English Alphabet based Sign Language Recognition

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Outline

Introduction

- More assistive tools are available to make learning less painful for hearing-impaired people.
- Lesser tools are available for communication between hearing-impaired and normal people.
- India has a shortage of certified interpreters.

Need of Alphabet based SL Recognition

- Bridge the gap between the hearing-impaired and the hearing world.
- Helps signers spell out names of people, places, and things without an established sign.
- Reduces the effort and time needed for interpretation.

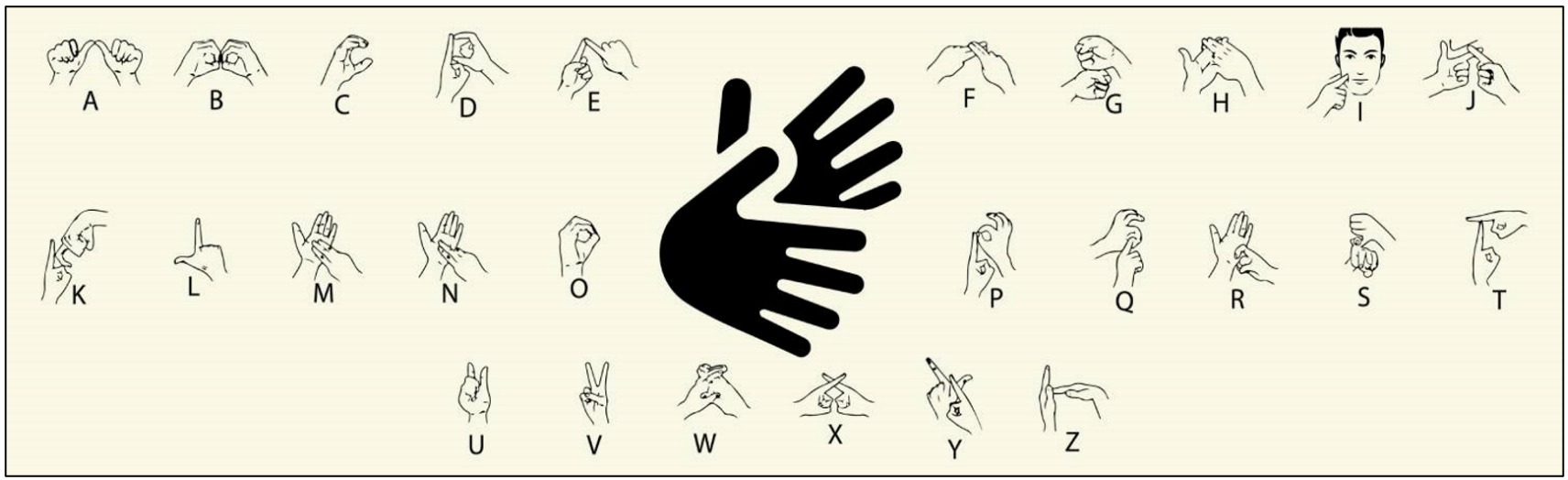


Figure: Indian Alphabet Based Sign Language

Related Work

Shravani et al. (2020) - Indian sign language character recognition.

- A data set was created for alphabets and numeric
- features were extracted from the collected segmented data using image pre-processing and Bag of words model.
- Histograms were generated to map alphabets with images, and these features were fed to supervised models for classification.

Related Work

Woo et al. (2018) - Convolutional block attention module.

- This paper introduces Convolutional block attention module.
- The module aims to increase representation power by using attention mechanisms
- It infers attention maps along two dimensions, channel and spatial, and then multiplies these attention maps to the input feature map for adaptive feature refinement.
- CBAM is end-to-end trainable and can be integrated into any CNN architectures with negligible overheads

