SIGN-LANGUAGE RECOGNITION SYSTEM

INTRODUCTION

Deafness is a disorder that can affect hearing and hearing impairment, whereas deafness is a speech impediment that limits their ability to speak. They are both paralyzed when they hear and/or talk, so they can do many other things. The only thing that separates them from ordinary people is communication. If there is a way for ordinary people and deaf people to speak, deaf people can easily live as normal people. In this age of technology, it is very important to make these people feel part of the community by helping them speak fluently.

The translator will not always be available and visual communication is very difficult to understand. Some programs recommend the use of gloves but the success rate has been low. And connecting cables limit freedom of movement. Researchers have long tackled this problem and the results show some promise. Interesting technology is being developed to recognize speech.

EXISTING METHODS

Identification of sign gestures is mainly performed by the following methods:

1. **The glove-based method** is in which the signer has to wear a hardware glove, while the hand movements are getting captured.
2. **Vision-based method**, further classified into static and dynamic recognition. Statics deals with the detection of static

gestures(2d-images) while dynamic is a real-time live capture of the gestures. This involves the use of the camera for capturing movements.

The Glove-based method, seems a bit uncomfortable for practical use, despite having an accuracy of over 90%. The problems of developing sign language recognition range from image acquisition to the classification process. Researchers are still finding the best method for image acquisition. Gathering images using a camera gives the difficulties of image pre-processing. Meanwhile, using an active sensor device can be costly. Classification methods also give researchers some drawbacks. The wide choice of recognition method makes researchers unable to focus on one best method. Choosing one method to be focused on, tends to make other methods that may be better suited for Sign Language Recognition, not being tested. Trying out other methods makes researchers barely develop one method to its fullest potentials so we preferred visual-based static detection.

The whole project was divided into three parts-

1. Creating a database

Creating a database was the first and most important task of the project. In creating a database high-resolution images needed to be photographed and a lot of space and memory was required in this case but due to lack of resources and due to excellent availability and data availability. a number of online resources. We have used the MNIST database available online.

2. Training a CNN on the captured dataset

We have a Convolutional Neural Network, or CNN, model to classify the static images in our dataset.

3. Predicting the data

After the creation of the dataset and training the dataset into the particular module. the last step is a prediction of data and checking of efficiency of the module.

Design and Implementation

Technology used

1. **Python: -**Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its high-level built in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together.

2. **Open CV: -**OpenCV (Open Source Computer Vision Library) is an open source computer vision and machine learning software library. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in commercial products.\

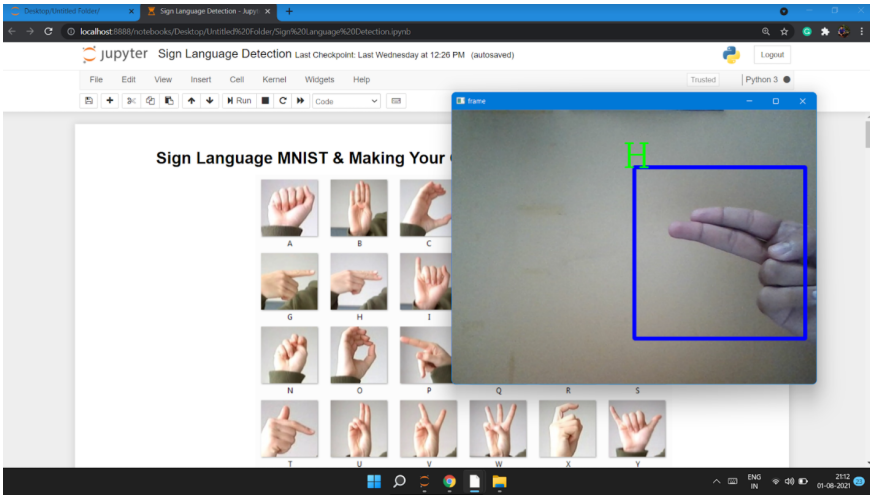
3. **Tensorflow[open source library]:** TensorFlow is an end-to-end open source platform for machine learning. It has a comprehensive, flexible ecosystem of tools, libraries and community resources that lets researchers push the state-of-the-art in ML .

