

A Noval Approach for Identification of Sign Languages using Deep Learning

Prateek Sharma¹, Aayush Ranjan², Abhishek Shekhawat³,
Mayank Raj⁴

^{1,2,3}Student, I.T.S Engineering College, Greater Noida, Uttar Pradesh

⁴Assistant Professor, I.T.S Engineering College, Greater Noida, Uttar Pradesh

Date of Submission: 15-04-2023

Date of Acceptance: 25-04-2023

ABSTRACT -Sign language is made up of hand gesture and it is a mode of non-verbal communication meaning to communicate without speaking. It is used by dumb and deaf individuals to interact with other people or among themselves because they have hearing and speech issues. Several countries around the world have created various sign language systems, however they are not adaptable and are very expensive for end users. As a result, we made our program that shows a prototype which can automatically detect the sign language for the aid of hard of hearing and mute individuals in communication with each other and other people more efficiently. Many individuals find it difficult to interact and to be in touch with deaf and dumb individuals, hence they are denied regular social interaction due to their disability. Some folks are forced to use visual aids or interpreters to communicate. Interpreters are not always accessible. The major form of conversation between the deaf and dumb community is sign language. The sign language is largely used by the deaf and dumb community and their families because an average person is unable to understand the syntax or meaning of the different gestures which make up the sign language.

I. INTRODUCTION

Those who are deaf or dumb utilize hand and body motions to communicate with others and with their own community as their major form of expression. The vocabulary, meaning, and syntax used in sign language are distinct from those used in spoken and written language. To express meaningful meanings, articulate sounds are mapped onto particular words and grammatical combinations in spoken language. Visual hand and body gestures are used in sign language to communicate important ideas. In the world, 300+ different sign languages are used today. They differ from one country to the another. Sign languages may have many different

diverse regional accents that cause subtle variances in how people use and comprehend signs, even in nations where the same language is spoken. For the approximately 7 million deaf people in India, there are only about 250 licensed sign language interpreters. Given the shortage of sign language interpreters in existence today, it would be difficult to teach sign language to everyone.

Sign language recognition is a technique of translating a user's hand signs or gestures into text. It helps individuals, who are unable to interact, with others thereby reducing the visible gap between the special aided individuals to the general public. Raw images and videos are turned into text which then can be read and comprehended, using image processing techniques and neural networks which link the sign to its corresponding text in the learning dataset.

The core of the issue statement is the concept of a camera-based sign language recognition system for the hearing handicapped, which would convert sign language movements to text. Our objective is to develop a simple, user-friendly solution. So, there is a need for a solution that can identify several indications and convey the message to normal individuals.

Sign language is widely practised by those people who suffer from hearing impaired and dumb people as a medium for conveying their messages. The sign language is made up of numerous signs and gestures which are created by various shapes by our hands, orientations, and its movements as well as the face expression. In our world, total of 446 million people suffers from hearing loss and out of them there are 34 million youngsters. There are 336 million dumb and mute people. Deaf people may have no ability to hear at all, and dumb people don't have the

ability to speak. For communicating these people use different sign languages.

Comparing the spoken and sign languages with each other, there are very few sign languages. In India we have our own sign language called the ISL- Indian Sign Language. There are surprisingly few deaf and mute institutions in emerging nations like India. These persons with physical disabilities have an extremely high unemployment rate.

The main objective is to create a real-time sign language detection system which detects every symbolic hand gestures and converts them into text so that the barrier between individuals who have disabilities and regular folks can be closed.

II. PROBLEM STATEMENT

Those who have trouble speaking or hearing use hand gestures and signs to communicate. Language comprehension is tough for average individuals. Hence, a system which could identify numerous signs/gestures and conveys the information to the common people is required. It reduces the differences between those with physical disabilities and average people.

The idea of a camera-based sign language detection system for the deaf, which would translate sign language movements to text, is at the heart of the issue statement. Our objective is to develop a simple and user-friendly solution. As a result, system that recognize, detects or predicts numerous sign and delivers the information to normal people is necessary.

III. MOTIVATION

Communication is the only mean of expressing one's emotion. But for some people it is hard to express themselves and their emotions. These people suffer from disability and couldn't speak or hear different people. They always have a human interpreter which convey their messages to common people.

Deaf and Dumb people uses different hand gestured sign language to communicate, which leads to others, outside their community, often facing difficulty in recognizing their language by the signs they make. To reduce the gap between physically challenged people and common folks we need a system which translate their hand gesture into text.