Dataset Used

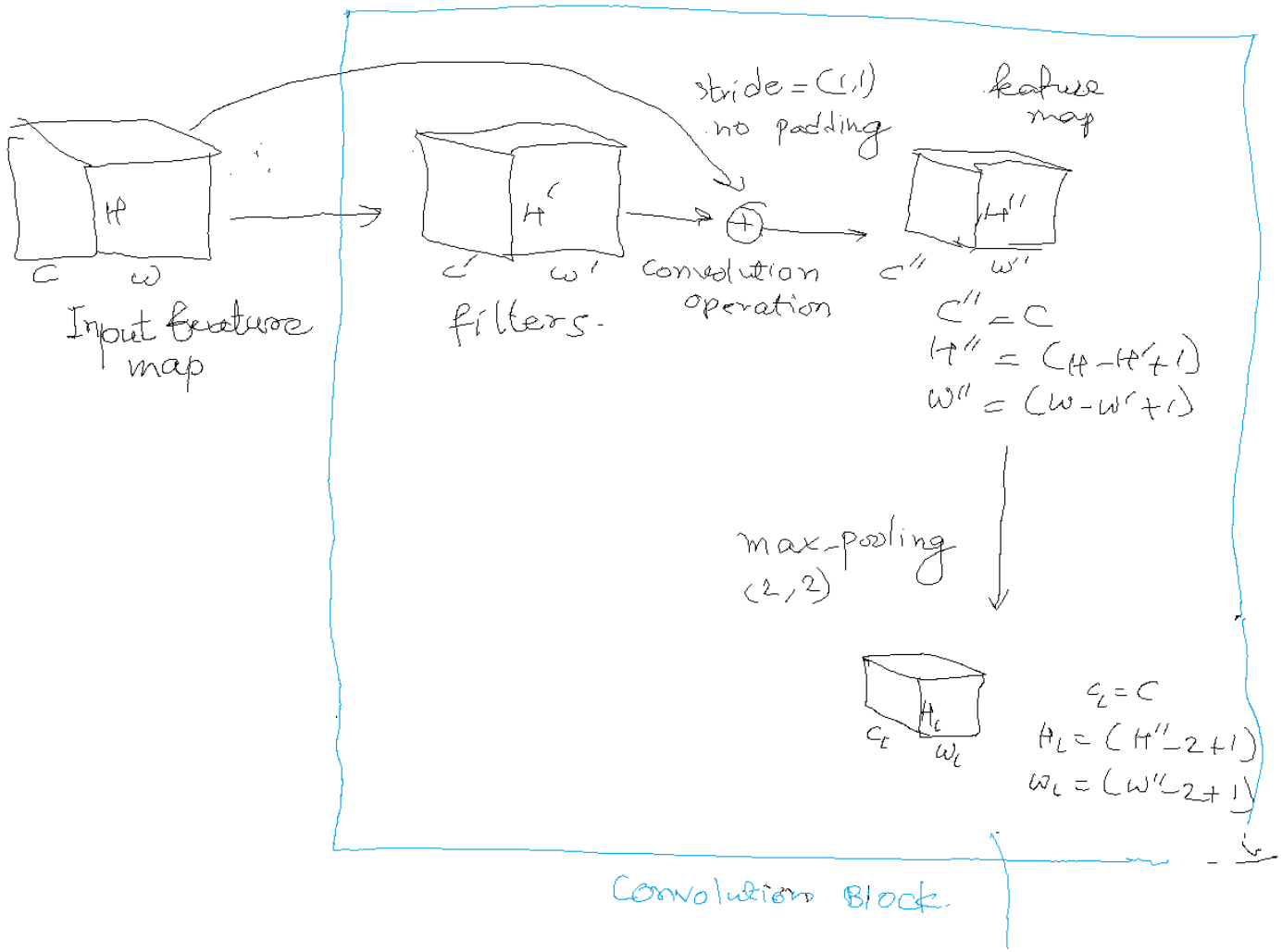
Indian Sign Language Dataset (kaggle.com)

- Consists of images for signs of 1-9 Numbers and A-Z alphabets.
- Every Class consists of 12000 images, each of .jpg format and size 128*128.

