PRESENTATION ON

SIGN LANGUAGE RECOGNITION FOR DIFFERENTLY- ABLED PEOPLE USING DEEP LEARNING

In Partial Fulfillment of the Requirement of

For the Degree of

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING

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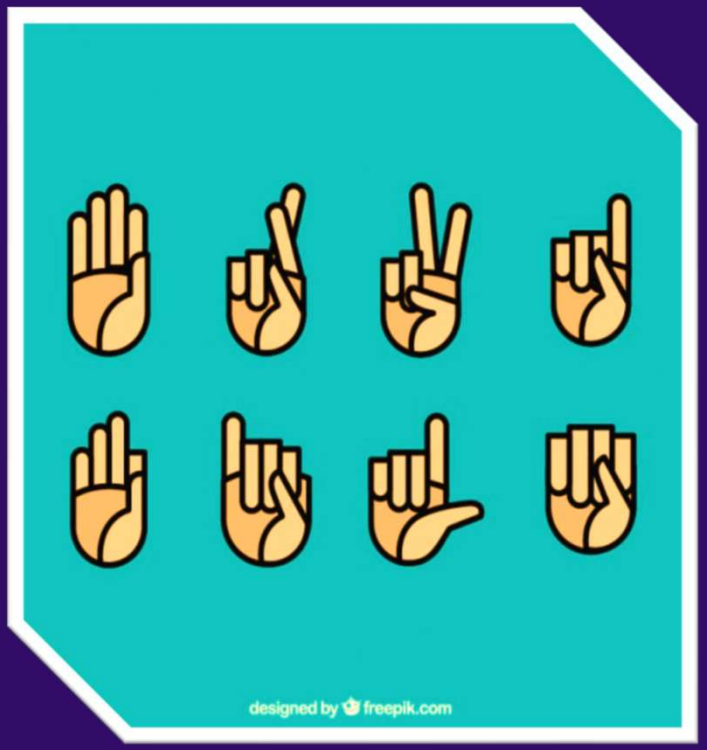
INTRODUCTION



- This project is all about using TECHNOLOGY to improve ACCESSIBILTY.
- The world is hardly live without communication, no matter whether it is in the form of texture, voice or visual expression.
- The communication among the deaf and dumb people is carried by text and visual expressions.Finger-spelling American sign language (ASL) is one such standard sign language which uses hand gestures to represent letters in English alphabet.
- One of the earliest written records of a sign language is from the fifth century BC, in Plato's Cratylus, where Socrates says: "If we hadn't a voice or a tongue, and wanted to express things to one another, wouldn't we try to make signs by moving our hands, head, and the rest of our body, just as dumb people do at present?"

PROBLEM STATEMENT

- A person with speaking disorders or hearing disorder face major problems of expressing their emotions as freely in this world.

- Understanding the exact context of symbolic expressions of deaf and dumb people is the challenging job in real life until unless it is properly specified.

OBJECTIVE

- Communication is always having a great impact in every domain and how it is considered the meaning of the thoughts and expressions that attract the researchers to bridge this gap for every living being.
- The Objective of this project is to identify the symbolic expression through images so that the communication gap between a normal and hearing impaired person can be easily bridged.

MOTIVATION

- Sign language is learned by deaf and dumb, and usually it is not known to normal people, so it becomes a challenge for communication between a normal and hearing impaired person.
- Its strike to our mind to bridge the between hearing impaired and normal people to make the communication easier.
- Sign language recognition (SLR) system takes an input expression from the hearing impaired person gives output to the normal person in the form text or voice

