IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 7, May 2022
Impact Factor: 6.252

Marathi Sign Language Recognition for Physically Disabled People

Aditya A. Darekar[1], Narayan B. Pawar[2], Rishikesh D. Pawar[3], Vikrant S. Sangale[4], Prof. Mrs. Varsha Khandekar[5]

Student, Department of IT[1,2,3,4]

Project Guide, Assistant Professor, Department of IT[5]

Smt. Kashibai Navale College of Engineering, Pune

Abstract: *Sign language is a general term for a language that uses a variety of expressions to communicate in everyday situations. In comparison to other sign languages, ISL interpretation has received less research attention. An automatic translation system for gestures of manual alphabets in Marathi sign language is presented. It is concerned with hand images that allow the user to interact with the system. The system allows deaf people to communicate with hearing people without the use of any other technology. Dumb people use hand signs to communicate, hence normal people face problem in recognizing their language by signs made. Hence there is a need of the systems which recognizes the different signs and conveys the information to the normal people. Hand gesture recognition is essential for human-computer interaction. We propose a real-time method for hand gesture recognition. The background subtraction method is used in our framework to extract the hand region from the background. The palm and fingers are then segmented so that the fingers can be detected and recognized. Finally, a rule classifier is used to predict hand gesture labels. Experiments on a 1300 image data set show that our method works well and is very efficient. Machine learning, and computer vision have all seen significant advancements. They have made a significant impact on how we perceive the world around us and how we apply their techniques in our daily lives. Many studies on sign gesture recognition have been conducted using various techniques such as CNN. However, the majority of them necessitate additional computing power. Result of our project is very much depending on the accuracy of identifying the correct meaning of sign language, many papers that we have studied have achieved this accuracy % up to 85 – 90 % but all of us will try to achieve maximum % of accuracy so that our project will be on the top of all other available systems. In order to extract features (binary pixels) and make the system more robust, we proposed normalizing and re-scaling our images to 64 pixels in our research. We use CNN to classify ten alphabetical American sign gestures and achieve a 98 percent accuracy.*

Index Term: Random Forest, Hand Gesture Recognition, Sign Language, Ridge Classifier, Sign Language Recognition, etc.

I. INTRODUCTION

Data Science is the leading domain of 21st century. Data Science is a domain of combination of various disciplines which uses statistics, various type of data analysis and machine learning algorithms for analyzing data and information and extracts knowledge and insights from it.

Data Science uses very powerful hardware, programming systems, and very efficient algorithms for solving data related problems. Now a days world is growing day by day with the help of new technologies like Data Science, Artificial Intelligence, etc. In today's date data is becoming very large in size like in Petabytes (PB). Some years ago, we are only dealing with some Gs of data so there is lot of difference in amount and size of data. Normally we will be not able to handle this huge amount of data but by using Data Science we are not only handling the data but extracting meaningful data out of it this is very big advantage of Data Science. Data Science is a technology which operated by various big companies like Google, Amazon, Netflix, etc., which handles huge amount of data, and using various algorithms of Data Science for better customer experiences.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 7, May 2022
Impact Factor: 6.252

We can convert raw and unstructured data into meaningful and useful information by Data Science technology. Data Science is working for automating transportation such as creating a self-driving car, which is future of transportation. Data Science is helping lot of companies for predicting various things about their customers and their users etc. Sign Languages, facial expressions, and body language are all used to communicate in sign language. It is mostly used by deaf persons and persons who can hear but cannot speak. However, it is also utilized by certain hearing people, most notably deaf family and relatives, as well as interpreters who help deaf and wider groups communicate. Deaf sign users employ Sign Language, which is an organized language in which each gesture has a specific meaning. Only deaf sign users can communicate using sign language. Many approaches have been developed by researchers using modern science and technology to assist deaf people communicate more smoothly. Sign Languages (SLs) are the most basic form of communication for those who are deaf or hard of hearing. In SLs, static morphs of the hands, known as postures, are combined with hand movements, known as gestures, and face emotions to produce words and sentences that correlate to spoken language words and phrases.

Assume you're trying to communicate with a deaf person. This may already appear to be a difficult undertaking, especially if you are unfamiliar with sign language. Millions of deaf people are unable to converse and interact with hearing people because of this problem. The issue with Deaf people is that they are socially excluded and made to feel worthless and unwelcome. So, how can we assist the deaf community in improving their quality of life? Information technology is the answer to these issues. We have pushed the development of recognition technologies, such as text and gesture recognition systems, in our quest for the most natural form of interaction. As a result, advances in information technology hold the potential of providing deaf people with ways to communicate with the hearing world. Furthermore, the cost of computer hardware continues to fall while processing power rises, allowing for the development of real-time sign language detection and translation systems. Real-time sign language translation technologies will be able to increase communication and give the deaf community full access to information and services.