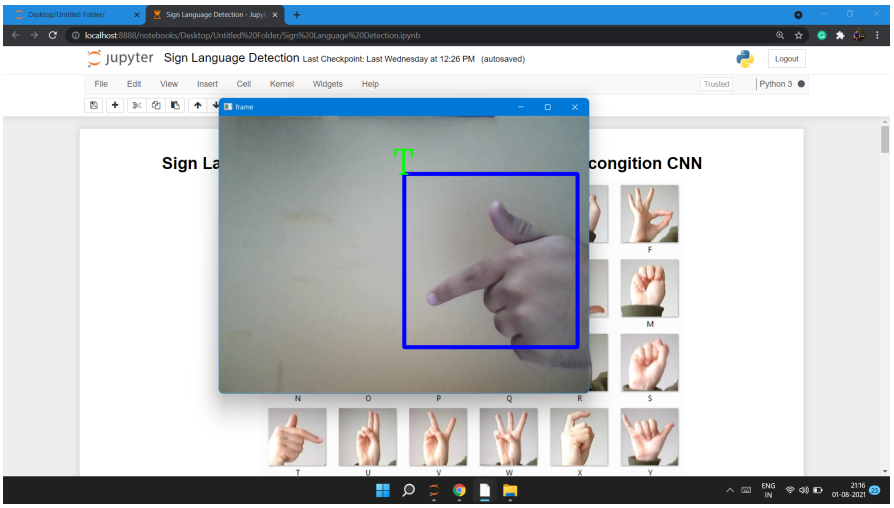
4. Keras[open souce python library]: Keras is an open-source software library that provides a Python interface for artificial neural networks. Keras acts as an interface for the TensorFlow library.Up until version 2.3, Keras supported multiple backends, including TensorFlow, Microsoft Cognitive Toolkit, Theano, and PlaidML.

