Report for CIFAR-10 classification via Resnet

1   Experimental details and results.

    1.1   Details.

The original images are resized to **224*224** before being input to the networks. The batch size is set to **32**. And the learning rate is multiplied by a gamma=0.1 every 20 epochs. The batch normalization and Relu activation are utilized to better accelerate the convergence. The average loss and accuracy are calculated and recorded on the trainset every **300** iterations, i.e. average loss and accuracy on every 9600 images during training. Besides, the average accuracy on the test set is calculated and recorded every epoch.
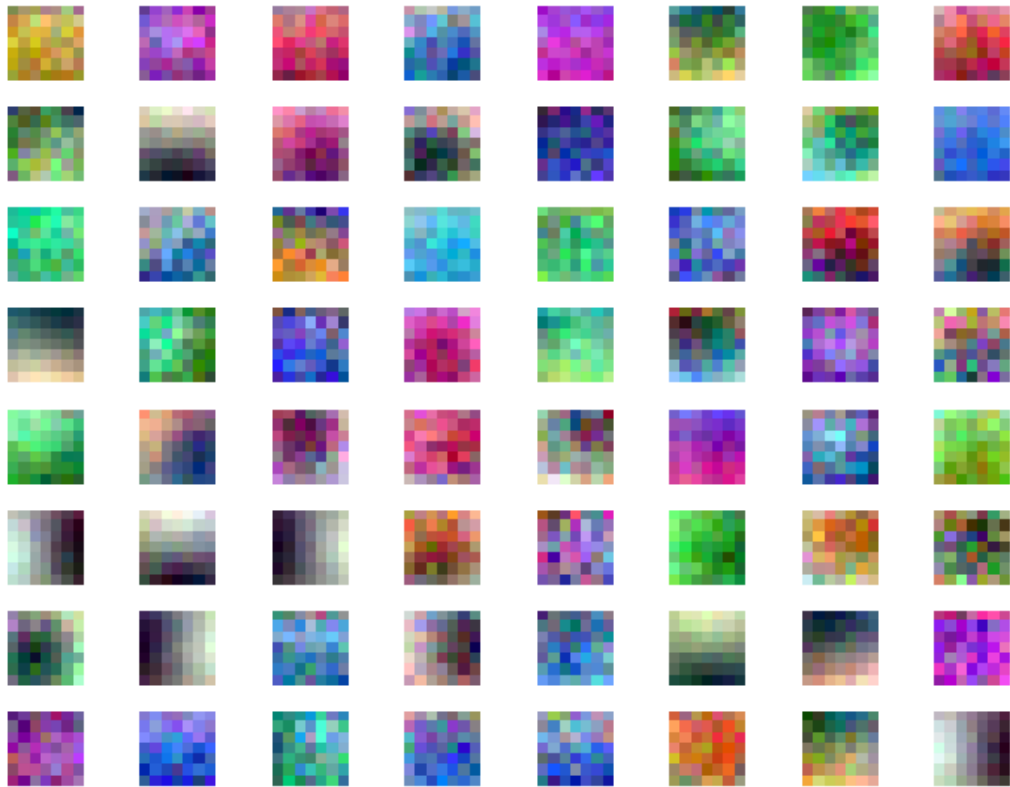
    1.2   Results.

The model is trained for 78,000 iterations (50 epochs). And the final accuracy is **98.406%** on the trainset and **82.270%** on the **test set**.

