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# Hand Gesture Detection Using CNN

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**Abstract**

Multimedia computing, secure data communication, biomedical, biometrics, remote sensing, texture comprehension, pattern recognition, content-based retrieval, compression, and many other applications are among the rapidly increasing disciplines. It all comes down to how a computer can detect graphical data after a picture has been processed. Pointing gestures are particularly intriguing communication and may be a more intuitive interface for choosing than the majority of gestures used by humans when communicating with one another. They allow for the indication of things and locations, for example, to construct a robot, we must modify the movement direction or simply mark some items.

This is especially useful with speech recognition software and pointing gestures, which can be used to describe parameters in vocal assertions. This technology may provide a benefit to impaired people who are unable to communicate. A translator can also be employed if the sender and receiver speak different languages. It has long been seen as a difficult issue in the subject of developing a natural interaction interface, in which individuals can engage with technologies as they would with the actual world. The hands-free application interface will naturally immerse the user from the actual world to the virtual environment since it is based on human sign and no gadgets are tied to the user.

The motion is identified and a corresponding output is created when the input image matches the provided dataset in the neural network's memory.

## 1. INTRODUCTION

### 1.1 Introduction

The human species has always enjoyed conveniences in a world of technological developments. However, because they are differently abled, many of our companions are denied these benefits. According to the Globe Health Organization, there are approximately 285 million blind people, 300 million deaf people, and 1 million deaf individuals in the world. Many research projects have been underway in the hopes of improving their lives. Our effort in this project to design an integrated system that may be used by any blind, deaf, or dumb person to easily communicate with both normal and differently abled people of any impairment is one such attempt. This could be turned into an innovative communication system that supports mobile or wireless communication. In a single tiny device, deaf, dumb, and blind persons can communicate.

The primary premise of the concept is to convert one medium of communication, Sign language, to another, text/speech. A well-structured nonverbal communication ability is sign language. The speaker's thoughts can be properly transmitted through sign language, in which each gesture, including hand, head, and other body parts movement, has a meaning. A gesture or sign image is supplied to the system

in the proposed system, which is then analyzed using a neural network model (CNN) convolutional neural network. Hidden layers are used to execute feature extraction and classification procedures to improve the features extracted from the image.

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### 1.2 Objective

The main goal of this research is to recognize a gesture using proper neural network training. During runtime, we want to achieve accuracy in identifying proper gestures. This identification method is useful for persons who are unable to converse with others.

## 2. Literature Survey

**Spatial Relationship Based Features for Indian Sign Language Recognition**

The challenge of detecting signals produced by hearing impaired people at the sentence level is addressed in this work. A new method for extracting spatial data in order to record a signer's hand movements has been developed. Frames from a video of a sign are preprocessed to remove the signer's facial and hand components. To extract spatial features, the local centroids of the extracted components, as well as the global centroid, are used. The concept of interval valued type symbolic data has been investigated in order to capture differences in the same sign made by different signers at different times.

**Vision based sign language recognition techniques and outcomes**

The American Sign Language Recognition (ASLR) process is a progression in which a computer recognizes ASL motions and converts them into human-readable text. Several academics have described various ways for recognizing static and dynamic movements in American Sign Language using distinct recognition algorithms. A sincere effort has been made in this study to highlight the numerous research efforts carried out and to compare and contrast those works in recognizing American Sign Language. It was also attempted to present sign language recognition approaches and techniques, as well as gesture recognition restrictions and process. This report also includes a comparative analysis and graphical representation of numerous methodologies used in related research by other researchers.

**A Comprehensive analysis of Sign Language detection using hand crafted and deep learning features**

Hearing-impaired people are increasingly using sign language as a means of communication. The sign language alphabets are the foundation of the language. To classify the signs more accurately, this paper uses a combination of hand-crafted characteristics and a deep learning algorithm. For accurate shape segmentation and texture features or local shape information, the skin colour based YCbCr segmentation approach and local binary pattern are used. The VGG-19 transfer learning framework is fine-tuned to obtain features, which are then fused with hand-crafted features using a serial-based fusion technique. Finally, an SVM classifier is used to classify the signs using these attributes.

## 3. OVERVIEW OF THESYSTEM

### 3.1 Existing System

Neha V. Tavan and Prof. A.V. Deorankar developed a method to extract HOG characteristics in their research. These characteristics were then utilized to build an artificial neural network that was later used to recognize gestures.

To extract visual features, Bhumika Gupta, Pushkar Shukla, and Ankush Mittal used HOG and SIFT. These characteristics are then integrated into one matrix. For these matrices, correlation is computed and input into a K-Nearest Neighbor Classifier. Only 179 of the 200 movements were accurately identified.

Sanil Jain and KV Sameer Raja used colored images to work on Indian Sign Language Recognition. They employed approaches including bag of visual words, Gaussian random, and the Histogram of Gradients to extract features (HoG). SVM was trained on three subjects, and when tested on a different user, they had an accuracy of 54.63 percent.

