# Sign language recognition using deep learning

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# Chapter 1

# Introduction

## 1.1 Background

Communication is a process of sending and receiving data among individuals. People communicate with o with a considerable measure of ways yet the best way is eye to eye correspondence. Numerous individuals trust that the significance of communication is like the importance of breathing. Indeed, communication facilitates the spread of knowledge and structures connections between individuals.

Deep learning added a immense lift to the already rapidly developing field of computer vision. With deep learning, a lot of new utilization of computer vision techniques have been presented and they are currently ending up some portion of our regular day to day existence.

Alongside with the intensity of the present computers, there are now various algorithms that were developed to empower the computers to perform tasks such as object tracking and pattern recognition.

In this study, the attention will be on hand gestures detection and make an interpretation of them into voice.

## 1.2 Problem Statement

Communication difficulties arising from damage to hearing directly have an effect on the standard of life. Difficulties in communication could end in deviations within the emotional and social development which will have a major impact on the standard of lifetime of every one. It is well recognized that hearing is crucial to speech and language development, communication, and learning. Folks with listening difficulties due to hearing loss or auditory processing problems continue to be an under-identified and under-served population. The earlier the matter is known and intervention began, the less serious the ultimate impact (Frajtag1 & Jelinic2, 2017).

The communication between hearing-impaired and other individuals is a colossal gab need to

be filled up. In order to overcome this challenge many researches and products have been developed to solve this problem, but there is a lot to be enhanced.

## 1.3 Objectives

- To study sign language gestures.
- To develop a new hand gesture into voice algorithm.
- To construct a hand gesture into voice model.