In recent years hand gesture recognition system is one of the most trending topics for research. The disabled person who is unable to talk and unable to speak uses the gestures for communication purpose. There are huge of number people in the world who are unable to understand the hand gestures or a sign language. All the peoples who cannot understand the sign languages can use the automated system which can recognize the gestures and their meaning.

The goal of Sign Language recognition researchers is to create a system that can identify gestures, which are commonly used for communicating information or controlling equipment. Camera-based gesture detection technologies have been widely employed in a variety of applications and have the potential to communicate via Human Computer Interaction. The Leap Motion Controller is a revolutionary gadget that delivers complete information about hands and can capture hand movements and gestures via API (Application Programming Interface). This device's real-time hand gesture recognition mechanism is described, along with an overview of available machine learning models.

II. Related Work

There are lot of techniques by which we can get meanings for Sign Languages. We have studied various number of research papers from IEEE and other resources from those papers we have conclude as in recent years no one has developed a system which has good accuracy, and the system doesn't have any type of flaw. As there is nothing in this whole world that doesn't have any type of flaw, and which is having accuracy of 100%. But we will give our best to make best system which will taking images of hand gestures i.e., Sign Languages and it will give the output as meaning of those gestures in Marathi language. We are going to use CNN (Convolutional Neural Network) algorithm to perform all the internal operations. As from our research we have concluded that no one has developed this type of system for

Marathi Sign Language Recognition.

We have studied reference papers and according to it we can conclude literature survey in a table. Table 2.1 shows the total literature survey of reference papers to construct the test sentences.

Sr. No.	Reference	Work Description	Input Used	Accuracy

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 7, May 2022
Impact Factor: 6.252

1	An Efficient Hand Gesture Recognition System Based on Deep CNN. (2019) [1]	In this author have developed two Deep CNN architectures from VGGNet and AlexNet, this will continuously be working until the hand leaves or come out of the camera.	Video	1) 84.99 % 2) 95.61 %
2	Real - Time Hand Gesture Detection and Classification Using Convolutional Neural Networks. (2019) [2]	In this author have developed system in which video is an input and then system possesses a Detector and Classifier these two works together and recognize the gestures.	Video	94.04 %
3	Hand Gesture Recognition with Convolutional Neural Networks. (2019) [3]	In this author has a proposed an algorithm for real – time hand gesture recognition using CNN.	Image	98.76 %
4	Hand Gesture Recognition Using an Adapted Convolutional Neural Network with Data Augmentation. (2018) [4]	In this author have developed a system which uses an image as an input and after taking it as an input system shifts the images in both the sides to increase the robustness and identify the gestures using ADCNN technique.	Image	99.73 %
5	Application Of Convolutional Neural Networks for Static Hand Gestures Recognition Under Different Invariant Features. (2017) [5]	In this author have developed two CNN architectures with different number of layers and both are having different accuracy.	Image	1) 95.37 % 2) 96.20 %
6	Sign Language Recognition Using 3D Convolutional Neural Networks. (2015) [6]	In this author have developed 3D CNN network, and for boosting the performance multi-channels of video streams which includes color information, body joint positions all these are used as an input to the system.	Video (Multi-channel), Body Joint Positions, Color.	90.80 %
7	Deep Learning-based Fast Hand Gesture Recognition using Representative Frames. (2016) [7]	In this author have developed system which extracts few representative frames and sends them as an input to the recurrent convolutional network, and they used novel tiled image and binary patterns within a segmentation based deep learning framework.	Video	91.00 %
8	Translation from Simple Marathi sentences to Indian Sign Language Using Phrase-Based Approach. (2021) [8]	In this author have developed a system which can translate Marathi language into equivalent Indian sign language representation.	Text	90.00 - 94.00 %
9	Toward a Mexican Sign Language System using Human Computer Interface. (2019) [9]	In this author have presented a new algorithm that supports for people interested in learning sign language based on Mexican Sign Language dictionary which is provided by CONAPRED. It uses Leap motion input sensor for processing work.	Image	99.80 %

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 7, May 2022
Impact Factor: 6.252

