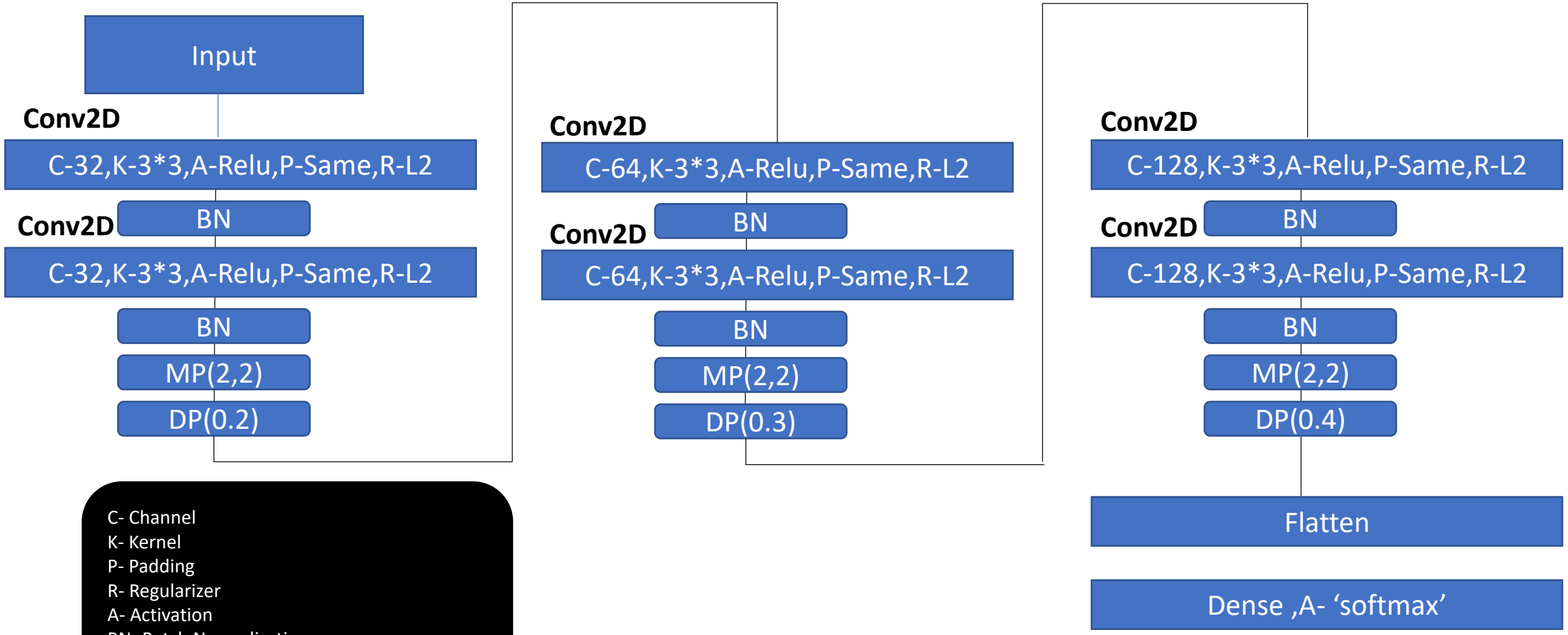
CNN Architecture



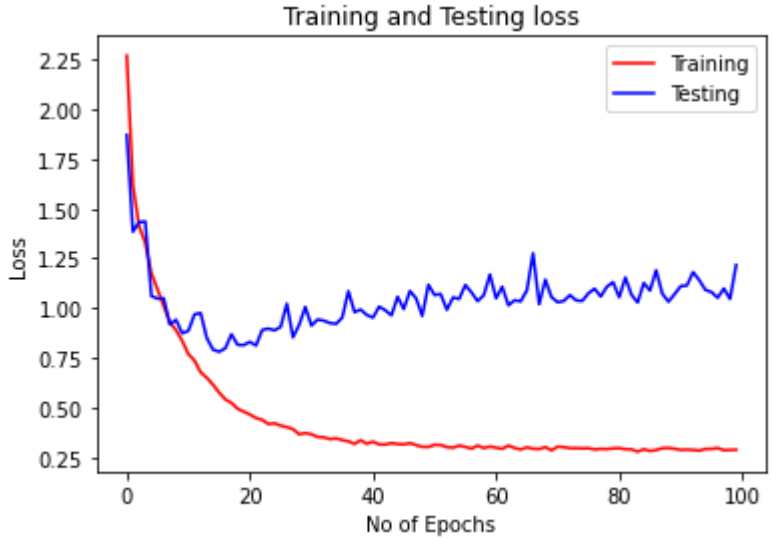
Homework 6 – CIFAR10

Problem	1
Training Set	20000
Testing Set	10000
Mini Batch Size	128
Total Number of Parameters	309290
Optimizer	Adam
Initializer	Glorat
Learning Rate	0.001
Epochs	100
Regularizer	L2
Training Accuracy	0.96
Testing Accuracy	0.78
r	0.22
Hidden Layer Activation	Relu
Output Layer	Softmax