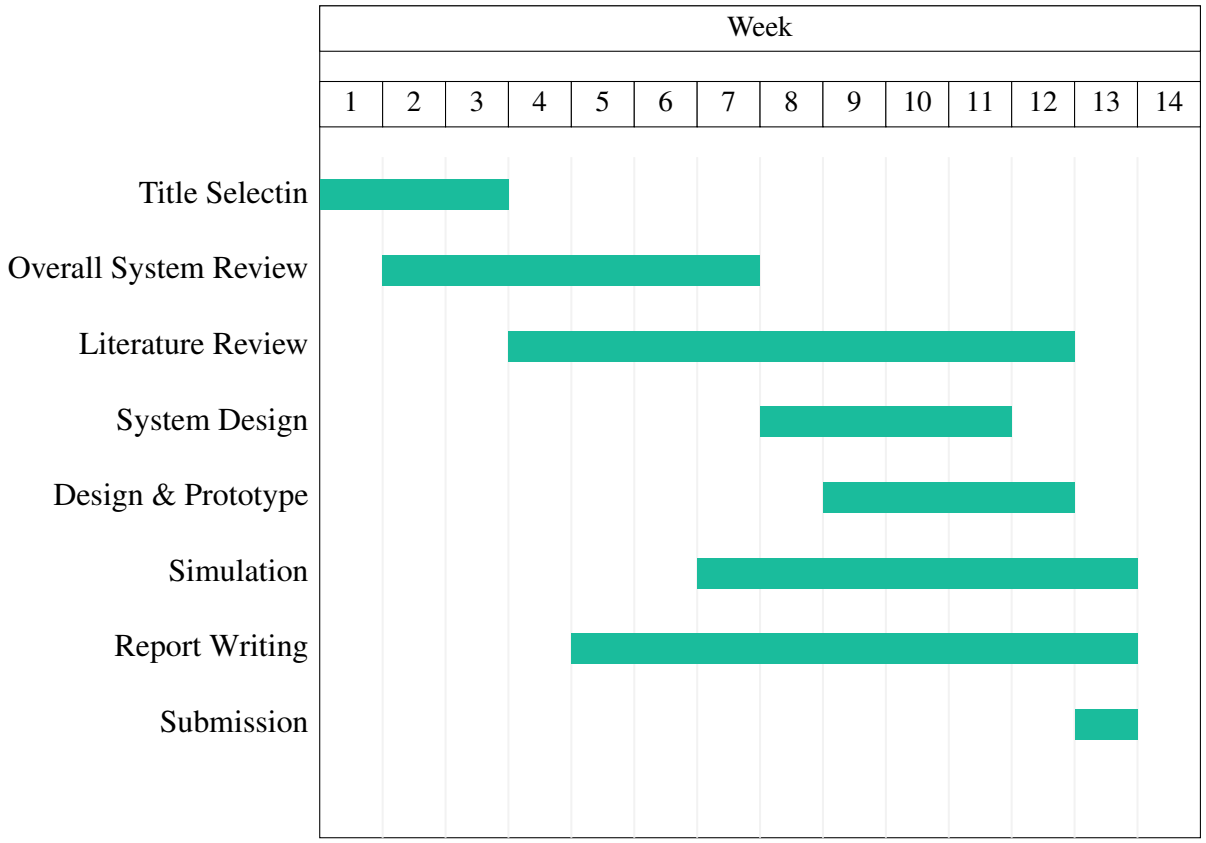
## 1.4 Scope

This research aims to develop a sign language recognition algorithm, and converting it into voice.

## 1.5 Significance

Help the hearing-impaired community to communicate with hearing ones, in order to make a strong connected community.

## 1.6 Timeline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Title Selectin
Overall System Review
Literature Review
System Design
Design & Prototype
Simulation
Report Writing
Submission

# Chapter 2

# Literature review

## 2.1 Introduction

This chapter includes reviews of other previous researcher and their proposed methods they used in implementing deep learning to recognize hand gestures. These researches will help to grasp the knowledge to achieve the project's objectives.

## 2.2 Previous works

(Bao, Maqueda, del Blanco, & García, 2017), proposed a Deep convolutional neural network algorithm for hand-gesture recognition without hand localisation, since the hands only occupy about 10% of the image. They used a combination of 9 convolution layers, 3 fully connected layers, interlaced with ReLU(Rectified Linear Unit) and dropout layers as shown in figure 2.1. Alongside this architecture the apply some image processing techniques to have sufficient computation efficiency and memory requirement. According to the paper the accuracy achieved was 97.1% in the images with simple backgrounds and 85.3% in the images with complex backgrounds.However, the main disadvantage of of the proposed algorithm is the training set which only includes 7 different gestures, and it tends to have bad accuracy with complex backgrounds.

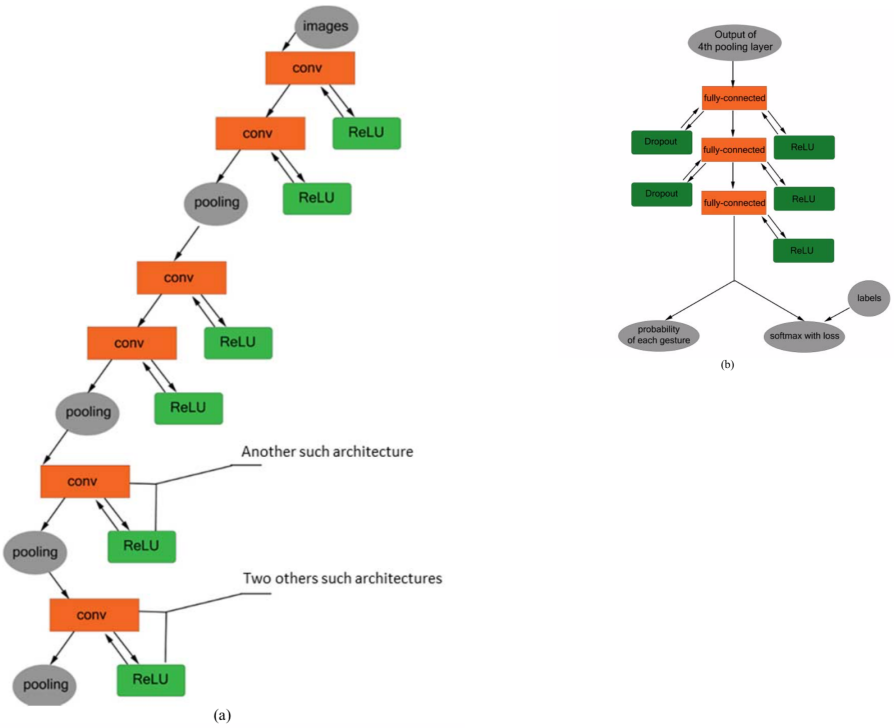


Figure 2.1: Architecture of the proposed deep CNN

(Rao, Syamala, Kishore, & Sastry, 2018), proposed a CNN architecture for classifying selfie sign language gestures. The CNN architecture is designed with four convolutional layers. Each convolutional layer with different filtering window sizes as shown in figure 2.2 They had a dataset with five different subjects performing 200 signs in 5 different viewing angles under various background environments. Each sign occupied for 60 frames or images in a video. The proposed model performed training on 3 batches to test the robustness of different training mode using caffe deep learning framework. However, the result accuracy was 92.88% need more training and improvements.