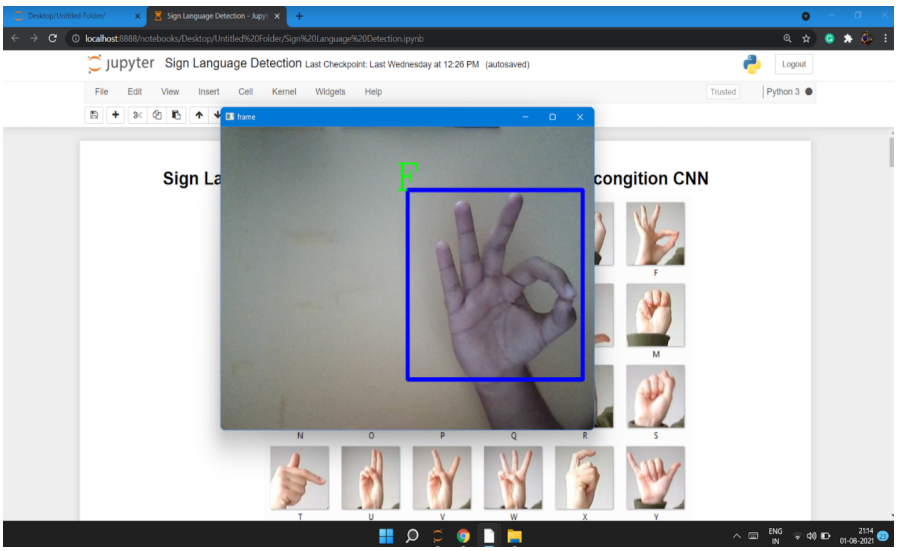
STATIC HAND GESTURE DETECTION

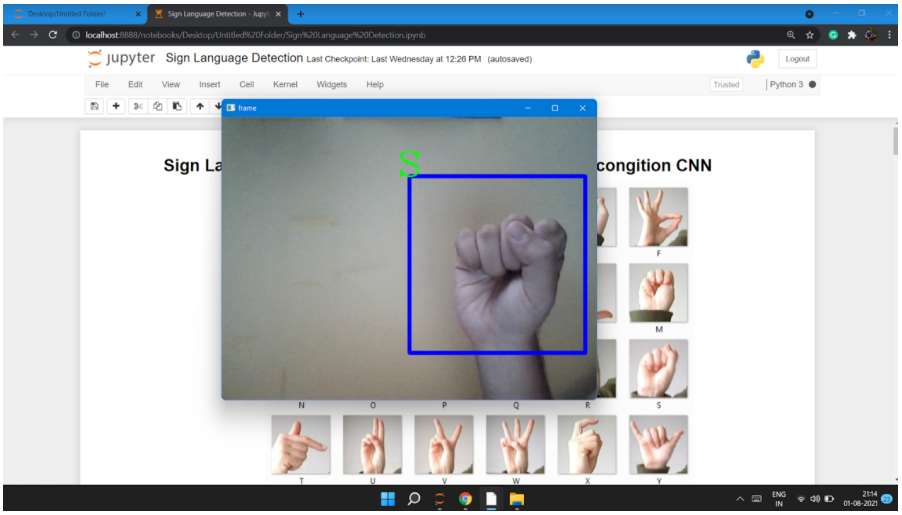
- Producing a model which can recognize Fingerspelling-based hand gestures in order to form a complete word by combining each gesture.
- Alphabets (A-Z) in American Sign Language
- Data Collection & Pre-Processing:
- Dataset: MNIST Dataset: 28×28 pixels images(24 alphabets: J and Z deleted as they include gesture movements: (Dataset) [Training: 27,455, Testing: 7172]
- Learning/Modeling:
- We have a Convolutional Neural Network, or CNN, model to classify the static images in our first dataset.