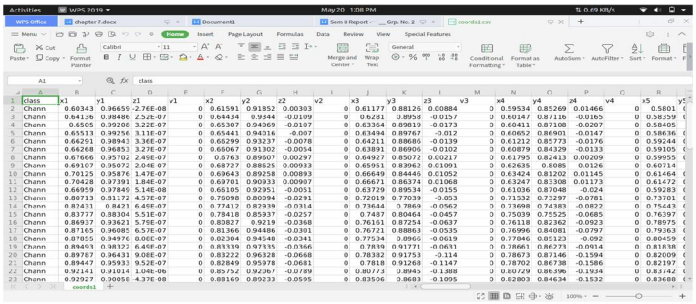
10	A Dynamic Hand Gesture Recognition Algorithm Using Codebook Model and Spatial Moments. (2015) [10]	In this author have developed a system for hand gesture detection using improved Codebook (CB) modeling methods and spatial moments	Image	95.50 %
11	Research on Data Augmentation for Image Classification Based on Convolution Neural Networks. (2017) [11]	In this author have used data augmentation techniques cropping, shifting etc.	Image	
12	Glove-Based Continuous Arabic Sign Language Recognition in User-Dependent Mode. (2015) [12]	In this author have developed system which uses novel technique for sequential data classification. This also uses MKNN approach for classification.	Image	98.9 %
13	Myanmar Sign Language Classification using Deep Learning. (2020) [13]	In this author have developed system based on Human Computer Interaction, and this system is implemented using MATLAB.	Image	96.00 – 97.50 %
14	A Novel Feature Extraction for American Sign Language Recognition Using Webcam. (2018) [14]	In this author have developed a system which uses feature extraction to recognize American sign languages, after this system uses Artificial Neural Network (ANN) to classify the signs.	Image	95.00 %
15	A Rule Based System for Bangla Voice and Text to Bangla Sign Language Interpretation. (2020) [15]	In this author have developed a rule-based system for Bangla voice and Bangla text. Authors have used 2D animation for model that is trained with 14 animated Bangla numeral signs.	1) Voice 2) Text	1) 96.03 % 2) 99.05 %

In this world lot of people are physically disabled like people are not able to speak or people who are unable to hear these people are normally familiar with various types of sign languages and sign because they always interact by using these methods only. But lot of people can't understand these sign languages and sign for this we are making this software by which normal people can understand emotions and sentiments of physically disabled peoples. We are making this software for our mother tongue and regional language Marathi. In current situation there is no any system available for conversion of this signs in Marathi language. And this is main reason to choose this project and making this type of software which can become voice of the voiceless and help normal people for understanding emotions and sentiments of disabled people in Marathi (regional) language. Sign language helps physically challenged people to communicate and share their thoughts with others. To develop a system which can recognize Marathi Sign Language based on hand gestures that can interact with people who are physically challenged.

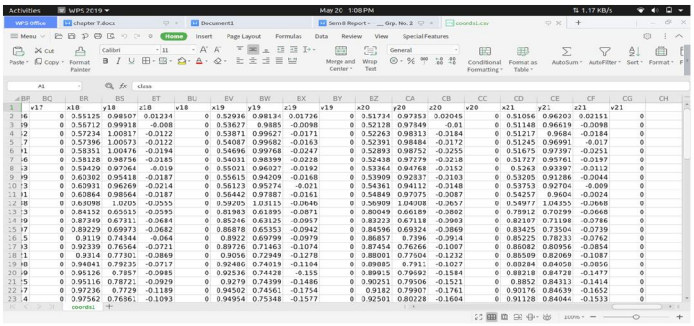
III. DATASET

In the data set section, we created Real - time own datasets using machine media-pipe libraries provided by Open CV in our csv data set, we created data set of 21 co-ordinates consisting of different types of hand sign co-ordinates.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 7, May 2022
Impact Factor: 6.252



There are two phases training model and testing model testing model is the final step for verifying model ISL Alphabet a data set which is used by author in this project has total 28 integrated files in which 26 of them are American alphabets (A to Z), and remaining 2 files are for Nothing and Space. For every character and Nothing and Space has n of number of test images. All these files are present in .jpg format this data set is around 100KB in memory size.



IV. PROPOSED SYSTEM

According to our literature and our all the research the system which we want to make it closely related with an existing system which was specially designed for American Sign Language Recognition. Author have used a readily available dataset named ASL Alphabet for all type of comparison, in this system author is taking image as an input and his classifier which was based on CNN technique is processing input and comparing image of that hand gesture with all the images present in the dataset and finds the meaning of given hand gesture in American Language. Fig. 4.1. shows the mostly used existing system. Fig. 4.1. is for ASL Detection, in this author have used a different combination of layers which are present in classifier.

In this system image is taken as an input and classifier which is having different number of layers is doing all the processing work. Author has got accuracy of 90 % for getting meaning of hand gestures in American language by user.

Classifier:

Classifier is the middle part of this system which is doing all the processing work of the system. Classifier is taking image of hand gesture as an input and various layers present in the classifier like convolution layer, pooling layer, and fully connected layer all these layers combinedly makes the image of hand gesture ready for comparison and compare that image with each image present in dataset and for accuracy if 1 character is matched then it will give output as meaning of that matched character in an American language.

V. PROPOSED SYSTEM ARCHITECTURE

We have developed a system by which normal person who doesn't have any knowledge about sin language can understand meaning of sign shown by disabled peoples. Fig. 4.2. shows the overall system architecture of the system.

