IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)
An International Open Access, Peer-reviewed, Refereed Journal

ASL ALPHABET RECOGNITION USING MACHINE LEARNING

Prof. Pravin B. More[1], Ms. Neha G. Gaikwad[2], Mr. Prathamesh V. Ghadage[3], Ms. Vaishnavi V. Kumbhar[4], Mr. Akash M. Mane[5]

Assistant Professor[1], Final Year B. Tech Students[2,3,4,5]
Annasaheb Dange College of Engineering and Technology, Ashta, India

Abstract: An ASL (American Sign Language) recognition system that employs machine learning is an innovative technology designed contribute to bridging the communication gap that exists between the environment and the deaf difficult of hearing persons. This system utilizes advanced algorithms and neural networks to analyze the intricate in body postures, facial gestures, and hand movements that make up sign language. By processing video or sensor data of sign language users, the machine learning model can identify and interpret these gestures, subsequently converting them into written text. The potential impact of such a system is profound. It enables those who use sign language as their primary mode of communication to interact with computers, smartphones, and other devices more seamlessly.
Additionally, it facilitates better communication with individuals who do not understand sign language, as the system can bridge the language barrier by providing real-time translations.This technology promotes inclusivity and accessibility, ultimately enriching the lives
of individuals with hearing impairments and fostering a more connected and understanding society. As machine learning and artificial intelligence continue to advance, so too does the potential for ASL recognition systems to become even more accurate and widespread in their applications.

Index Terms - Sign Language Recognition, Deep Learning, American sign language, Hand Gesture.

I. INTRODUCTION

In today's interconnected world, effective communication is a fundamental aspect of human interaction. However, for individuals who are both mute and deaf, expressing themselves and understanding others can be incredibly challenging. To bridge this communication gap, modern technology has stepped in to offer solutions that empower these individuals to communicate effectively with the wider community. One such technology is the development of a Sign Recognition System using Machine Learning.

This system aims to leverage the power of artificial intelligence and machine learning techniques to recognize and interpret sign language gestures, enabling seamless communication between mute and deaf individuals and those who may not understand traditional sign language. By translating sign gestures into text or speech, this system holds the potential to revolutionize the way these individuals interact with the world around them.

In this project, we will delve into the details of designing and implementing a Sign Recognition System tailored specifically to cater to the needs of mute and deaf individuals. We will explore various machine learning algorithms and techniques that enable the system to accurately detect and interpret different sign gestures. The system's core objective is to recognize gestures with high accuracy, transforming them into meaningful text or spoken words in real-time.

Throughout this endeavor, we will encounter challenges related to data collection, preprocessing, and training. Additionally, we'll consider the significance of using appropriate hardware and software interfaces that cater to the unique requirements of the target audience. Ethical considerations, user privacy, and the overall user experience will also be key components of our exploration.

By the end of this project, we aim to not only develop a functional and efficient Sign Recognition System but also contribute to the inclusion and empowerment of mute and deaf individuals in both their local communities and the broader society. As technology continues to advance, it is imperative that we harness its potential to create positive and transformative impacts on the lives of those who often find themselves on the margins of effective communication

II. .METHODOLGY

Figure 1 shows, the system architecture for sign language recognition consists of two parts: feature extraction and recognition. The feature extraction component extracts characteristics from sign language photographs, while the recognition component recognizes gestures using extracted features. The system operates by taking pictures of sign language users and tagging them with appropriate signs. The system operates by acquiring pictures of a person using sign language, extracting features, recognizing gestures, and outputting identified words. It also includes hand detection, tracking, and segmentation for improved recognition accuracy. The diagram shows a user interface for a sign language recognition system.

