

# CHAPTER 1

## INTRODUCTION

The goal of this project was to build a neural network able to classify which letter of the Indian Sign Language (ISL) alphabet is being signed, given an image of a signing hand. This project is a first step towards building a possible sign language translator, which can take communications in sign language and translate them into written and oral language. Such a translator would greatly lower the barrier for many deaf and mute individuals to be able to better communicate with others in day to day interactions.

This goal is further motivated by the isolation that is felt within the deaf community. Loneliness and depression exists in higher rates among the deaf population, especially when they are immersed in a hearing world. Large barriers that profoundly affect life quality stem from the communication disconnect between the deaf and the hearing. Some examples are information deprivation, limitation of social connections, and difficulty integrating in society.

Most research implementations for this task have used depth maps generated by depth camera and high resolution images. The objective of this project was to see if neural networks are able to classify signed ISL letters using simple images of hands taken with a personal device such as a laptop webcam. This is in alignment with the motivation as this would make a future implementation of a real time ISL-to-oral/written language translator practical in an everyday situation.



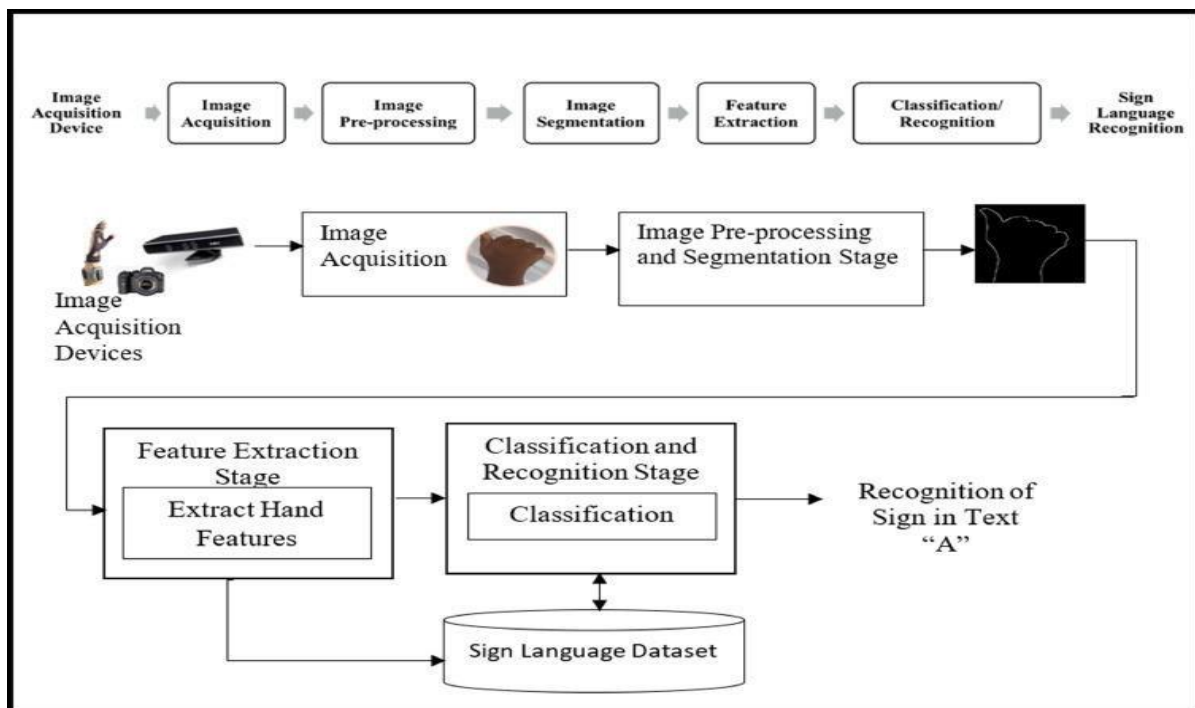
### 1.2 PROBLEM STATEMENT

Speech impaired people use hand signs and gestures to communicate. Normal people face difficulty in understanding their language. Hence there is a need of a system which recognizes the different signs, gestures and conveys the information to the normal people. It bridges the gap between physically challenged people and normal people.

