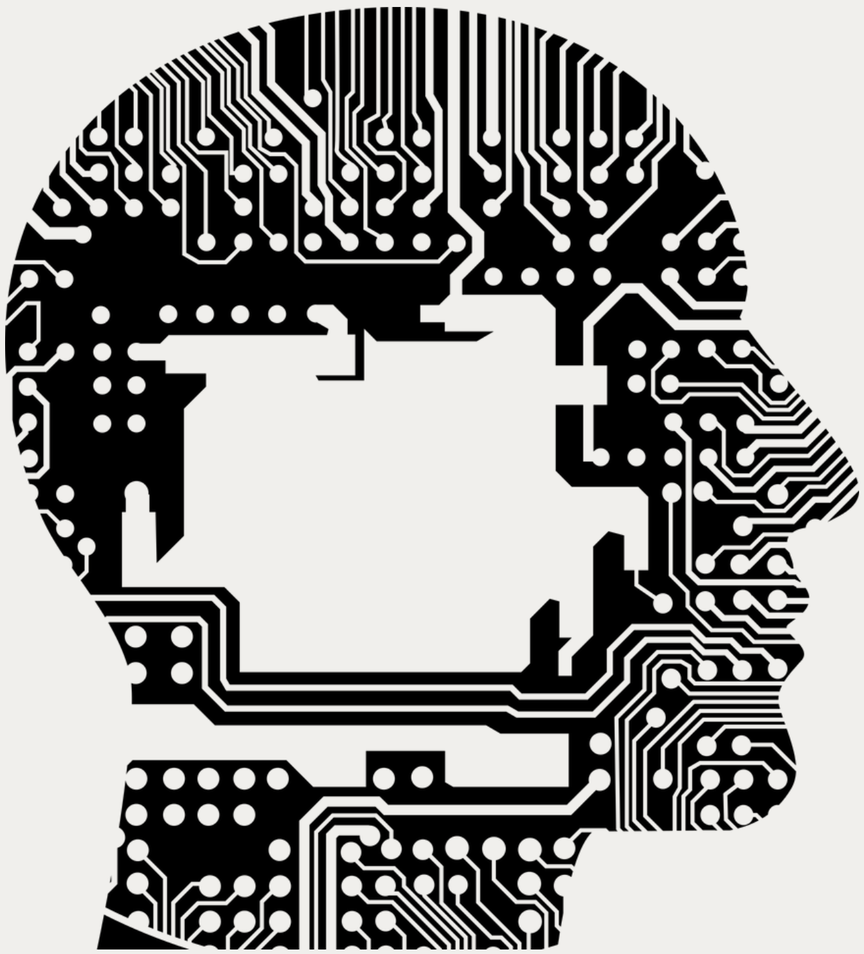
SIGN LANGUAGE RECOGNITION SYSTEM



MACHINE LEARNING PROJECT

MARYAM AHMED
TOOBA BIBI
MNABEEL KHAN

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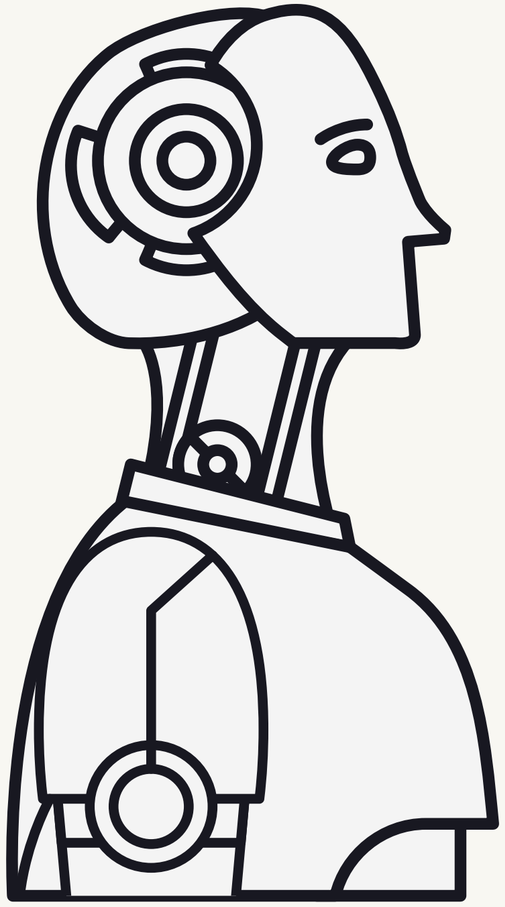


