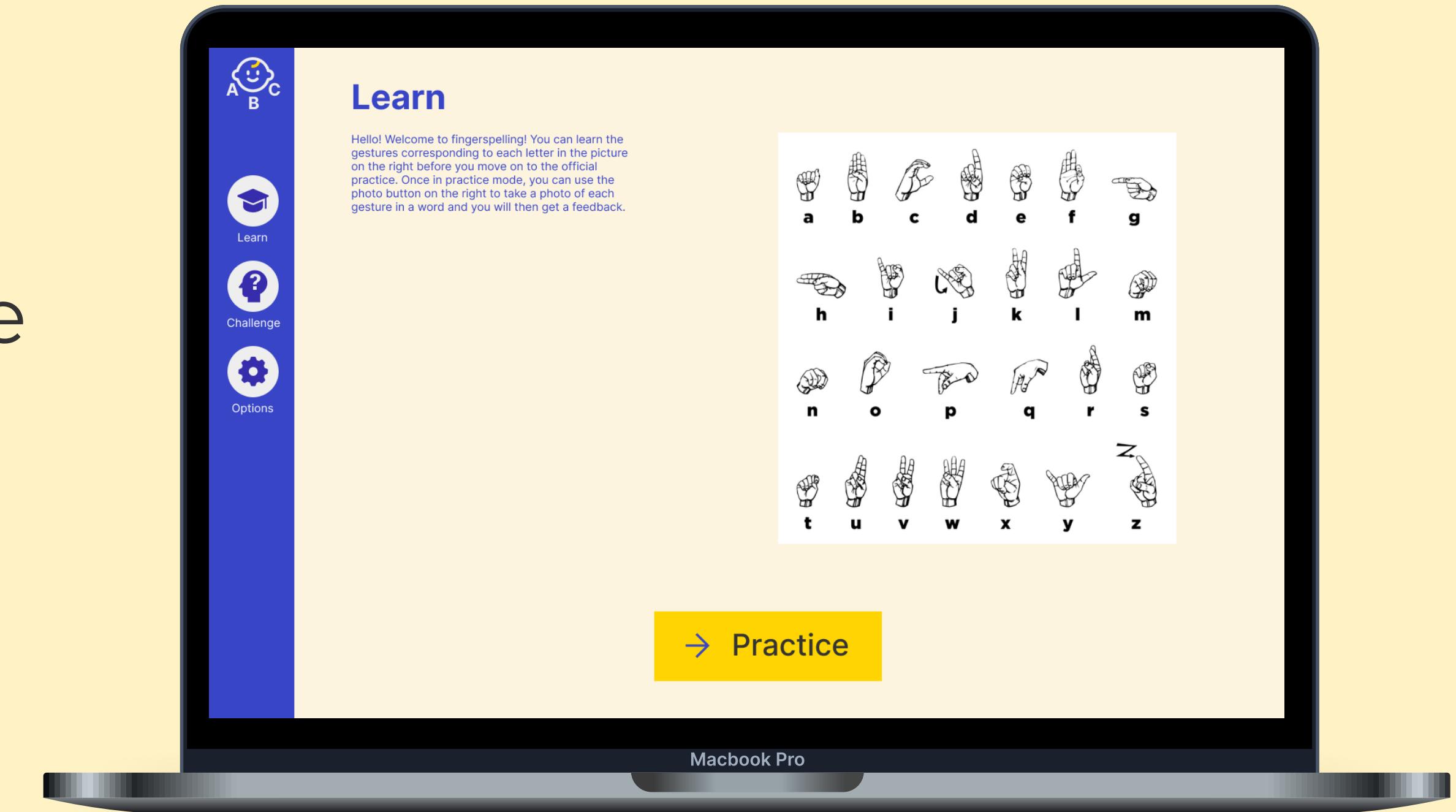


# Interactive Machine Learning