### 1.3 Objective

1. To Bridge the gap of communication between deaf and mute people with any common person .
2. To develop model identify Indian Sign Language convert it into text in English and marathi language.
3. To develop simple user friendly interface .
4. To develop model which provide speech to mute people in term of technology by converting text to speech .

### 1.4 Organization Of The Work



## CHAPTER 2

### LITERATURE REVIEW

[1] “Indian Sign Language Recognition System” .

Normal humans can easily interact and communicate with one another, but the person with hearing and speaking disabilities face problems in communicating with other hearing people without a translator. The Sign Language is a barrier of communication for deaf and dumb people. People with hearing and speaking disability are highly dependent on non-verbal form of communication that involves hand gesture. This is the reason that the implementation of a system that recognize the sign language would have a significant benefit impact on dumb - deaf people. In this paper, a method is proposed for the automatic recognition of the finger spelling in the Indian sign language. Here, the sign in the form of gestures is given as an input to the system. Further various steps are performed on the input sign image. Firstly segmentation phase is performed based on the skin colour so as to detect the shape of the sign. The detected region is then transformed into binary image. Later, the Euclidean distance transformation is applied on the obtained binary image. Row and column projection is applied on the distance transformed image. For feature extraction central moments along with HUs moments are used. For classification, neural network and SVM are used.2022 .

[2] “Integrative Review on Vision-Based Dynamic Indian Sign Language Recognition Systems” .

Human-computer interaction is capable of solving the complex problems and challenges faced by human beings, among many of the complex jobs Sign Language Recognition is one of them. Therefore, automatically detecting the sign language is a broad area of research many works have been done in this area, and still, the work is going on. A variety of sign languages can be found throughout the globe sometimes the sign languages can be diversified by the country or region, the sign language(SL) which is available in India is known as the Indian Sign Language(ISL). Indian sign language requires the involvement of both hands, face, and upper body part movement which makes it difficult from the other single-handed sign languages. If we compare the Static gesture identification with the dynamic gesture identification, it's obvious that the former is easier. In real-life scenarios, a system should have the ability to identify the continuous and dynamic gestures, so that it can become an interface between the hearing impaired people and the normal people. Therefore, an Integrative review has been presented here which strongly summarizes the works on Indian Sign Language

Recognition(ISLR) systems capable of identifying the dynamic and continuous Vision-based gestures without using any gloves or sensor-enabled wearables.2021.

[3] “Indian Sign Language Recognition”

The paper focuses on designing and developing a user interface to help out the dumb community in making a better use of their gestures. It mainly deals with making services of the hand gestures to be easily accessible and understandable to by the people using sign languages. This system makes use of data collected from standards of Indian Sign Languages (ISL). The system is built using machine learning tools, TensorFlow library. The result of this project is to translate the gestures into the texts and return it to the web interface. The sole reason of this project is to help the individual with speech and hearing impairment2021 .

[4] “Indian Sign Language Recognition”

Sign language is a language that is used by dumb and deaf people in order to communicate with society. The problem is that common people find difficulty in understanding this language, so we have come up with a sign language recognition model which can solve this issue. Sign language recognition is the most important in research areas when it comes to Human computer Interaction (HCI).We have developed our model using TensorFlow , it is a framework used for creating deep learning models. We used Jupyter notebook to build our model. .Jupyter notebook is a web based application for authoring documents that combine live code with narrative text ,equations and visualizations.2021

[5] “Indian Sign Language Recognition Using Random Forest Classifier”

Communication is the foundation of all human relationships, both personal and professional. It is one of the basic requirements for survival in a society. Verbal communication is impossible without a well-defined language that is understood by both parties. Around 26% of the disabled population in India use sign language for communication. As a result, there is a pressing need to bridge the communication gap between the general public and the speech impaired. The proposed idea is to develop a pair of sensor gloves which detects Indian Sign Language (ISL) gestures and converts them into audible speech. The gloves are mounted with various sensors and modules such as the Arduino Nano microcontrollers, flex sensors, touch sensors, Inertial Measurement Units (IMU), RF and Bluetooth modules. With these sensors, the state of both hands can be quantified in a series of numerical data to capture their motion. The sensor values are also sent to a Machine Learning classification algorithm which improves the accuracy of

gesture recognition. The audible speech output is obtained by creating an app on a smart phone that can convert text to speech.2021 .