2   Visualization of the learning process.
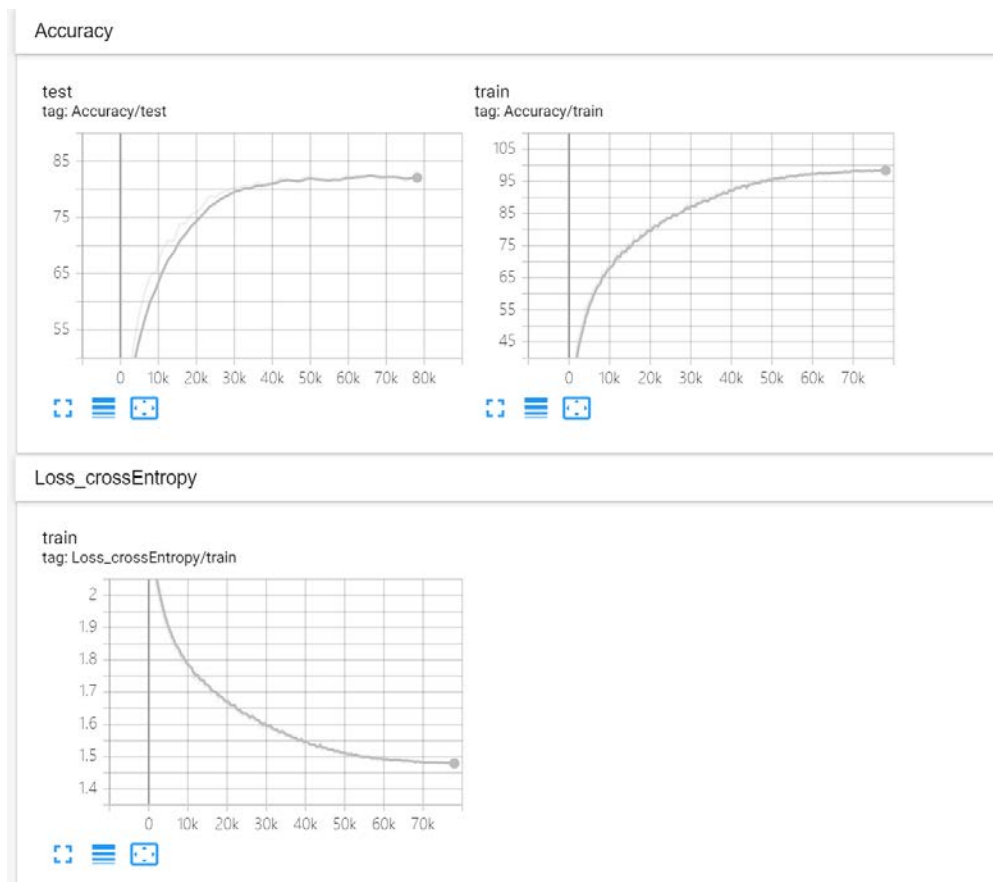
3   Filter Visualization.

    3.1   The 64 filters of the first convolution layer from the final model.

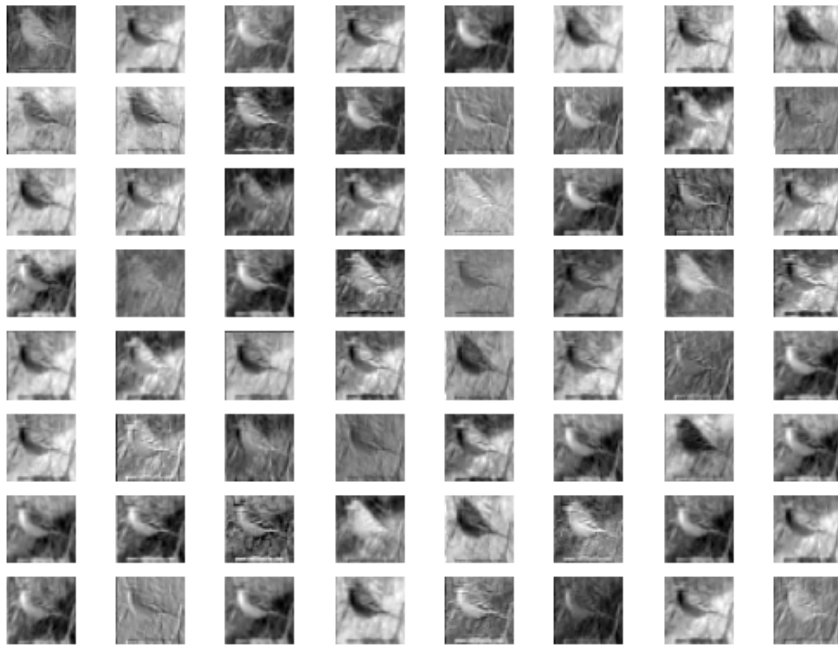3.2   The 64 feature maps after the first layer.

Fig 1. Input image.

Fig 2. 112*112*64 feature maps.

3.3 The 512 feature maps after the last layer.
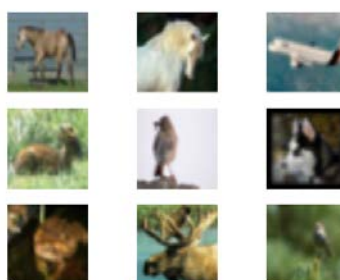

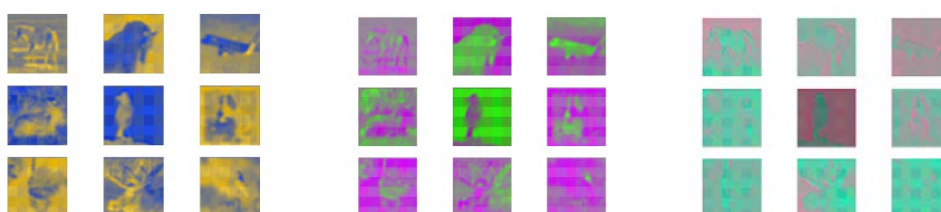Fig 3. Input image.

Fig 4. 7*7*512 feature maps.

