

Sign Language Recognition Using Machine Learning

¹Student, Sneha Prabhu, ²Student, Sriraksha Shetty,
³Student, Sushmitha P Suvarna, ⁴Student, Vindya Sanil,
⁵HOD & Associate Professor, Dr. Jagadisha N,

Canara Engineering College, Mangalore, Karnataka
Canara Engineering College, Mangalore, Karnataka
Canara Engineering College, Mangalore, Karnataka
Canara Engineering College, Mangalore, Karnataka
Dept. of ISE, Canara Engineering College, Mangalore, Karnataka

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ABSTRACT: Communication must happen in both ways. Communicating with the people having hearing disability is a difficult task so we developed the real time sign language recognition system using machine learning. This system contains the hand gestures performed by people which is captured using the web camera. Out of all images the region of interest is identified and the system will predict and show the name of the sign captured. The captured sign will undergo some of the processing steps such as data acquisition, image processing, feature extraction and classification. We additionally use the Convolutional Neural Network (CNN) to teach our model. Hence it is very useful for people with hearing and speech disability.

KEYWORDS: CNN, Sign Language, Machine Learning.

I. INTRODUCTION

Sign language is a language for the deaf and dumb which uses simultaneous orientation and movement of hand shapes instead of acoustically conveyed sound patterns. Deaf and Dumb humans rely upon sign language interpreters for communications. However, locating skilled and certified interpreters for his or her daily affairs all through lifestyles duration is a completely hard challenge and additionally unaffordable. Sign language is the fundamental manner of verbal exchange for people with listening to and vocal disabilities. Those deprived have problem of their daily lives. A correct, however probable massive group, accommodates those who had no hassle in speaking however thru harm or disease, are not able to talk. Sign language interpreters to textual content or

speech, might deliver them regular verbal exchange. In local and rural areas, there may be an pressing want for growing beneficial interactive verbal exchange equipment for signers with assist of computer systems wishes to be provided. The reason is to growth the capability of deaf and listening to-impaired humans to get admission to offerings anyplace they require without taking the assist of a expert sign language expert. This pc useful resource structures can lessen the call for for expert decoding offerings and may definitely enhance the great of lifestyles. It also can be used for sign language schooling and for those who are not able to talk thru illness or harm however have unimpaired guide dexterity. We purpose to expand a machine that might ease this problem in verbal exchange. Sign language includes making shapes or moves together along with your palms with admire to the top or different frame components in conjunction with positive facial cues. A popularity machine might as a result need to pick out especially the top and hand orientation or moves, facial features or even frame pose. We endorse the layout for a fundamental but extensible machine this is capable of understand Sign Language. American Sign Language turned into selected because it's miles used by a majority of these disabled. We consider that it's going to advantage deaf and listening to-impaired humans via way of means of supplying them a bendy decoding opportunity while face-to-face decoding isn't available. Sign Language Recognition System (SLR) utilize computer vision and machine learning method convolutional neural network (CNN).



Fig i: Sign Language for alphabets and Numbers

II. IMPLEMENTATION

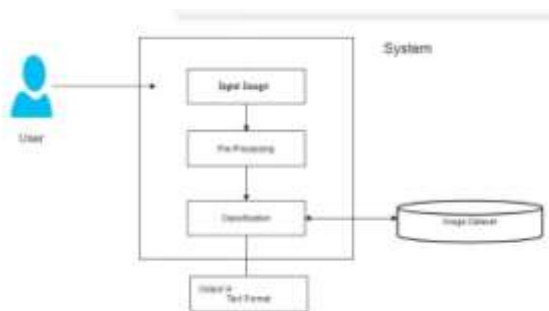


Fig i. Architectural Design

Data: Our project aim is to recognize the sign language and translate them into understandable output that is into text. Datasets for training the model is taken from Kaggle which standard datasets that A-Z and 0-10. These datasets are in image format(.jpeg). Total images used is 6282 where data was split into 8:2 ratio for training and testing.

Pre-Processing: Pre-processing is the system of disposing of high-depth noises from the photo frames. The first step is smoothing or blurring. Then the photo is transformed to gray scale from RGB. The major goal of changing the photo into gray scale is to lessen the dimensions and quantity of processing. These pictures became additionally resized to 30X30 and have been cut up withinside the ratio of 8:2 for the education and checking out section respectively.