In our system a new user has to register himself in our software by adding his name, phone number, and some other

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 7, May 2022
Impact Factor: 6.252

details like email id. After this step he has to set a password for his own profile which should be matched the required mandatory format. After all this user can login and then by clicking on the "Recognize Marathi Signs" button camera will start when user creates different signs by using left hand system will take 30 pictures per minute which will be working as a video input to the system, after getting input from user system will recognize the sign by using 21 coordinates of the left hand. And after recognizing the signs system will show the meaning of that sign in Marathi language in a new blank tab and it will also give the meaning of specific sign in Marathi language in an audio format via speakers of the laptop or system.

For this project main thing is to have a proper, well-trained dataset which was not readily available because no one has implemented this sign recognition for Marathi language. So, because of this reason we have developed our own dataset which is having majority of letters and words which are used frequently on daily basis. For a single letter we are taking all the 21 coordinates approximately 1200 times for accuracy purpose. We have used logistic regression, random forest classifier, and ridge classifier for training the various signs and all these are also used for comparing the coordinates of the hand with the dataset and for predicting the sign given as an input

Pre-processing

Gesture Recognition component gets frames from camera with +field image () function. Gesture Recognition component includes some complex pattern recognition algorithm like Random Forest, Logistic regression, Ridge Classifier, Gradient Boosting Classifier. Recognition process starts with extraction of features vectors that have been trained before. According to feature vector extracted, implemented algorithm of Convolutional neural network. Theory tries to recognize predefined valid gestures.

If a valid gesture, decided by bool +feature Extraction () function call, is recognized its corresponding object is created with method (Preprocessing) function call and passed to sklearn standard scalar navigation component with +method (classification) function call

Processing Narrative:

The navigation component is in charge of maintaining the state of the user interface, specifically the current menu to paint in the GUI. If the gesture from the Gesture Recognition component indicates a number and the current menu in the interface is a numbered menu, it selects the corresponding menu and repaints the interface. Furthermore, if the gesture is 'approved,' the Navigation component performs the action if the UI is in an action that requires approval. It is also in charge of triggering the other components of the Interface package. It is a simple process that attempts to change the UI based on the given action of gesture id from the engine component. If the current state of the UI allows for the upcoming actions, it applies.

System Design:

In this module, the administrator must log in using a valid user name and password. After successfully logging in, he can perform a variety of operations, including View All Users and Authorize, Sign Classification, and Hand Sign Testing with Training Data Set.

View and Authorize Users

- The admin can view a list of all registered users in this module, the admin can see the various details of users such as, user name, email, address and admin authorize the users.
- View Prediction of Accuracy
- Training Data Set
- Testing Data Set

There will be a variety of users in this module. Before performing any operations, the user should register. When a user registers, their information is saved in the database. After successfully registering, he must log in using his authorized user name and password. Once logged in, the user will see Direct Output. After displaying the hand sign, the classification result will be displayed on the screen. We employ various machine learning algorithms such as Random Forest, Logistic Regression, and the Gradient Boosting Algorithm.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 7, May 2022
Impact Factor: 6.252

End User:

There are a n number of users in this module. Before performing any operations, the user must first register. When a user registers, their information is added to the database. After successfully registering, he must login with his authorized user name and password. Once logged in, the user will perform some operations such as sign testing, sign classification, and prediction accuracy.

authorized user name and password Once Login is successful user will do some operations like sign testing, sign classification, and prediction accuracy.

VI. ALGORITHM

There are 3 algorithms which are typically used for Sign Language detection but we are using Ridge Classifier, Random Forest and gradient boosting technique to get all the results. It is a deep, feed-forward artificial neural network. This type of networks is also called as multi-layer perceptron's, which are quintessential deep learning models. Convolutional neural networks have been one of the most influential innovations in the field of computer vision. They have performed exceptionally well than traditional computer algorithms and also, they have produced state of art results. There are lot of applications in real-life case studies.

Logical Regression:

A supervised classification algorithm, logistic regression is. For a given set of features, the target variable (or output), y, can only take discrete values in a classification problem (or inputs), Logistic regression, contrary to popular belief, is a regression model. The model creates a regression model to forecast the likelihood that a given data entry belongs to the "1" category. Logistic regression models the data using the sigmoid function, just like linear regression assumes that the data follows a linear function.

Logistic Regression Algorithm:

Step 1: Import the required model

1) Make_calssification:
Make_classification available in sklearn.datasets and used to generate dataset
2) Matlpoitlib.pyplot:
Matploutlib uses for plotting the point on graph which after will be stored in array.
3) LogisticRegression:
This is imported from sklearn.linear_model.Used for performing logistic regression train_test_split:
imported from sklearn.model_selection and used to split data set into training and test datasets.
4) Confusion Matrix:
Imported from sklearn.metrics and used to generate the confusion matrix of the classifiers
5) Pandas:
Pandas use for managing data set.

