



本地训练环境搭建与训练方案

（resnet18 网络进行垃圾分类为例）

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前言

概述

本文档主要介绍本地训练环境搭建与训练方案指导手册。

产品版本

与本文档相对应的主芯片版本如下。

产品名称	产品版本
Hi3516	V100R001C00SPC021

读者对象

本文档（本指南）主要适用于以下工程师：

- 软件开发工程师
- 硬件开发工程师

修订记录

修订记录累积了每次文档更新的说明。最新版本的文档包含以前所有文档版本的更新内容。

修订日期	版本	修订说明
2021-04-21	00B01	第一次临时版本发布。



目 录

前 言.....	iii
1 概述.....	5
1.1 本地训练环境搭建须知.....	5
2 本地环境搭建	6
2.1 本地环境安装	6
2.1.1 安装需求	6
2.1.2 软件包安装	6
2.1.3 下载 mmclassification 代码到本地服务器	11
2.1.4 安装 mmclassification 所需环境和库	11
3 本地环境进行模型训练	12
3.1 训练素材准备和代码修改.....	12
3.2 本地模型训练	14



1 概述

1.1 本地训练环境搭建须知

对于环境的搭建，用户可以自行选择本地或者 NAIE 进行训练，本文重点介绍本地环境训练。本文环境采用 2 张 NVIDIA GPU 服务器环境来做训练，训练环境如下图所示：

```
(open-mmlab) [redacted]-Z390-UD:/home/hisi/data/[redacted]/mmclassification$ nvidia-smi
Tue Apr 20 19:11:49 2021
```

NVIDIA-SMI 440.100 Driver Version: 440.100 CUDA Version: 10.2									
GPU	Name	Persistence-M	Bus-Id	Disp.A	Memory-Usage	GPU-Util	Uncorr. ECC		
Fan	Temp	Perf	Pwr:Usage/Cap			GPU-Util	Compute M.		
0	GeForce RTX 208...	Off	00000000:01:00.0	Off	26MiB / 11016MiB	0%	N/A	Default	
43%	51C	P0	50W / 250W						
1	GeForce RTX 208...	Off	00000000:05:00.0	Off	1MiB / 11019MiB	0%	N/A	Default	
27%	36C	P8	21W / 250W						

Processes:					GPU Memory Usage
GPU	PID	Type	Process name		
0	1773	G	/usr/lib/xorg/Xorg		9MiB
0	1999	G	/usr/bin/gnome-shell		14MiB



2 本地环境搭建

2.1 本地环境安装

2.1.1 安装需求

- Python 3.6+
- PyTorch 1.3+
- [MMCV](#)

兼容的 MMClassification 和 MMCV 版本如下。请安装正确版本的 MMCV，以避免安装问题，如下表所示。

MMClassification version	MMCV version
master	mmcv>=1.3.0
0.10.0	mmcv>=1.3.0
0.9.0	mmcv>=1.1.4
0.8.0	mmcv>=1.1.4
0.7.0	mmcv>=1.1.4
0.6.0	mmcv>=1.1.4

2.1.2 软件包安装

本文所有的环境都是基于本地 linux 服务器版本进行安装。

(1) Anaconda 安装

首先下载 anaconda 安装脚本，在有 GPU 环境的服务器下，本文选择 Anaconda3-5.2.0-Linux-x86_64，切换到安装目录下，在 linux 命令端输入：

```
wget https://repo.anaconda.com/archive/Anaconda3-5.2.0-Linux-x86\_64.sh
```

如下图所示：

```
hisi@Z390-UD:/home/hisi/data/ ~$ wget https://repo.anaconda.com/archive/Anaconda3-5.2.0-Linux-x86_64.sh
```