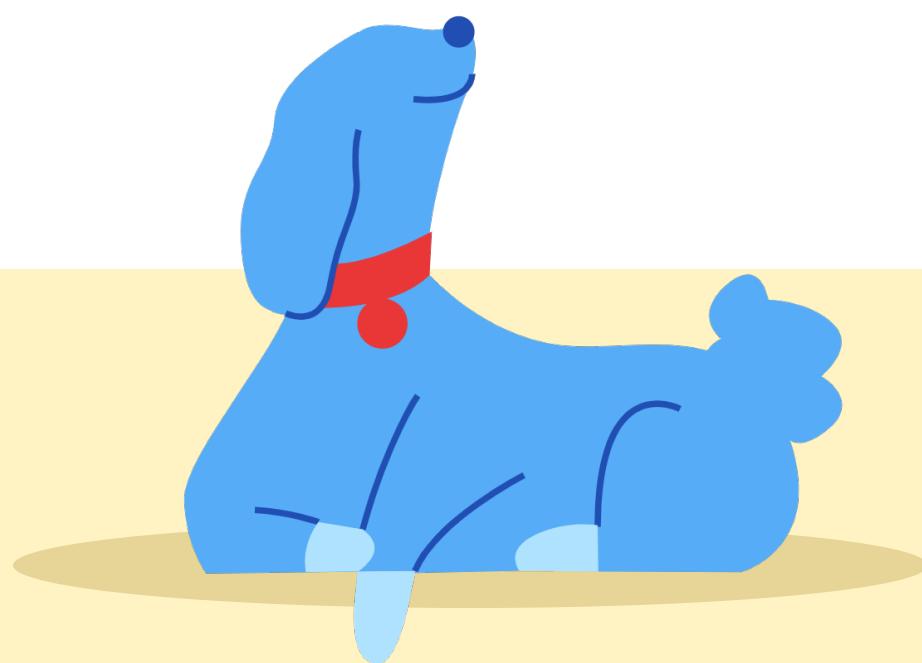
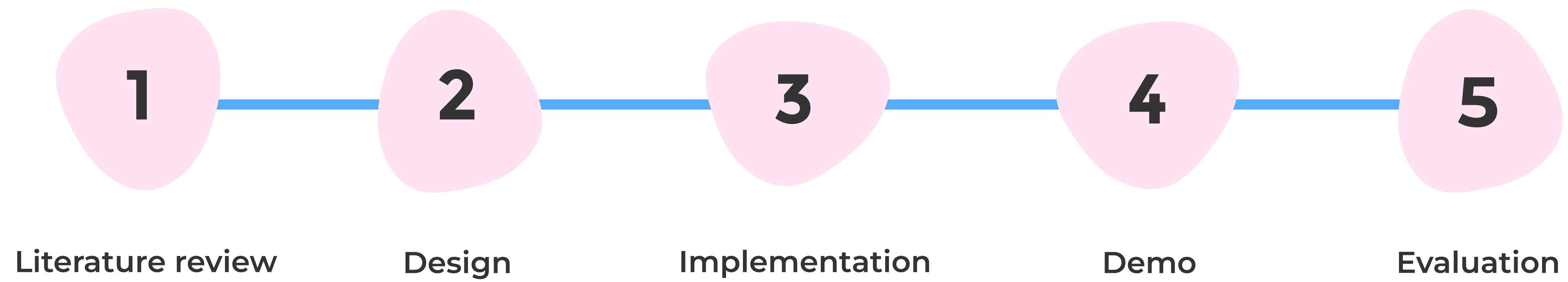
# SignABC