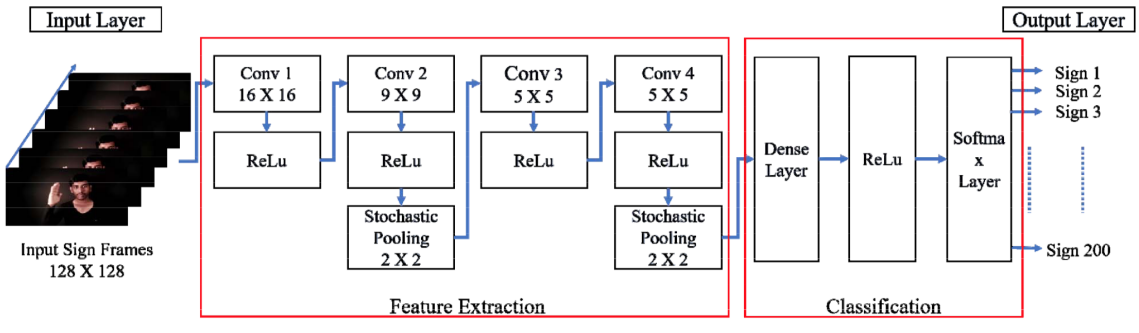


Figure 2.2: Proposed Deep CNN architecture

(Hussain, Saxena, Han, Khan, & Shin, 2017), introduced a CNN based classifier trained through the process of transfer learning over a pretrained convolutional neural network which is trained on a large dataset. We are using VGG16 figure 2.3 as the pretrained model. The According to the paper the accuracy was 93.09%,while using AlexNet figure 2.4 was 76.96%. the same problem here with the other papers which is the small number of sign that begin trained on 7 signs, and the accuracy need to be improved as well.