Result Image

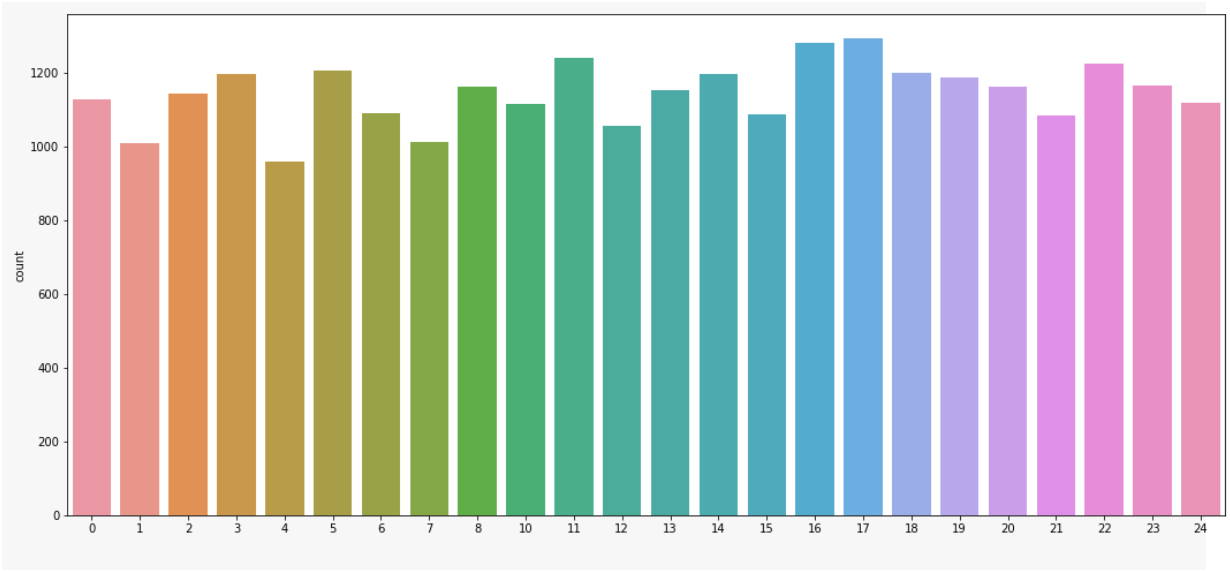








Sign Language MNIST Dataset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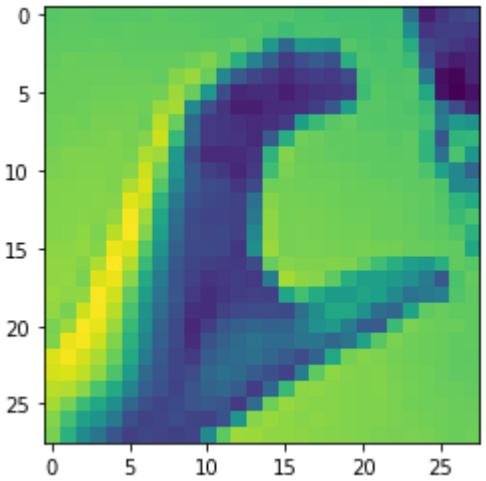
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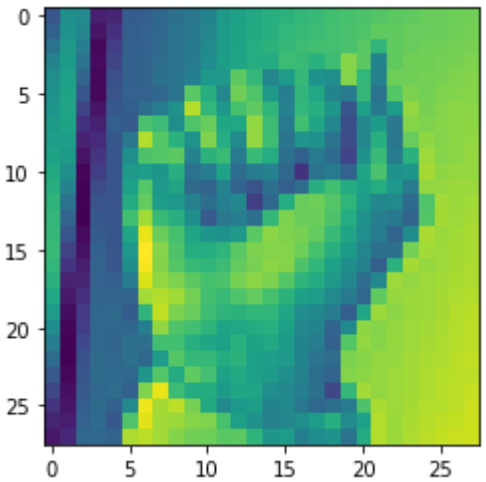
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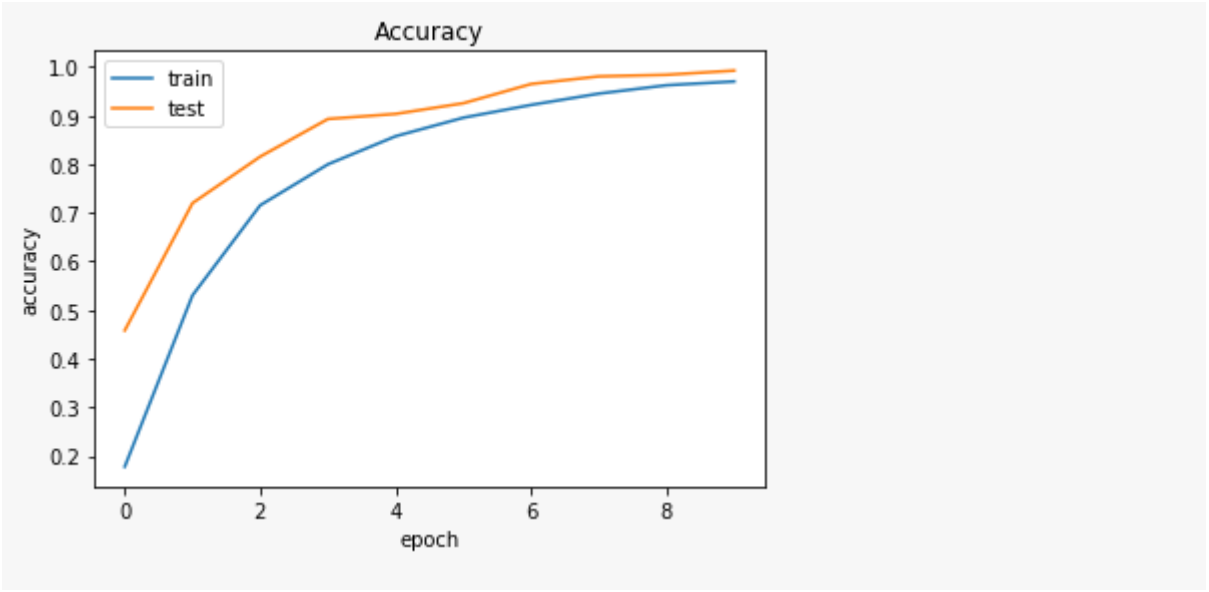

RESULTS

DATASET	TRAINING, TESTING SET	LAYERS CNN	ACCURACY
1. MNIST Dataset	27,455, 7172	3 Layer CNN	Train: 95.3% Test: 94.7%