由于 Anaconda3-5.2.0-Linux-x86_64.sh 文件较大，下载过程需要耐心等待，下载成功后，在下载目录下即可看到该文件，如下图所示：

```
@hisi-Z390-UD:/home/hisi/data/ $ ls -lah
total 1.3G
drwxrwxrwx 6 wxl013372 wxl013372 4.0K Apr 20 19:26 .
drwxrwxrwx 21 hisi hisi 4.0K Apr 9 10:51 ..
drwxrwxr-x 23 wxl013372 wxl013372 4.0K Apr 9 14:59 '$'\033'[A'$'\033'[A'
-rw-rw-r-- 1 wxl013372 wxl013372 622M May 31 2018 Anaconda3-5.2.0-Linux-x86_64.sh
drwxrwxr-x 14 wxl013372 wxl013372 4.0K Apr 20 19:18 mmclassification
drwxrwxrwx 11 hisi hisi 4.0K Apr 21 09:55 PytorchToCaffe-master-clean
-rwxrwx-rw- 1 hisi hisi 691M Apr 20 10:24 torch-1.4.0+cu100-cp35-cp35m-linux_x86_64.whl
-rwxrwx-rw- 1 hisi hisi 8.5M Apr 20 09:55 torchvision-0.4.0-cp35-cp35m-manylinux1_x86_64.whl
drwxrwxrwx 4 hisi hisi 4.0K Apr 20 18:52 trash_classify_data_collect
```

下载成功后，安装 Anaconda，在命令行输入：bash Anaconda3-5.2.0-Linux-x86_64.sh，如下图所示：

```
@hisi-Z390-UD:/home/hisi/data/ $ bash Anaconda3-5.2.0-Linux-x86_64.sh
```

按 enter 键，即可开始安装，如下图所示：

```
@hisi-Z390-UD:/home/hisi/data/ $ bash Anaconda3-5.2.0-Linux-x86_64.sh

Welcome to Anaconda3 5.2.0

In order to continue the installation process, please review the license
agreement.
Please, press ENTER to continue
>>>
=====
Anaconda End User License Agreement
=====
Copyright 2015, Anaconda, Inc.
```

在 Do you accept the license terms? [yes|no]，输入 yes

```
Do you accept the license terms? [yes|no]
[no] >>>
Please answer 'yes' or 'no':
>>> yes
```

稍等片刻等待安装完成。

若安装成功，输入 conda --version，即可显示版本号，如下图所示：

```
@hisi-Z390-UD:/home/hisi/data/ $ conda --version
conda 4.5.4
```

若运行过程中出现：conda command not found 类似字样，需配置下环境，输入：

export PATH="/home/xxx/anaconda3/bin:\$PATH"

/home/xxx/anaconda3/ 需根据开发者服务器实际路径进行替换，替换成功后，退出 terminal 并再次打开 terminal 即可。



(2) 创建 conda 虚拟环境，并激活

由于安装包较大，在安装之前先配置下清华源，加速下载，输入：

```
conda config --add channels https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkg/free/
```

```
conda config --add channels https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkg/main/
```

```
@hisi-Z390-UD:/home/hisi/data$ conda config --add channels https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkg/free/
@hisi-Z390-UD:/home/hisi/data$
@hisi-Z390-UD:/home/hisi/data$
@hisi-Z390-UD:/home/hisi/data$
@hisi-Z390-UD:/home/hisi/data$
@hisi-Z390-UD:/home/hisi/data$
@hisi-Z390-UD:/home/hisi/data$ conda config --add channels https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkg/main/
```

在服务器路径下输入 `conda create -n open-mmlab python=3.6`，本环境安装的 python 版本为 3.6.13，如下图所示：

```
@hisi-Z390-UD:/home/hisi/data/ $ conda create -n open-mmlab python=3.6
Solving environment: done

==> WARNING: A newer version of conda exists. <==
  current version: 4.5.4
  latest version: 4.10.1

Please update conda by running

  $ conda update -n base conda

## Package Plan ##

## Package Plan ##
                               /envs/open-mmlab

added / updated specs: home/hisi/data/fancunquan/
- python=3.6
```

在安装开始会提示 The following packages will be downloaded, The following NEW packages will be INSTALLED 字样，若出现 Proceed ([y]/n)? y，选择 y，如下图所示：

```
The following packages will be downloaded:
```