INTRODUCTION

PROBLEM STATEMENT

- Difficulty for the deaf community to communicate
- lack of understanding of sign language in the community
- difficulty in their every day life

INTRODUCTION

AIM

- To create and automated system for sign language recognition

INTRODUCTION

OBJECTIVES:

- To recognize alphabetic and numerical hand gestures images
- To accurately classify the alphabetic and numeric images to their meaning
- To recognize and classify alphabetic and numeric images on a live camera feed

METHODOLOGY
DATASET

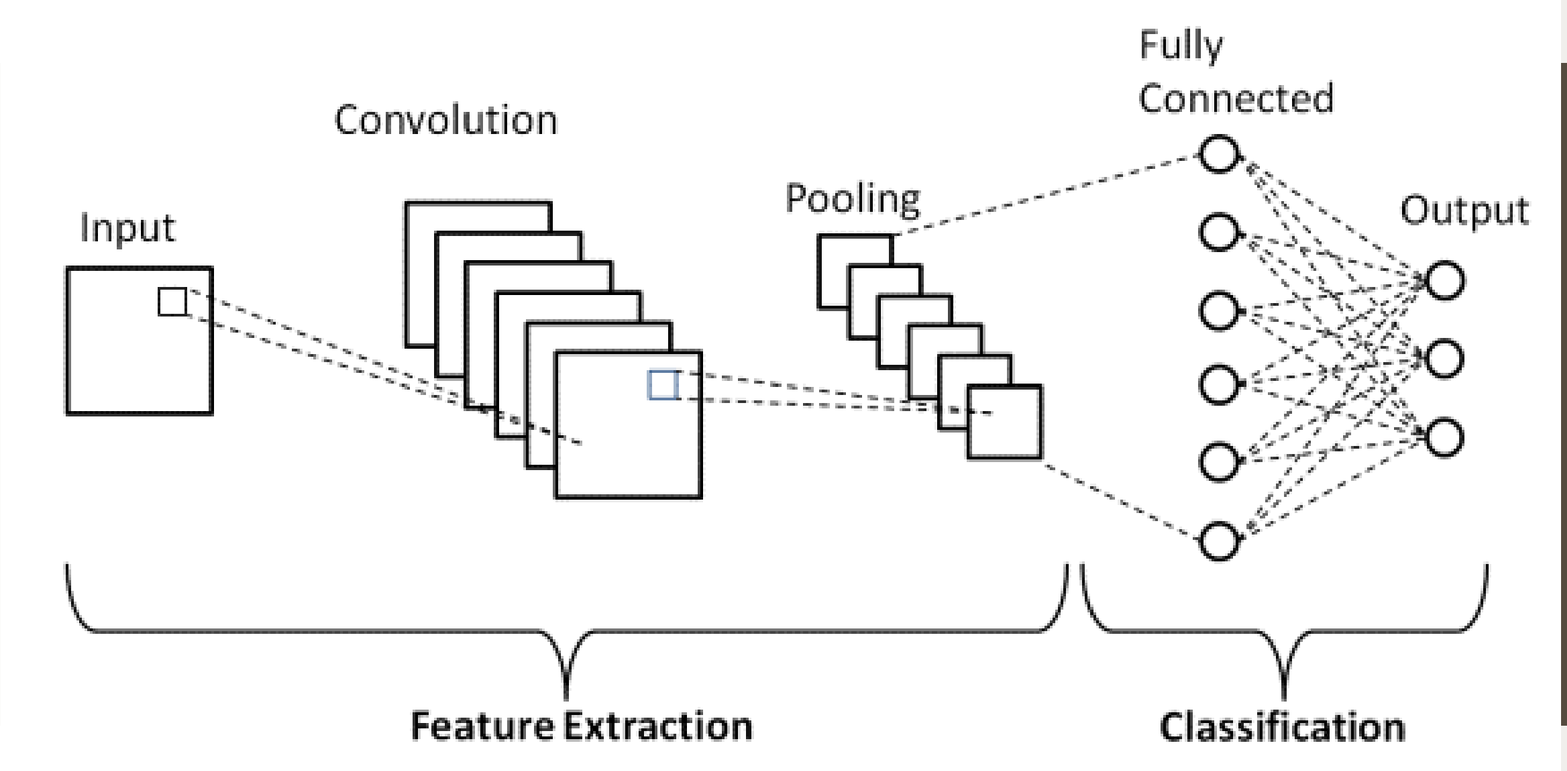
- 37 hand gestures: numerical gestures of 0-9 and alphabetical gestures for A-Z
- total of 1500 images for each gesture

