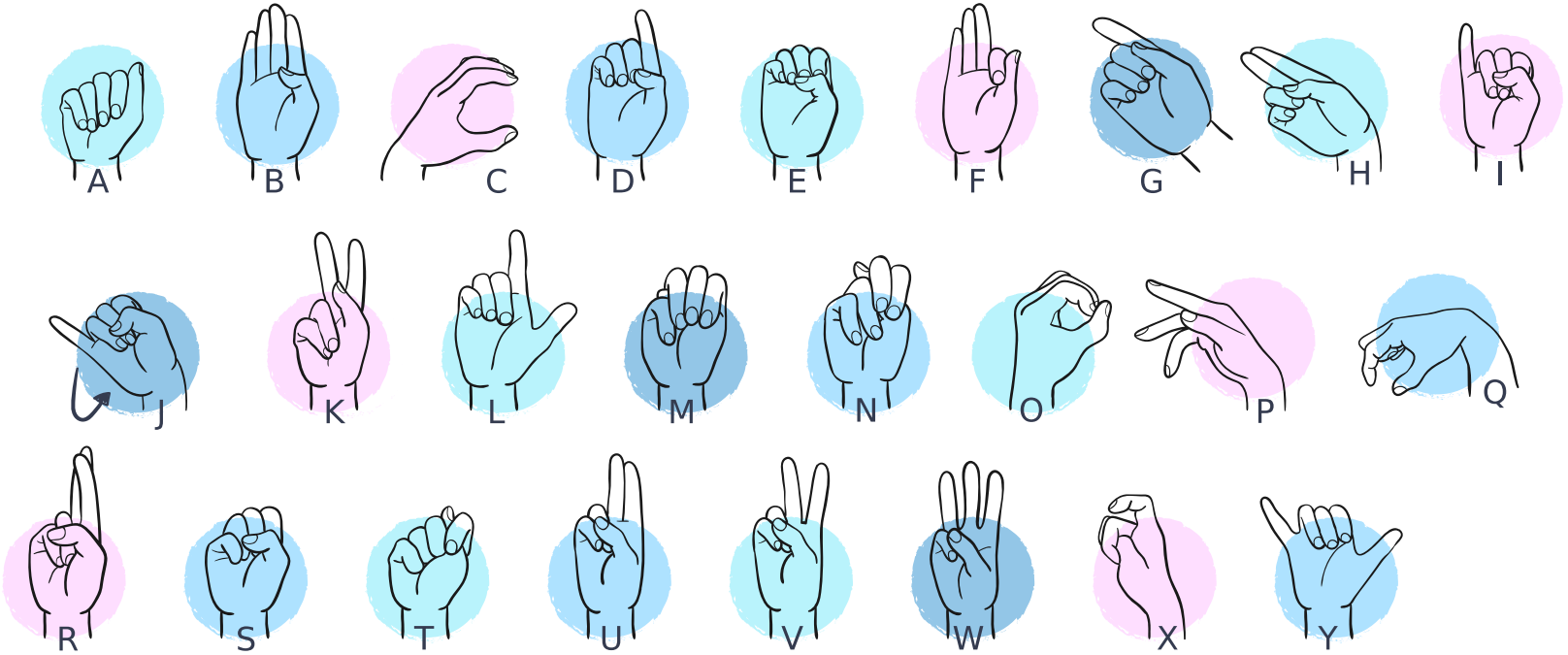
Data Collection using Kaggle

Model Training Using EfficientNet B0 Model

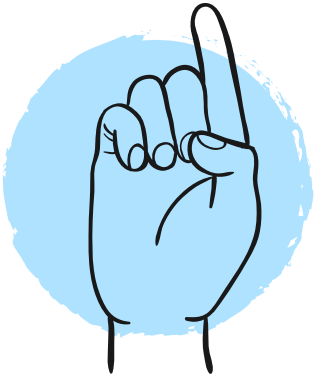
OpenCV Integration Using android Studio

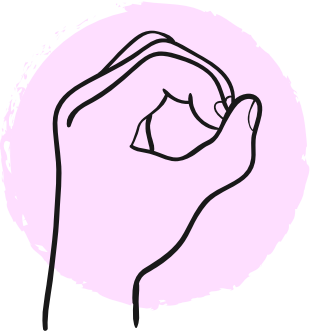
Real-time Gesture Detection using Camera