package	build	size	url
xz-5.2.5	h7b6447c_0	438 KB	https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkg/main
openssl-1.1.1k	h27cfd23_0	3.8 MB	https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkg/main
setuptools-52.0.0	py36h06a4308_0	933 KB	https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkg/main
ncurses-6.2	he6710b0_1	1.1 MB	https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkg/main
ld_impl_linux-64-2.33.1	h53a641e_7	645 KB	https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkg/main
_libgcc_mutex-0.1	main	3 KB	https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkg/main
readline-8.1	h27cfd23_0	464 KB	https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkg/main
python-3.6.13	hdb3f193_0	33.9 MB	https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkg/main
ca-certificates-2021.4.13	h06a4308_1	120 KB	https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkg/main
libgcc-ng-9.1.0	hdf63c60_0	8.1 MB	https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkg/main
certifi-2020.12.5	py36h06a4308_0	144 KB	https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkg/main
pip-21.0.1	py36h06a4308_0	2.0 MB	https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkg/main



```
The following NEW packages will be INSTALLED:

 _libgcc_mutex:      0.1-main                  https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/main
 ca-certificates:    2021.4.13-h06a4308_1      https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/main
 certifi:            2020.12.5-py36h06a4308_0 https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/main
 ld_impl_linux-64:  2.33.1-h53a641e_7         https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/main
 libffi:            3.3-he6710b0_2            https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/main
 libgcc-ng:         9.1.0-hdf63c60_0          https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/main
 libstdcxx-ng:      9.1.0-hdf63c60_0          https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/main
 ncurses:           6.2-he6710b0_1           https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/main
 openssl:           1.1.1k-h27cfd23_0         https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/main
 pip:               21.0.1-py36h06a4308_0     https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/main
 python:            3.6.13-hdb3f193_0         https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/main
 readline:          8.1-h27cfd23_0            https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/main
 setuptools:        52.0.0-py36h06a4308_0     https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/main
 sqlite:            3.35.4-hdfb4753_0         https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/main
 tk:                8.6.10-hbc83047_0         https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/main
 wheel:             0.36.2-pyhd3eb1b0_0       https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/main
 xz:                5.2.5-h7b6447c_0         https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/main
 zlib:             1.2.11-h7b6447c_3       https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/main

Proceed ([y]/n)? y
```

若下载过程中出现 `CondaError: Downloaded bytes did not match Content-Length`，表示某些包没有下载成功，这里与网络速度有关，再次输入 `conda create -n open-mmlab python=3.6` 下载即可，系统会自动下载没有下载成功的软件，如下图所示：

```
CondaError: Downloaded bytes did not match Content-Length
url: https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/main/linux-64/python-3.6.13-hdb3f193_0.tar.bz2
CondaError: Downloaded bytes did not match/pkgs/python-3.6.13-hdb3f193_0.tar.bz2
Content-Length: 35502540a.tsinghua.edu.cn/anaconda/pkgs/main/linux-64/python-3.6.13-hdb3f193_0.tar.bz2
downloaded bytes: 12648110ta/ /
```

下载成功后，会出现如下字样，如下图所示：

```
Downloading and Extracting Packages
python-3.6.13      | 33.9 MB | #####
Preparing transaction: done
Verifying transaction: done
Executing transaction: done
#
# To activate this environment, use
#
#     $ conda activate open-mmlab
#
# To deactivate an active environment, use
#
#     $ conda deactivate
```

接下来激活虚拟环境，输入 `conda activate open-mmlab` 命令，若出现如下图所示的(open-mmlab) 显示，表示显示成功。

注：以下软件包和环境的安装均需要在(open-mmlab)虚拟环境下进行。

```
-Z390-UD:/home/hisi/data/ $ conda activate open-mmlab
(open-mmlab) wx1013372@hisi-Z390-UD:/home/hisi/data/ $
(open-mmlab) wx1013372@hisi-Z390-UD:/home/hisi/data/ $
(open-mmlab) wx1013372@hisi-Z390-UD:/home/hisi/data/ $
(open-mmlab) wx1013372@hisi-Z390-UD:/home/hisi/data/ $
```



若出现激活击败的情况，按照如下步骤才操作即可，如下图所示：

```
# 激活环
source activate
# 退出环境
source deactivate
conda activate open-mmlab
```

```
hisi-Z390-UD:/home/hisi/data/ $ source activate
(base) hisi-Z390-UD:/home/hisi/data/ $
(base) hisi-Z390-UD:/home/hisi/data/ $
(base) hisi-Z390-UD:/home/hisi/data/ $
(base) hisi-Z390-UD:/home/hisi/data/ $
(base) hisi-Z390-UD:/home/hisi/data/ $
(base) hisi-Z390-UD:/home/hisi/data/ $
(base) hisi-Z390-UD:/home/hisi/data/ $ source deactivate
hisi-Z390-UD:/home/hisi/data/ $
hisi-Z390-UD:/home/hisi/data/ $
hisi-Z390-UD:/home/hisi/data/ $
hisi-Z390-UD:/home/hisi/data/ $ conda activate open-mmlab
(open-mmlab) hisi-Z390-UD:/home/hisi/data/ $
(open-mmlab) hisi-Z390-UD:/home/hisi/data/ $
```