LITERATURE REVIEW

AUTHOR	PUBLICATION	YEAR	TITLE	METHODOLOGY	REMARK
Mathavan Suresh Anand, Nagarajan Mohan Kumar, Angappan Kumaresan	IJISA	June 2016	An Efficient Framework for Indian Sign Language Recognition Using Wavelet Transform	Use of Discrete Wavelet Transform (DWT) based feature extraction and nearest neighbour classifier is used to recognize the sign language	99.23% classification accuracy while using cosine distance classifier.
Mandeep Kaur Ahuja, Amardeep Singh	IJCSET	July 2015	Hand Gesture Recognition Using PCA	database-driven hand gesture recognition based upon skin color model approach and thresholding approach along with an effective template matching	The system shows 91.43% with low brightness images
Saleh Aly Basma Osman.Walaa Aly , Mahmoud Saber	IEEE	2016	Arabic sign language fingerspelling recognition from depth and intensity images	Local features from depth and intensity images are learned using unsupervised deep learning method called PCANet. The extracted features are then recognized using linear support vector machine classifier	Proposed system improved by combining both depth and intensity information which give an average accuracy of 99:5%.

Cont…

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AUTHOR	PUBLICATION	YEAR	TITLE	METHODOLOGY	REMARK
Dai Jiang,Jifang Duan, Xiao Liu, Richard Bayford	IEEE	2018	Towards a High Accuracy Wearable Hand Gesture Recognition System Using EITYu	hand gesture recognition system based on electrical impedance tomography (EIT)	.Nineteen hand gestures are designed for recognition, and with the proposed round robin sub-grouping method, an accuracy of over 98% is achieved.
Neelam K. Gilorkar, Manisha M. Ingl	IJECET	May 2014	Real Time Detection And Recognition Of Indian And American Sign Language Using Sift	Scale Invariant Feature Transform (SIFT) and same was used to extract features. The system is model using MATLAB	The system was able to recognize a subset (35 letters) of ASL, ISL with an accuracy of 92- 96% using SIFT algorithm
Ashish Sethi, Hemanth ,Kuldeep Kumar,Bhaskara Rao ,Krishnan R,	IJCSET	May 2012	Sign Pro-An Application Suite for Deaf and Dumb	Gesture extraction involves techniques such as histogram matching, bounding box computation, skin colour segmentation and region growing	Approach consisting of Region Growing with Feature point matching using SIFT gives more accurate matching.

TECHNOLOGY USED

SOFTWARE

- Microsoft Windows 7 or later / Ubuntu 12.0 LTS or later /MAC OS 10.1 or later.
- Python 3.7
- PyCharm Community Edition 2019.3.3 x64
- Tensorflow 1.5 framework
- Keras API
- OpenCV 3.4
- Graphicviz 2.38