[6] “Detection and Recognition of Hand Gestures for Indian Sign Language Recognition System”

People with disabilities (hearing and listening impaired) have a vast social circle all over the world. For deaf and mute people, the sign language paves a way for the better communication which is the method that everyone understands and leads to effective communication among our diverse population. This study provides a comparative analysis for this complex task problems which are out of reach for a simple machine. As a result, there is an urgent need for the solution for such a problem, so the solution is integrating this problem with Machine Learning algorithms like Support Vector Machine, Convolutional Neural Network, K- Nearest neighbors. The results produced from Convolutional Neural Network are more accurate than those which is achieved by other several classifiers.2021 .

[7] “Indian Sign Language Recognition on PYNQ Board”

Sign language is the only way to communicate for speech-impaired people. But this sign language is not known to normal people so this is a barrier in communication. This is the problem faced by people with speech impairments or disorder. In this paper, we have presented a system which captures hand gestures with a Kinect camera and classifies the hand gesture into its correct symbol. 2020 .

[8] “Indian Sign Language Recognition using SVM Classifier”

Sign language is the medium of communication for the hearing impaired people. It uses gestures instead of sound to convey meaning. It combines hand-shapes, orientation and movement of the hands, arms or body, facial expressions and lip-patterns for conveying messages. Different types of project are done against deaf, mute, hard hearing people. A system with computer human interface is proposed for sign language recognition. But there is country wide variation available in that project. The main idea of this project is design a system which is useful for communication of that people with outside world in any public places, so that no need to interpreter in public places. In that project we need the isolated images in the form of database with Indian sign language of numeric sign. A regular camera is useful for acquiring this numeric sign. Principal Component Analysis (PCA) is used for pre-processing, in which the removal of redundant and unwanted data is done.2020.

[9] “Indian Sign Language Recognition System using Openpose”

Human beings communicate through language, be it verbal or be it a sign language that makes use of body motion. Hearing and Speech impaired people, having no way to communicate verbally, make use of Sign Language. They perform gestures using a sign language in order to convey their message and effectively communicate with each other. Since, not everyone knows about Indian Sign Language (ISL), it becomes difficult for normal people to fluently communicate with Hearing and Speech impaired community. This paper proposes ISL gesture recognition system in order to decrease this communication gap. The dataset consists of videos of ISL gestures, which are performed by different Subjects. The proposed system uses OpenPose library, which helps in creating the skeleton of human body and thus it provides key points of the whole human body frame by frame. The use of this library removes the dependency on lighting conditions and background. It helps in focusing on just the gesture movements. After extracting the key points, Long Short Term Memory (LSTM) is used for classification of gestures. LSTM model classifies which ISL gesture the particular video belongs to. 2019

[10] “Indian Sign Language Recognition System in Marathi Language Text”

Sign language is a natural language that is used to communicate with deaf and mute people. It is a significant way of communication between normal and deaf and dumb people, which does not require an interpreter. The main objective of this project is to develop a system that helps hearing and speech impaired people to convey their messages to ordinary people. There are different sign languages in the world. But the main focus of system is on Indian Sign Language (ISL) which is on the way of standardization. This system will concentrate on hand gestures only. Hand gesture is very important part of the body for exchanging ideas, messages, thoughts among deaf and dumb people. The proposed system will recognize the Indian hand sign language of words and sentences and translate the signs into Marathi text with images which have been extracted from the input videos. The process is divided into three parts i.e. pre-processing, feature extraction, classification.