(3) 安装跟 CUDA 版本对应的 torch 和 torchvision

例如：本文的 CUDA 版本为 10.0，可通过 `nvcc --version` 查看，如下图所示：

```
hisi-Z390-UD:/home/hisi/data/ $ nvcc --version
nvcc: NVIDIA (R) Cuda compiler driver
Copyright (c) 2005-2018 NVIDIA Corporation
Built on Sat Aug 25 21:08:01 CDT 2018
Cuda compilation tools, release 10.0, V10.0.130
```

CUDA 匹配的 torch 和 torchvision 版本，可通过如下链接查看，这里需读者仔细确认，以免安装错误，耽误安装时间和开发效率。

https://download.pytorch.org/whl/cu100/torch_stable.html

本环境 CUDA 版本为 10.0，torch 版本为 1.4.0，torchvision 版本为 0.4.0

安装 torch 包，输入 `pip3 install torch==1.4.0` 命令，若安装成功，则出现 `Successfully installed torch-1.4.0`

```
(open-mmlab) hisi-Z390-UD:/home/hisi/data/ $ pip3 install torch==1.4.0
Looking in indexes: http://mirrors.tools.huawei.com/pypi/simple
Collecting torch==1.4.0
  Downloading http://mirrors.tools.huawei.com/pypi/packages/24/19/4804aea17cd136f1705a5e98a00618cb8f6ccc375ad8bfa437408e09d058/torch-1.4.0-cp36-cp36m-manylinux1_x86_64.whl (753.4 MB)
    753.4 MB 2.4 MB/s
Installing collected packages: torch
  Attempting uninstall: torch
    Found existing installation: torch 1.2.0
    Uninstalling torch-1.2.0:
      Successfully uninstalled torch-1.2.0
Successfully installed torch-1.4.0
```

安装 torchvision 包，输入 `pip3 install torchvision==0.4.0`，如下图所示



```
(open-mmlab) @hisi-Z390-UD:/home/hisi/data/ $ pip3 install torchvision==0.4.0
Looking in indexes: http://mirrors.tools.huawei.com/pypi/simple
Collecting torchvision==0.4.0
  Downloading http://mirrors.tools.huawei.com/pypi/packages/06/e6/a564eba563f7ff53aa7318ff6aaa5bd8385cbda39ed55ba471e95af27d19/torchvision-0.4.0-cp36-cp36m-linux_x86_64.whl (8.8 MB)
    8.8 MB 7.9 MB/s
Collecting six
  Downloading http://mirrors.tools.huawei.com/pypi/packages/ee/ff/48bde5c0f013094d729fe4b0316ba2a24774b3ffc52d924a8a4cb04078a/six-1.15.0-py2.py3-none-any.whl (10 kB)
Collecting pillow>=4.1.1
  Downloading http://mirrors.tools.huawei.com/pypi/packages/89/d2/942af29f8494a1a3f4bc4f483d520f7c02ccae677f5f50cf76c6b3d827d8/Pillow-8.2.0-cp36-cp36m-linux_x86_64.whl (3.0 MB)
    3.0 MB 99.8 MB/s
Collecting torch==1.2.0
  Downloading http://mirrors.tools.huawei.com/pypi/packages/30/57/d5cceb0799c06733eefce80c395459f28970ebb9e896846ce96ab579a3f1/torch-1.2.0-cp36-cp36m-manylinux1_x86_64.whl (748.8 MB)
    748.8 MB 40.1 MB/s
Collecting numpy
  Downloading http://mirrors.tools.huawei.com/pypi/packages/14/32/d3fa649ad7ec0b82737b92fed3c4dd376b0bb23730715124569f38f3a08/numpy-1.19.5-cp36-cp36m-manylinux1_x86_64.whl (14.8 MB)
    14.8 MB 15.1 MB/s
Installing collected packages: numpy, torch, six, pillow, torchvision
  Attempting uninstall: torch
    Found existing installation: torch 1.4.0
    Uninstalling torch-1.4.0:
      Successfully uninstalled torch-1.4.0
Successfully installed numpy-1.19.5 pillow-8.2.0 six-1.15.0 torch-1.2.0 torchvision-0.4.0
```