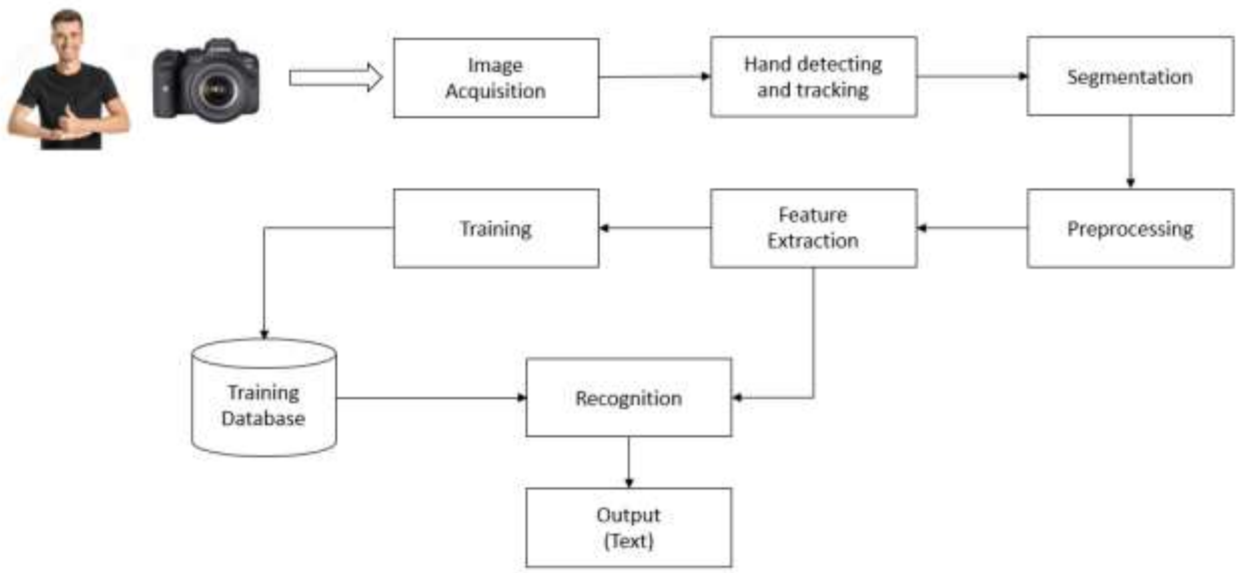

Figure 1: System Architecture for ASL recognition

1. Image Acquisition:

Getting a picture of the user signing is the initial stage in the ASL recognition system. A camera, such the one on a webcam or a smartphone, can be used for this.In order to recognize sign language, image acquisition entails taking pictures of the gestures used in sign language.
Numerous tools, including cameras, depth sensors, and even specially designed gloves with sensors, can be used to do this. RGB pictures of hand gestures are typically captured by cameras; however, depth sensors offer extra depth information that makes it possible to monitor hand and body motion more precisely. The resolution, frames rate, as well as depth sensitivity needed for a given application all play a role in the acquisition device selection. To guarantee high-quality image data to precise gesture identification, further thought should be paid to angles of view, lighting, and background clutter.

2. Hand detection and Tracking:

The system must identify and follow the user's hands in the image after it has been captured.Many computer vision techniques, including edge, motion, and skin colour detection, can be used to do this.

3. Data Pre-processing:

This module populates its binary images dependent on the object that the camera detects in front of it. Meaning that the background will be completely black and the object completely white. The next method in modules assigns a numerical value between 0 and 1 based on

the pixel's regions. Remove noise, standardize illumination, and normalize both hand and facial gestures to purify and preprocess the data.

4. Feature Extraction:

Identify useful characteristics in the data. Hand form, hand posture, hand their position, facial reactions, and body posture are all aspects that can be used to recognize signs in sign language. To extract important features, use methods like image recognition and picture processing.

5. Model selection:

Select the best deep learning or machine learning model for recognizing sign language. Recurrent neural network models (RNNs) and convolutional neural network models (CNNs) are frequently employed for this. To make use of already existing knowledge, think about employing transfer learning or pre-trained models.

6. Model training:

Based on the dataset, create test, training, and validation sets. Make use of the validation set to evaluate the model's performance after developing the selected model using the training set. Adjust the hyperparameters to enhance the model's performance.

This Training and the validation Loss Graph illustrates the training loss, a measure of how well a model created using deep learning matches the training set of data. On the other hand, a statistic known as validation loss is used to evaluate how well the machine learning model performs on the validation set.