Step 2: Generate Dataset

mediapipe library:
We generate dataset using mediapipe library provided by opencv, capturing all 21 column co-ordinates x1, y1, x2, y2, x3, y3... etc coordinate of left hand and append new different position co-ordinate of left hand each frame.

Step3: Train Test Data Set Splitting:

We split the dataset into train and test using the sklearn test train split library function, where we create X train, X test, y train, y test variables, and pass drop coloum class and target value. We split the data testing dataset 0.3, which means % for testing and the remaining 70 % for training.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 7, May 2022
Impact Factor: 6.252

Step4: Perform Logistic Regression:
Training Model:

1) Import the logistic regression class's sklearn.linear model.
2) Creating a model of the logistic regression class.
3) Passing the x and y trains to the fit function for model training.
4) After successfully training the model, this data is used in testing for prediction and accuracy of the score
5) Following the successful training of the model, this data is used in testing for prediction and accuracy of the score testing model:

Testing Model:

1) Create a testing model object from the logistic regression class.
2) Passed X test data to model.predict function to make prediction of testing model output
3) Model was passed X test and Y test data. Score function was used to calculate model mean accuracy.
4) Passed X test data to model predict to determine model predictability during testing

Step 5: Visualize Confusion Matrix:

1) Import confusion matrix from sklearn.metrics.
2) Pass actual and predicted value to confusion matrix function.
3) Print confusion matrix.

Random Forest:

A random forest is a machine learning technique for solving regression and classification problems. It makes use of ensemble learning, a technique that combines many classifiers to solve complex problems.

Random Forest is appropriate when we have a large dataset and interpretability is not an issue. Decision trees are far more straightforward to interpret and comprehend. Because a random forest combines multiple decision trees, interpreting it becomes more difficult.

Random Forest is a bagging algorithm that employs the Ensemble Learning technique. It grows as many trees as possible on the subset of data and then combines the results of all the trees. In this way it reduces overfitting problem in decision trees and also reduces the variance and therefore improves the accuracy Random forests or random decision forests is associate ensemble learning technique for classification, regression and totally different tasks that operates by constructing an outsized variety of decision trees at coaching job time. For classification tasks, the output of the random forest is that the class selected by most trees. For regression tasks, the mean or average prediction of the individual trees is coming. Random decision forests correct for decision trees' habit of overfitting to their coaching job set. Random forests generally trounce decision trees, but their accuracy is below gradient boosted trees. However, data characteristics can have a sway on their performance.

Random Forest Algorithm Working:

Step 1: Import the Required Model

1) Import Random Forest Classifier from sklearn.ensemble
2) Train_test_split:
Imported from sklearn.model_selection and used to split dataset into training and test datasets
3)Pandas:
Import panda as pd. Pandas use for managing data set.

Step 2: Generate Dataset

mediapipe library:
We generate data set using mediapipe library provided by opencv, capturing all 21 co-ordinate of hand and append new co-ordinate on each frame.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 7, May 2022
Impact Factor: 6.252

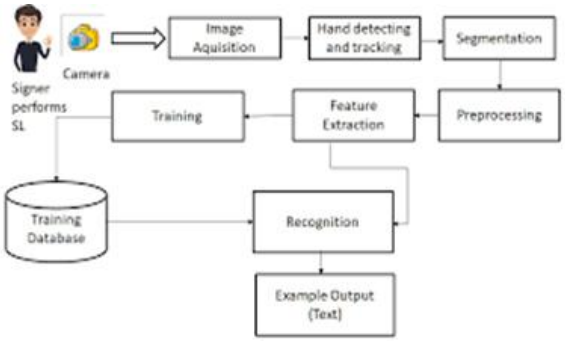
Step3: Train Test Data Set Splitting:

We split the dataset into train and test using the sklearn test train split library function, where we create X train, X test, y train, y test variables, and pass drop coloum class and target value. We split the data testing data set 0.3, which means % for testing and the remaining 70 % for training.

Step4) Perform Random Forest Classifier:

Training Model:

1) Create Random Forest Classifier class object name model.
2) Pass X_train,Y_train to fit function for training model.
3) Model.fit function train model with n_estimator 50 forest.
4) This data is used in testing for prediction and accuracy of the score testing model:



Test Model:

1) Calculate model score:
1) Calculate y predict value and compare to y_test value.
2) Print accuracy of model.
3) Model was passed X test and Y test data. Score function was used to calculate model mean accuracy.
4) Passed X test data to model predict to determine model predictability during testing.

Step 5) Visualize Confusion Matrix:

1) Import confusion matrix from sklearn.metrics.
2) Pass actual and predicted value to confusion matrix function.
3) Print confusion matrix.