A Fingerspelling Learning Website  
For Hearing Impaired Children

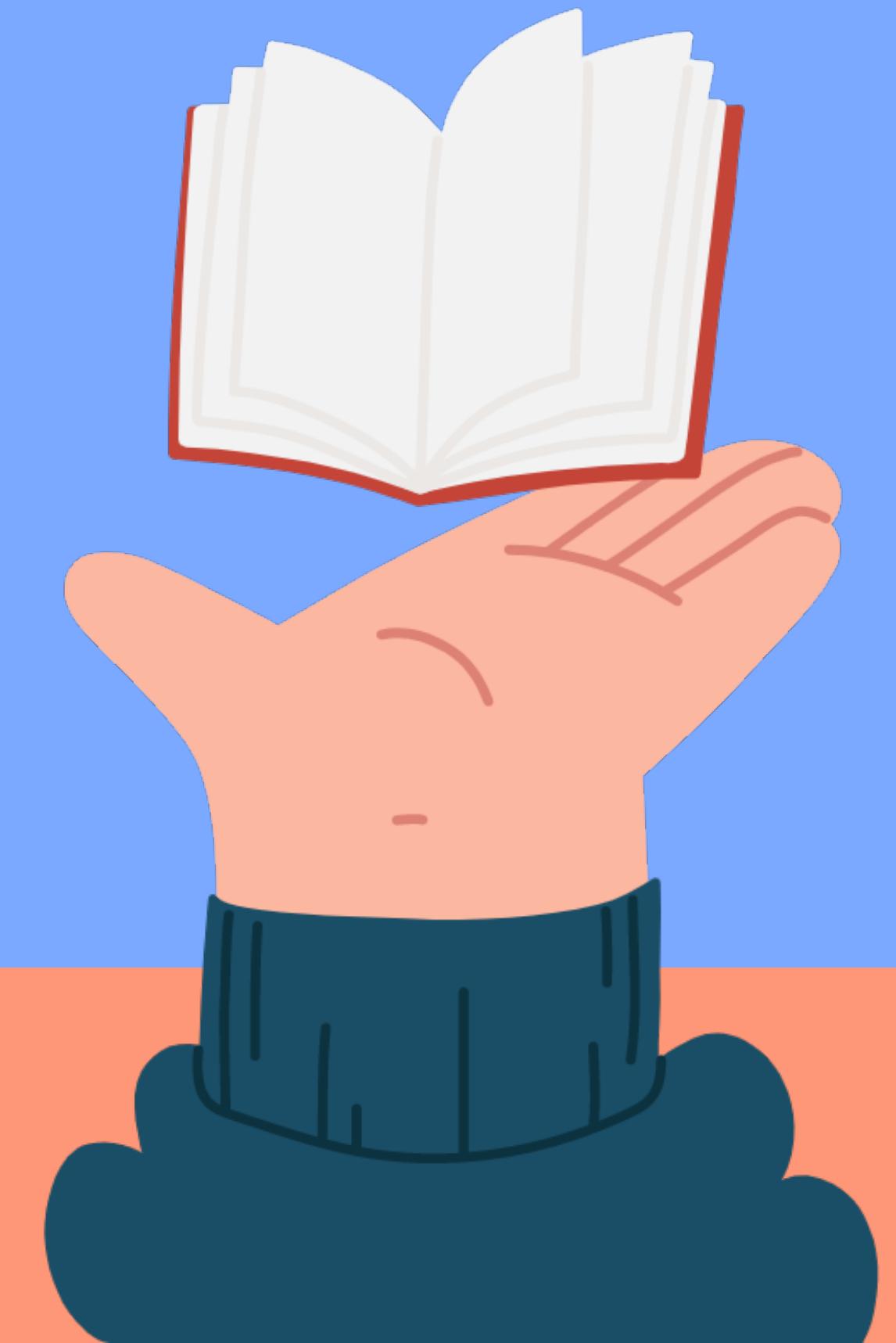


Shutong Zheng, Han Wen, Hongxi Du and Chenxi Bi

# Content



# Literature Review



# Deafness And Fingerspelling



## Definition

- The use of hand configurations to represent the letters of a writing system.