安装 mmcv 包，输入 `pip3 install mmcv`，如下图所示：

```
(open-mmlab) @hisi-Z390-UD:/home/hisi/data/ $ pip3 install mmcv
Looking in indexes: http://mirrors.tools.huawei.com/pypi/simple
Collecting mmcv
  Downloading http://mirrors.tools.huawei.com/pypi/packages/59/c4/4a54b5543fce619f1903864c2947b78ec4b8770286ea7a20ad0eeb69e83d/mmcv-1.3.1.tar.gz (259 kB)
    259 kB 7.2 MB/s
Collecting addict
  Downloading http://mirrors.tools.huawei.com/pypi/packages/6a/00/b08f23b7d7e1e14ce01419a467b583edbb93c6cdeb8654e54a9cc579cd61f/addict-2.4.0-py3-none-any.whl (10 kB)
    10 kB 10.0 MB/s
Collecting addict
  Downloading http://mirrors.tools.huawei.com/pypi/packages/6a/00/b08f23b7d7e1e14ce01419a467b583edbb93c6cdeb8654e54a9cc579cd61f/addict-2.4.0-py3-none-any.whl (10 kB)
    10 kB 10.0 MB/s
Collecting pyyaml
  Downloading http://mirrors.tools.huawei.com/pypi/packages/7a/5b/bc0b5ab38247bba158504a410112b6c03f153c652734ece1849749e5f518/PyYAML-5.4.1-cp36-cp36m-manylinux1_x86_64.whl (344 kB)
    344 kB 13.5 MB/s
Collecting yapf
  Downloading http://mirrors.tools.huawei.com/pypi/packages/5f/0d/8814e79eb865eab42d95023b58b650d01dec6f8ea87fc9260978b1bf2167/yapf-0.31.0-py2.py3-none-any.whl (185 kB)
    185 kB 97.1 MB/s
Collecting opencv-python>=3
  Downloading http://mirrors.tools.huawei.com/pypi/packages/e0/20/4d78eb1ce337efd609ade8ebe0c82260cd47dd73f8c57dcfe4814c6a3b59/opencv_python-4.5.1.48-cp36-cp36m-linux_x86_64.whl (50.4 MB)
    50.4 MB 27.0 MB/s
Building wheels for collected packages: mmcv
  Building wheel for mmcv (setup.py) ... done
  Created wheel for mmcv: filename=mmcv-1.3.1-py2.py3-none-any.whl size=375354 sha256=928ed830c083c3a8bf5c23d75d5fb8770412dd7d9ef96b8d395581199ba166a9
  Stored in directory: /home/wx1013372/.cache/pip/wheels/e5/dd/64/bcb171cb006dbcb44713b7fd5c7fa30dce577391229209e
Successfully built mmcv
Installing collected packages: yapf, pyyaml, opencv-python, addict, mmcv
Successfully installed addict-2.4.0 mmcv-1.3.1 opencv-python-4.5.1.48 pyyaml-5.4.1 yapf-0.31.0
```

2.1.3 下载 mmclassification 代码到本地服务器

在虚拟环境(open-mmlab)下，输入：`git clone https://github.com/open-mmlab/mclassification.git`，即可将代码下载至相应目录下，如下图所示：

```
(open-mmlab) @hisi-Z390-UD:/home/hisi/data/ $ git clone https://github.com/open-mmlab/mclassification.git
Cloning into 'mclassification'...
remote: Enumerating objects: 2211, done.
remote: Counting objects: 100% (279/279), done.
remote: Compressing objects: 100% (197/197), done.
remote: Total 2211 (delta 127), reused 169 (delta 81), pack-reused 1932
Receiving objects: 100% (2211/2211), 2.06 MiB | 900.00 KiB/s, done.
Resolving deltas: 100% (1313/1313), done.
```

```
(open-mmlab) @hisi-Z390-UD:/home/hisi/data/ $ ls
'$'\033''[A'$'\033''[A' Anaconda3-5.2.0-Linux-x86_64.sh mclassification torch-1.4.0+cu100-cp35-cp35m-linux_x86_64.whl
```

`cd mclassification` 到该目录下，`ls` 查看代码结构，如下图所示：

```
(open-mmlab) @hisi-Z390-UD:/home/hisi/data/ /mclassification$ ls
configs demo docs LICENSE mmcls README.md requirements requirements.txt resources setup.cfg setup.py tests tools
```