VII. 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

Model Construction:

Machine learning algorithms play a role in this. The neural networks were used in this project. The following is an example of such an algorithm:

1. Start with the object: model = Sequential ()
2. Next, there are layers with different types: model. Add (type of layer ())
3. The model is compiled after adding a sufficient number of layers.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 7, May 2022
Impact Factor: 6.252

Keras is currently communicating with TensorFlow to build the model. A loss function and an optimizer algorithm should be written during model compilation. Model.comile(loss='name of loss function',
optimizer='name of optimazer alg') looks like this: The loss function depicts the model's accuracy in each prediction. Scaling data is necessary before model training.

Model Training:
Model training begins after model construction. The model is trained in this phase using training data and expected output for this data. This is how it appeared: model. Suitable (training data, expected output). When the script Model.

Model Testing:
A second set of data is loaded during this phase. Because the model has never seen this data set before, its true accuracy will be verified. After the model training is
completed and it is determined that the model produces the desired results, 21 co-ordinates can be saved by: model. Save ("name of file.h5"). Finally, the model that was saved can be used in the real world. This phase is known as model evaluation. This means that the model can be applied to new data.

Test Plan:
The purpose of testing is to find errors. Testing could be a method of attempting to discover each conceivable fault or weakness in a very work product. It provides some way to examine the practicality of parts, sub-assemblies, assemblies and/or a finished product. it's the method of sweat package with the intent of ensuring that the code meets its necessities and user expectations and does not fail in Associate in Nursing unacceptable manner. Software testing is a crucial part of the package quality assurance and represents the final word review of specification, style and committal to writing. The increasing feasibility of package as a system and therefore the price related to the package failures are intended forces for purposeful through testing.

Test Cases:
For testing and getting accurate results we have taken some test cases regarding login in to the software, registering new user in the software.

Login Test Case:
Table 8.1. shows the login test cases that we have taken for login the registered user into the software.
Resgistration Test Case:

Test Case Id	Test Case	Test Case I/P	Actual Result	Expected Result	Test Case Criteria(P/F)
001	Enter Wrong Username or Password Click on Submit	Username or Password	Error Comes	Error Should Come	P
002	Enter Correct Username and Password click on submit button	Username and Password	Accept	Accept	P

The below table shows the registration test cases that we have taken for register the new user into the software. System Test Case: The below table shows the test cases of the system in which we are running our software.

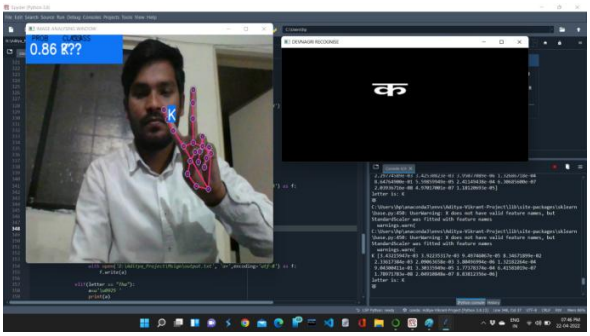
Test Case Id	Test Case	Test Case I/P	Actual Result	Expected Result	Test Case Criteria(P/F)
001	Enter Number in Username, Middle Name, Last Name field	Number	Error comes	Error Should Come	P

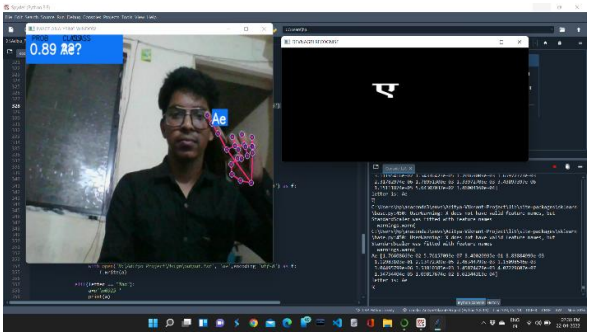
IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 7, May 2022
Impact Factor: 6.252

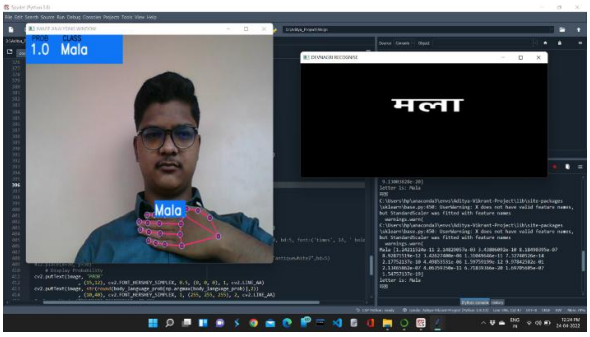
001	Enter the Character in Username, Middle Name, Last Name field	Character	Accept	Accept	P
002	Enter the Invalid Email – id format in email id field	Vsgmail.com	Error Comes	Error Should Come	P
002	Enter the Valid Email – id format in email id field	vs@gmail.com	Accept	Accept	P
003	Enter invalid digit number in phone number	88888	Error Comes	Error Should Come	P
003	Enter 10-digit number in phone number	9999999999	Accept	Accept	P

