**AlexNet应用于cifar数据集实验报告**

15331416 赵寒旭

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**1. 修改的AlexNet结构**

1）AlexNet详细结构

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Modified AlexNet for Cifar(3FC) | | | | | |
| input | 32\*32\*3 | | | | |
| layer1 | Conv2d | kernel | channel | padding | stride |
| 11\*11\*3 | 64 | 5 | 4 |
| Relu | inplace=True | | | |
| MaxPool2d | kernel\_size | | stride | |
| 2\*2 | | 2 | |
| layer2 | Conv2d | kernel | channel | padding | stride |
| 5\*5\*64 | 192 | 2 | default |
| Relu | inplace=True | | | |
| MaxPool2d | kernel\_size | | stride | |
| 2\*2 | | 2 | |
| layer3 | Conv2d | kernel | channel | padding | stride |
| 3\*3\*192 | 384 | 1 | default |
| Relu | inplace=True | | | |
| layer4 | Conv2d | kernel | channel | padding | stride |
| 3\*3\*384 | 256 | 1 | default |
| Relu | inplace=True | | | |
| layer5 | Conv2d | kernel | channel | padding | stride |
| 3\*3\*256 | 256 | 1 | default |
| Relu | inplace=True | | | |
| MaxPool2d | kernel\_size | | stride | |
| 2\*2 | | 2 | |
| fully-connected | Dropout | | | | |
| Linear | 256->4096 | | | |
| Relu | inplace=True | | | |
| Dropout | | | | |
| Linear | 4096->4096 | | | |
| Relu | inplace=True | | | |
| Linear | 4096->10 | | | |

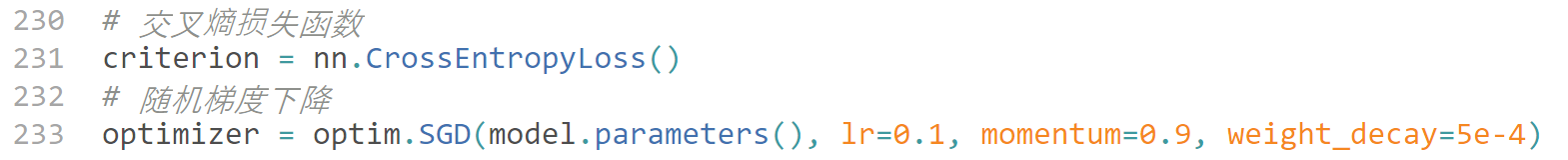
2）参数初始化

learning\_rate = 0.1

momentum = 0.9

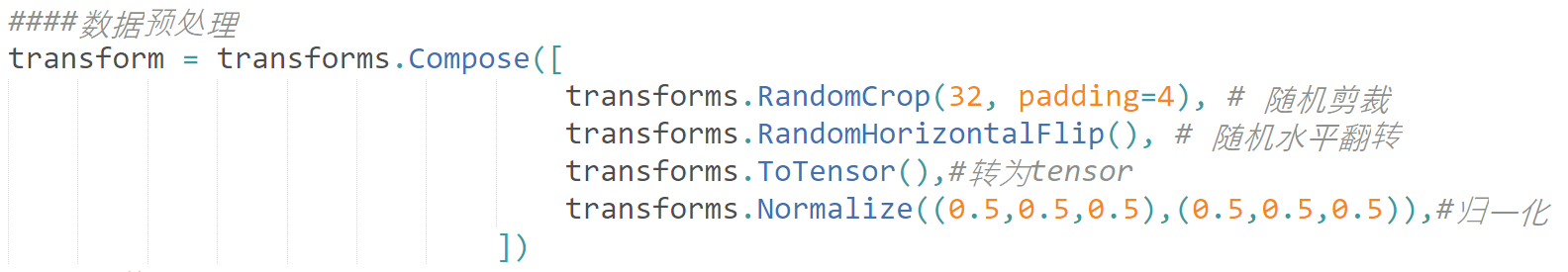
weight\_decay = 0.0005

损失函数使用交叉熵，训练过程使用带动量的随机梯度下降法。

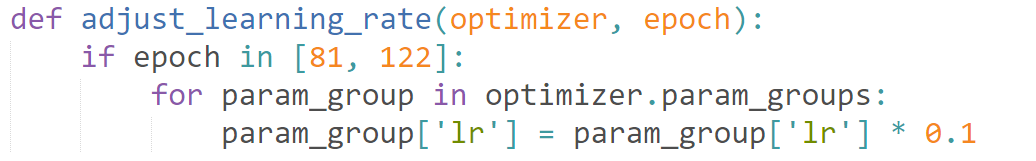


3）测试及网络参数调整

（1）增强数据集



（2）修改学习率



4）结果对比展示

（1）无数据增强，无学习率调整

|  |  |  |
| --- | --- | --- |
| Best Accuracy | | |
| train | Top-1 | 79.48 |
| Top-5 | 98.044 |
| test | Top-1 | 67.65 |
| Top-5 | 96.01 |

（2）无数据增强，有学习率调整

|  |  |  |
| --- | --- | --- |
| Best Accuracy | | |
| train | Top-1 | 100 |
| Top-5 | 100 |
| test | Top-1 | 72.17 |
| Top-5 | 96.46 |

（3）有数据增强，无学习率调整

|  |  |  |
| --- | --- | --- |
| Best Accuracy | | |
| train | Top-1 | 64.344 |
| Top-5 | 95.28 |
| test | Top-1 | 65.25 |
| Top-5 | 95.73 |

（4）有数据增强，有学习率调整

|  |  |  |
| --- | --- | --- |
| Best Accuracy | | |
| train | Top-1 | 92.35 |
| Top-5 | 99.904 |
| test | Top-1 | 77.61 |
| Top-5 | 98.43 |