IV. LITERATURE REVIEW

Sanket Bankar, Tushar Kadam, Vedant Korhale, Mrs. A. A. Kulkarni "Real Time Sign

Language Recognition Using Deep Learning" 2022

[1]: The authors of this paper suggested a method of sign language detection system using CNN algorithms. CNN has max pooling layers for the model training making it a slow process. So to overcome this drawback they created YOLO- You Only Look Once algorithm. This algorithm is used for real-time object identification by applying neural network. Because of its speed, faster processing and accuracy it is very popular.

Ravindra Bula, Dipalee Golekar, Rutuja Hole, Sidheshwar Katare, S. R. Bhujbal "Sign Language Recognition Based on Computer Vision" 2022

[2]: The sign language recognition project is made using LSTM (Long short term memory) networks. It comes under the category of recurrent neural network (RNN). RNN are used for long term dependencies specially in sequence prediction problem.

Prof. Radha S. Shirbhate, Mr. Vedant D. Shinde, Ms. Pooja U. Borkar, Ms. Sanam A. Metkari, Ms. Mayuri A. Khandge "Sign language Recognition Using Machine Learning Algorithm" 2020

[3]: The SVM- support vector machine algorithm is the foundation of the method suggested for the objective in this research. This algorithm for supervised learning is used to solve regression and classification problems. Moreover, hierarchical classification and random forest classification are used.

N. Padmaja, B. Nikhil Sai Raja, B. Pavan Kumar "Real time sign language detection system using deep learning techniques" 2022

[4]: This paper methodology is based on Regional Convolutional Neural Network (R-CNN) Method. It is made using MATLAB Residual Network (ResNet-50). ResNet-50 is deep learning CNN model that is 50 layers deep.

Sigberto Alarcon Viesca, Brandon Garcia, "Real-time American Sign Language Recognition with Convolutional Neural Networks" from Stanford University

[6]: This paper proposed a method where the model is trained using CNN. It also uses Caffe and GoogleNet for develop, test and run CNN model.

V. METHODOLOGY

1. Dataset Generation - A set of data used to train the model is known as a machine learning dataset. To educate the machine learning algorithm on how to make predictions, a dataset is used as an example. Text, audio, and image data are the most prevalent sorts of data. Our own training

dataset is produced. Our set consists of the information that will be utilised to train our model at first. To put it another way, it instructs each algorithm what to look for in the data. For instance, in our study, we train our model using photos of the sign language letter A.



Fig 1: Letter A in american sign language

- Convolutional Neural Network- Machine learning includes convolutional neural networks, also known as convnets or CNNs. It is one of a number of models of artificial neural networks used for various tasks and datasets. For deep learning algorithms, a CNN is a unique type of network architecture that is used for tasks like image classifying and processing pixelated data. Despite the reality that deep learning uses a number of neural network types, CNNs are the preferred network design for recognising and classifying objects. They are therefore ideally suited for computer vision (CV) tasks and for technologies like facial recognition and various object recognition. CNNs are particularly helpful for image identification, image classification, and computer vision (CV) applications because they generate incredibly accurate results, especially when a huge amount of data is being involved. As the object data passes through the CNN's numerous layers, it also picks up the features of the item over time. The requirement for manual feature extraction is eliminated by this direct (and deep) learning.

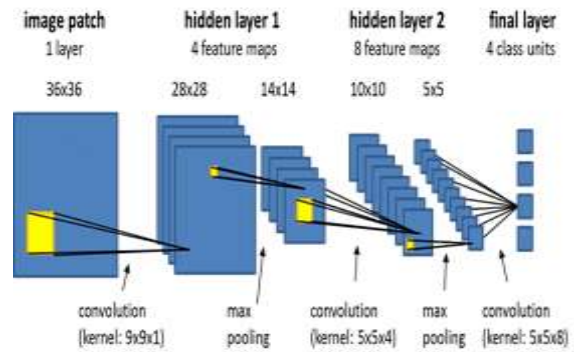


Fig 2: Convolutional Neural Network

VI. DESIGN OF THE PROJECT

- Data Flow Diagram - Another name for the DFD is the bubble chart. It uses a simple graphical framework to show how a system works in regard to the data that is provided to it, the multiple operations that are carried out on it, and the data that is produced as an outcome of those activities.