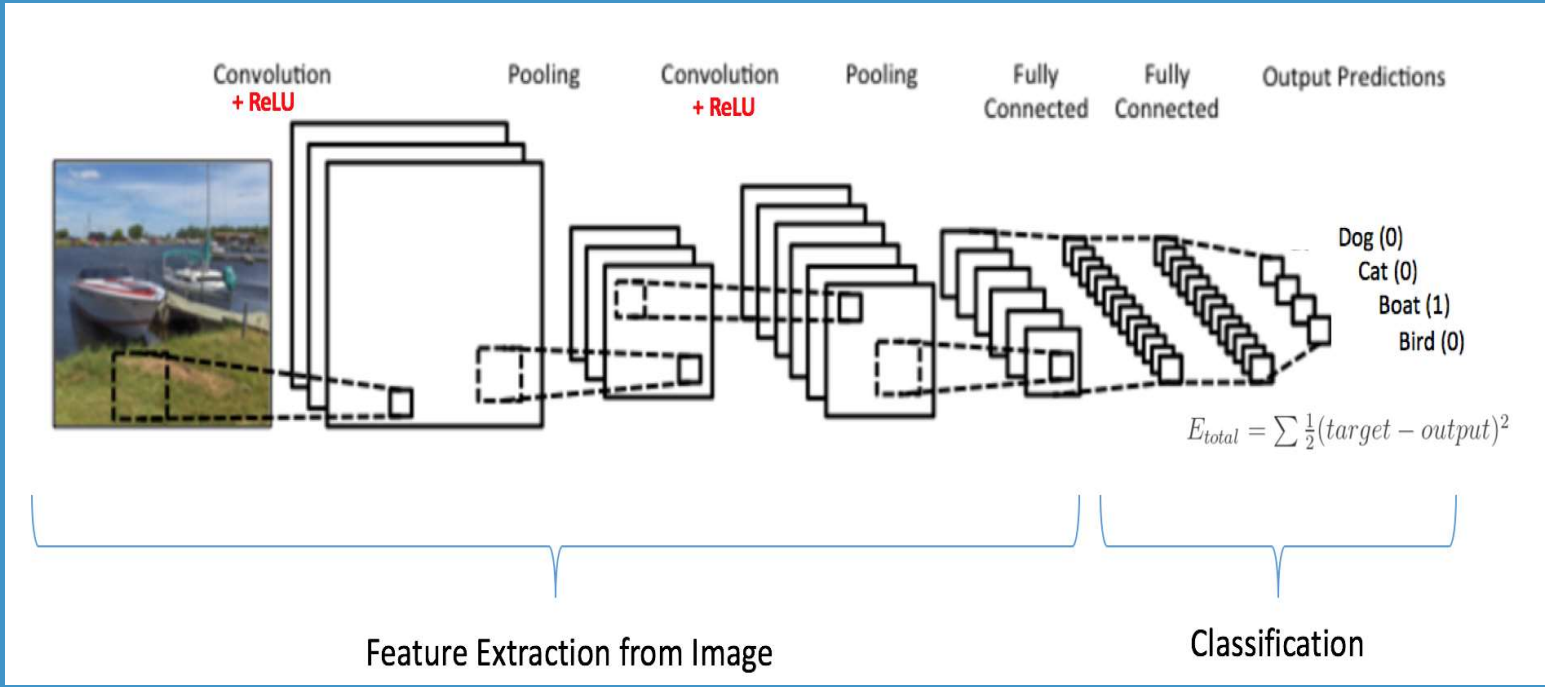
HARDWARE

- Intel Core i3 3rd gen processor or later.
- 512 MB disk space atleast .
- 4 GB RAM.
- Any external or inbuild camera with minimum pixel resolution 200 x 200 (300ppi or 150lpi) 5-megapixel cameras and up

PYTHON LIBRARIES REQUIRED-

- h5py
- pyttsx3
- PyQT5
- Tkinter
- Numpy
- scikit-learn
- sklearn
- tensorflow-gpu
- keras
- opencv-python
- Scipy
- winGuiAuto
- pypiwin32
- pillow

CONVOLUTIONAL NEURAL NETWORK

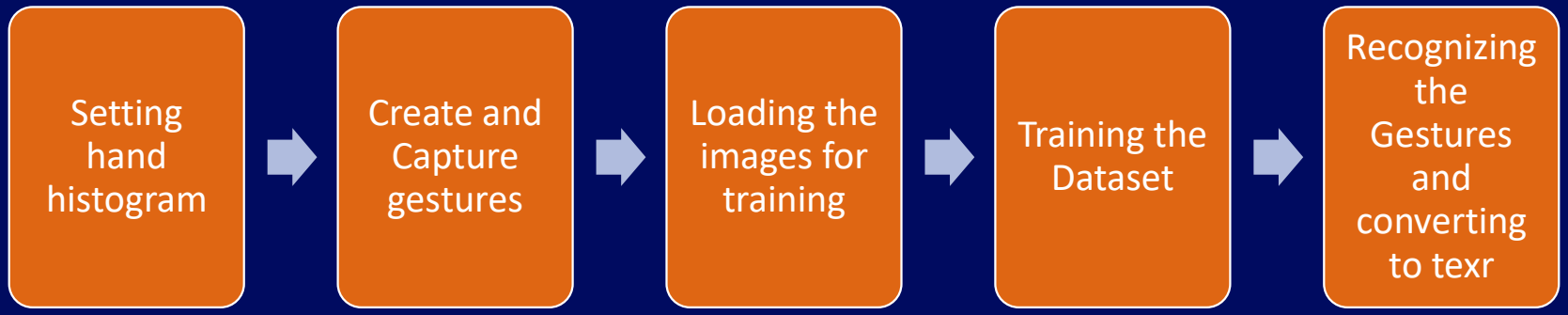


The functional blocks of Convolutional Neural Network:

