Sign Language Translation

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1. Abstract

- It has been estimated that there are more than a million hearing impaired in India making the country with the largest number of deaf and mute and perhaps the country with the largest number of sign language users.
- There exists a communication gap between the mute-hearing people with normal people which is of paramount importance to be bridged.
- The aim is to create a highly economical, accurate and independent model which will translate sign language gestures into text as per American Sign Language standard.
- The model in this project is built using the tools provided by tensorFlow and Keras Python libraries.

2. Introduction

- Sign language is a language through which communication is possible without the means of acoustic sounds.
- Instead, sign language relies on sign patterns, i.e., body language, orientation and movements of the arm to facilitate understanding between people.
- It has been estimated that there are between 0.9 and 14 million hearing impaired in India and perhaps "one of every five people who are deaf in the world, lives in India", making it the country with the largest number of Deaf, and perhaps also the largest number of sign language users.
- Keeping this in mind we aim to build a convolutional neural network model that classifies all the alphabetical gestures correctly for better interpretation and effective communication.

3. Project Objective

- Create a Model that mitigates the challenges faced by deaf and mute people.
- Pre-process the data to improve the accuracy of the model.
- Classify and correctly predict the 26 alphabets in sign language.

4. Literature Survey

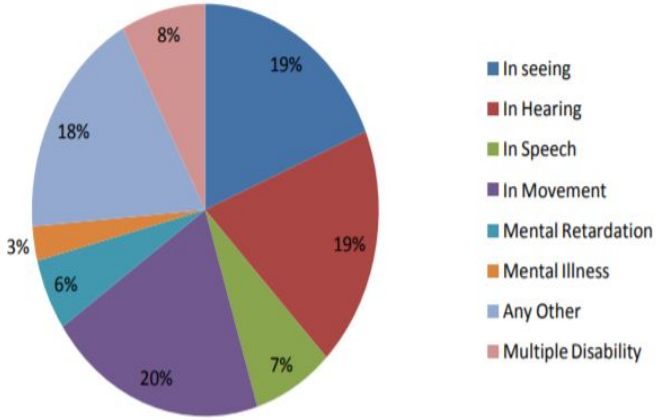
There are two approaches used in sign language recognition they are sensor based and image based. In sensor based approach, sensor collects data by performing various gestures then the data is analysed based on recognition model. In vision based approach the data is collected in the form of images then extraction of main features of image is done to recognise the gesture .In recent research sign language recognition system has three important steps data acquisition , extraction of data and classification .For recognition , classification methods used are Neural network ,Support vector machine ,Hidden Markov model ,scale invariant feature transform.

In the research paper mentioned in Ref 1 a sensor base approach is used. A flex sensor based model is developed and a text to speech synthesizer based on HMM is used for text to speech conversion. In research paper in ref 2 a flex sensor and accelerometer are used for gesture classification. The set of gestures are very small. The gesture is further displayed on LCD screen. In the paper mentioned in ref 4 a neural network model is used for image classification and the accuracy is no more than 85%. In Ref 7 flex sensors and accelerometer is used and a simple machine learning model is applied for classification.

6. Field Survey

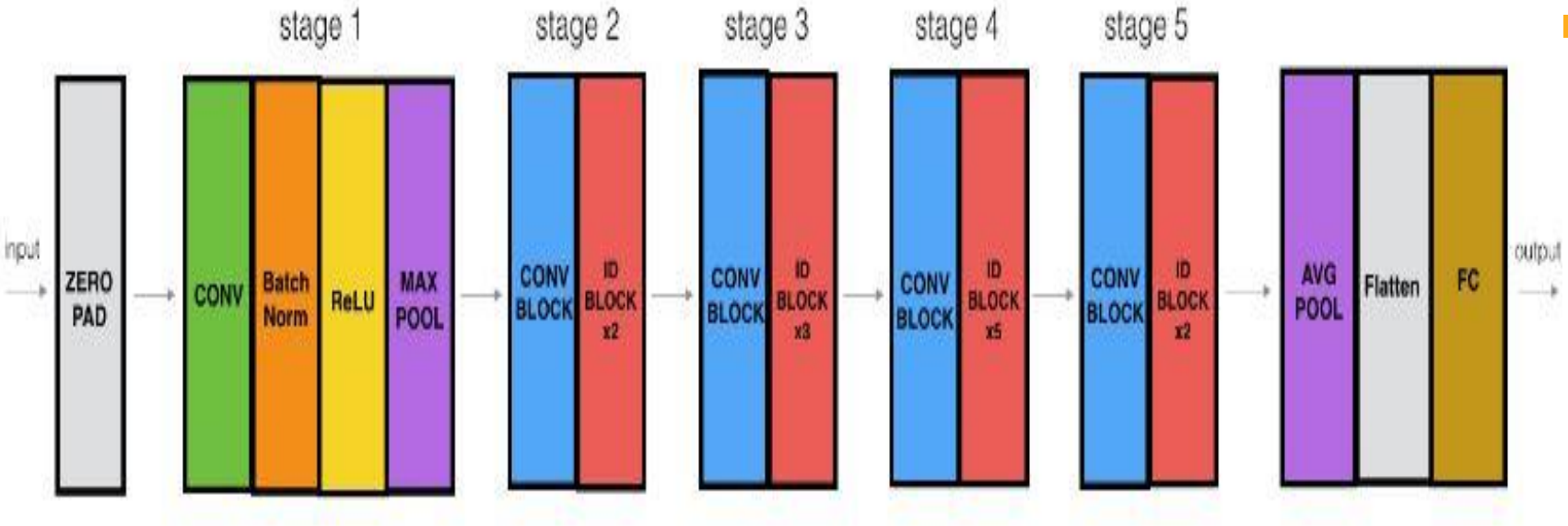
Human beings express their thought, ideas, and communicate most often via speech. However, according to Disabled Persons Statistics in India, 3.0 million people are hearing impaired, while 1.2 million people are speech impaired.