**2. 全连接层结构调整**

1）AlexNet详细结构

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Modified AlexNet for Cifar(1FC) | | | | | |
| input | 32\*32\*3 | | | | |
| layer1 | Conv2d | kernel | channel | padding | stride | |
| 11\*11\*3 | 64 | 5 | 4 | |
| Relu | inplace=True | | | | |
| MaxPool2d | kernel\_size | | stride | | |
| 2\*2 | | 2 | | |
| layer2 | Conv2d | kernel | channel | padding | stride | |
| 5\*5\*64 | 192 | 2 | default | |
| Relu | inplace=True | | | | |
| MaxPool2d | kernel\_size | | stride | | |
| 2\*2 | | 2 | | |
| layer3 | Conv2d | kernel | channel | padding | stride | |
| 3\*3\*192 | 384 | 1 | default | |
| Relu | inplace=True | | | | |
| layer4 | Conv2d | kernel | channel | padding | stride | |
| 3\*3\*384 | 256 | 1 | default | |
| Relu | inplace=True | | | | |
| layer5 | Conv2d | kernel | channel | padding | stride | |
| 3\*3\*256 | 256 | 1 | default | |
| Relu | inplace=True | | | | |
| MaxPool2d | kernel\_size | | stride | | |
| 2\*2 | | 2 | | |
| fully-connected | 256 -> 10 | | | | |

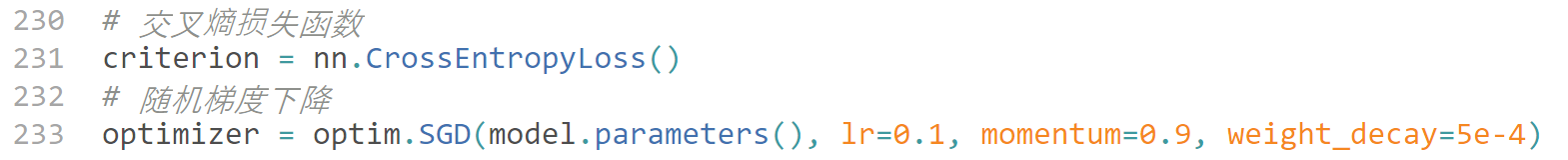
2）参数初始化

learning\_rate = 0.1

momentum = 0.9

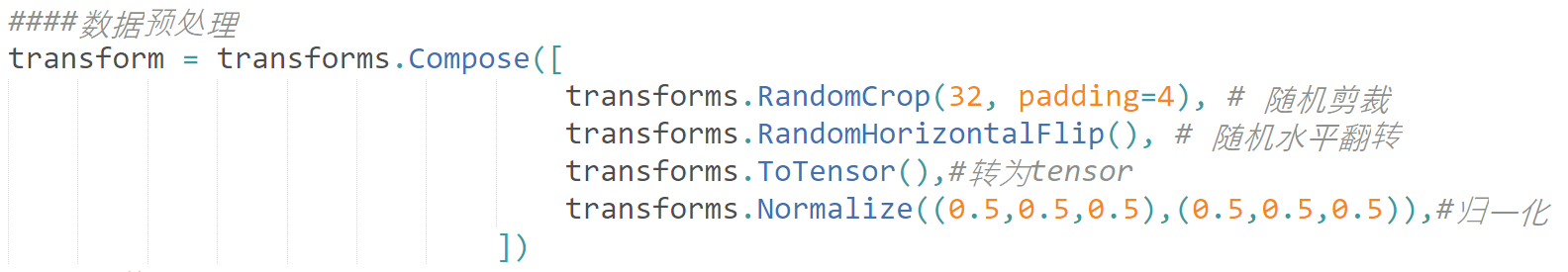
weight\_decay = 0.0005

损失函数使用交叉熵，训练过程使用带动量的随机梯度下降法。

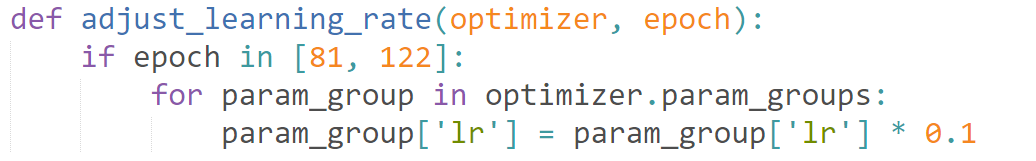


3）测试及网络参数调整

（1）增强数据集



（2）修改学习率



4）结果对比展示

（1）无数据增强，无学习率调整

|  |  |  |
| --- | --- | --- |
| Best Accuracy | | |
| train | Top-1 | 84.674 |
| Top-5 | 99.444 |
| test | Top-1 | 67.31 |
| Top-5 | 96.51 |

（2）无数据增强，有学习率调整

|  |  |  |
| --- | --- | --- |
| Best Accuracy | | |
| train | Top-1 | 100 |
| Top-5 | 100 |
| test | Top-1 | 72.26 |
| Top-5 | 96.96 |

（3）有数据增强，无学习率调整

|  |  |  |
| --- | --- | --- |
| Best Accuracy | | |
| train | Top-1 | 67.524 |
| Top-5 | 96.974 |
| test | Top-1 | 67.33 |
| Top-5 | 96.9 |

（4）有数据增强，有学习率调整

|  |  |  |
| --- | --- | --- |
| Best Accuracy | | |
| train | Top-1 | 95.164 |
| Top-5 | 99.984 |
| test | Top-1 | 78.2 |
| Top-5 | 98.56 |