2.1.4 安装 mmclassification 所需环境和库

在 `mclassification` 路径下，输入 `pip install -e .`，这里需要注意提前安装好 `mmcv`。



```
(open-mmlab) @hisi-Z390-UD:/home/hisi/data/.../mmlclassification$ pip install -e .
Looking in indexes: http://mirrors.tools.huawei.com/pypi/simple
Obtaining file:///home/hisi/data/fancunquan/mmlclassification
Collecting matplotlib
  Downloading http://mirrors.tools.huawei.com/pypi/packages/09/03/b7b30fa81cb687d1178e085d0f01111ceaea3bf81f9330c937fb6f6c8ca0/matplotlib-3.3.4-cp36-cp36m-...
    11.5 MB 16.1 MB/s
  Downloading http://mirrors.tools.huawei.com/pypi/packages/09/03/b/envs/open-mmlab/lib/python3.6/site-packages (from mmcls==0.10.0) (1.19.5).4-cp36-cp36m-...
Collecting matplotlib
  Downloading http://mirrors.tools.huawei.com/pypi/packages/09/03/b/envs/open-mmlab/lib/python3.6/site-packages (from matplotlib>mmcls==0.10.0) (1.19.5).4-cp36-cp36m-...
Collecting kiwisolver>=1.0.1, tools.huawei.com/pypi/packages/09/03/b/envs/open-mmlab/lib/python3.6/site-packages (from mmcls==0.10.0) (1.19.5).4-cp36-cp36m-...
  Downloading http://mirrors.tools.huawei.com/pypi/packages/a7/1b/cbd8ae738719b5f41592a12057ef5442e2ed5f5cb5451f8fc7e9f8875a1a/kiwisolver-1.3.1-cp36-cp36m-...
    1.1 MB 116.9 MB/s
Collecting python-dateutil>=2.1
  Downloading http://mirrors.tools.huawei.com/pypi/packages/d4/70/d60450c3dd48ef87586924207ae8907090de0b306af2bce5d134d78615cb/python_dateutil-2.8.1-py2.py3-...
    227 kB 121.2 MB/s
Collecting cycycler>=0.10
  Downloading http://mirrors.tools.huawei.com/pypi/packages/f7/d2/e07d3ebb2bd7af696440ce7e754c59dd546ffe1bbe732c8ab68b9c834e61/cycycler-0.10.0-py2.py3-none-...
Collecting pyparsing!=2.0.4,!=2.1.2,!=2.1.6,>=2.0.3
  Downloading http://mirrors.tools.huawei.com/pypi/packages/8a/bb/488841f56197b13700afd5658fc279a2025a39e22449b7cf29864669b15d/pyparsing-2.4.7-py2.py3-none-...
    67 kB 92.1 MB/s
  Downloading http://mirrors.tools.huawei.com/pypi/packages/8a/bb/envs/open-mmlab/lib/python3.6/site-packages (from cycycler>=0.10->matplotlib>mmcls==0.10.0) (1.19.5).4-cp36-cp36m-...
Installing collected packages: python-dateutil, pyparsing, kiwisolver, cycycler, matplotlib, mmcls
Running setup.py develop for mmcls in /home/hisi/data/fancunquan/
Successfully installed cycycler-0.10.0 kiwisolver-1.3.1 matplotlib-3.3.4 mmcls pyparsing-2.4.7 python-dateutil-2.8.1
```

至此环境搭建结束。

3 本地环境进行模型训练

3.1 训练素材准备和代码修改

关于视频录制和数据集标注，参考《基于 Taurus 套件进行训练图片制作、模型训练、模型转换指导手册（resnet18 网络进行垃圾分类为例）.pdf》第 2 章和第 3 章内容，这里不再详细阐述，如下图所示：

前言
目录
1 概述
1.1 AI训练思路
1.2 流程图
2 视频录制
2.1 视频录制样本
2.2 视频录制注意事项
2.3 视频录制处理及结果
3 数据集制作和标注
3.1 搭建FFmpeg环境
3.2 制作数据集
3.2 数据标注
4 NAIE训练
4.1 NAIE云端注册及报名指南
4.2 NAIE创建项目
4.3 NAIE模型训练流程
4.3.1 数据集制作与上传
4.3.2 特征工程使用
4.3.3 模型训练
4.3.4 模型管理
5 Pytorch2Caffe方案
5.1 环境搭建
5.2 代码导入与更改
5.3 模型转换结果及下载