3.4   The reconstructed patterns and the corresponding feature maps.

The top 9 feature maps of the first conv layer and the last conv layer are reconstructed for visualization
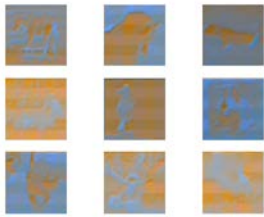
For first convolution layer---Conv1:

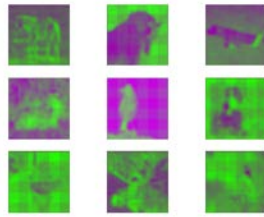**The original images.**

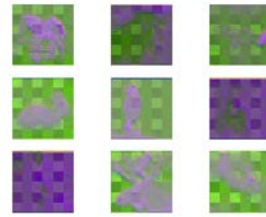Conv1_recons_channel_0   Conv1_recons_channel_1   Conv1_recons_channel_2
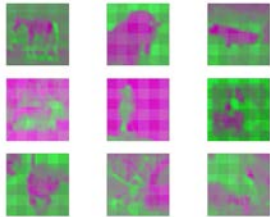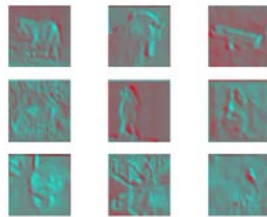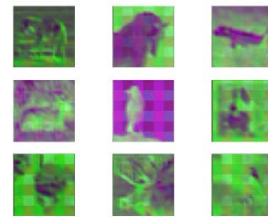
Conv1_recons_channel_3

Conv1_recons_channel_4

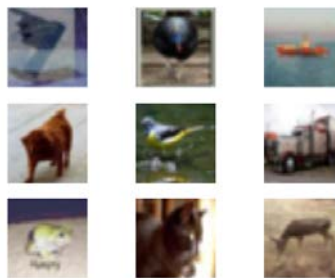**Conv1_recons_channel_5**

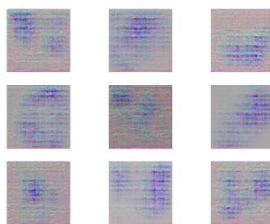**Conv1_recons_channel_6**

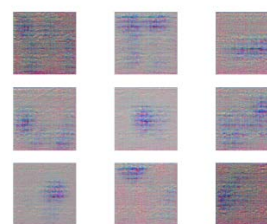**Conv1_recons_channel_7**

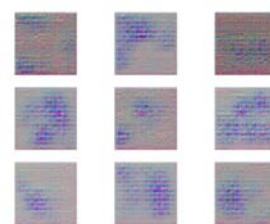**Conv1_recons_channel_8**

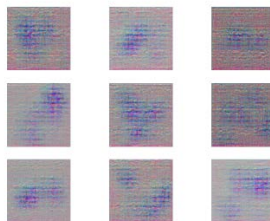**For last convolution layer---Conv5:**
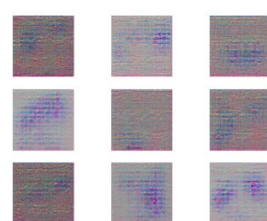

The original images.

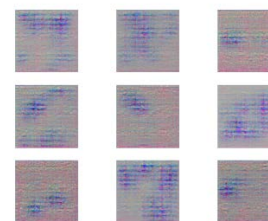**Conv5_recons_channel_0**

Conv5_recons_channel_1

Conv5_recons_channel_2

Conv5_recons_channel_3

Conv5_recons_channel_4

Conv5_recons_channel_5
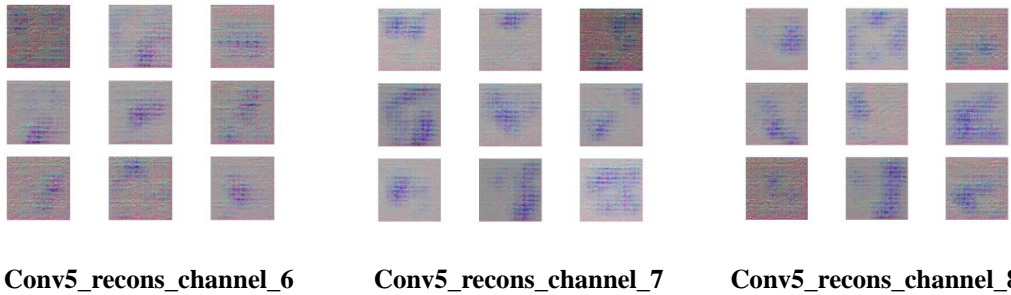
Conv5_recons_channel_6   **Conv5_recons_channel_7**   **Conv5_recons_channel_8**

4   Feedback

    4.1   Spend about 40 hours or more.

    4.2   The course is basically good. Maybe it could be better if the efficiency of class can be improved.

    4.3   It really benefits me well to complete this assignment. But some of the requirements or descriptions in the assignment is quite confusing and hard to understand, thus caused the waste of time in doing unnecessary or misunderstanding steps.

    4.4   Maybe we could learn some classic or hard for self-teaching methods and its application in current research.

5   Reference

    5.1   network.py

        [1] https://pytorch.org/docs/stable/_modules/torchvision/models/resnet.html

        [2] https://www.cnblogs.com/zf-blog/p/7792373.html

    5.2   visualizer.py and reverse_network.py

        [1] https://github.com/grishasergei/conviz

        [2] https://github.com/kvfrans/feature-visualization

        [3] https://github.com/utkuozbulak/pytorch-cnn-visualizations