Data distributed into 3 sets:

- Training set: 1050 images
- Validation set: 150 images
- Testing set: 300 images

CLASSIFIER USED:

CNN



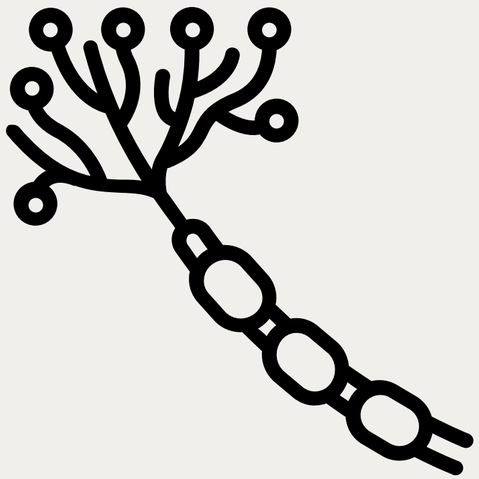
MODEL VGG16:

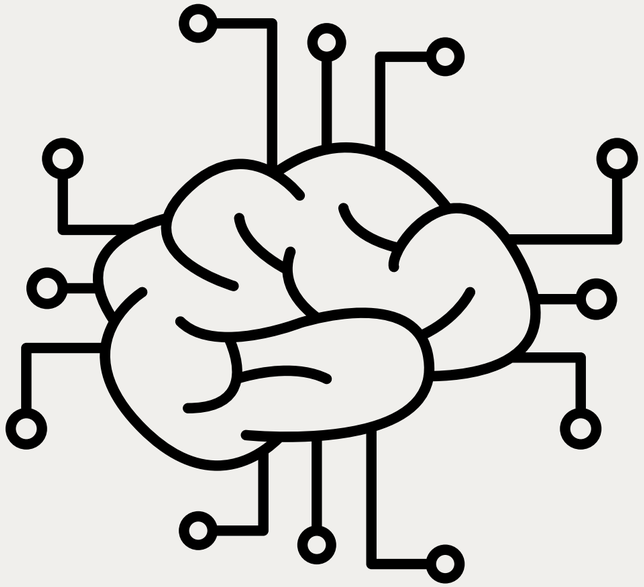
3 LAYER

ARCHITECTURE

Why CNN

1. Detects features without human supervision
2. Has parameter sharing which reduces the number of computations
3. Has dimensionality reducing features
4. CNN is feed forward while RNN is feed backwards
5. It is easy to understand and fast to implement
6. It has the highest accuracy among all the algorithms
7. CNN can handle images while RNN can only handle text





Timeline

Step 1

Convolution layer

- convolution function
- activation function (ReLU)