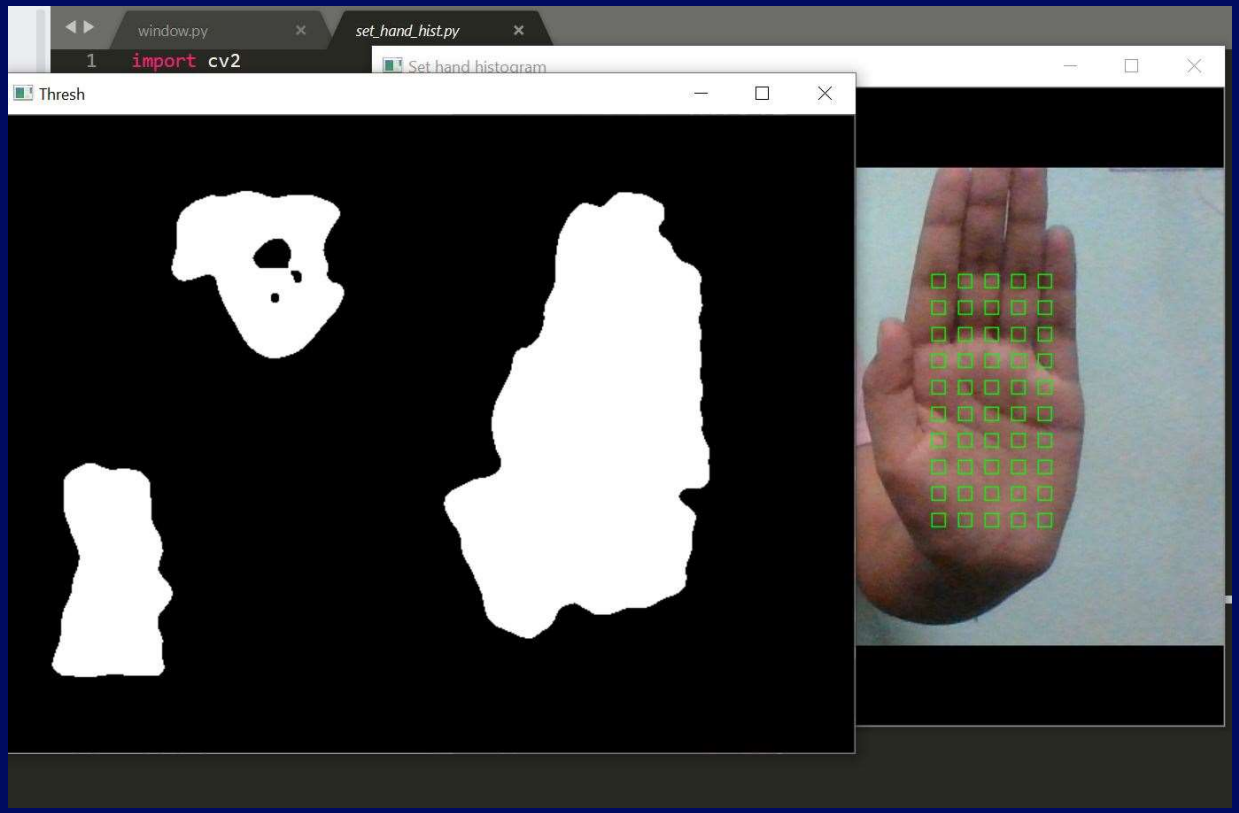
1. Convolutional Layer
2. Max Pooling layer
3. Relu
4. Fully-Connected layer

