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## Real-Time Sign Language Recognition using TensorFlow

*Dr. Meenakshi Thalor<sup>1</sup>, Anisha Biju<sup>2</sup>*

<sup>1</sup>Head of the Department, Department of Information Technology, AISSMS's Institute of Information Technology, Pune-411001, INDIA

<sup>2</sup>TE. BE (Information Technology), AISSMS's Institute of Information Technology, Pune-411001, INDIA

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### ABSTRACT

Communication is the act of sharing or replacing information and emotions. To establish conversation between two humans, both of them are required to have expertise and understanding of a not unusual language. In the case of deaf and dumb humans, the manner of conversation are unique. Ordinary cannot interact with differently abled human beings effortlessly. This research have a look at approximately photo type by way of the usage of the deep neural community (DNN) or also known as Deep learning via using framework TensorFlow. This version is skilled in the use of the SSD ML algorithm. It acknowledges symptoms as words and helps to understand the statement very fast.

Keywords: SSD model, TensorFlow object detection model, Deep learning

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### 1. Introduction

Sign language is a language that only a small number of people can use. To help the deaf and the dumb, sign languages were primarily developed. They use a coordinated and precise combination of hand motions, hand shapes, and hand orientation to convey precise information. There is still a need for more research in this area despite the extensive amount that has already been done. Since a real-time SLR system was not employed. The solution is to create a translator that can recognize sign language and then input that sign into a transfer learning algorithm, which is then recognized by a neural network and translated on the screen so that a regular person can understand what the sign is saying.

#### 1.1 Motivation

We are living in a society where all kinds of people coexist. It is necessary that we consider every ones feelings and problems. Communication is a key aspect to achieve this motive. Since disabled people cannot interact and communicate with normal people, this is an attempt to bridge the gap

#### 1.2 Objectives

The aim of this project is to communicate with differently-abled people without the help of any expensive human interpreter

Project Objectives

1. It connects persons who are physically handicapped with others who are not.
2. We can recognize the indications and provide the appropriate text output using computer vision and neural networks.
3. Allow the user to communicate on his or her own. Making them feel independent.
4. Many firms are creating solutions for deaf and hard-of-hearing persons, but not everyone can afford them. Some are very pricey ,this is completely free, and anyone may use it.

#### 1.3. Literature Survey

The first approach in relation to sign language recognition was by Bergh in 2011 [1]. Haar wavelets and database searching were employed to build a hand gesture recognition system. Although this system gives good results, it only considers six classes of gestures. In a study by Balbin et al. [2], the system only recognized five Filipino words and used colored gloves for hand position recognition; our model can be trained for different gestures and can be recognized without any colored gloves and using only bare hands. In our model, the images are captured using a PC Cam and were able to get an accuracy of 75% at on average. In other models, these were captured using motion sensors, such as electromyography (EMG) sensors [3], RGB cameras [4], and Kinect sensors [5] and their combinations. Although the accuracy of detecting the signs is high, they also have limitations; first is their cost, as

they require large-size datasets with diverse sign motion they go to a high-end computer with powerful specifications; whereas in our model this can be achieved with minimum specifications

#### 1.4 Features

**Tensorflow** : It is an open-source artificial intelligence package that builds models using data flow graphs. It enables developers to build large-scale neural networks with several layers. TensorFlow is mostly used for classification, perception, comprehension, discovery, prediction, and creation. TensorFlow uses SSD model

**SSD MODEL**: The Mobile Net SSD model is a single-shot multibox detection (SSD) network that scans the pixels of an image that are inside the bounding box coordinates and class probabilities to conduct object detection

**Transfer Learning**: Transfer learning is a machine learning technique where a model trained on one task is re-purposed on a second related task. Transfer learning is an optimization that allows rapid progress or improved performance when modeling the second task. Transfer learning is related to problems such as multi-task learning and concept drift



Fig 1 Transfer Learning architecture

## 2. Methodology

### Data Acquisition

For data acquisition, images are captured by webcam using Python and OpenCV. OpenCV provides functions which are primarily aimed at the real-time computer vision. Indian sign language data set is used.