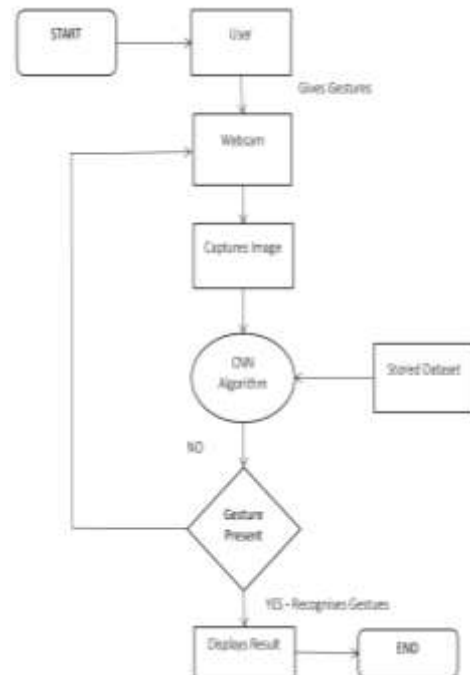


Fig 3: Data Flow Diagram

- Use Case Diagram- 2. A use case diagram is a tool for condensing information about a system and the users within it. It is frequently shown as a graphic depiction of the interactions between different system components. Use case diagrams will illustrate the system's events in detail, along with their timing.

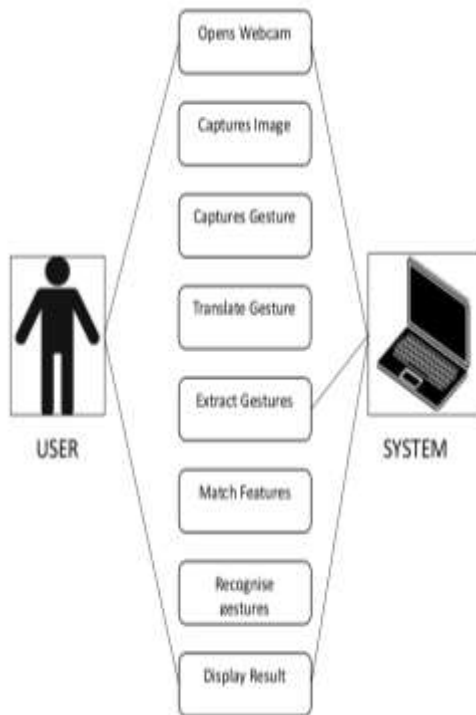


Fig 4: Usecase Diagram [2]

3. System Architecture-

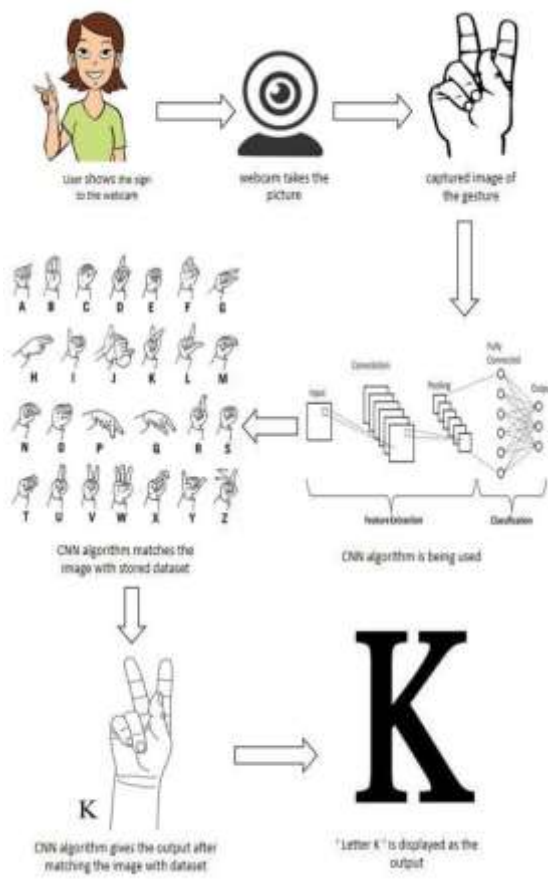


Fig 5: System Architecture

VII. RESULTS

Here is the result of converting sign language into text using machine learning. Letter A, B, C and D are converted from sign language to text.

Fig 6: Sign Language converted to text

VIII. CONCLUSION

Using help of deep learning (Convolution Neural Network) and machine learning, a notion for workable communication between speech and hearing challenged people and the normal person with more visual and auditory senses. Its two main parts are classifying images and understanding the gestures in photos. The suggested system can be accessed using the built-in camera, which recognises hand movements (signs) after detecting them.

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