METHODOLOGY

MODULES -



1. SETTING HAND HISTOGRAM



HISTOGRAM BACKPROJECTION

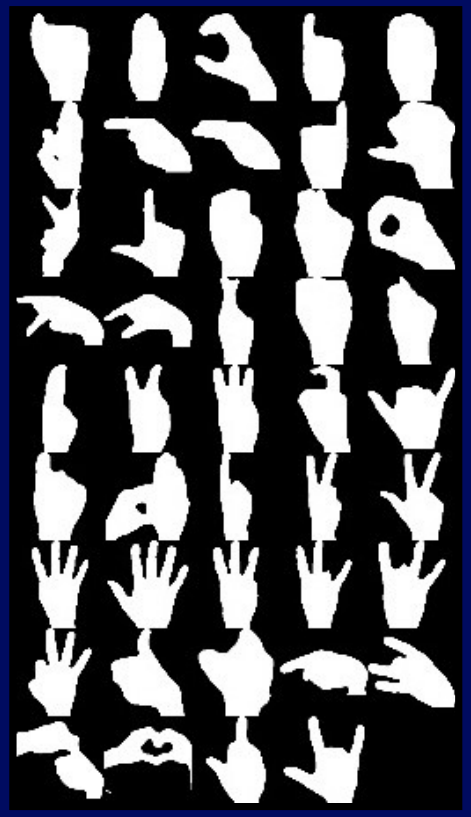
- It is used for image segmentation or finding objects of interest in an image.
- Here our object of interest is hand.

- Histogram should be set every time when the lightning conditions are changed.

2. CREATE AND CAPTURE GESTURES

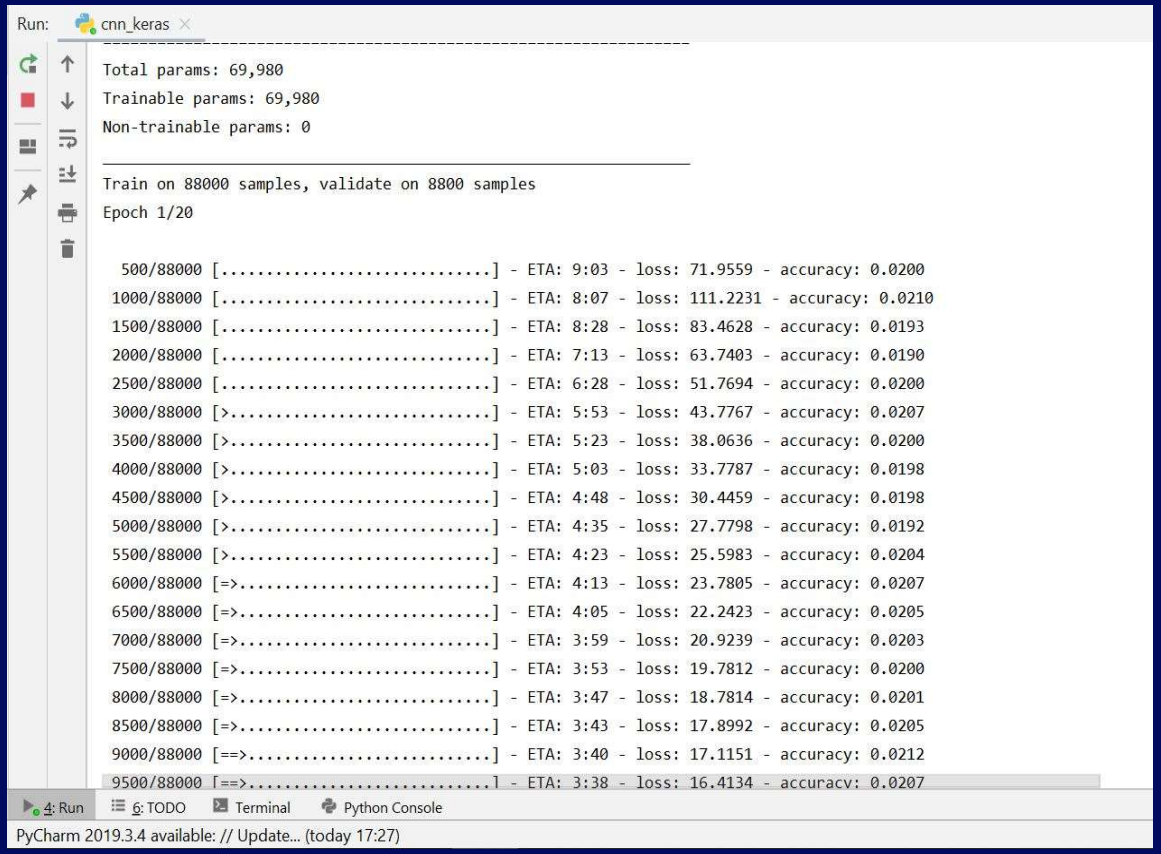
- We are capturing 1200 images for each gesture for the training data set.
- Thosa gestures are stored in a folder by the gesture name.
- The database (.db file) of the training data is created to load it to the Training model