## Importance

- Regularly used as part of Sign Language to spell names and words that have no signed equivalent.
- Deaf adults use fingerspelling as an element of everyday sign language conversation.

## Effect

- Helps literacy development (fingerspelling skill significantly predicted reading fluency)

[1]: Battison, R. 1974. Phonological Deletion in American Sign Language. *Sign Language Studies*, 5: 1-19.

[2]: Stone, A., Kartheiser, G., Hauser, P.C., Petitto, L.A. and Allen, T.E., 2015. Fingerspelling as a novel gateway into reading fluency in deaf bilinguals. *PloS one*, 10(10), p.e0139610.

[3]: Duarte,K. 2010. The Mechanism of Fingerspelling: Analyzing Ethiopian Sign Language. *Sign Language Studies*, 11(1): 5-21.

# Convolutional Neural Network (CNN)

## Definition

An artificial neural network that is widely used for image classification and recognition

## Related Works

- A Deep Convolutional Neural Network Approach for Static Hand Gesture
- Deep Residual Learning for Image Recognition
- Real-time sign language fingerspelling recognition using convolutional neural networks from depth map



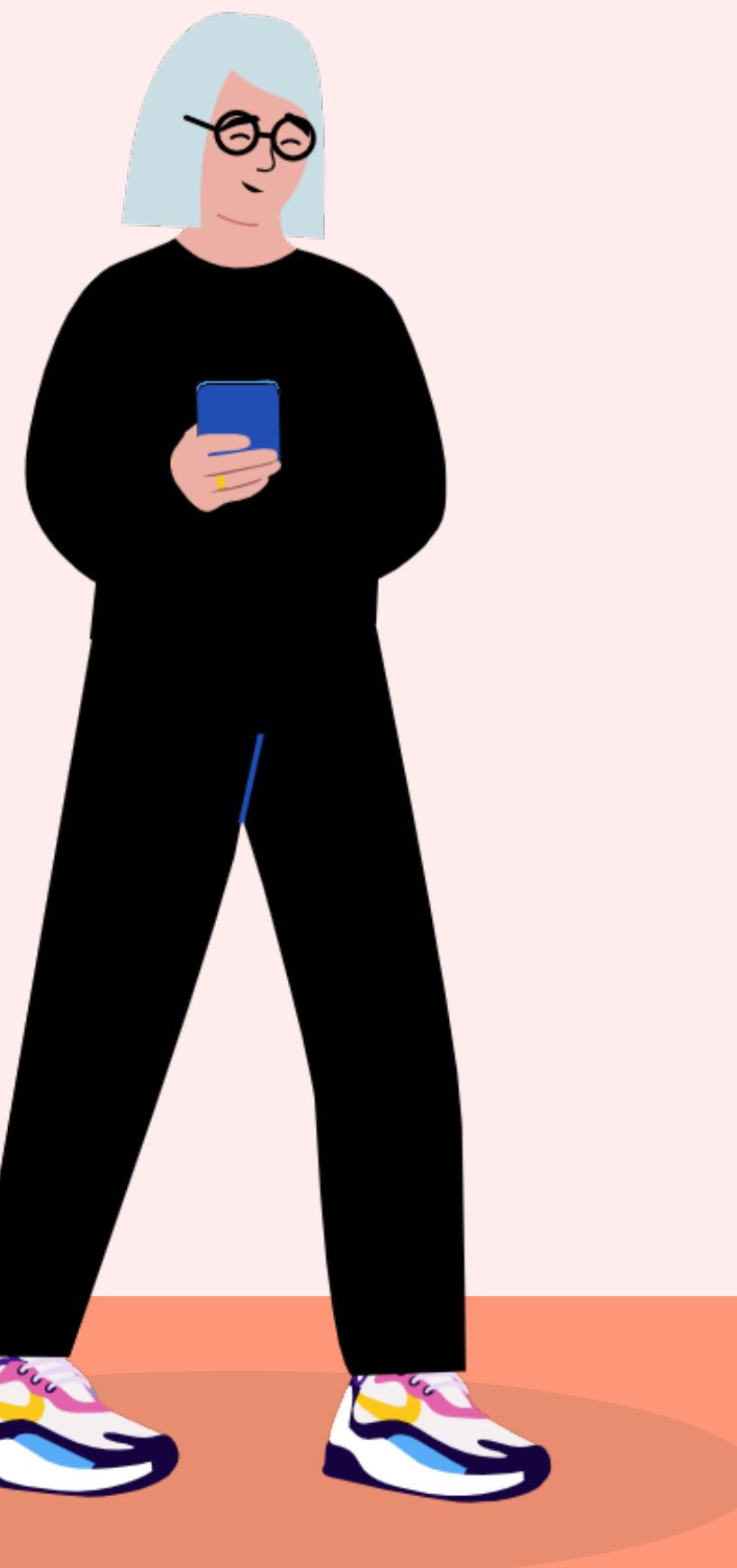
[4]: Ciresan, D.C., Meier, U., Masci, J., Gambardella, L.M. and Schmidhuber, J., 2011, June. Flexible, high performance convolutional neural networks for image classification. In Twenty-second international joint conference on artificial intelligence.