Datasets

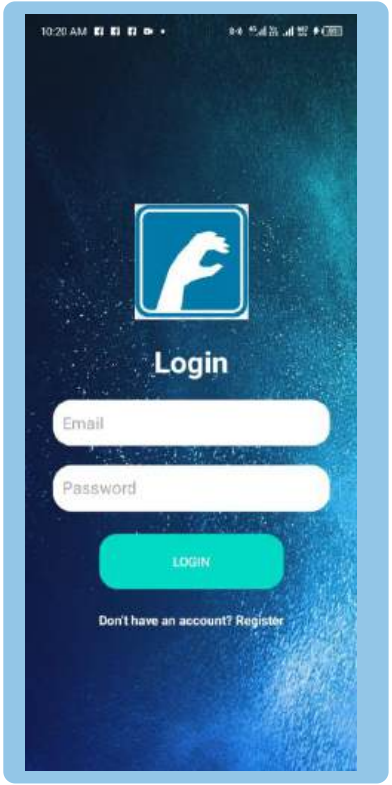


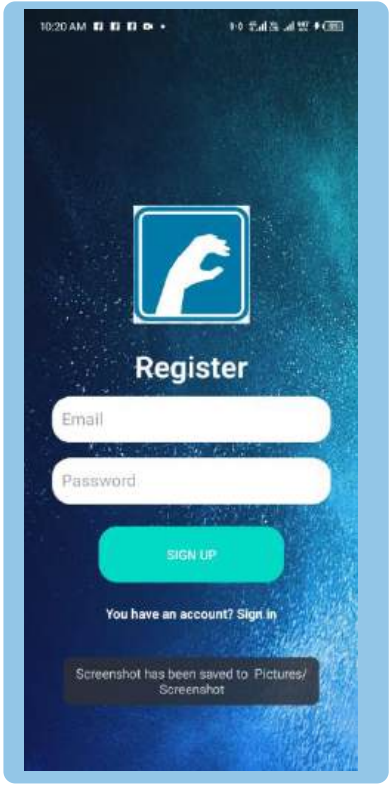
Application Overview

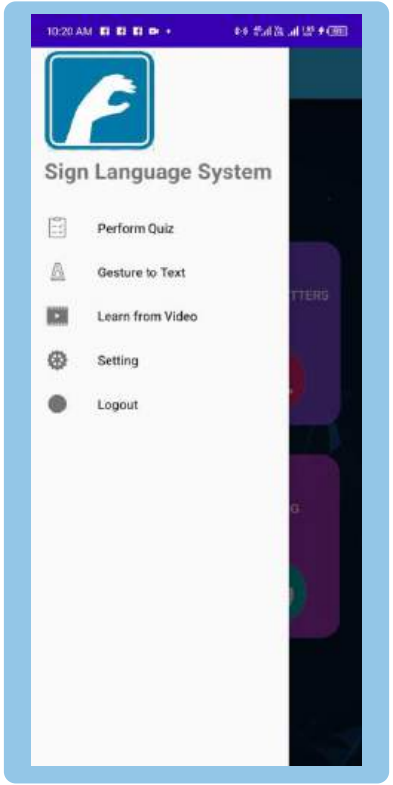




Authentication Screens and drawer







Combine Letter

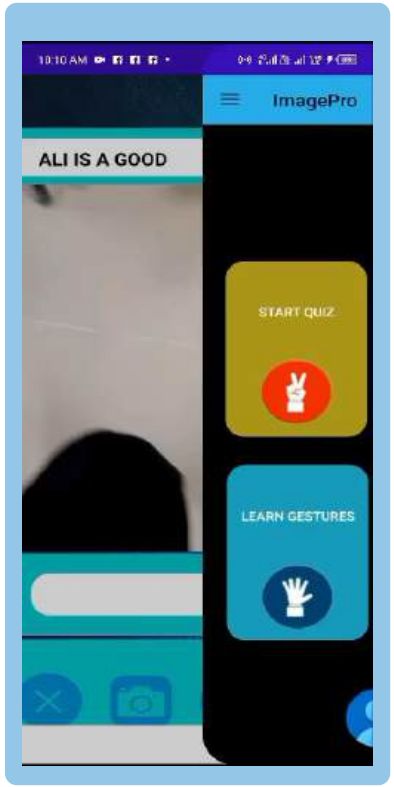
The system provides a comprehensive learning experience, enabling users to progress from recognizing individual ASL gestures to forming complete words and string there by enhancing their overall communication skills.

Mini Quiz System

- Enhance ASL learning through interactive and engaging quizzes.
- Test and improve users' gesture recognition skills in a fun and educational manner.
- Provides an engaging and effective method for users to practice and improve their ASL skills

Learn Gesture By Video

- Enhance ASL learning by providing visual aids through sign language videos.
- Provides a powerful visual learning tool that enhances the user's ability to understand and master ASL gestures.
- Making the learning process more effective and enjoyable.



