

ASL Translator Capstone Project

Model metrics file

Six different CNNs were trained during this project. The chosen model was the following:

Convolutional Neural Network with the following parameters and structure

Parameters:

- Epochs=15
- Data augmentation=None
- Number of parameters=1,830,428
- Reduce learning rate=Yes
- Reduce learning rate patience=1
- Reduce learning rate Factor=0.5
- Reduce learning rate min_lr=0.000001
- Compile optimizer='adam'
- Loss='categorical_crossentropy'

Structure of the chosen CNN:

Layer (type)	Output Shape	Param #
conv2d_14 (Conv2D)	(None, 28, 28, 32)	320
batch_normalization_10 (Batch Normalization)	(None, 28, 28, 32)	128
max_pooling2d_9 (MaxPooling2D)	(None, 14, 14, 32)	0
conv2d_15 (Conv2D)	(None, 14, 14, 64)	18496
dropout_16 (Dropout)	(None, 14, 14, 64)	0
batch_normalization_11 (Batch Normalization)	(None, 14, 14, 64)	256
conv2d_16 (Conv2D)	(None, 14, 14, 128)	73856
dropout_17 (Dropout)	(None, 14, 14, 128)	0
batch_normalization_12 (Batch Normalization)	(None, 14, 14, 128)	512
max_pooling2d_10 (MaxPooling2D)	(None, 7, 7, 128)	0
conv2d_17 (Conv2D)	(None, 7, 7, 128)	147584
dropout_18 (Dropout)	(None, 7, 7, 128)	0
batch_normalization_13 (Batch Normalization)	(None, 7, 7, 128)	512
max_pooling2d_11 (MaxPooling2D)	(None, 4, 4, 128)	0
flatten_5 (Flatten)	(None, 2048)	0
dense_15 (Dense)	(None, 512)	1049088
dropout_19 (Dropout)	(None, 512)	0
dense_16 (Dense)	(None, 512)	262656
dropout_20 (Dropout)	(None, 512)	0
dense_17 (Dense)	(None, 512)	262656
dropout_21 (Dropout)	(None, 512)	0
dense_18 (Dense)	(None, 28)	14364
dropout_27 (Dropout)	(None, 28)	0
dropout_33 (Dropout)	(None, 28)	0
Total params: 1,830,428		
Trainable params: 1,829,724		
Non-trainable params: 704		

'X' features of the train dataset:

The features set contained the following information:

- Rows: 109,455
- Columns (pixels): 784 for 28 x 28 sized images
- Normalized values for every pixel in range [0,1]

'y' labels of the train dataset:

The labels have categorical values for 28 classes:

- Rows: 109,455
- Columns: 1 (values for 28 classes in range [0,27])
- Class values represent the following:
 - a) 26 values for [A-Z]
 - b) 1 value for delete sign
 - c) 1 value for space sign

Test set:

The test set contained the following information:

- Rows: 37,172
- Feature columns (pixels): 784 for 28 x 28 sized images
- Label columns: 1 (values for 28 classes in range [0,27])

Comparison table for the six trained CNNs:

CNN	Data augmented	Number of parameters	Reduce learning rate	Epochs	Train Accuracy	Validation Accuracy	Test accuracy	Number misclassified
1	No	210,204	No	5	90.5%	91.1%	80.3%	-
2	Yes	210,204	No	5	33.9%	42.1%	35.6%	-
3	Yes	6,719,260	No	5	42.5%	55.0%	46.2%	-
4	Yes	1,830,428	Yes	5	71.5%	80.4%	75.6%	-
5	Yes	1,830,428	Yes	25	96.9%	98.4%	97.5%	948/37,172
6	No	1,830,428	Yes	15	99.5%	99.9%	99.8%	71/37,172