Fig. 3.4: Disabled population by type of Disability in India - Census, 2011



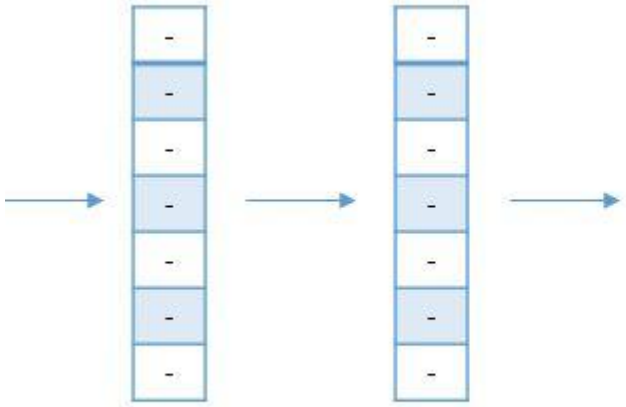
- People affected by speech impairment can't communicate using hearing and speech, they rely on sign language for communication.
- Sign language is used among everybody who is speech impaired, but they find a hard time communicating with people which are non-signers.
- So requirement of a sign language interpreter is a must for speech impaired people. This makes their informal and formal communication difficult.
- There isn't any infrastructure available for speech impaired people to communicate with non-signers without the interpreter.
- There is not a pathway created for automation of sign language translation.
- So that's why there is need of automation of sign language translation so which would result in convenient communication between speech impaired people and a non-signer without the need of an interpreter for translation.

ResNet 50 Model

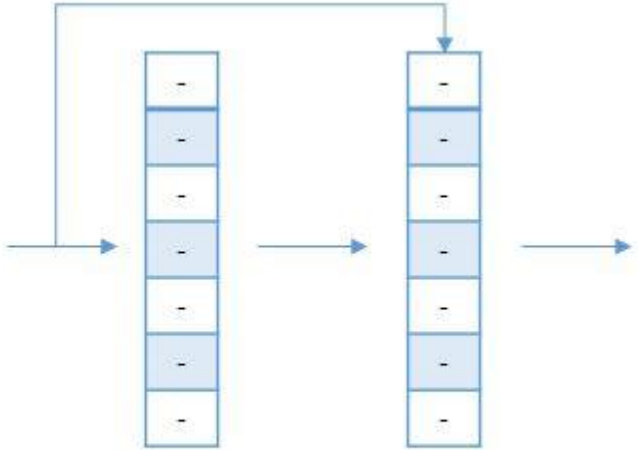


PLOT DIAGRAM OF MODEL (ResNet50)

Why ResNets?