[5]: Adithya, V. and Rajesh, R., 2020. A deep convolutional neural network approach for static hand gesture recognition. Procedia computer science, 171, pp.2353-2361.

[6]: He, K., Zhang, X., Ren, S. and Sun, J., 2016. Deep residual learning for image recognition. In Proceedings of the IEEE conference on computer vision and pattern recognition (pp. 770-778).

[7]: Kang, B., Tripathi, S. and Nguyen, T.Q., 2015, November. Real-time sign language fingerspelling recognition using convolutional neural networks from depth map. In 2015 3rd IAPR Asian Conference on Pattern Recognition (ACPR) (pp. 136-140). IEEE.

# Update

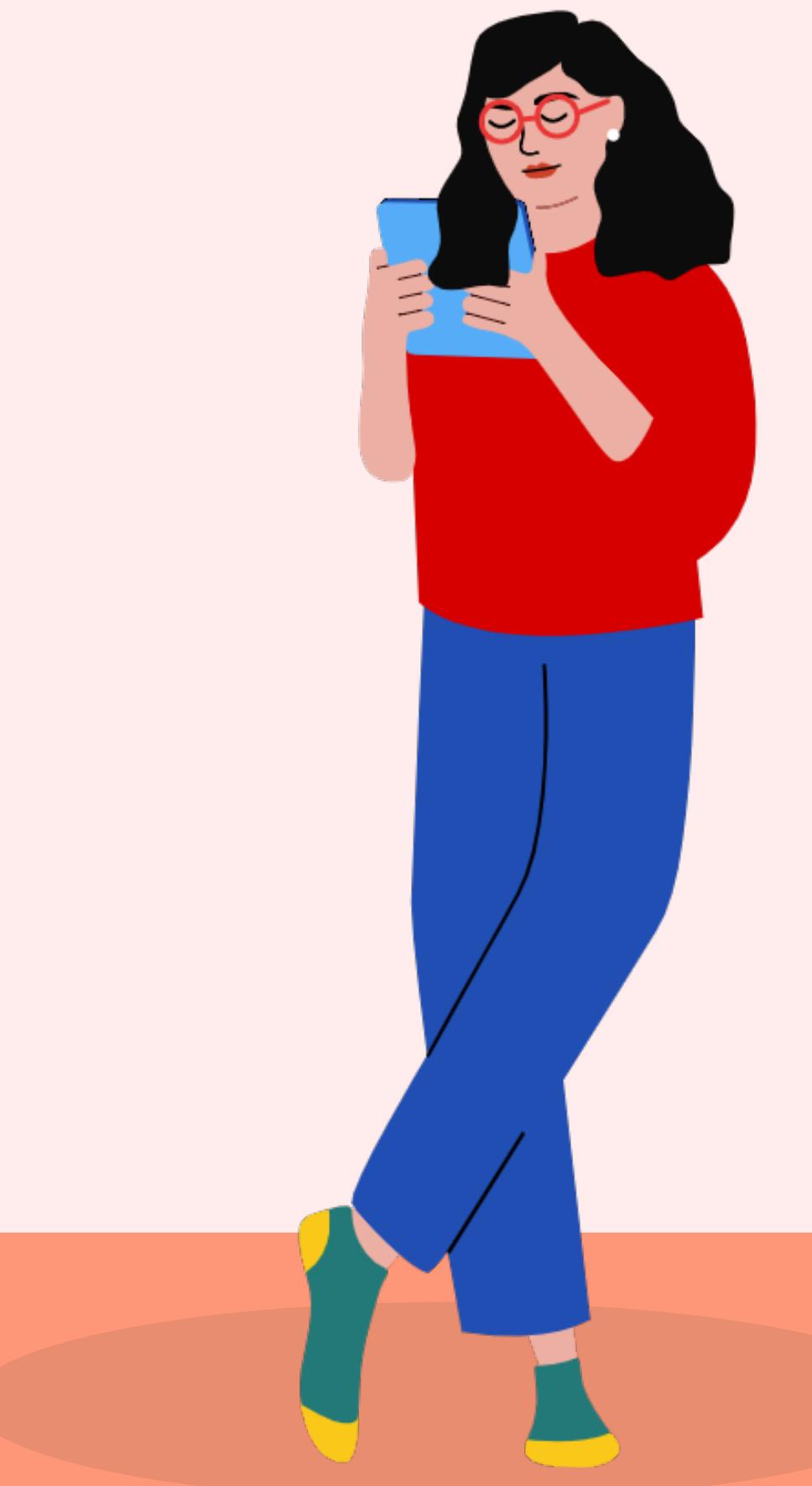


**1.**

Data of the population  
that suffers from  
disabling hearing loss  
& the consequences

**2.**

The importance of  
fingerspelling among  