本地训练环境搭建与训练方案

将生成的数据集存放在本地服务器路径下（一般为 data 区），本文路径如下图所示：

```
(open-mmlab) wx1013372@hisi-Z390-UD:/home/hisi/data/fancunquan$ ls
's'033' '[A's'033' '[A' mmclassification torch-1.4.0-cu100-cp35-cp35m-linux_x86_64.whl trash_classify_data_collect
Anaconda3-5.2.0-Linux-x86_64.sh PytorchToCaffe-master-clean torchvision-0.4.0-cp35-cp35m-manylinux1_x86_64.whl
```

```
(open-mmlab) wx1013372@hisi-Z390-UD:/home/hisi/data/fancunquan/trash_classify_data_collect$ ls
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000001.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000179.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000045.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000002.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000180.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000046.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000003.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000181.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000047.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000004.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000182.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000048.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000005.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000183.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000049.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000006.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000184.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000050.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000007.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000185.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000051.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000008.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000186.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000052.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000009.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000187.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000053.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000010.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000188.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000054.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000011.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000189.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000055.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000012.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000190.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000056.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000013.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000191.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000057.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000014.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000192.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000058.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000015.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000193.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000059.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000016.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000194.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000060.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000017.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000195.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000061.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000018.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000196.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000062.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000019.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000197.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000063.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000020.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000198.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000064.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000021.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000199.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000065.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000022.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000200.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000066.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000023.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000201.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000067.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000024.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000202.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000068.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000025.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000203.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000069.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000026.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000204.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000070.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000027.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000205.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000071.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000028.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000206.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000072.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000029.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000207.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000073.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000030.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000208.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000074.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000031.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000209.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000075.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000032.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000210.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000076.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000033.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000211.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000077.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000034.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000212.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000078.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000035.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000213.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000079.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000036.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000214.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000080.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000037.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000215.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000081.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000038.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000216.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000082.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000039.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000217.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000083.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000040.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000218.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000084.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000041.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000219.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000085.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000042.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000220.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000086.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000043.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000221.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000087.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000044.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000222.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000088.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000045.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000223.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000089.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000046.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000224.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000090.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000047.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000225.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000091.png
01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000048.png 01_Kitchen_waste_Watermelon_rind_green_background_Watermelon_rind_000226.png 01_Kitchen_waste_Watermelon_rind_white_background_Watermelon_rind_000092.png
```

接下来修改开源代码，需配置数据集路径，该文件路径在/mmclassification/configs/_base_/datasets 目录下，这里需替换自己的数据集实际路径，安装下图所示进行修改，包括 mean、std、resize、crop、data_prefix 确认修改，这个务必配置对，否则影响模型训练的效果。

```
(open-mmlab) ghisi-Z390-UD:/home/hisi/data/ /mmclassification/configs/_base_/datasets$ cat imagenet_bs32.py
# dataset settings
dataset_type = 'ImageNet'
img_norm_cfg = dict(
    mean=[127.5, 127.5, 127.5], std=[127.5, 127.5, 127.5], to_rgb=True)
train_pipeline = [
    dict(type='LoadImageFromFile'),
    dict(type='RandomResizedCrop', size=224),
    dict(type='Resize', size=(256, 256)),
    dict(type='CenterCrop', crop_size=224),
    dict(type='RandomFlip', flip_prob=0.5, direction='horizontal'),
    dict(type='Normalize', **img_norm_cfg),
    dict(type='ImageToTensor', keys=['img']),
    dict(type='ToTensor', keys=['gt_label']),
    dict(type='Collect', keys=['img', 'gt_label'])
]
test_pipeline = [
    dict(type='LoadImageFromFile'),
    dict(type='Resize', size=(256, 256)),
    dict(type='CenterCrop', crop_size=224),
    dict(type='Normalize', **img_norm_cfg),
    dict(type='ImageToTensor', keys=['img']),
    dict(type='Collect', keys=['img'])
]
data = dict(
    samples_per_gpu=32,
    workers_per_gpu=2,
    train=dict(
        type=dataset_type,
        data_prefix='/home/hisi/data/ /trash_classify_data_collect',
        pipeline=train_pipeline),
    val=dict(
        type=dataset_type,
        data_prefix='/home/hisi/data/ /trash_classify_data_collect',
        # ann_file='data/imagenet/meta/val.txt',
        pipeline=test_pipeline),
    test=dict(
        # replace 'data/val' with 'data/test' for standard test
        type=dataset_type,
        data_prefix='/home/hisi/data/ /trash_classify_data_collect',
        # ann_file='data/imagenet/meta/val.txt',
        pipeline=test_pipeline))
evaluation = dict(interval=1, metric='accuracy')
```

