

Assignment 4

Part 1

1. The name under which you submitted on Kaggle:

My name in Kaggle is Joe Shi, Email address is :chuqiaoshi@gmail.com

2. Best accuracy (should match your accuracy on Kaggle).

my best accuracy is 0.552

3. Table defining your final architecture similar to the image above.

Layer No.	Layer Type	Kernel Size	Input/Output dimension	Input/Output Channels
1	conv2d	3	32/32(same padding)	3/32
2	relu		32/32	
3	maxpooling 2d	2	32/16	
4	conv2d	3	16/16	32/64
5	relu		16/16	
6	maxpooling 2d	2	16/8	
7	conv2d	3	8/8	64/128
8	relu		8/8	
9	maxpooling 2d	2	8/4	
10	linear		2048/16384	
11	relu		16384/16384	
	linear		16384/8192	
	relu		8192/8192	
	linear		8192/4096	
	relu		4096/4096	

Layer No.	Layer Type	Kernel Size	Input/Output dimension	Input/Output Channels
	linear		4096/100	

4. Factors which helped improve your model performance. Explain each factor in 2-3 lines.

1. Data normalization

It helps to make the training data in the same range and spread

2. Data augmentation

Increase the variance of training set and improve the accuracy

3. Number of parameters/deeper layers.

More parameters can fit a more complex function. So I add more parameters in the CNN model, including to add channels of convolution layers, add more parameters in fully connected layers and add more convolution and fully connected layers. More parameters need more time to train but it can increase the accuracy

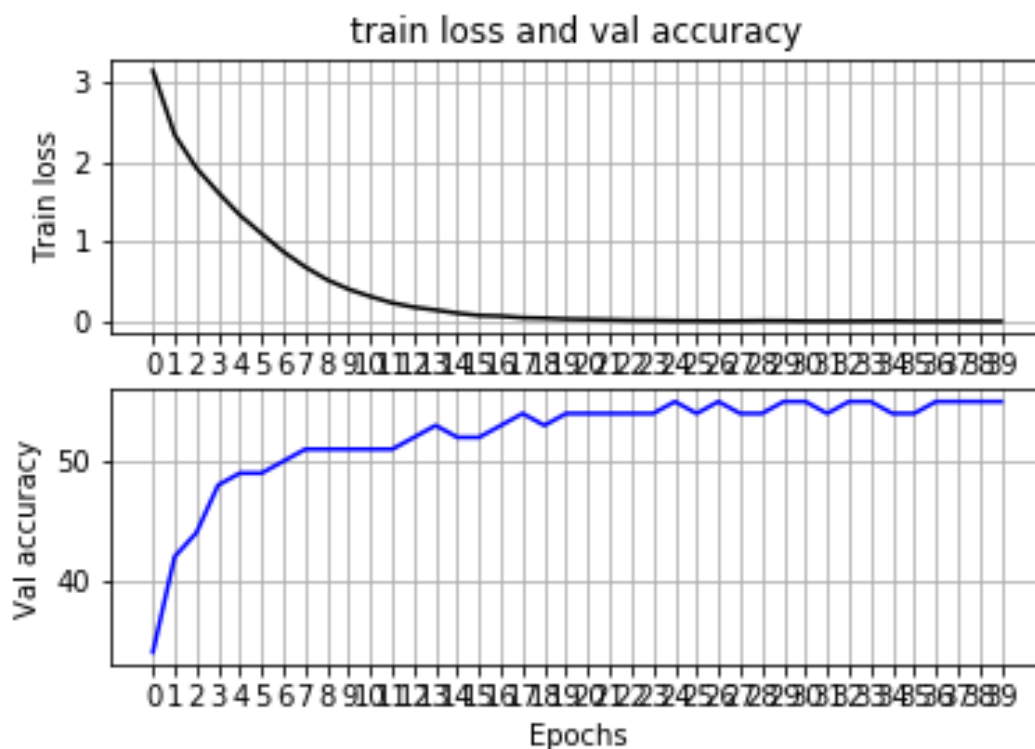
4. Padding

I use zero paddings in the convolution layers to make sure after convolving, the size will not change. It can help to keep the size not decrease so fast so I can add more convolve layers in the model.

5. convolve kernel size

I use 3*3 kernel instead of 5*5 and the accuracy increased. I think is that the training image is small (only 32*32) so 3*3 is enough to extract the feature, 5*5 may be too big.

5. Final architecture's plot for training loss and validation accuracy.



6. Ablation study to validate the above choices.

I try to compare different number of layer, different channels in convolutional layers, different kernel size and I tried the model with/without zero padding, dropout.

I tried to increase the number of channels of each convolutional layers and the number of layers. I start from 3-6-16 to 3-16-32 to 3-32-64 to 3-32-64-128 the accuracy is increased as the table.

CNN structure	accuracy
3-6-16	0.23
3-16-32	0.35
3-32-64	0.45
3-32-64-128	0.47

I also tried different kernel size, and with/without padding

kernel size	padding	Not padding	
3*3		0.55	0.53
5*5		0.52	0.47

So smaller kernel size zero padding can increase the result.

6. Explanation of any extra credit features if attempted.

I use zero padding and smaller kernel size, which are not mentioned on the website.

Part 2

1. Report the train and test accuracy

Fixed feature extractor :

Train accuracy: 0.8383

Test accuracy: 0.4573

Fine-tuning the whole network:

Train accuracy: 0.8677

Test accuracy: 0.4392

2. Report any hyperparameter

Batch size = 32

Learning rate = 0.01

Number of epoch = 50