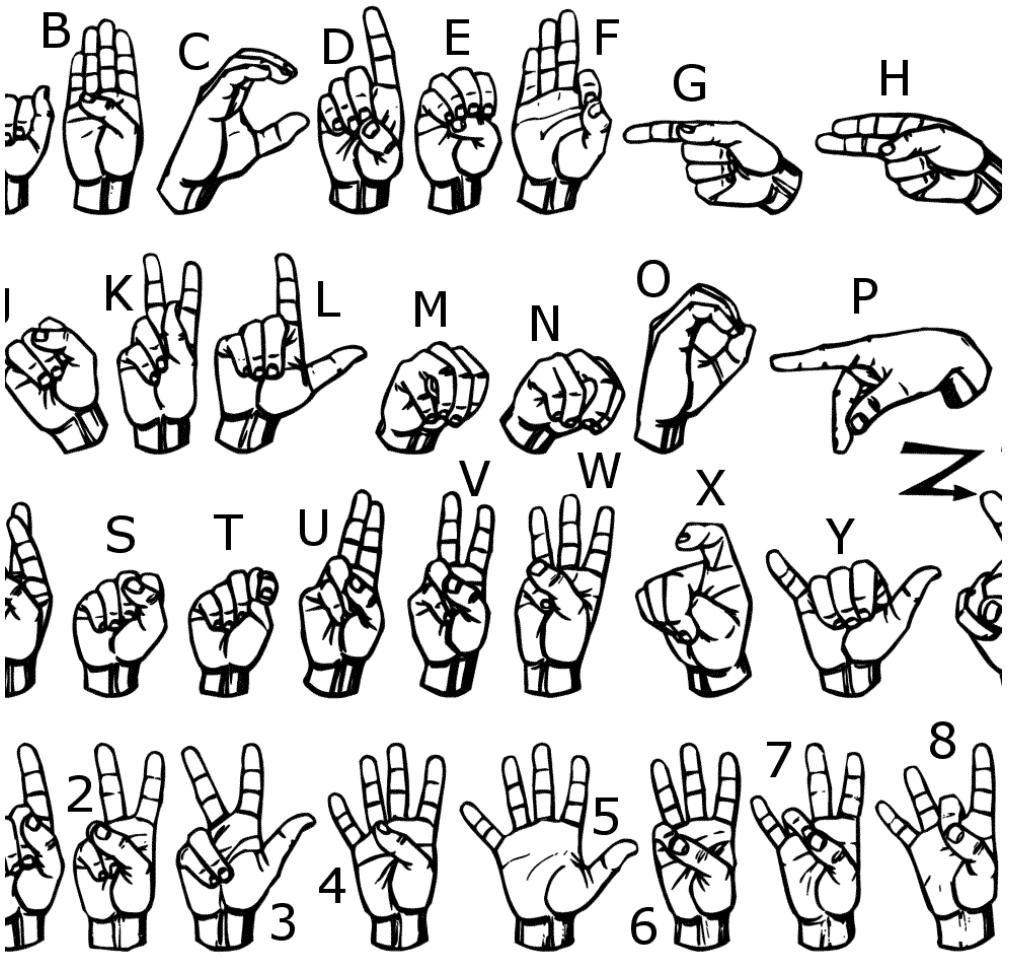
Sign Language Recognition using Deep Learning



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INTRODUCTION

- Sign language is the only way for deaf people to communicate with other individuals, not all individuals can understand sign language. which leads to deaf people having a hard time communicating with others.

- Objective : The goal of this project is to build Convelution Neural Network(CNN) that decide which is the letter based on the shape of the hand in sign language, and bridging the gap in the process of communication between the Deaf and Dumb people with rest of the world.