people with deafness  
or hearing loss



# Design



# Design

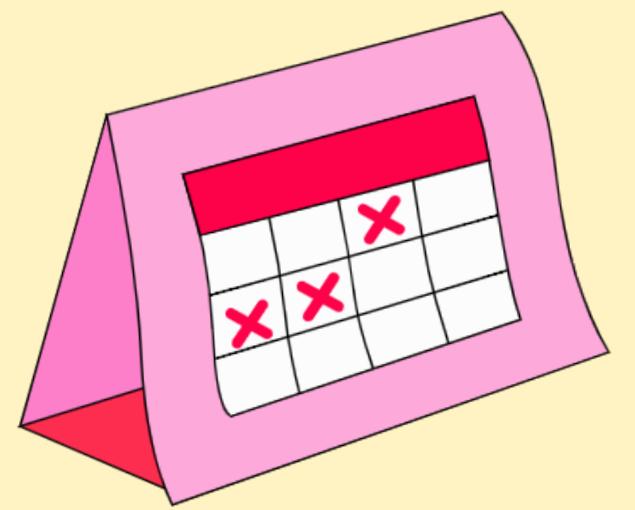
## Target User

- Hearing impaired young children with hearing parents

## Technique

- Convolutional neural networks
- A machine learning library for ASL fingerspelling





# A Web Application For Fingerspelling Learning Of Young Children With Hearing Impairment



# Design

## Learn

A collection of the finger alphabets + exercise mode

## Challenge

The users will be marked based on accuracy



## Wordbook

Pre-set wordbook that users are able to customize and including grammar correction

## Record

Records of finished challenges and marks

# Implementation



# Implementation Process



**1.**

Creating a Marcelle project and choose the Wizard layout. Writing the pages and components by using the Marcelle API.

