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时间 2016-02-04 21:38:57  Github (</sites/fyAnyi>)

原文 <https://github.com/KaimingHe/deep-residual-networks> (<http://www.tuicool.com/articles/hit/buay6b>)

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Deep Residual Networks

By Kaiming He (<http://research.microsoft.com/en-us/um/people/kahe/>) , Xiangyu Zhang (<https://scholar.google.com/citations?user=yuB-cfoAAAAJ&hl=en>) , Shaoqing Ren (<http://home.ustc.edu.cn/%7Esqren/>) , Jian Sun (<http://research.microsoft.com/en-us/people/jiansun/>) .

Microsoft Research Asia (MSRA).

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Introduction

This repository contains the original models (ResNet-50, ResNet-101, and ResNet-152) described in the paper "Deep Residual Learning for Image Recognition" (<http://arxiv.org/abs/1512.03385> (<http://arxiv.org/abs/1512.03385>)). These models are those used in ILSVRC (<http://image-net.org/challenges/LSVRC/2015/>) and COCO (<http://mscoco.org/dataset/#detections-challenge2015>) 2015 competitions, which won the 1st places in: ImageNet classification, ImageNet detection, ImageNet localization, COCO detection, and COCO segmentation.

Note- Check re-implementations with **training code** and models from Facebook AI Research (FAIR)! -- blog (<http://torch.ch/blog/2016/02/04/resnets.html>) , code (<https://github.com/facebook/fb.resnet.torch>)



(<http://www.w3cschool.cn/welcome?tnid=1002>)



(<https://activity.ksyun.com/1703/index.html?ch=00033.00018&hmsr=%E6%8E%A8%E9%85%B7&hmpl=1703&>)

If you use these models in your research, please cite:

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```
@article{He2015,
```

```
author = {Kaiming He and Xianming Qiu and Shaoqing Ren and Jian Sun},
```

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```
title = {Deep Residual Learning for Image Recognition},
```

```
journal = {arXiv preprint arXiv:1512.03385},
```

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```
year = {2015}
```

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}
```

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1. These models are converted from our own implementation to a recent version of Caffe (2016/2/3, b590f1d). The numerical results using this code are as in the tables below.
2. These models are for the usage of testing or fine-tuning.
3. These models were **not** trained using this version of Caffe.
4. If you want to train these models using this version of Caffe without modifications, please notice that:
 - GPU memory might be insufficient for extremely deep models.
 - Changes of mini-batch size should impact accuracy (we use a mini-batch of 256 images on 8 GPUs, that is, 32 images per GPU).
 - Implementation of data augmentation might be different (see our paper about the data augmentation we used).
 - We randomly shuffle data at the beginning of every epoch.
 - There might be some other untested issues.
5. In our BN layers, the provided mean and variance are strictly computed using average (**not** moving average) on a sufficiently large training batch after the training procedure. The numerical results are very stable (variation of val error < 0.1%). Using moving average might lead to different results.
6. In the BN paper, the BN layer learns gamma/beta. To implement BN in this version of Caffe, we use its provided "batch_norm_layer" (which has no gamma/beta learned) followed by "scale_layer" (which learns gamma/beta).
7. We use Caffe's implementation of SGD with momentum: $v := \text{momentum} * v + \text{lr} * g$. If you want to port these models to other libraries (e.g., Torch, CNTK), please pay careful attention to the possibly different implementation of SGD with momentum : $v := \text{momentum} * v + (1 - \text{momentum}) * \text{lr} * g$, which changes the effective learning rates.

Models

1. Visualizations of network structures:
 - ResNet-50 (<http://ethereon.github.io/netscope/#!/gist/db945b393d40bfa26006>)
 - ResNet-101 (<http://ethereon.github.io/netscope/#!/gist/b21e2aae116dc1ac7b50>)
 - ResNet-152 (<http://ethereon.github.io/netscope/#!/gist/d38f3e6091952b45198b>)
2. Model files:
 - MSR download: link (<http://research.microsoft.com/en-us/um/people/kahe/resnet/models.zip>)



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[summit.org/](http://ml-summit.org/)?