修改/mmclassification/configs/_base_/models 目录下 resnet18.py，按下图修改即可：



```
(open-mmlab) @hisi-Z390-UD:/home/hisi/data/ /mmclassification/configs/_base_/models$ cat resnet18.py
# model settings
model = dict(
  type='ImageClassifier',
  backbone=dict(
    type='ResNet',
    depth=18,
    num_stages=4,
    out_indices=(3, ),
    style='pytorch'),
  neck=dict(type='GlobalAveragePooling'),
  head=dict(
    type='LinearClsHead',
    num_classes=2,
    in_channels=512,
    loss=dict(type='CrossEntropyLoss', loss_weight=1.0),
    topk=(1, 2),
  ))
```

3.2 本地模型训练

切换到 mmclassification 目录下，运行命令：

```
sh ./tools/dist_train.sh configs/resnet/resnet18_b32x8_imagenet.py 2 --work-dir ./ckpt
```

对上述命令阐述如下：

dist_train.sh – 训练 sh 脚本

configs/resnet/resnet18_b32x8_imagenet.py – 训练依赖的配置

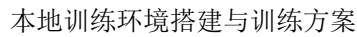
2 – GPU 个数

--work-dir ./ckpt – 模型存放的路径

若上述配置成功，即可进行训练，如下图所示：

```
pen-mmlab) @hisi-Z390-UD:/home/hisi/data/ /mmclassification$ sh ./tools/dist_train.sh configs/resnet/resnet18_b32x8_imagenet.py 2 --work-dir ./ckpt
*****
tting OMP_NUM_THREADS environment variable for each process to be 1 in default, to avoid your system being overloaded, please further tune the variable for optimal pe
*****
tplotlib is building the font cache; this may take a moment.
tplotlib is building the font cache; this may take a moment.
21-04-20 19:18:31,243 - mmcls - INFO - Environment info:
-----
s.platform: linux
thon: 3.6.13 [Anaconda, Inc.] (default, Feb 23 2021, 21:15:04) [GCC 7.3.0]
DA available: True
U 0,1: GeForce RTX 2080 Ti
DA_HOME: /usr/local/cuda-10.0
CC: Cuda compilation tools, release 10.0, V10.0.130
C: gcc (Ubuntu 7.5.0-3ubuntu1~18.04) 7.5.0
Torch: 1.2.0
Torch compiling details: PyTorch built with:
  - GCC 7.3
  - Intel(R) Math Kernel Library Version 2019.0.4 Product Build 20190411 for Intel(R) 64 architecture applications
  - Intel(R) MKL-DNN v0.18.1 (Git Hash 7de7e5d02bf687f971e7668963649728356e0c20)
  - OpenMP 201511 (a.k.a. OpenMP 4.5)
  - NNPACK is enabled
  - CUDA Runtime 10.0
  - NVCC architecture flags: -gencode;arch=compute_35,code=sm_35;-gencode;arch=compute_50,code=sm_50;-gencode;arch=compute_60,code=sm_60;-gencode;arch=compute_61,code=sm_61
  - CuDNN 7.6.2
  - Magma 2.5.1
  - Build settings: BLAS=MKL, BUILD_NAMEDTENSOR=OFF, BUILD_TYPE=Release, CXX_FLAGS=-Wno-deprecated -fvisibility-inlines-hidden -fopenmp -DUSE_FBGEMM -DUSE_QNNPACK -DUSE_PYTORCH
  - TorchVision: 0.4.0
  - enCV: 4.5.1
  - CV: 1.3.1
  - CV Compiler: n/a
  - CV CUDA Compiler: n/a
  - Classification: 0.10.0+31a6a36
```

由于训练过程消耗时间较长，请耐心等待，epoch 可根据实际情况进行设置，观察训练是否收敛，准确率在一段时间内稳定不再上升时，代表训练结束，如下图所示：



进入 ckpt 文件夹，即可查看训练出来的 pytorch 模型，如下图所示：

至此模型训练讲述完毕。

后面如何将 pytorch 模型转化为 caffe 模型，请参考

参考《基于 Taurus 套件进行训练图片制作、模型训练、模型转换指导手册（resnet18 网络进行垃圾分类为例）.pdf》第 5 章节的内容，这里不再详细论述。