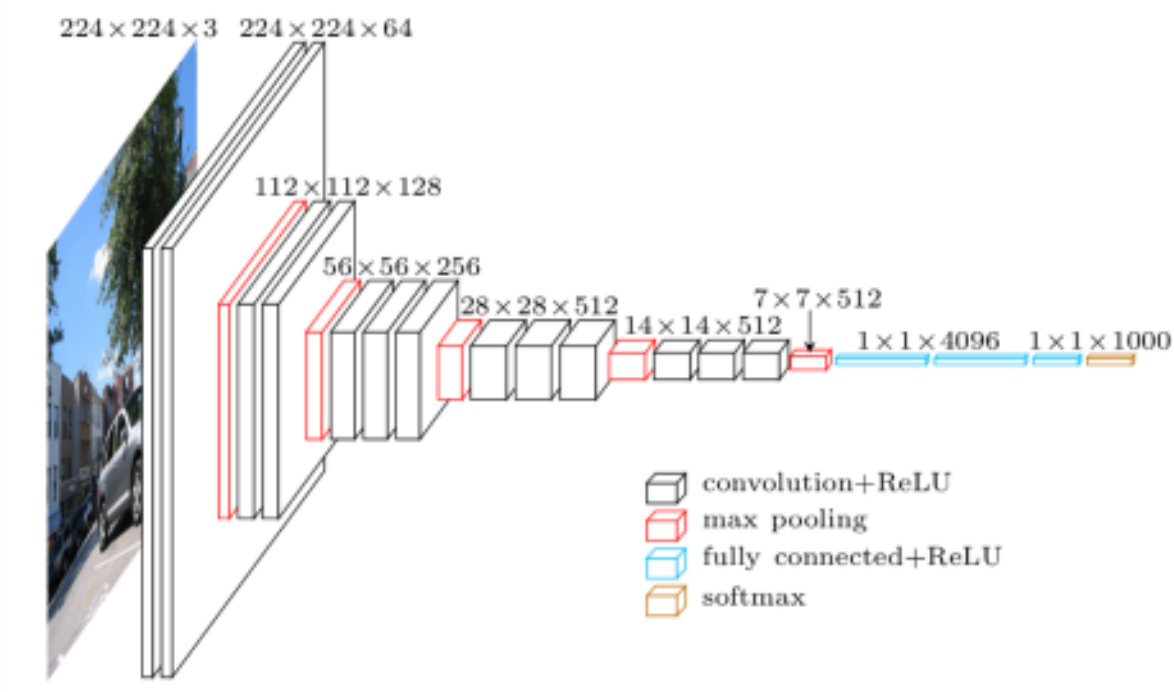


Figure 2.3: VGG16 architecture. Retrieved from www.cs.toronto.edu

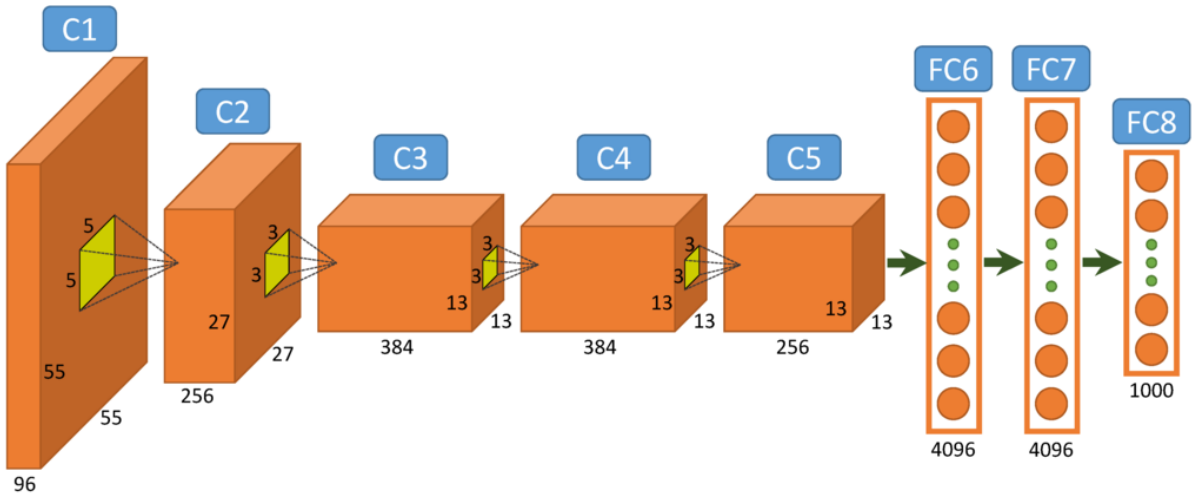


Figure 2.4: VGG16 architecture. Retrieved from www.saagie.com

## 2.3 Summary

This chapter illustrates some works have been done previously on hand gesture and sign language recognition using deep learning. Table 2.1 the Summary of the literature review.

Table 2.1: Summary of the literature review

| Title | Year | Accuracy | Software |
|---|---|---|---|
| Tiny Hand Gesture Recognition without Localization via a Deep Convolutional Network | 2017 | 97.1% | CNN |
| Deep Convolutional Neural Networks for Sign Language Recognition | 2018 | 92.88% | CNN |
| Hand Gesture Recognition Using Deep Learning | 2017 | 93.09% | CNN VGG16 |

# References

Bao, P., Maqueda, A. I., del Blanco, C. R., & García, N. (2017, August). Tiny hand gesture recognition without localization via a deep convolutional network. *IEEE Transactions on Consumer Electronics*, *63*(3), 251–257. doi: 10.1109/TCE.2017.014971

Frajtag1, J. B., & Jelinic2, J. D. (2017). Communication problems and quality of life people with hearing loss. *Glob J Otolaryngol*.

Hussain, S., Saxena, R., Han, X., Khan, J. A., & Shin, H. (2017, November). Hand gesture recognition using deep learning. In *Proc. int. soc design conf. (isocc)* (pp. 48–49). doi: 10.1109/ISOCC.2017.8368821

Rao, G. A., Syamala, K., Kishore, P. V. V., & Sastry, A. S. C. S. (2018, January). Deep convolutional neural networks for sign language recognition. In *Proc. conf. signal processing and communication engineering systems (spaces)* (pp. 194–197). doi: 10.1109/SPACES.2018.8316344