Classification: For classification sequential model was built using Convolution Neural Network(CNN).To create a model its necessary to go through following phases:

1. Model Construction
2. Model Training
3. Model Testing

Model Construction :It depends on machine learning algorithms. In this project 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. Once enough layers have been added, the model is compiled. At that time,Keras is in contact with TensorFlow to build the model.
4. When compiling the model, it is important to write a loss function and optimize algorithm. It looks like:
model.compile(loss='name_of_loss_function',optimizer='name_of_optimizer_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 construction of the model, it is time to train on the model. At this point, the model is formed using training data and expected results for that data. It's look this way:model.fit(training_data, expected_output). Progress is visible on the console when the scriptruns. At the end it will report the final accuracy of the model.

Model Testing: In this phase one dataset is loaded. After the model training is finished and it is understood that the model shows the correct result, it can be saved by:model.save("name_of_file.h5"). Finally, the saved model can be used in the real world.

Below is the code to implement a sequential model using Convolution Neural Network(CNN).

```
#Building the model
model=Sequential()
model.add(Conv2D(filters=32, kernel_size=(5,5),
activation='relu',input_shape=X_train.shape[1:]))
model.add(Conv2D(filters=32,kernel_size=(5,5),
activation='relu'))
model.add(MaxPool2D(pool_size=(2,2)))
model.add(Dropout(rate=0.25))
model.add(Conv2D(filters=64,kernel_size=(3,3),
activation='relu'))
model.add(Conv2D(filters=64, kernel_size=(3, 3),
activation='relu'))
model.add(MaxPool2D(pool_size=(2,2)))
model.add(Dropout(rate=0.25))
model.add(Flatten())
model.add(Dense(256,activation='relu'))
model.add(Dropout(rate=0.5))
model.add(Dense(36,activation='softmax'))
model.summary()
```

```
#Compilation of the model
model.compile(loss='categorical_crossentropy',
optimizer='adam', metrics=['accuracy'])
epochs=15
history=model.fit(X_train,y_train,batch_size=32,
epochs=epochs, validation_data=(X_test, y_test))
model.save("my_model.h5")
```

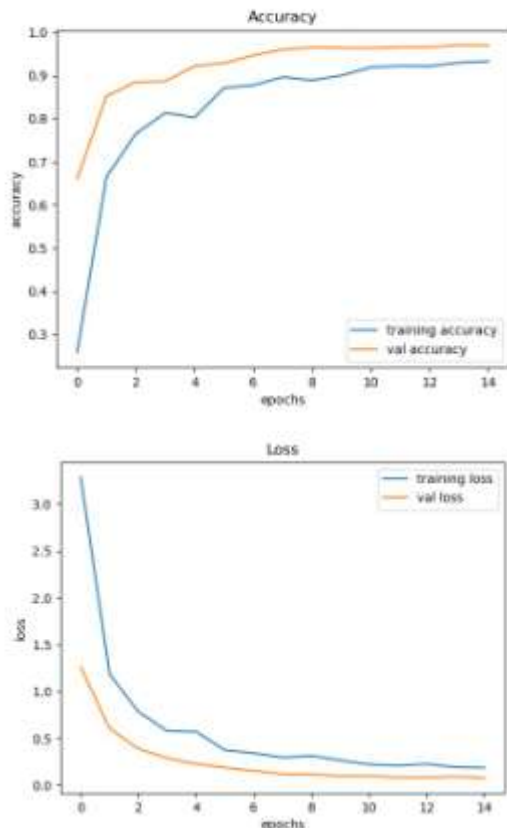


Fig ii Training and Validation Accuracy Graph
Fig iii Training and Validation Loss Graph

Test Cases: The test cases used to for entire model to recognize sign language.

id	Test Case Name	Input Description	Expected Output	Status
1	Loading the model	Initializing trained model and load it into ON	Loaded Model without errors	Pass
2	Testing for the signs of Numbers	Running model by inputting the numbers data.	Recognizing the number sign and output the text	Pass
3	Testing	Running	Recognizing	Pass

for the A-Z alphabets signs	model by inputting the alphabets data.	the alphabets sign and output the text	
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Table 1: Test Cases for Sign Language Recognition Model

III. RESULT

We have developed a website that recognizes the sign language and translate them into text. The website includes a home page with login and register, about us page, Prediction page. The proposed model had obtained an accuracy of 93.27% and yields promising results without much errors and less computational time.



Fig iv Home Page



Fig v Model recognizing Alphabet



Fig. vi Model recognizing Number

IV. CONCLUSION

The Sign Language Recognition (SLR) system is a method for recognizing a collection of formed signs and translating them into text with the appropriate context. We attempted to build a model using a Convolutional Neural Network in this project. For our reason we've got used American Sign Language as our datasets to educate the model. This mission we proposed an concept for possible conversation among listening to impaired and regular character with assist of system gaining knowledge of approach. This proposed work ensures the accuracy of 87.14% using CNN. This work can be further extended to building a real time application which identify the sign language and including words, sentences recognize.

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