3.LOADING THE IMAGES FOR TRAINING



- List of all the 44 gestures loaded for training
- Prior to training we have stored 1200 images for each and every gesture in our ‘gesture’ folder . These images need to be fed to our training model . In order to train our model, we need to load these images.
- Finally a pickle dump is formed .

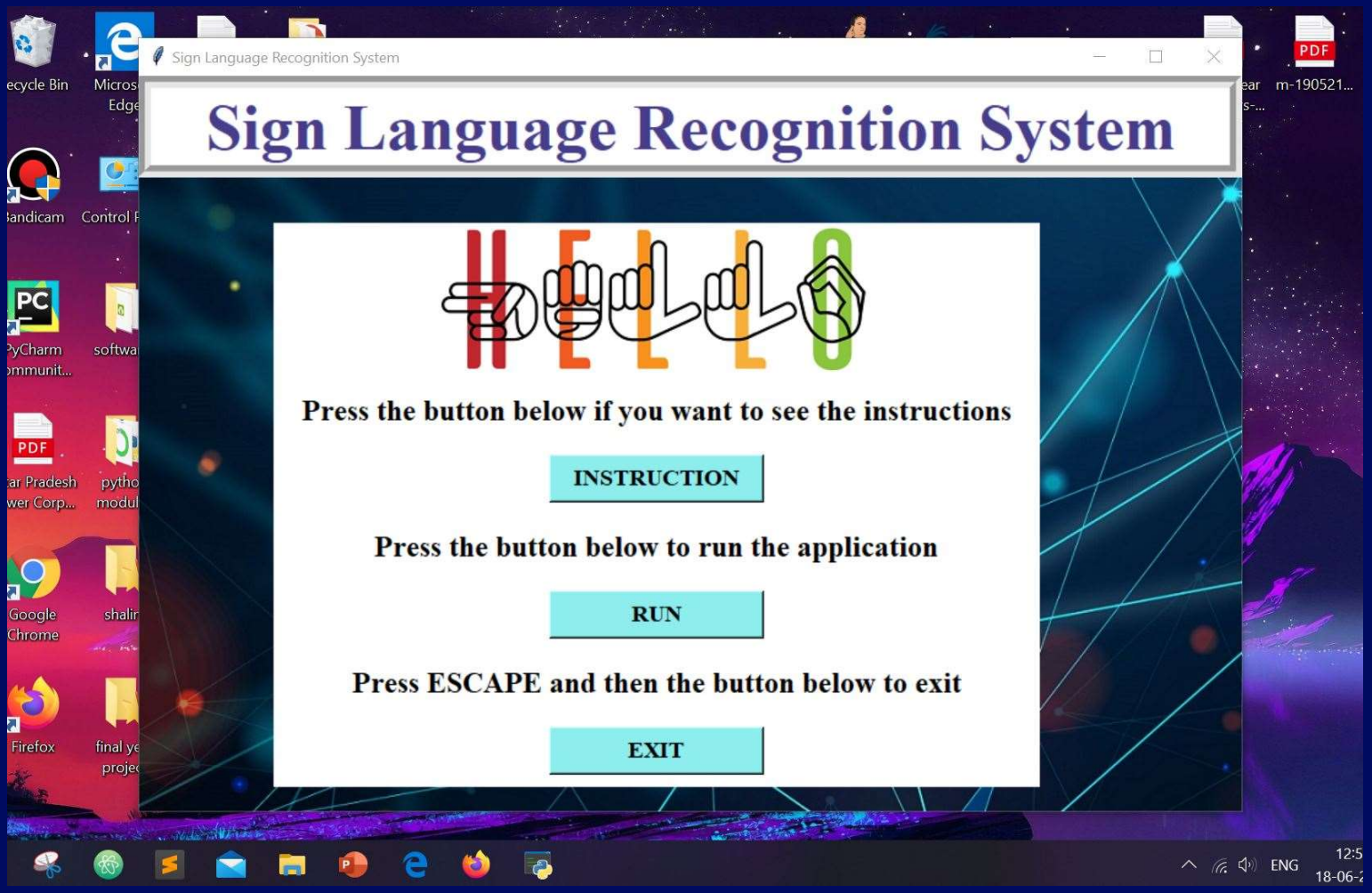
4.TRAINING THE DATASET



- The gestures that is stored in the training dataset, after loading is ready to be trained for recognition.
- This model uses Keras for training the model
- We imported Sequential from keras.models, to initialise our neural network model as a sequential network.
- We Trained on 88000 sample images for 20 epochs
- After Training a cnn_kear.h5 model will be created .