DATASET

- The dataset was imported from the Kaggle website.
- It contains more than 70000 sign language images
- The images have been taken in different shapes, resolutions, lighting, and rotation

TOOLS

- Jupyter Notebook
- Matplotlib
- Numpy
- Pandas
- Sklearn
- Keras
- Tensorflow

WORKFLOW

- Pre-processing
- Baseline Model
- Simple CNN
- Complex CCN
- Transfer Learning
- Model Deployment

PRE-PROCESSING

- Reshape images,: it was 200* 200, then reshape into 64*64
- Images augmentation

CHALLENGES

- When we apply Augmentation, we have a problem wit RAM
- Resources, CPU and memory was small for training the model with Hight pixels
- Training time, the model took a lot of time to train and experiment

BASELINE

- To test regression model reshaping to 2-d is required
- The score is very low as we expected. Then we bilut a simple Neural Network

BASELINE MODELS	TRAIN	Validation
Logistic Regression	0.54220	0.53770
Simple Nural Network **MAE: 13.17, MSE: 241.34**	0.03470	0.03333
Complex Nural Network **MAE: 0.22, MSE: 2.09**	0.82724	0.81816

MORE COMPLEX CNN

WE Bild it as:-

- Conv2D
- MaxPooling2D
- Conv2D
- MaxPooling2D
- Flatten
- Dense
- Dropout =0.05
- Early stop= “val_loss”
- Keras …
- With **Ten** epochs