## CHAPTER 3

### METHODOLOGY

#### TRAINING MODULE:

Supervised machine learning: It is one of the ways of machine learning where the model is trained by input data and expected output data. To create such model, it is necessary to go through the following phases:

1. model construction
2. model training
3. model testing
4. model evaluation

#### Model construction:

It depends on machine learning algorithms. In this projects case, it was neural networks. Such an algorithm looks like: 1. begin with its object: `model = Sequential()` 2. then consist of layers with their types: `model. Add(type_of_layer())` 3. after adding a sufficient number of layers the model is compiled. At this moment Keras communicates with TensorFlow for construction of the model. During model compilation it is important to write a loss function and an optimizer algorithm. It looks like: `model.comile(loss= 'name_of_loss_function', optimizer= 'name_of_opimazer_alg' )` The loss function shows the accuracy of each prediction made by the model. Before model training it is important to scale data for their further use.

#### Model training:

After model construction it is time for model training. In this phase, the model is trained using training data and expected output for this data. It's look this way: `model.fit(training_data, expected_output)`. Progress is visible on the console when the script runs. At the end it will report the final accuracy of the model.

#### Model Testing:

During this phase a second set of data is loaded. This data set has never been seen by the model and therefore it's true accuracy will be verified. After the model training is complete, and it is understood that the model shows the right result, it can be saved by: `model.save("name_of_file.h5")`. Finally, the saved model can be used in the real world. The

name of this phase is model evaluation. This means that the model can be used to evaluate new data.