### 3.1.1 Disadvantages of Existing System

- These are physically in contact with the system.
- This process is not automatic manual processing is required.

## 3.2 Proposed System

We collect dataset from user input and store it in a folder in the suggested system. The A-to-Z dataset is saved, with one letter considered as input for each gesture. The dataset is trained using the CNN method, and the model is then saved in the system for Realtime prediction of alphabets based on gestures.

### Advantages of Proposed System

This application can be utilized in Service robots, which directly interacts with humans via various traditional interface approaches such as Remote Control. There is a pressing need these days to develop a more natural and user-friendly interaction system via which systems can be made more user-friendly. The various Human Computer Interaction implementations mentioned in this project can be used to control robots using gestures to give commands.

## 3.3 Methodology

In this project work, I used five modules and each module has own functions, such as:

1. Dataset collection
2. preprocessing
3. Initialize algorithm
4. Save Model
5. Predict

#### *3.3.1 Dataset Collection*

In this stage data set is collecting by running camera and pictures are captured for each gesture and folder is saved with one alphabet for each gesture.

#### *3.3.2 Preprocessing*

In this stage data set is preprocessing by converting images to required size and images are covered to required back ground corrections.

#### 3.3.3 *Splitting Data:*

Data set is divided in to folders features and labels and where features are images signs and labels are alphabets.

#### *3.3.4 Initialize algorithm*

This module is a user module who has permission to register and login to application and send request to client and get key to download files.

## 4 Architecture

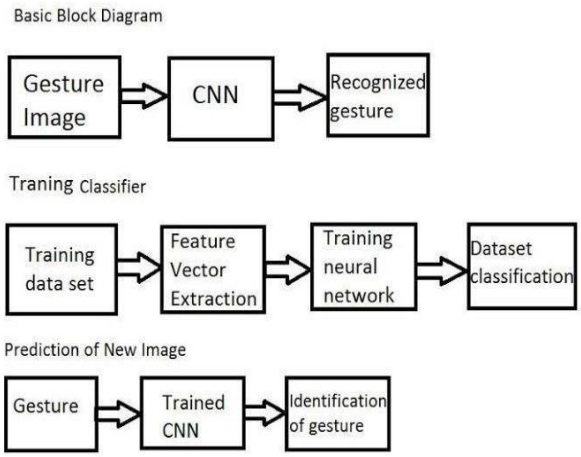
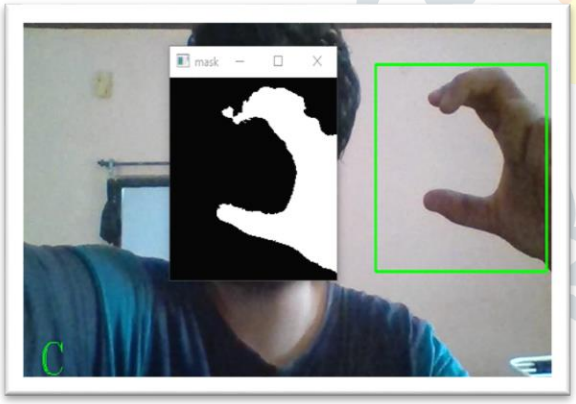



Fig 1: Frame work of DC Store

Above architecture diagram shows three stages of data flow form one module to another module. Data collection, preprocessing and algorithm training.

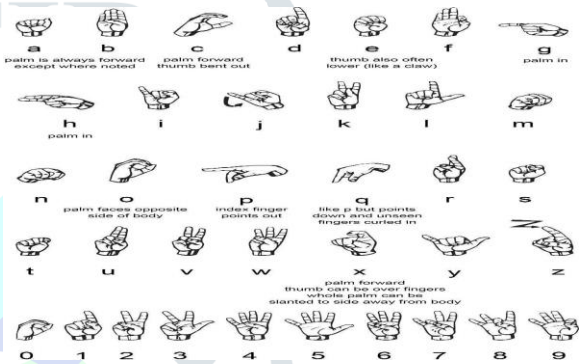
## 5 RESULTS SCREEN SHOT

**Prediction Result:**




**Dataset:**

**Gesture details:**



## 7. CONCLUSION

Communication is crucial in our daily lives. Deaf and dumb persons have a lot of difficulties communicating with normal people because they can't speak or listen. People with these difficulties try to communicate in a variety of ways. The use of sign language, or hand movements, is one of the most used methods. It is required to create an application that recognizes sign language movements and activities so that deaf and dumb individuals can easily communicate with those who do not understand sign language. The goal of this project is to use sign language to take a first step in breaking down communication barriers between normal people and deaf and dumb persons. When a Convolutional Neural Network

was employed, the model's accuracy increased significantly.

**Future Enhancement**

The proposed approach and CNN architecture pave the way for future gesture recognition implementation in embedded devices with limited hardware. Only examples of gestures present in static images are addressed by the suggested methodology, which excludes hand recognition and tracking as well as cases of hand occlusion. In the future, we plan to investigate various color segmentation techniques [38–40] and deep learning architectures while working on these specific scenarios in a new data preprocessing methodology.

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