MODEL	Train	Validation
Convelutional Nural Network	0.99614813	0.992183908

MAE: 0.03 MSE: 0.24

TRANSFER LEARNING

MODELS	EPOCHS	TRAIN	VALIDATION
VGG16Max	4	0.9888283	0.99034482
NASNetLarge	4	0.99033834	0.99149425

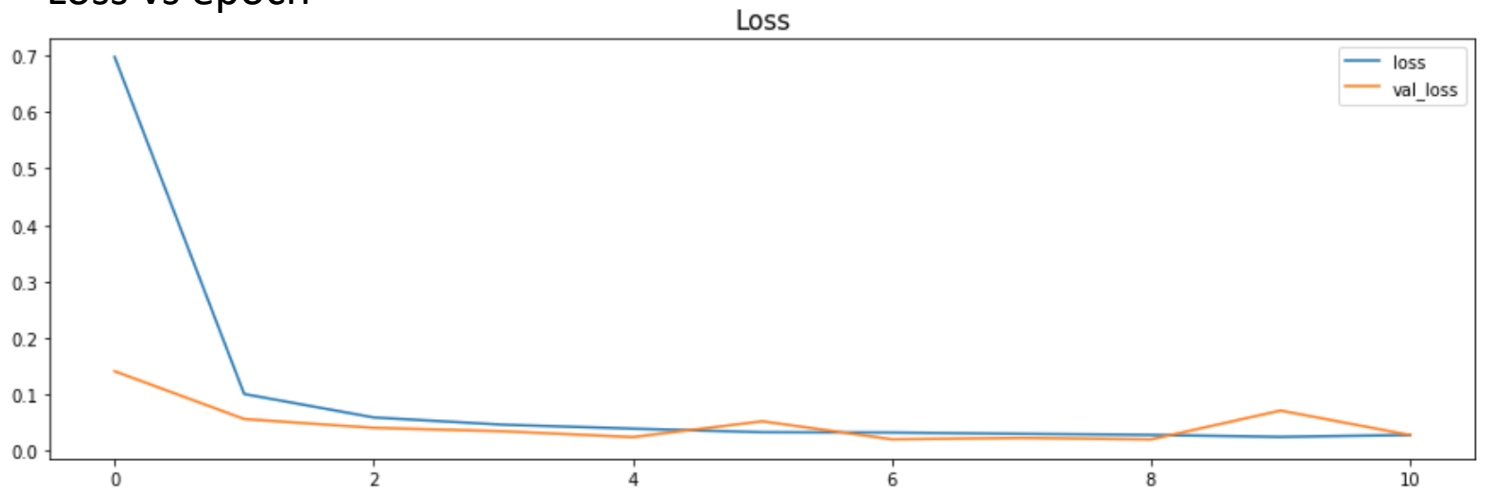
BEST MODEL

MODELS	EPOCHS	TRAIN	VALEDATION
CNN	50	0.99735	0.9949425

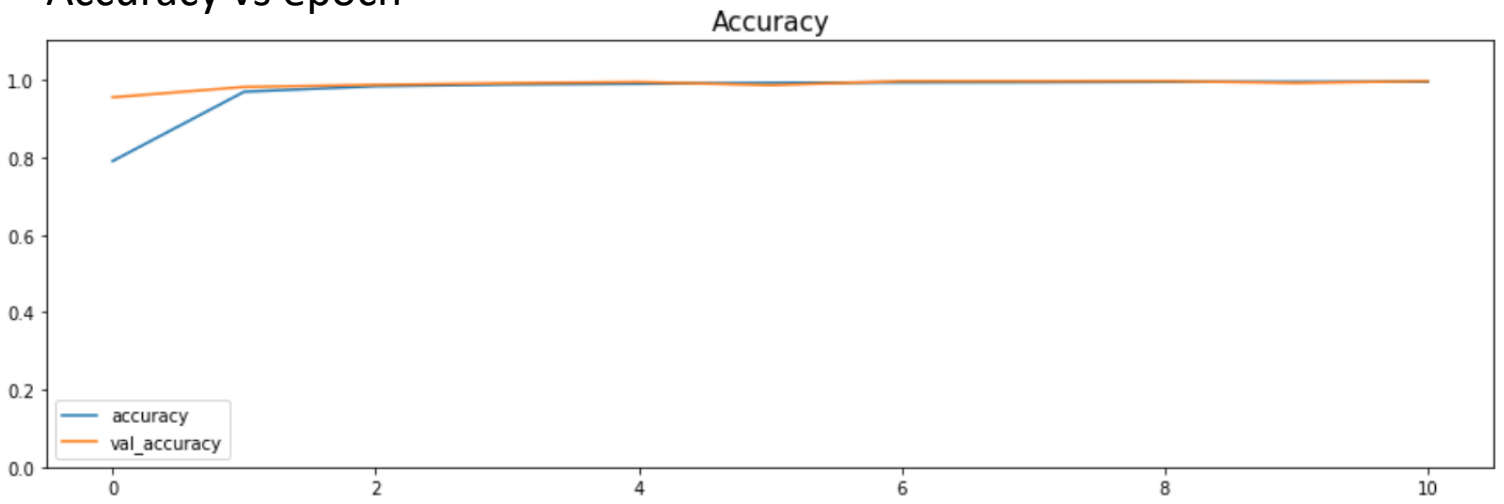
- **Best model with Dropout =0.05**
- **Early stop= “val_loss”**