**2.**

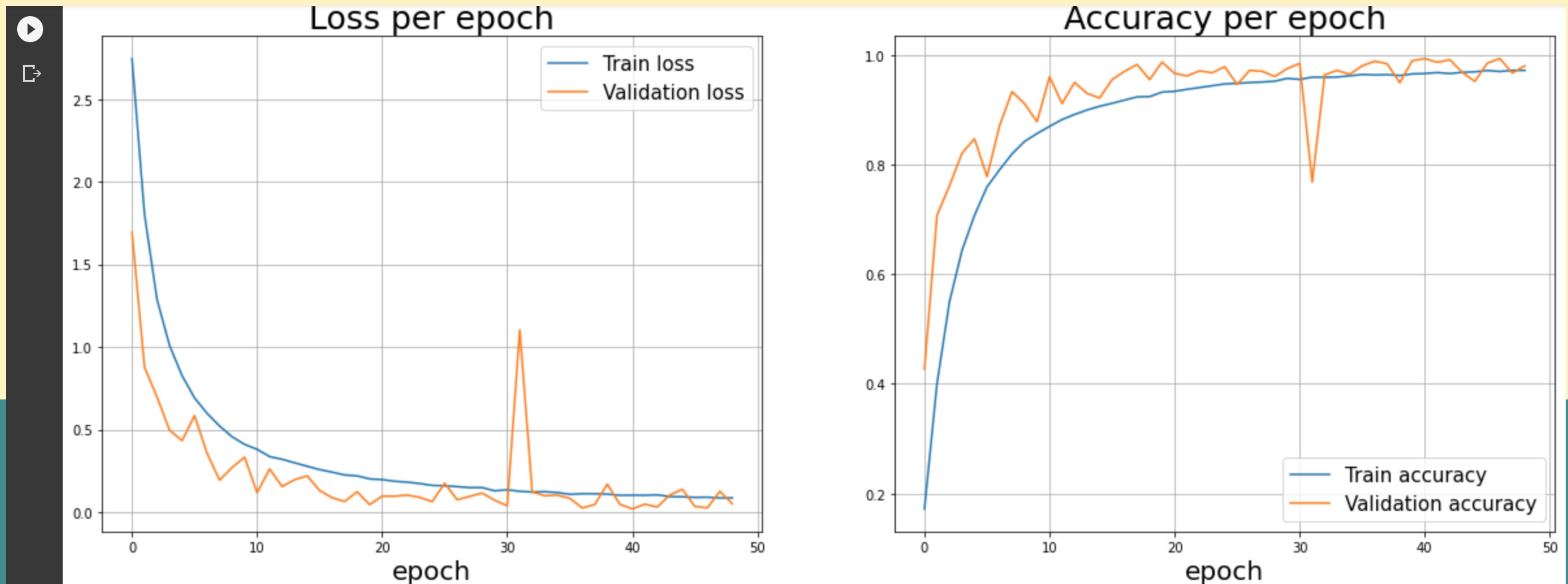
Performing the pre-training model building by using the Keras model from TensorFlow.



**3.**

Implementing the real-time recognition of gestures based on the video stream from the webcam.

# Training



# Evaluation



# Hypothesis

H0:

The website does not have significant advantage on the fingerspelling learning of children with hearing impairment compared to traditional way of learning.

H1:

The website significantly improves the fingerspelling skills of children with hearing impairment compared to traditional way of learning.



# Participants

- 30 children between the ages of 3 and 6
- with congenital deafness
- with no prior experience of receiving dedicated training in fingerspelling



# Experimental Design

- A placement test before the experiment
- Half of the participants (15 children) will start to learn fingerspelling with a printed list of the hand shapes only, while the other half of the participants use the fingerspelling learning website we have developed
- The duration will be 4 hours a week for 4 weeks
- In the end, all participants will take a fingerspelling test again



# Thank You