Typical Neural Network Connection Flow

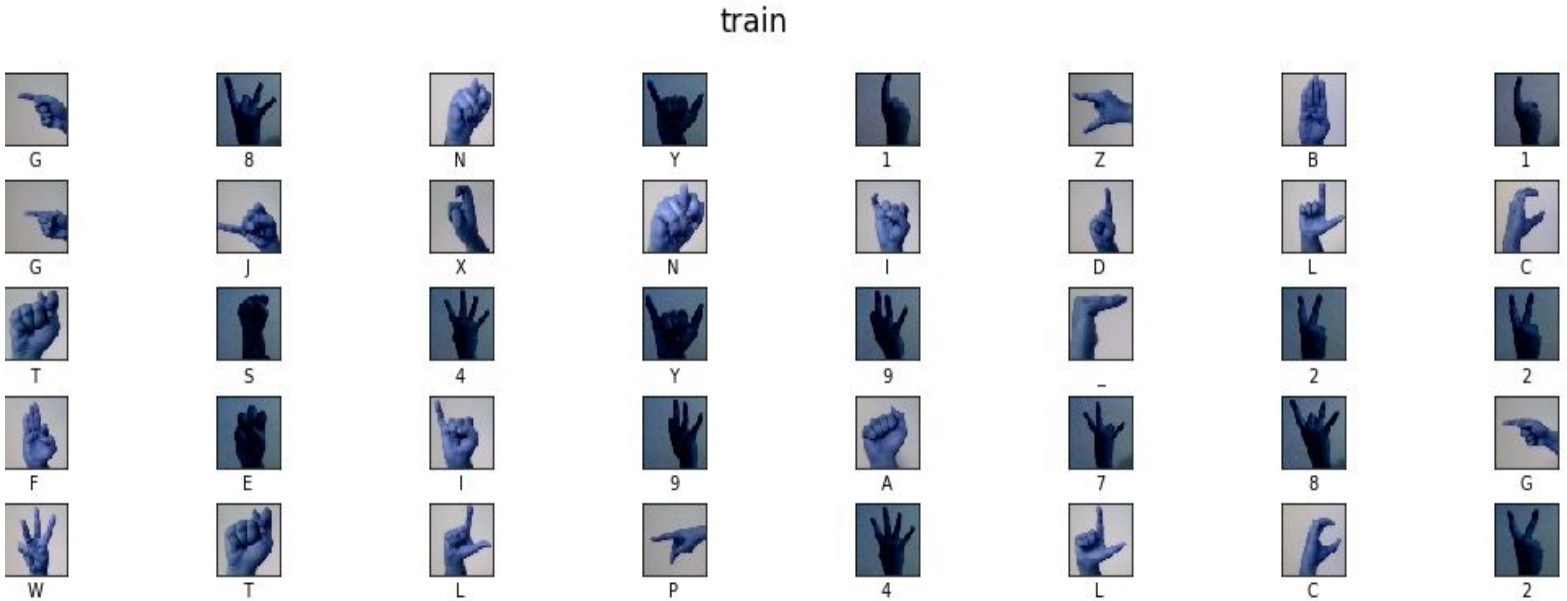


ResNets Connection Flow

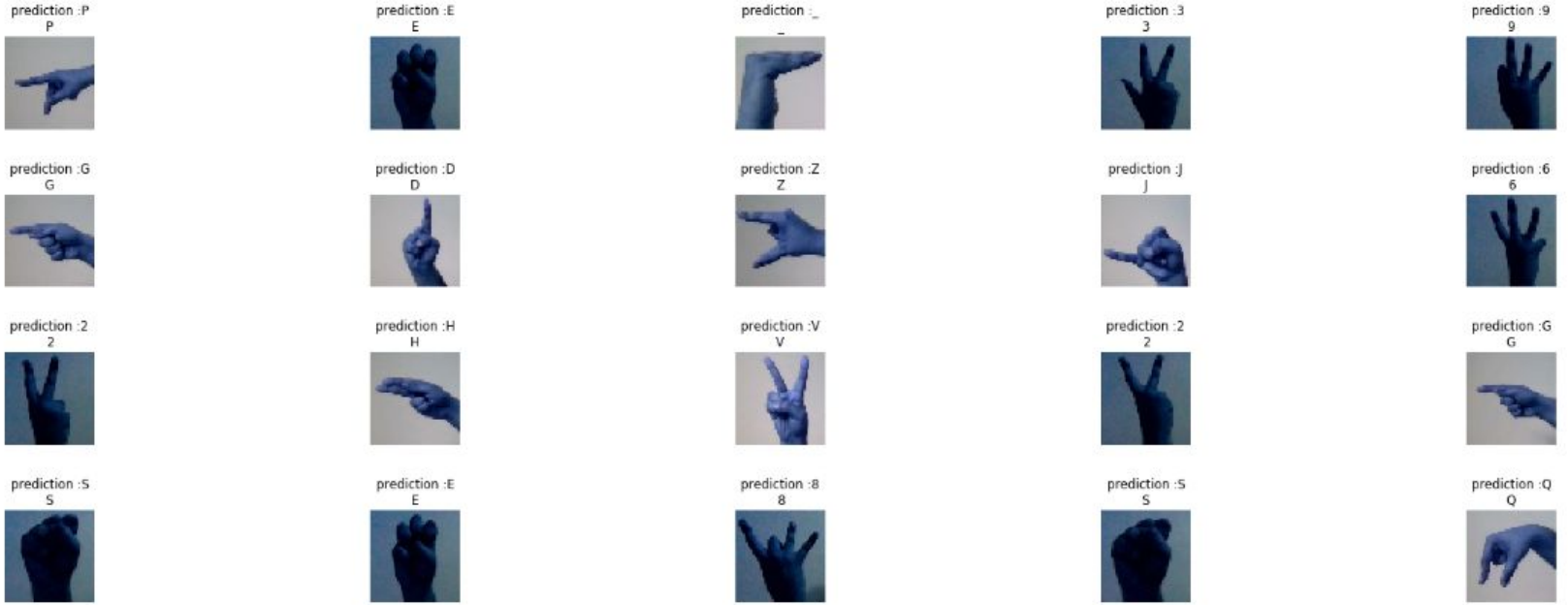
Libraries Used

- Numpy
- Open CV
- Keras
- Matplotlib
- sklearn

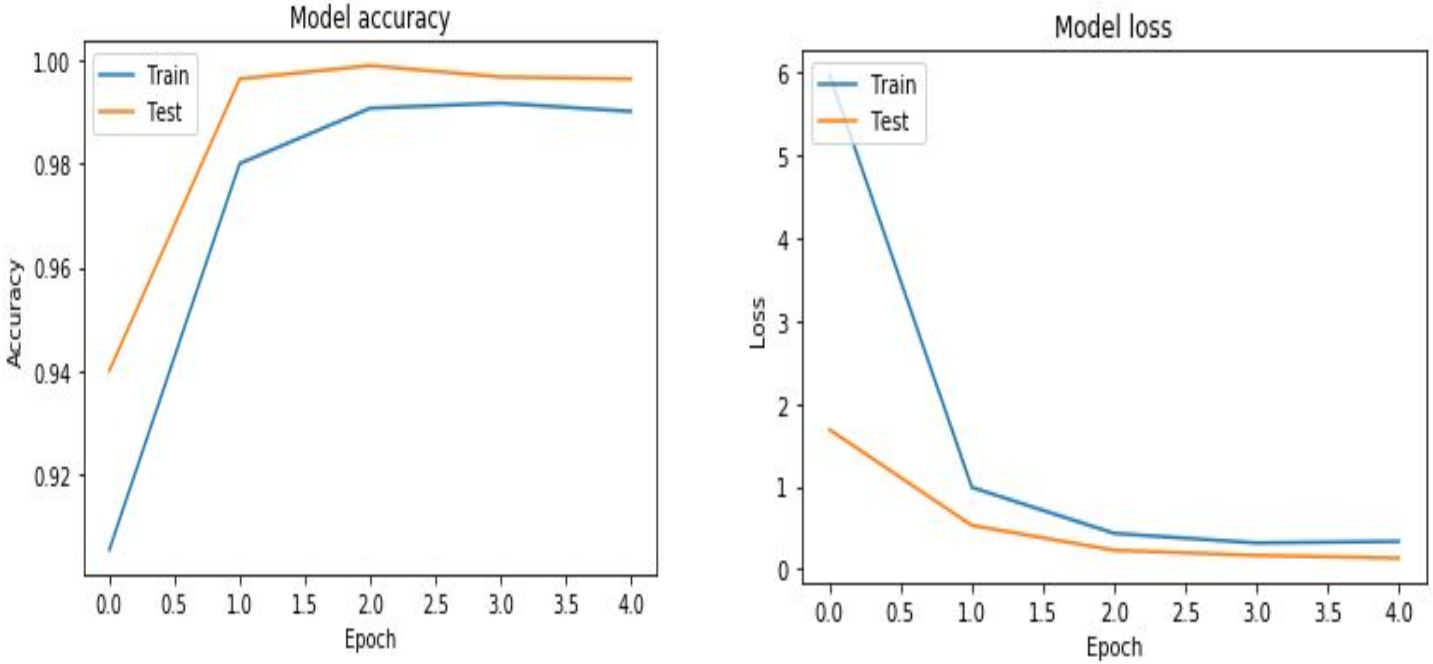
Training Dataset



Output Predictions



Results



Variation of Model accuracy and Model loss per epoch for training and testing data

Conclusion

- The idea of communication of speech impaired through sign language is discussed and the problem they face when there is absence of interpreter.
- So this project aims to implement a sign language translator which will facilitate them to communicate with non-signers without any complications. They can also communicate in the absence of a sign language interpreter.
- The focus of this project is to automate sign language interpretation using deep learning nets for improving the prediction accuracy to a satisfactory level.

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Thanks!