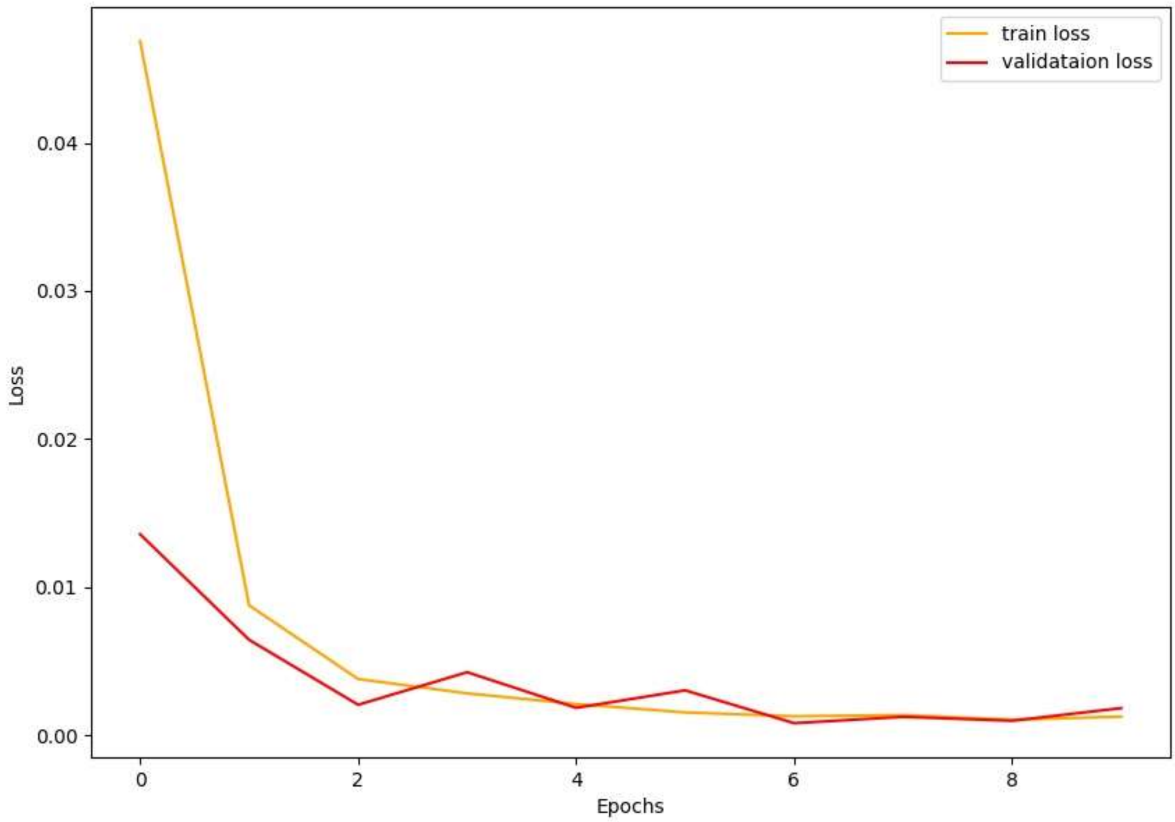

Figure 2: Training and Validation Loss

Training and Accuracy Grapg shows, the training dataset, or the data that was utilised to fit the model While the validation dataset is used during the training phase to confirm the model's generalizability or to terminate it early, the testing dataset is used to use data for reasons other than training and validating.