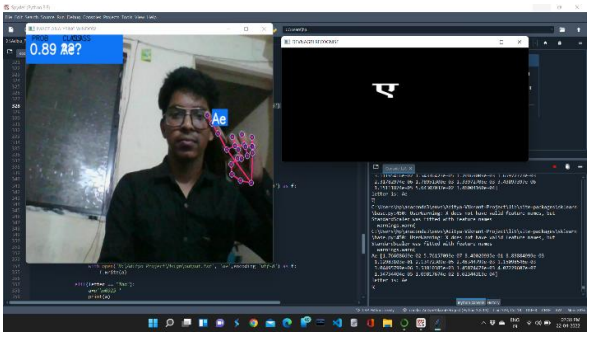
VIII. RESULT

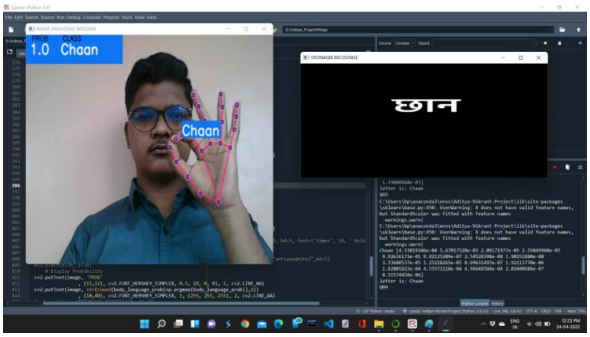
In following pictures, we are showing the results we got after running our software in the system. In this we are successfully getting the meaning of signs which are given as an input to the software in Marathi (regional) language.

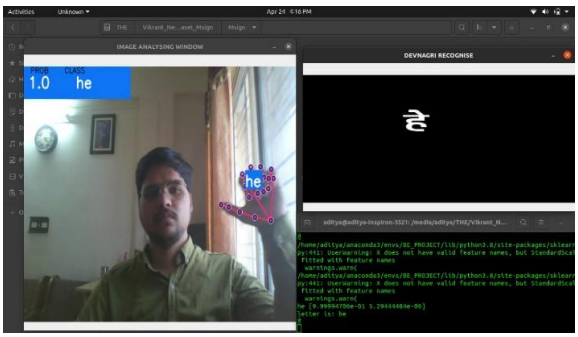




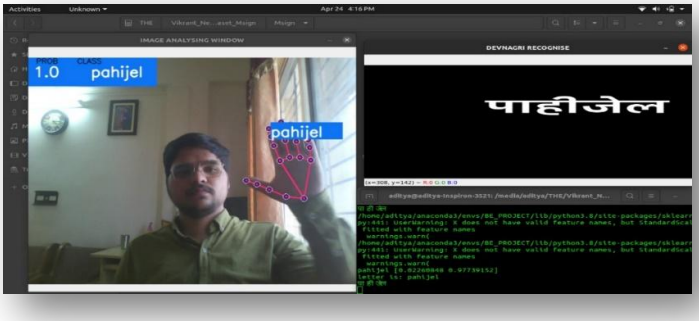








IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 7, May 2022
Impact Factor: 6.252



IX. Conclusion

Deep learning and computer vision have all advanced significantly. There has been a significant impact on how we think about how we think about how we think about how we think about how we think about how we think about how we think about how we think about how we think about Many studies on sign gesture recognition have been carried out, with various techniques such as CNN being used. However, the majority of them require additional computing power. The accuracy of identifying the correct meaning of sign language is very important in our project. Many papers that we have studied have achieved this accuracy percentage of up to 85 – 90 percent, but we will try to achieve maximum accuracy so that our project will be on top of all other available systems.

Future Scope

We'd like to include facial expressions capability in the system because it could help us better understand what customers are saying and hence produce more accurate transcriptions. Another CNN could be useful for detecting facial expressions, which is something we'd like to investigate more to improve the transcribing system.

Our current understanding of language processing is insufficient to describe the specific aspects of this future effort, but one possibility is to use Hidden Markov Models to create finger-spelled words and correct CNN errors. Because SL uses symbols to represent words rather than fingerspelling them, the word formation stage is avoided if a word gesture is identified. In the final step of the transcribing process, recognized words will be used to construct sentences.