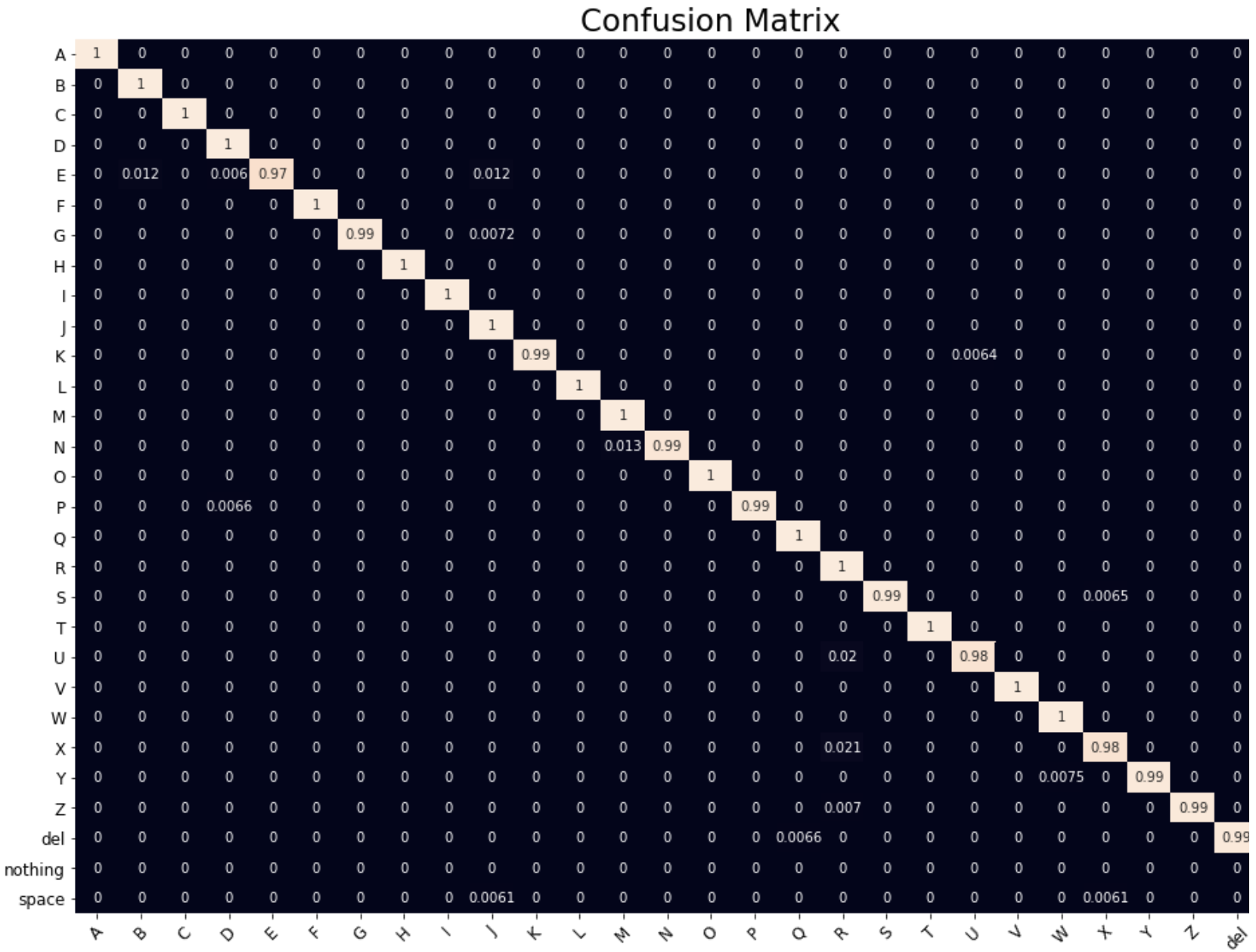
ACCURACY & LOSS FUNCTIONS

Loss vs epoch



Accuracy vs epoch




Confusion Matrix
A 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
B 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
C 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
D 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
E 0 0.012 0 0.006 0.97 0 0 0 0 0.012 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
F 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
G 0 0 0 0 0 0 0.99 0 0 0.0072 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
H 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
I 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
J 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
K 0 0 0 0 0 0 0 0 0 0 0.99 0 0 0 0 0 0 0 0 0 0.0064 0 0 0 0 0 0 0
L 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
M 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
N 0 0 0 0 0 0 0 0 0 0 0 0 0.013 0.99 0 0 0 0 0 0 0 0 0 0 0 0 0 0
O 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
P 0 0 0 0.0066 0 0 0 0 0 0 0 0 0 0 0 0.99 0 0 0 0 0 0 0 0 0 0 0 0
Q 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0
R 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0
S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.99 0 0 0 0 0.0065 0 0 0
T 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0
U 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.02 0 0 0.98 0 0 0 0 0 0
V 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0
W 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
X 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.021 0 0 0 0 0 0.98 0 0 0
Y 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.0075 0 0.99 0 0
Z 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.007 0 0 0 0 0 0 0 0.99 0
del 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.0066 0 0 0 0 0 0 0 0 0 0.99
nothing 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
space 0 0 0 0 0 0 0 0 0 0.0061 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.0061 0 0 0
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z del