Step 2

Pooling layer

- max pool function

Step 3

Flatten layer

- flatten function

Step 4

Fully connected layer

- Dense function
- Softmax function

Timeline

Step 5

Compiling

- SGD optimiser
- Loss function: catagorical crossentropy

Step 6

Stopping training

- ReduceLR
- EarlyStopping

Step 7

Prediction on dataset

Step 8

Live data

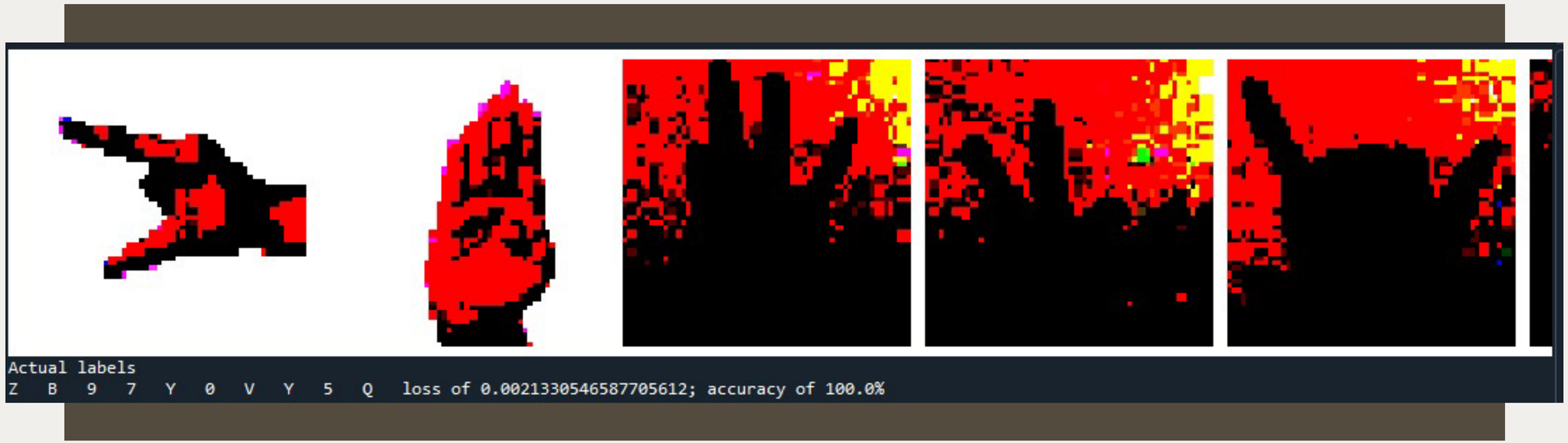
Results

Accuracy of each epoch

```
Epoch 1/10
3780/3780 [==============================] - 282s 74ms/step - loss: 0.3206 - accuracy: 0.9142 - val_loss: 0.1787 - val_accuracy: 0.9513
Epoch 2/10
3780/3780 [==============================] - 274s 72ms/step - loss: 0.0013 - accuracy: 1.0000 - val_loss: 0.2035 - val_accuracy: 0.9502
Epoch 3/10
3780/3780 [==============================] - 253s 67ms/step - loss: 5.3299e-04 - accuracy: 1.0000 - val_loss: 0.2040 - val_accuracy: 0.9507
Epoch 4/10
3780/3780 [==============================] - 237s 63ms/step - loss: 3.2998e-04 - accuracy: 1.0000 - val_loss: 0.2097 - val_accuracy: 0.9494
Epoch 5/10
3780/3780 [==============================] - 223s 59ms/step - loss: 2.4583e-04 - accuracy: 1.0000 - val_loss: 0.2071 - val_accuracy: 0.9524
Epoch 6/10
3780/3780 [==============================] - 233s 62ms/step - loss: 1.9296e-04 - accuracy: 1.0000 - val_loss: 0.2097 - val_accuracy: 0.9530
Epoch 7/10
3780/3780 [==============================] - 231s 61ms/step - loss: 1.5882e-04 - accuracy: 1.0000 - val_loss: 0.2099 - val_accuracy: 0.9554
Epoch 8/10
3780/3780 [==============================] - 241s 64ms/step - loss: 1.3366e-04 - accuracy: 1.0000 - val_loss: 0.2117 - val_accuracy: 0.9546
Epoch 9/10
3780/3780 [==============================] - 233s 62ms/step - loss: 1.1547e-04 - accuracy: 1.0000 - val_loss: 0.2114 - val_accuracy: 0.9563
Epoch 10/10
3780/3780 [==============================] - 242s 64ms/step - loss: 1.0148e-04 - accuracy: 1.0000 - val_loss: 0.2167 - val_accuracy: 0.9552
loss of 0.0019201111281290 65; accuracy of 100.0%
```

Results

Gesture images with correct predictions



Meet our **awesome team**

Maryam Ahmed
f19csc31

Tooba Bibi
f19csc08

Nabeel Khan
f19csc13