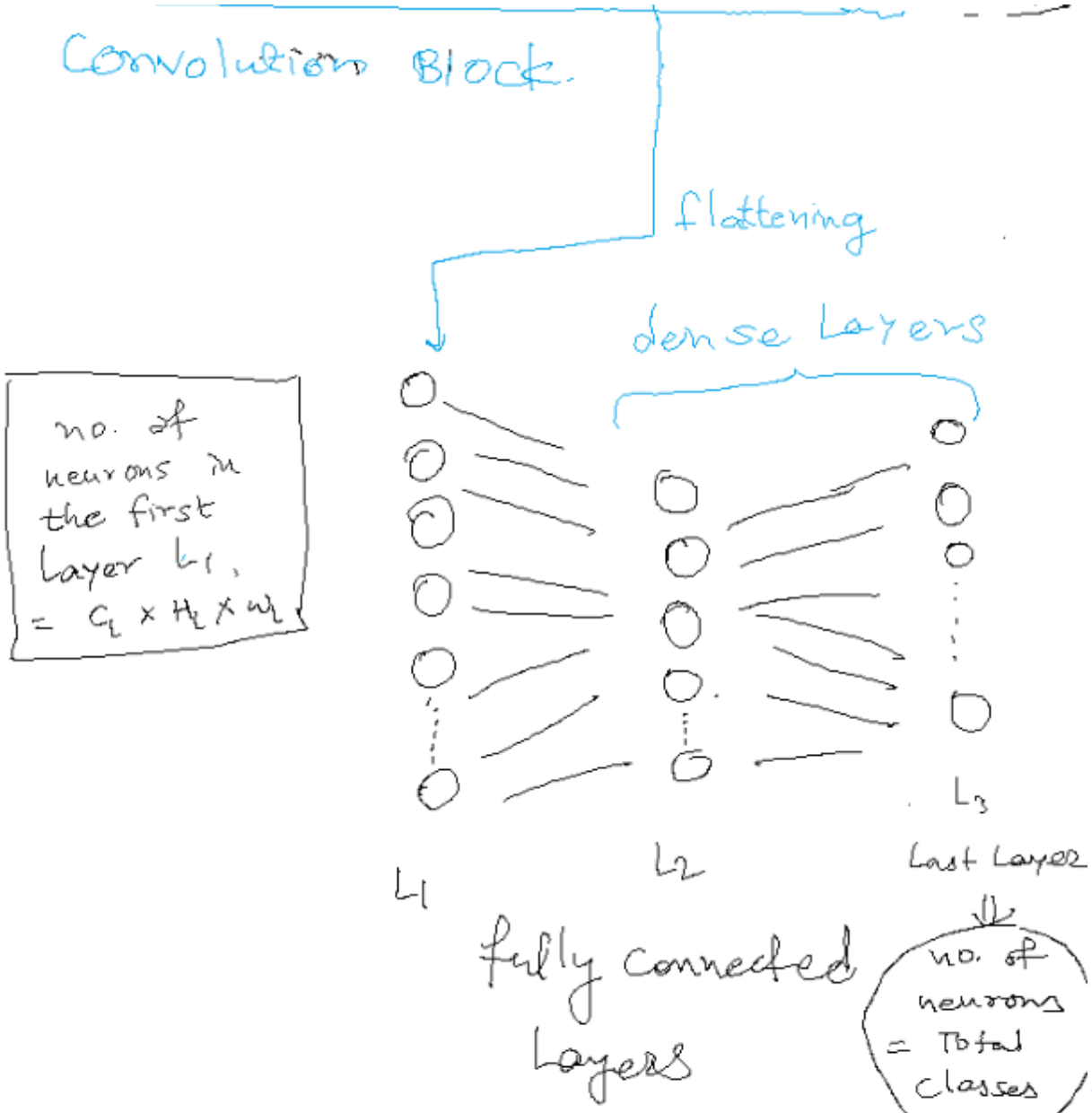
Image Processing

- resize to 128*128 without losing much quality
- convert to grayscale image
- skin masking to automatically segment and isolate the skin regions from image to focus upon hands.
- use of Canny edge detection for feature extraction and pattern recognition