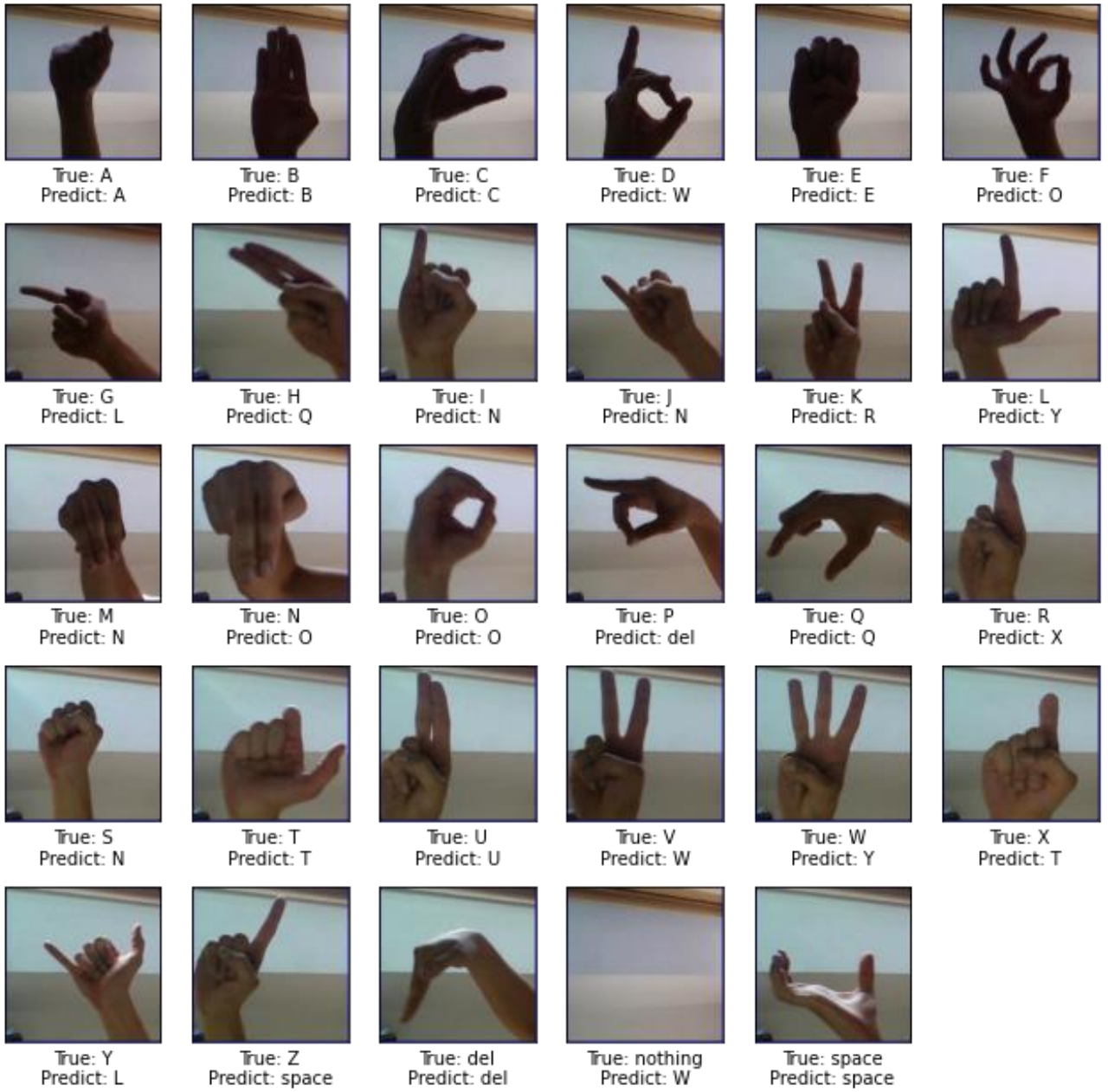
CONF METRIX

BUILD FINAL MODEL

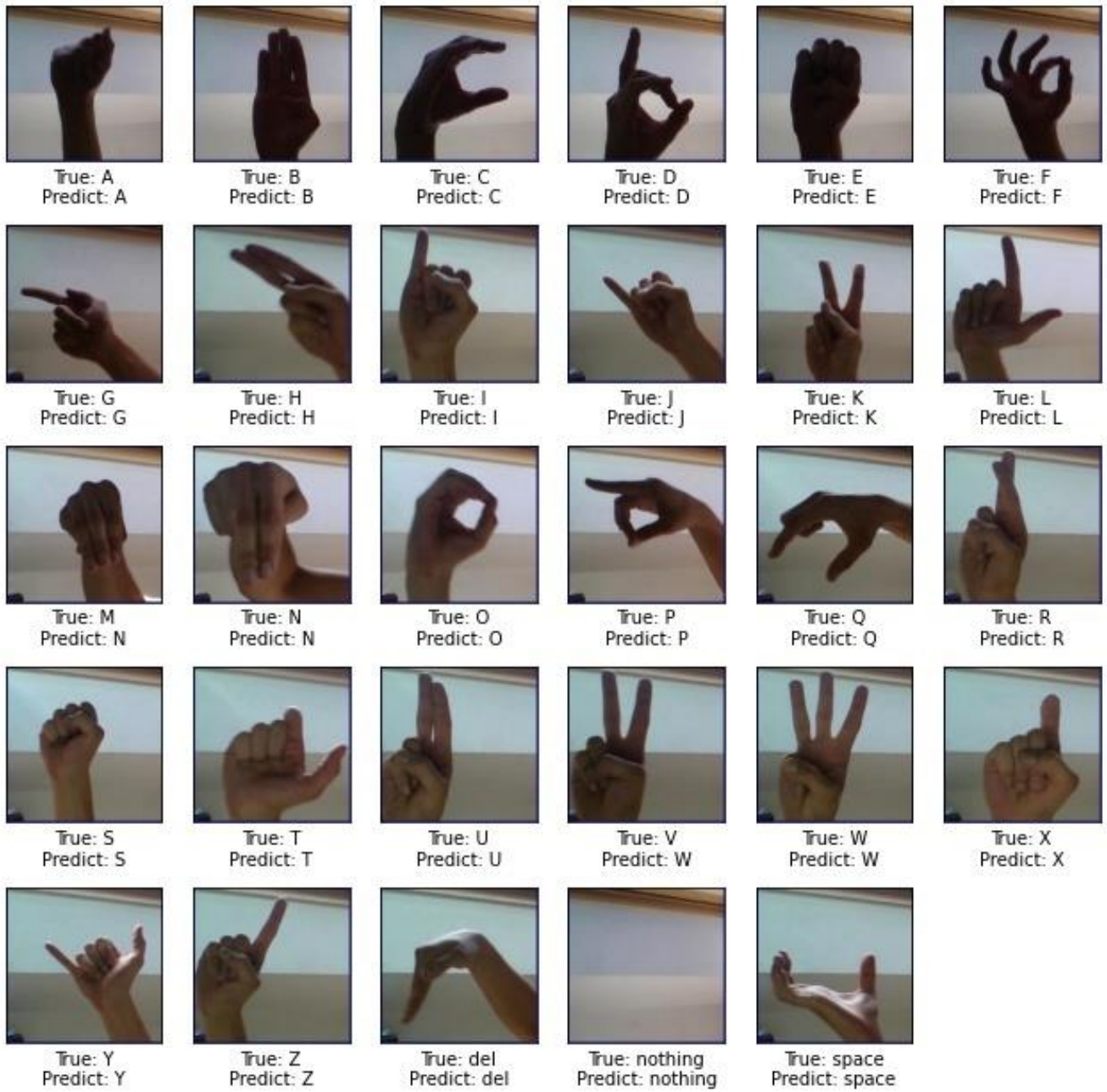
Combining training and validation then testing on test data

EPOCHS	TRAIN	VALIDATION
4	0.998	0.996

BAD PREDICT RESULT



GOOD PREDICT RESULT



FEATURE WORK

- Making a phone app that recognize sign language and translate