Limitation of Project

- A sufficient amount of light should be present for successful detection of signs and their meanings.
- The user must make an exact sign, and only the meaning of that sign will be predicted.
- We have only trained a few words so far, and only those will be correctly predicted.
- The system cannot form a specific sentence; only words are predicted and displayed on a GUI tab.

References

[1] Chung, H.-Y., Chung, Y.-L., & Tsai, W.-F. (2019). An Efficient Hand Gesture Recognition System Based on Deep CNN. 2019 IEEE International Conference on Industrial Technology (ICIT).

[2] Kopuklu, O., Gunduz, A., Kose, N., & Rigoll, G. (2019). Real-time Hand Gesture Detection and Classification Using Convolutional Neural Networks. 2019 14th IEEE International Conference on Automatic Face & Gesture Recognition (FG 2019).

[3] Zhan, F. (2019). Hand Gesture Recognition with Convolution Neural Networks. 2019 IEEE 20th International Conference on Information Reuse and Integration for Data Science (IRI).

[4] A. A. Alani, G. Cosma, A. Taherkhani and T. M. McGinnity, "Hand gesture recognition using an adapted convolutional neural network with data augmentation," 2018 4th International Conference on Information Management (ICIM), 2018, pp. 5-12, doi: 10.1109/INFOMAN.2018.8392660.

[5] C. J. L. Flores, A. E. G. Cutipa and R. L. Enciso, "Application of convolutional neural networks for static hand gestures recognition under different invariant features," 2017 IEEE XXIV International Conference on Electronics,

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 7, May 2022
Impact Factor: 6.252

Electrical Engineering and Computing (INTERCON), 2017, pp. 1-4, doi: 10.1109/INTERCON.2017.8079727.

[6] Jie Huang, Wengang Zhou, Houqiang Li and Weiping Li, "Sign Language Recognition using 3D convolutional neural networks", 2015 IEEE International Conference on Multimedia and Expo (ICME), pp. 1-6, 2015.

[7] V. John, A. Boyali, S. Mita, M. Imanishi and N. Sanma, "Deep Learning-Based Fast Hand Gesture Recognition Using Representative Frames", 2016 International Conference on Digital Image Computing: Techniques and Applications (DICTA), pp. 1-8, 2016.

[8] S. R. Bhagwat, R. P. Bhavsar and B. V. Pawar, "Translation from Simple Marathi sentences to Indian Sign Language Using Phrase-Based Approach," 2021 International Conference on Emerging Smart Computing and Informatics (ESCI), 2021, pp. 367-373, doi: 10.1109/ESCI50559.2021.9396900.

[9] C. R. Estrivero-Chavez, M. A. Contreras-Teran, J. A. Miranda-Hernandez, J. J. Cardenas-Cornejo, M. A. Ibarra-Manzano and D. L. Almanza-Ojeda, "Toward a Mexican Sign Language System using Human Computer Interface," 2019 International Conference on Mechatronics, Electronics and Automotive Engineering (ICMEAE), 2019, pp. 13-17, doi: 10.1109/ICMEAE.2019.00010.

[10] K. Wang, B. Xiao, J. Xia and D. Li, "A Dynamic Hand Gesture Recognition Algorithm Using Codebook Model and Spatial Moments," 2015 7th International Conference on Intelligent Human-Machine Systems and Cybernetics, 2015, pp. 130-133, doi: 10.1109/IHMSC.2015.202.

[11] J. Shijie, W. Ping, J. Peiyi and H. Siping, "Research on data augmentation for image classification based on convolution neural networks," 2017 Chinese Automation Congress (CAC), 2017, pp. 4165-4170, doi: 10.1109/CAC.2017.8243510.

[12] N. Tubaiz, T. Shanableh and K. Assaleh, "Glove-Based Continuous Arabic Sign Language Recognition in User-Dependent Mode," in IEEE Transactions on Human-Machine Systems, vol. 45, no. 4, pp. 526-533, Aug. 2015, doi: 10.1109/THMS.2015.2406692.

[13] S. M. Htet, B. Aye and M. M. Hein, "Myanmar Sign Language Classification using Deep Learning," 2020 International Conference on Advanced Information Technologies (ICAIT), 2020, pp. 200-205, doi.

[14] A. Thongtawee, O. Pinsanoh and Y. Kitjaidure, "A Novel Feature Extraction for American Sign Language Recognition Using Webcam," 2018 11th Biomedical Engineering International Conference (BMEiCON), 2018, pp. 1-5, doi: 10.1109/BMEiCON.2018.8609933.

[15] M. A. Rahaman, M. Parvez Hossain, M. M. Rana, M. Arifur Rahman and T. Akter, "A Rule Based System for Bangla Voice and Text to Bangla Sign Language Interpretation," 2020 2nd International Conference on Sustainable Technologies for Industry 4.0 (STI), 2020, pp. 1-6, doi: 10.1109/STI50764.2020.9350468.