### Data Creation

After labelling All the images along with their XML files are then divided into training data and validation data in the ratio of 80:20. From 25 images of an alphabet, 20 (80%) of them were taken and stored as training dataset and the remaining 5 (20%) were taken and stored as validation dataset. This task was performed for all the images of all 26 alphabets

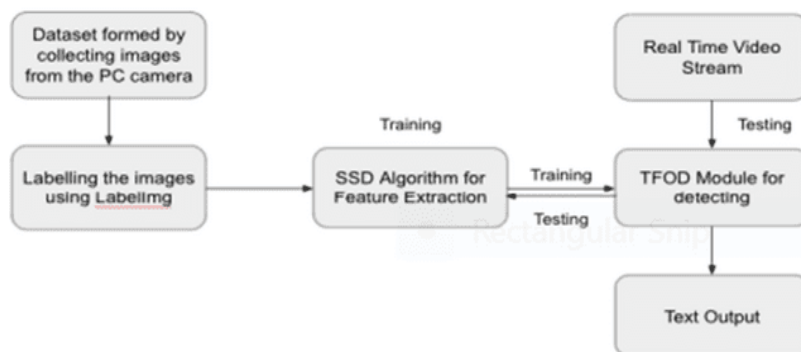


Fig 2 System architecture[7]

## SSD MODEL Working

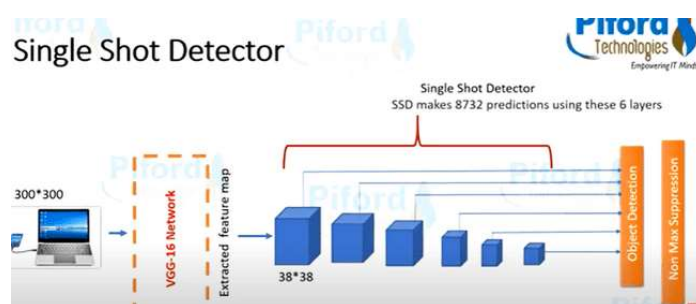


Fig 3 SSD Model

Train : The input should contain ground truth boxes

The convolutional layers are used to check different default boxes of different sizes and aspect ratios on the entire image. [6]



Fig 4 ground truth boxes

Match

While training SSD match the default bounding boxes with ground truth boxes. For the matching purpose intersection over union is used. The overlap should be more than 50% Pick those predicted boxes which have maximum overlap of the ground truth boxes[6]

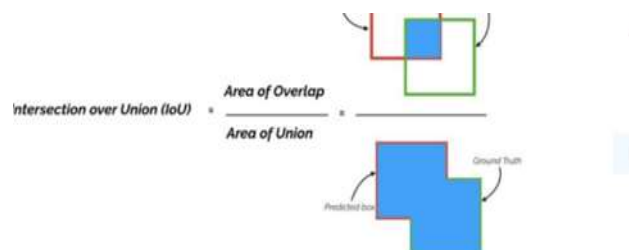


Fig 5 Intersection over union

## Conclusion

The fundamental goal of a sign language detecting system is to provide a practical mechanism for normal and deaf individuals to communicate through hand gestures. The proposed system will be used with a webcam or any other in-built camera that detects and processes indicators for recognition. In the future data set can be enlarged so that the system can recognize more gestures. A drawback in this work of not getting accurate results in dark can be eradicated, during capturing images we can capture the same image in dark as well as in light. We can change the data set for a specific language in India. Improving the model's ability to identify express

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**References**

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- [1] M. Van den Bergh and L. Van Gool, "Combining RGB and ToF cameras for real-time 3D hand gesture interaction," 2011 IEEE Workshop on Applications of Computer Vision (WACV), 2011, pp. 66-72
- [2] J. R. Balbin et al., "Sign language word translator using Neural Networks for the Aurally Impaired as a tool for communication," 2016 6th IEEE International Conference on Control System, Computing and Engineering (ICCSCE), 2016, pp. 425-429.
- [3] J. Wu, Z. Tian, L. Sun, L. Estevez and R. Jafari, "Real-time American Sign Language Recognition using wrist-worn motion and surface EMG sensors," 2015 IEEE 12th International Conference on Wearable and Implantable Body Sensor Networks (BSN), 2015, pp. 1-6.
- [4] D. Mart, Sign Language Translator Using Microsoft Kinect XBOX 360 TM, 2012, pp. 1-76.
- [5] Cao Dong, M. C. Leu and Z. Yin, "American Sign Language alphabet recognition using Microsoft Kinect," 2015 IEEE Conference on Computer Vision and Pattern Recognition Workshops (CVPRW), 2015
- [6] [https://www.youtube.com/watch?v=NUEim5bF0\\_0](https://www.youtube.com/watch?v=NUEim5bF0_0) SSD model
- [7] P. Rishi Sanmitra1 , V. V. Sai Sowmya2 , K. Lalithanjana3\* "Machine Learning Based Real Time Sign Language Detection" *International Journal of Research in Engineering, Science and Management* Volume 4, Issue 6, June 2021 <https://www.ijresm.com> | ISSN (Online): 2581-5792