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(http://www.bagevent.com/event/268776?bag_track=tuicool)



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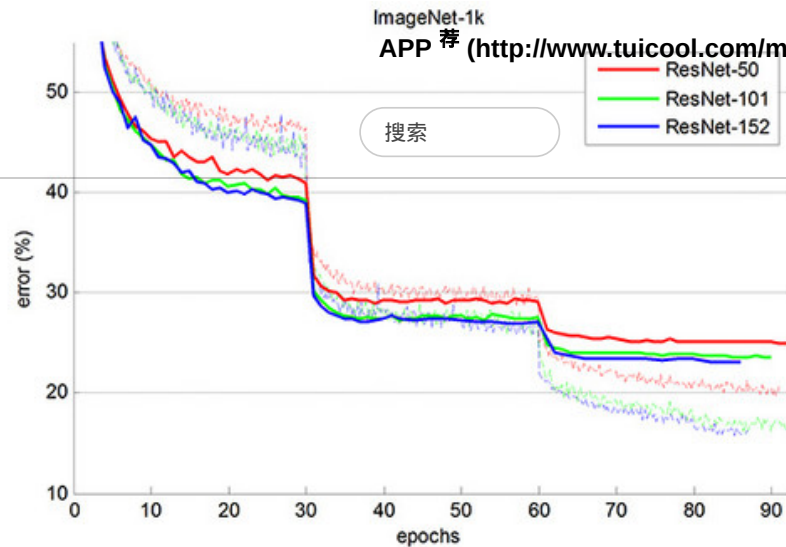
- OneDrive download: link (<https://onedrive.live.com/?authkey=%21AAFW2-FVoxeVRck&id=4006CBB8476FF777%2117887&cid=4006CBB8476FF777>)

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Results

- Curves on ImageNet (solid lines: 1-crop val error; dashed lines: training error):



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- 1-crop validation error on ImageNet (center 224x224 crop from resized image with shorter side=256):

model	top-1	top-5
VGG-16 (http://www.vlfeat.org/matconvnet/pretrained/)	28.5% (http://www.vlfeat.org/matconvnet/pretrained/)	9.9% (http://www.vlfeat.org/matconvnet/pretrained/)
ResNet-50	24.7%	7.8%
ResNet-101	23.6%	7.1%
ResNet-152	23.0%	6.7%

- 10-crop validation error on ImageNet (averaging softmax scores of 10 224x224 crops from resized image with shorter side=256), the same as those in the paper:

model	top-1	top-5
ResNet-50	22.9%	6.7%



(<https://sspaas.com/>)

model	top-1	top-5
ResNet-101	21.8%	6.1%
ResNet-152	21.4%	5.7%

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Third-party re-implementations

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Deep residual networks are very easy to implement and train. We recommend to see also the following third-party re-implementations and extensions:

搜索

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1. By Facebook AI Research (FAIR), with training code in Torch and pre-trained ResNet-18/34/50/101 models for ImageNet : blog (<http://torch.ch/blog/2016/02/04/resnets.html>) , code (<https://github.com/facebook/fb.resnet.torch>)
2. Torch, CIFAR-10, with ResNet-20 to ResNet-110, training code, and curves:code
3. Lasagne, CIFAR-10, with ResNet-32 and ResNet-56 and training code:code
4. Neon, CIFAR-10, with pre-trained ResNet-32 to ResNet-110 models, training code, and curves:code
5. Torch, MNIST, 100 layers: blog (<https://deeplmlblog.wordpress.com/2016/01/05/residual-networks-in-torch-mnist/>) , code (<https://github.com/arunpatala/residual.mnist>)
6. A winning entry in Kaggle's right whale recognition challenge: blog (<http://blog.kaggle.com/2016/02/04/noaa-right-whale-recognition-winners-interview-2nd-place-felix-lau/>) , code (<https://github.com/felixlaumon/kaggle-right-whale>)
7. Neon, Place2 (mini), 40 layers: blog (<http://www.nervanasys.com/using-neon-for-scene-recognition-mini-places2/>) , code (<https://github.com/hunterlang/mpmz/>)



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