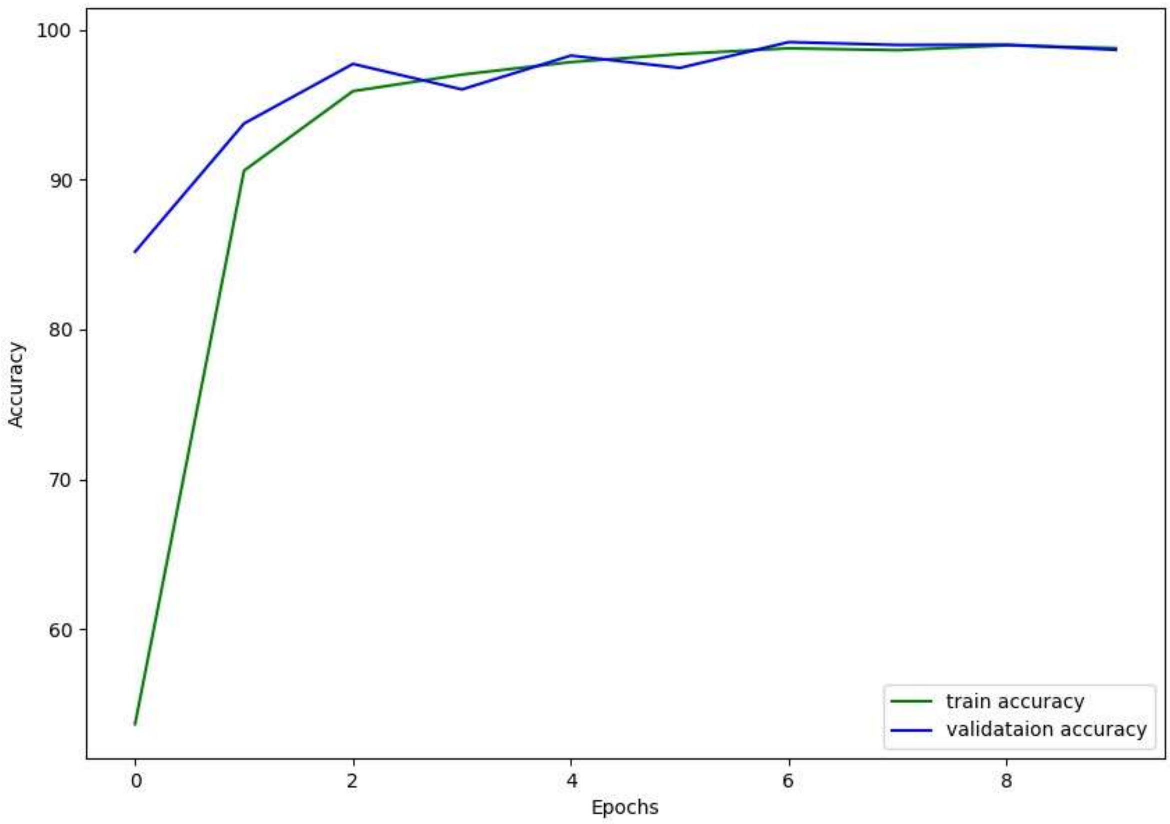

Figure 3: Training and Accuracy

7. Hand Gesture Recognition:
   The preprocessed images are fed into the Keras CNN simulation. The trained model produces the projected label. Every gesture descriptor carries a probability associated with it. The expected label is based on the label with the highest probability.

8. Display as a Text:
   The model translates recognized movements into words. A phrase is made up of the recognized words. establishing the overall context. The recognised ASL signs are output as text by the machine. There are several methods to accomplish this, including projecting the text onto a screen, reading it loudly, or transferring it to a computer.

9. Evaluation:
   To evaluate the model's performance, use a testing dataset and measures like as precision, recall, accuracy, and F1 score. Consider soliciting feedback from and usability testing from deaf and mute people.

10. Accessability:
    Make sure the interface is simple to use, accessible, and has choices for personalization based on user requirements and sign language variations.

III. Results and Discussions

Machine learning has become a powerful tool for sign language detection, offering significant progress in bridging the communication gap for deaf and hearing-impaired individuals. Here's a breakdown of the results and discussion on this application:

Result:

• High Accuracy: Machine learning approaches, particularly Convolutional Neural Networks (CNNs) have achieved impressive accuracy in sign language detection. Studies report recognition rates exceeding 93% for isolated signs

• Real-time Applications: Machine learning models can be optimized for real-time processing, enabling applications like sign language translation and communication tools

Discussion:

• Challenges:

Complexity of Signs: Sign languages involve hand movements, facial expressions, and body posture. Capturing these nuances requires robust models and large datasets for training.

IV. References

[1]"An Efficient Framework for Indian Sign Language Recognition Using Wavelet Transform" written by Mathavan Suresh Anand, Nagarajan Mohan Kumar, Angappan Kumaresan, published by Circuits and Systems, Vol.7 No.8, 2016

[2] "Hand Gesture Recognition System for Dumb People using Image Processing" Swaroop Y P1, Abhishek T G2, Kishor K3, Ravindra Prasad Y K4, Anisha P S5

[3] "An Automated System for Indian Sign Language Recognition" Chandandeep Kaur,N. Gill Published 2020

[4] "Hand Gesture Recognition for Sign Language Recognition": A Review Swapnil Chandel Mrs. Akanksha Awasthi Research Scholar Assistant Professor Department of Electronics Engineering Department of Electronics EngineeringC.V. Raman University,Bilaspur, C.G. C.V. Raman University, Bilaspur, C. G.

[5] International Journal on Recent and Innovation Trends in Computing and Communication (ISSN:2321-8169/Volume:3/Issue:5) "Design Issue and Proposed Implementation of Communication Aid for Deaf and Dumb People" Nakul Nagpal Jhulelal Institute of Technology, Dr. Arun Mitra Manoharbai Institute of Engg. and Technology, Gondia, Dr. Pankaj Agrawal Shri Ramdeobaba College of Engg. and Management, Nagpur.