Model Summary

```
Model: "sequential_4"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv2d_16 (Conv2D)           (None, 32, 32, 32)        896
_________________________________________________________________
batch_normalization_12 (Batc (None, 32, 32, 32)        128
_________________________________________________________________
conv2d_17 (Conv2D)           (None, 32, 32, 32)        9248
_________________________________________________________________
batch_normalization_13 (Batc (None, 32, 32, 32)        128
_________________________________________________________________
max_pooling2d_8 (MaxPooling2 (None, 16, 16, 32)        0
_________________________________________________________________
dropout_9 (Dropout)          (None, 16, 16, 32)        0
_________________________________________________________________
conv2d_18 (Conv2D)           (None, 16, 16, 64)        18496
_________________________________________________________________
batch_normalization_14 (Batc (None, 16, 16, 64)        256
_________________________________________________________________
conv2d_19 (Conv2D)           (None, 16, 16, 64)        36928
_________________________________________________________________
batch_normalization_15 (Batc (None, 16, 16, 64)        256
_________________________________________________________________
max_pooling2d_9 (MaxPooling2 (None, 8, 8, 64)          0
_________________________________________________________________
dropout_10 (Dropout)         (None, 8, 8, 64)          0
_________________________________________________________________
conv2d_20 (Conv2D)           (None, 8, 8, 128)         73856
_________________________________________________________________
batch_normalization_16 (Batc (None, 8, 8, 128)         512
_________________________________________________________________
conv2d_21 (Conv2D)           (None, 8, 8, 128)         147584
_________________________________________________________________
batch_normalization_17 (Batc (None, 8, 8, 128)         512
_________________________________________________________________
max_pooling2d_10 (MaxPooling (None, 4, 4, 128)         0
_________________________________________________________________
dropout_11 (Dropout)         (None, 4, 4, 128)         0
_________________________________________________________________
flatten_3 (Flatten)          (None, 2048)              0
_________________________________________________________________
dense_4 (Dense)              (None, 10)                20490
=================================================================
Total params: 309,290
Trainable params: 308,394
Non-trainable params: 896
```

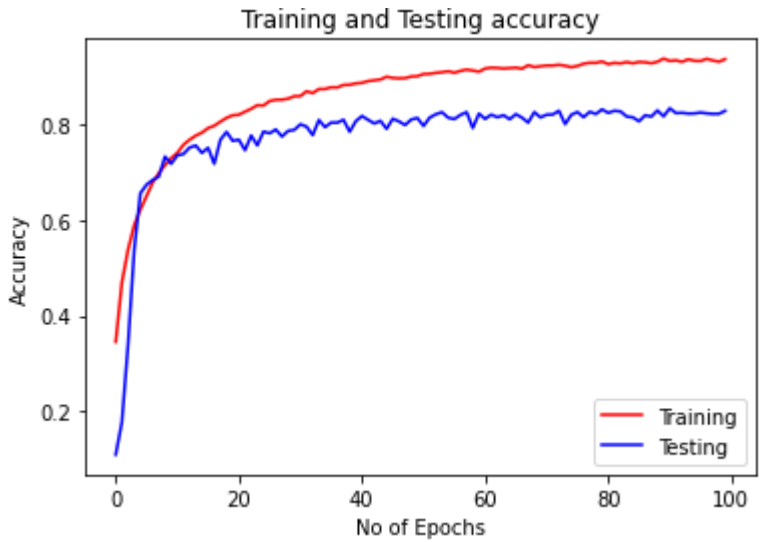

Training and Testing accuracy
Training
Testing
Accuracy
No of Epochs
0.4
0.5
0.6
0.7
0.8
0.9
0
20
40
60
80
100

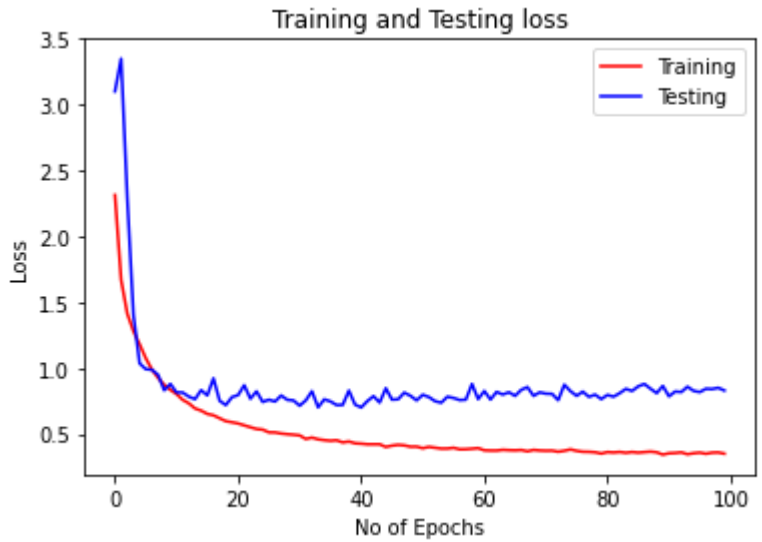

Training and Testing loss
Training
Testing
Loss
No of Epochs
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
2.25
0
20
40
60
80
100

Problem 2 with Augmentation

Problem	1
Training Set	20000
Testing Set	10000
Mini Batch Size	128
Total Number of Parameters	309290
Optimizer	Adam
Initializer	Glorat
Learning Rate	0.001
Epochs	100
Regularizer	L2
Training Accuracy	0.93
Testing Accuracy	0.82
r	0.23
Hidden Layer Activation	Relu
Output Layer	Softmax

I tried different augmentation techniques but with only horizontal flip I got better accuracy


Training and Testing accuracy
Accuracy
No of Epochs
Training
Testing
0.2
0.4
0.6
0.8
0
20
40
60
80
100


Training and Testing loss
Loss
No of Epochs
Training
Testing
0.5
1.0
1.5
2.0
2.5
3.0
3.5
0
20
40
60
80
100

Code Collab Links

- Problem 1: https://colab.research.google.com/drive/1AqNi7unvRk-NkKId3wHfRtu5WUVmiloC
- Problem 2: https://colab.research.google.com/drive/1medLw3hqpZ5NJ3M6PaLIJZrurKGjZo98