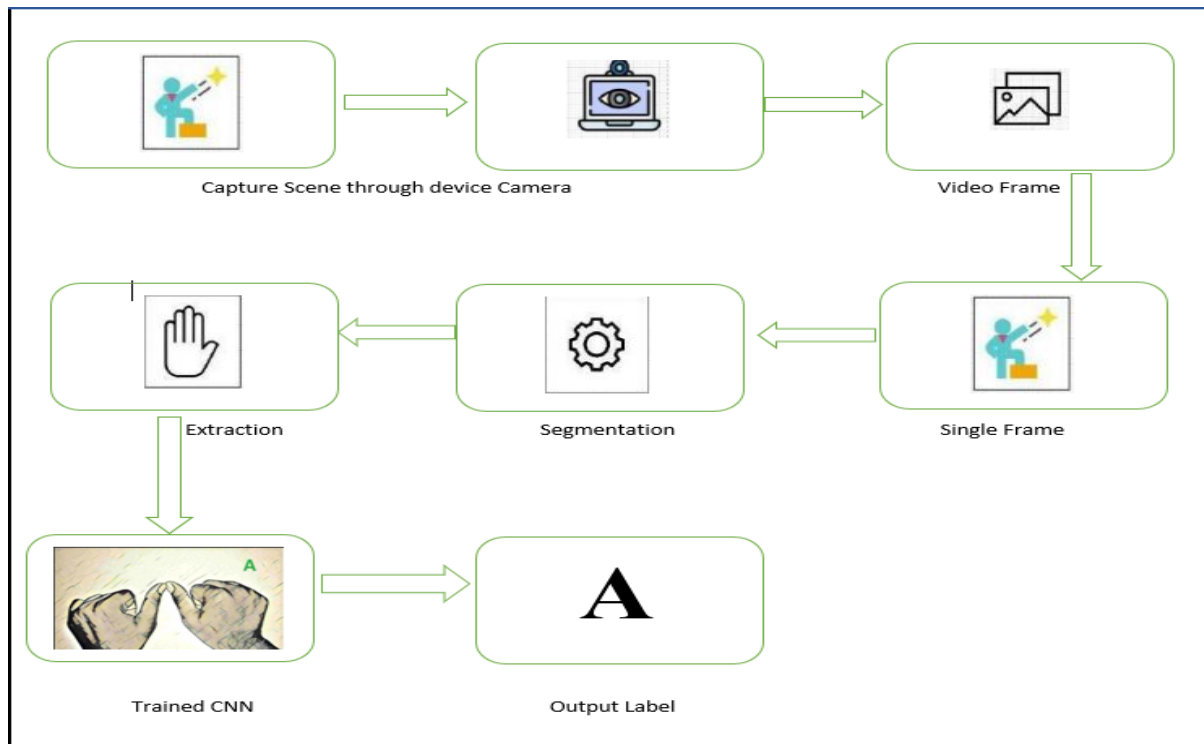
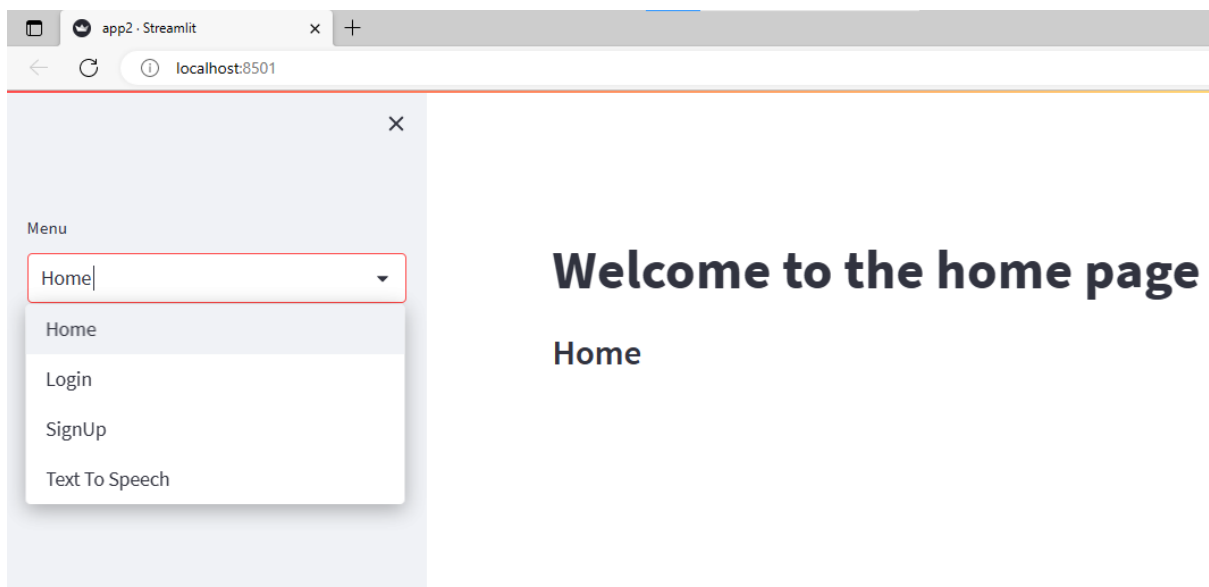
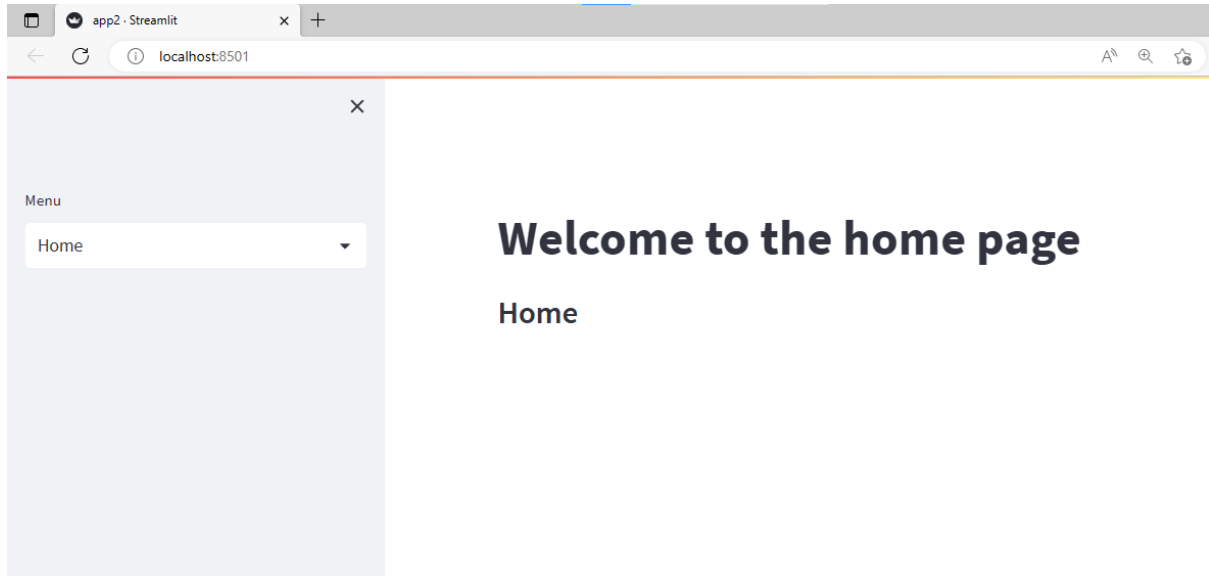