CNN Architecture



CNN Architecture



Results

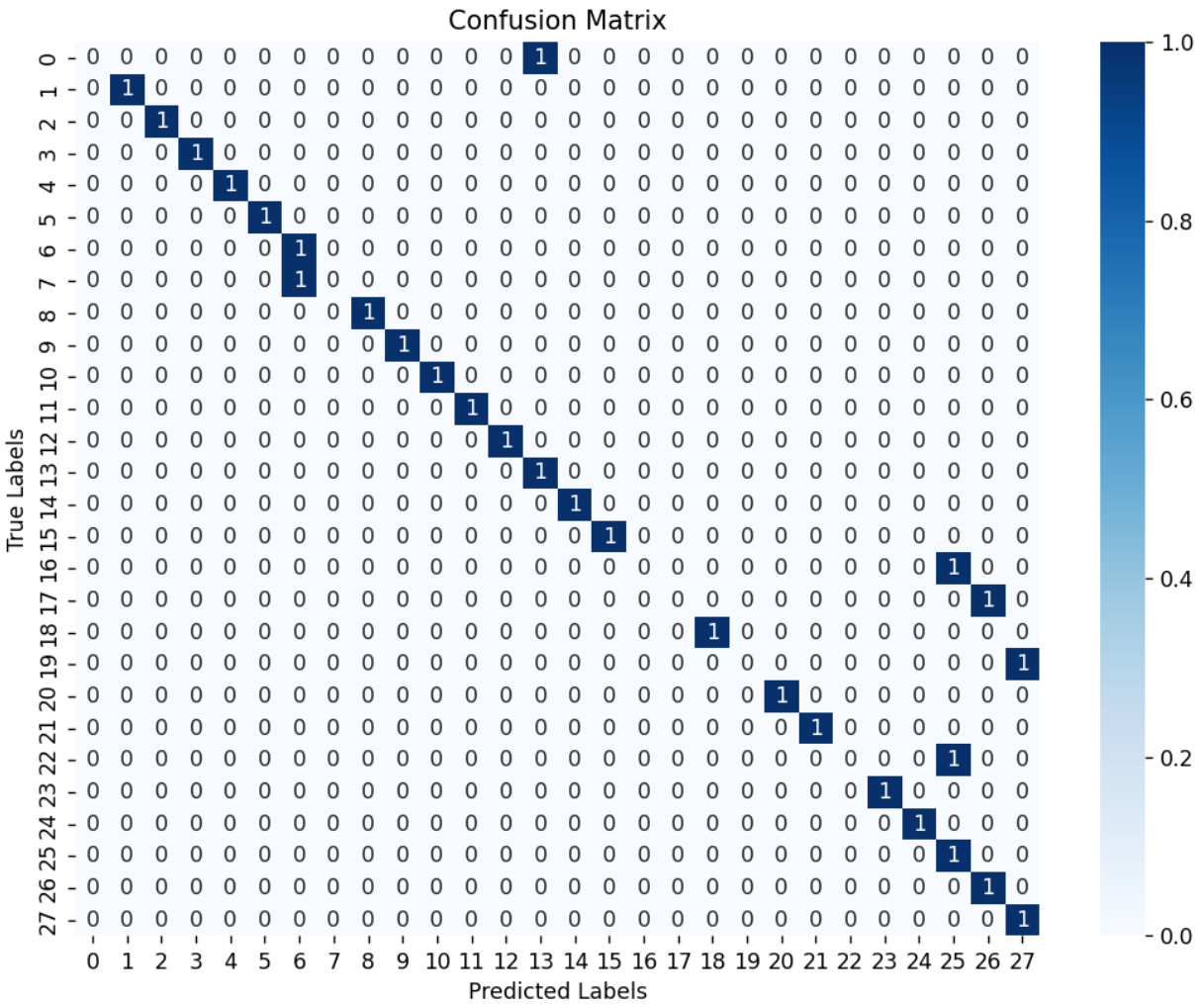


Figure: Confusion matrix for set of test cases

Results

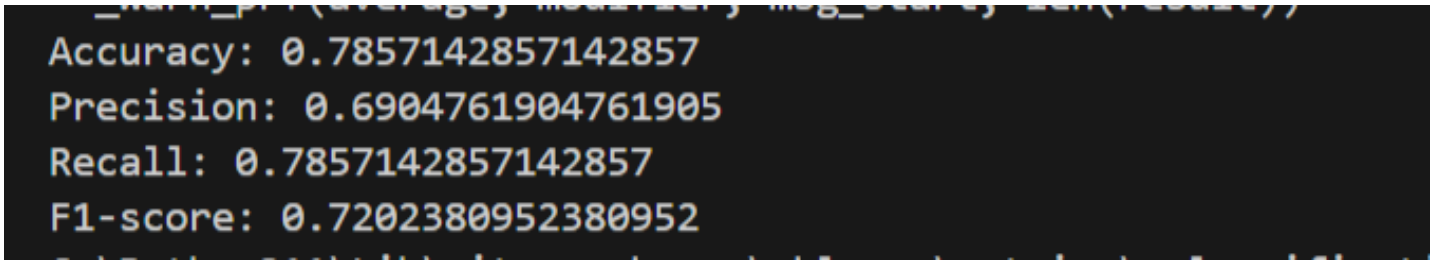


Figure: Evaluation score

Conclusion and Future Work

- Further addition of CBAM in the current network architecture can help enhance the representation power of the model.
- Real-time recognition can also be implemented to enable faster and more responsive sign language recognition systems.
- Incorporating Long Short-Term Memory (LSTM) networks into the model architecture can enhance the accuracy of sign language recognition by capturing temporal dependencies in the sequential data.

References

1. Shravani, K., Lakshmi, A. S., Geethika, M. S., & Sapna, B. K. (2020). Indian sign language character recognition. IOSR Journal of Computer Engineering, 22(3), 14-19.
2. Woo, S., Park, J., Lee, J. Y., & Kweon, I. S. (2018). Cbam: Convolutional block attention module. In Proceedings of the European conference on computer vision (ECCV) (pp. 3-19).