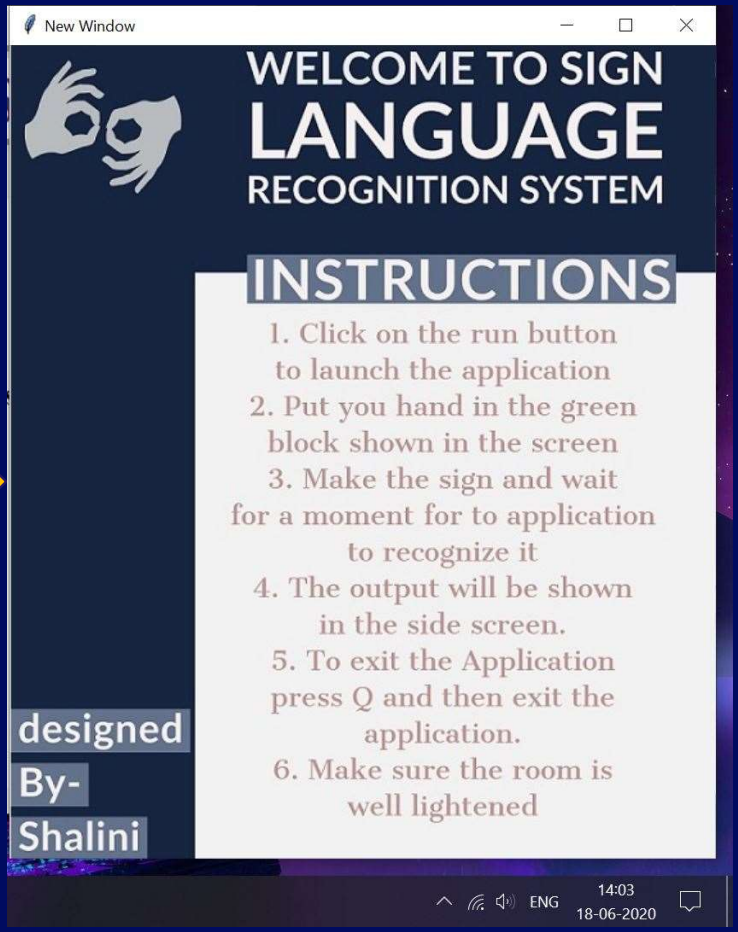
5.RECOGNIZING THE GESTURE AND CONVERTING TO TEXT

PROJECT DEMO

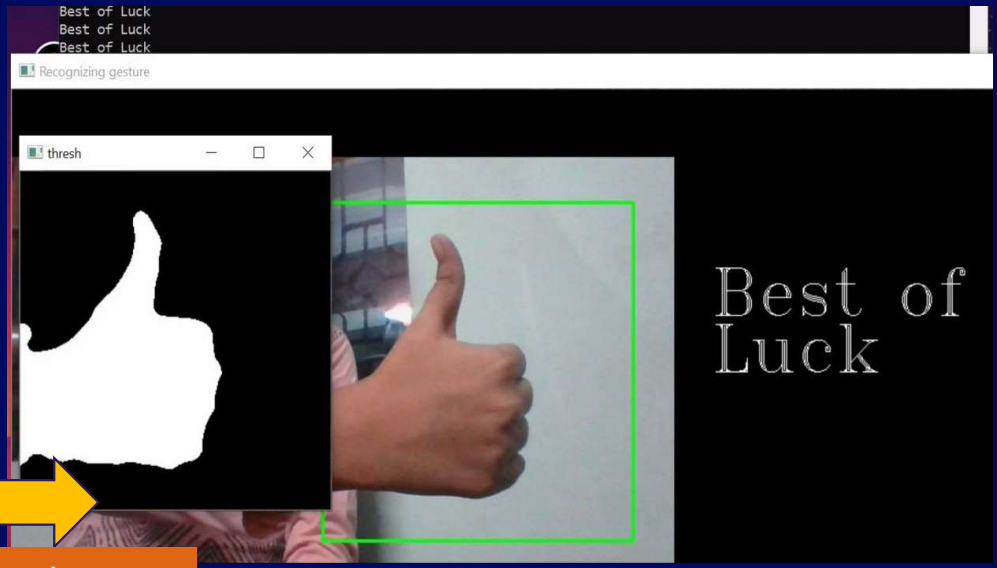


PROJECT DEMO

On clicking on INSTRUCTION BUTTON



PROJECT DEMO



On Clicking on run button the recognition application will start.

By clicking this button you can exit the application

LIMITATIONS

- **UNCONTROLLED ENVIRONMENT**

The uncontrolled environment is one of the major concerns of developing any real time computer vision project. The dynamic changes in illumination, background and camera positions will make it complex to develop a technique to extract the regions of interest from the entire frame.

(A) Hand gesture with fair skin-tone and variable background

(B) Hand gesture with a brown skin-tone and poor lighting conditions

- **OCCLUSION**

In ASL recognition, few signs obstruct the visibility of certain parts of hand and figures which will create ambiguity in image classification task.

(A) ASL gesture for 'R'

(B) ASL gesture for 'D'

CONCLUSION