Fig . System Architecture



## CHAPTER 4

### RESULT AND DISCUSSION



app2 - Streamlit

localhost:8501

×

Menu

Login

User Name

Password

☐ Login

# Welcome to the home page

## Login Section

app2 - Streamlit

localhost:8501

×

Menu

SignUp

# Welcome to the home page

## Create New Account

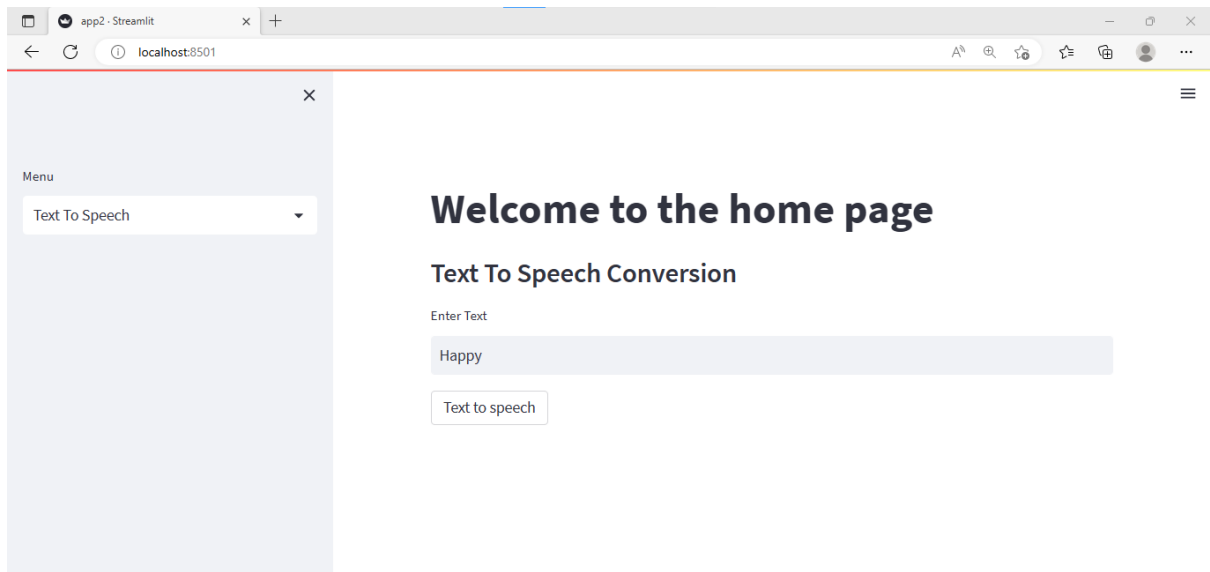
Enter Name

Email

Mobile No

Username

Password



## **CHAPTER 5**

### **REFERENCES**

#### **Reference from Website:**

- [1] [Indian Sign Language Recognition | Science Gate](#)
- [2] [\(PDF\) Indian Sign Language Recognition System \(researchgate.net\)](#)
- [3] [Indian Sign Language Recognition using SVM Classifier | Science Gate](#)
- [4] <https://ieeexplore.ieee.org/document/7507939>
- [5] <https://ieeexplore.ieee.org/document/7916786>
- [6] <https://www.sciencedirect.com/science/article/pii/S1877050917320720>
- [7] [A UGC Approved and Indexed with ICI, DOI, Research Gate, Google Scholar, DPI Digital Library, Scopus \(under review\), Thomson Reuters \(under review\) \) | Engineering UGC approved journal | computer science UGC approved journal | computer science and engineering UGC approved journal \(ijcseonline.org\)](#)