Setting

- Provide users with the ability to customize their learning experience and application settings according to their preferences.
- Users can customize the duration of the quiz timer to match their learning pace.

EfficientNet B0 Model

EfficientNet B0 is a model architecture developed by Google researchers. It is part of the EfficientNet family, which is designed to optimize both accuracy and efficiency by scaling up the network's width, depth, and resolution in a balanced manner.

EfficientNet B0 is designed to be lightweight and efficient, making it suitable for applications that need to run on devices with limited computational power, such as mobile devices.

Working of Model

Pre Processing

- Resize images 96 x 96
- random

Splitting

Training	85%
Testing	15%

INPUT

EfficientNetB0

GLOBAL AVERAGE POLLING 2D

Dense

Dropout

OUTPUT

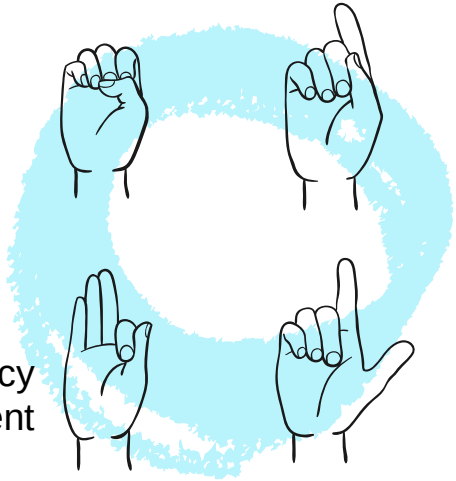
Parameters	
Total params	4086720 (15.59 MB)
Trainable params	4044697(15.43 MB)
Non-Trainable params	42023 (164 KB)

Accuracy

98%

Results

Achieved 98% accuracy in recognizing ASL gestures using the EfficientNet B0 model.

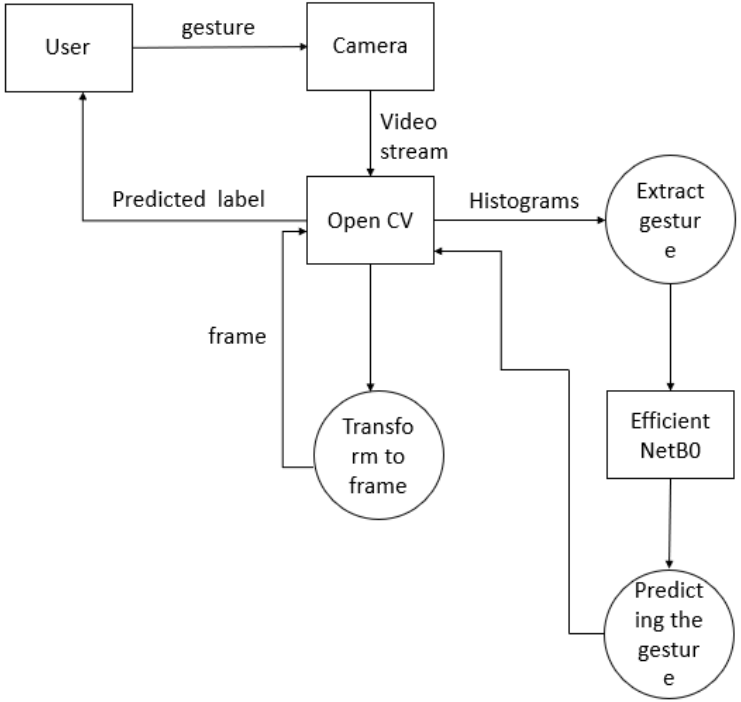


Successfully converts ASL gestures into text.

Calculates and displays accuracy results, enhancing user engagement and learning.

Real-Time recognition and classification of gestures and show accuracy results

Flow chart

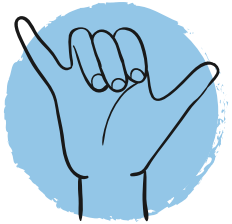

User
gesture
Camera
Video stream
Predicted label
Open CV
Histograms
Extract gestur e
frame
Transfo rm to frame
Efficient NetB0
Predict ing the gestur e

Project Goals

Real-Time Gesture Conversion

Interactive Learning Tool

High Accuracy and Reliability



Technological Innovation

Future Work

Hands

Integrate more detailed handshape detection to recognize complex gestures and improve accuracy.

Facial Expression

Capture and analyze facial expressions, which are critical in sign language for conveying emotions.

Body Movements

Incorporate full-body tracking to understand the complete context of sign language, including posture and movement.

Grammar

Develop models to recognize and interpret ASL grammar rules, including word order and non-manual signals.

END