- Our model was able to predict the 44 characters in the ASL with a prediction accuracy >95%.
- In this project, we presented the concept of gesture to speech conversion concept, due to which the communication between the vocally impaired people of the society and the common people will be carried out without any obstruction.
- We tried to bring more precise gesture capturing process along with fast reply. Not only that but this system can be adapted on various smartphones in the form of application, so that it is accessible to everyone.

FUTURE SCOPE

Features that can be added:

- Deploy the project on cloud and create an API for using it.
- Increase the vocabulary of our model.
- Incorporate feedback mechanism to make the model more robust add more sign languages
- System can be adapted on various smartphones in the form of application, so that it is accessible to everyone.

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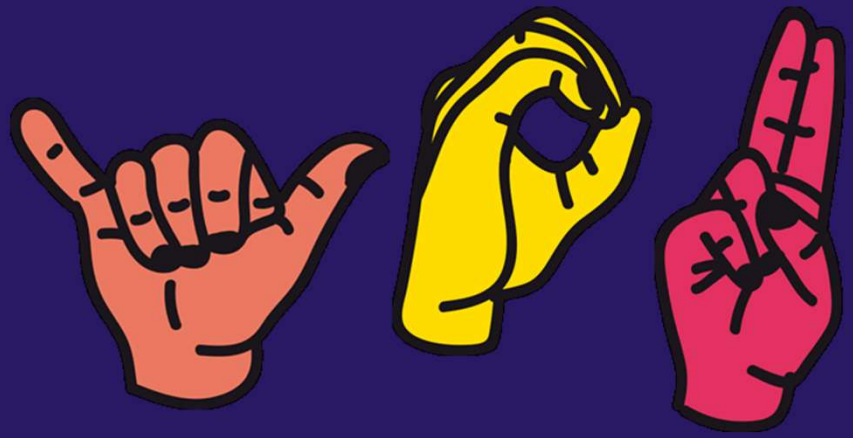
T H A N K



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