

# 1.安装 OpenTuner

去清华源下载，选择python3.8的x86\_64版本

Miniconda3-py38_4.8.3-Windows-x86_64.exe	55.7 MiB	2020-06-17 04:06
Miniconda3-py38_4.9.2-Linux-aarch64.sh	111.8 MiB	2021-05-14 22:53
Miniconda3-py38_4.9.2-Linux-ppc64le.sh	91.9 MiB	2020-11-24 03:21
Miniconda3-py38_4.9.2-Linux-s390x.sh	102.5 MiB	2021-05-14 23:15
<u>Miniconda3-py38_4.9.2-Linux-x86_64.sh</u>	89.9 MiB	2020-11-24 03:21
Miniconda3-py38_4.9.2-MacOSX-x86_64.pkg	62.0 MiB	2020-11-24 03:21
Miniconda3-py38_4.9.2-MacOSX-x86_64.sh	54.5 MiB	2020-11-24 03:22
Miniconda3-py38_4.9.2-Windows-x86.exe	54.2 MiB	2020-11-24 03:22
Miniconda3-py38_4.9.2-Windows-x86_64.exe	57.0 MiB	2020-11-24 03:22
Miniconda3-py39_4.10.1-Linux-aarch64.sh	69.8 MiB	2021-06-02 07:46
Miniconda3-py39_4.10.1-Linux-s390x.sh	57.1 MiB	2021-06-02 07:46
Miniconda3-py39_4.10.3-Linux-aarch64.sh	62.6 MiB	2021-07-22 00:14
Miniconda3-py39_4.10.3-Linux-ppc64le.sh	60.6 MiB	2021-07-22 00:14
Miniconda3-py39_4.10.3-Linux-s390x.sh	57.1 MiB	2021-07-22 00:14
Miniconda3-py39_4.10.3-Linux-x86_64.sh	63.6 MiB	2021-07-22 00:14
Miniconda3-py39_4.10.3-MacOSX-x86_64.pkg	49.9 MiB	2021-07-22 00:14
Miniconda3-py39_4.10.3-MacOSX-x86_64.sh	42.3 MiB	2021-07-22 00:14
Miniconda3-py39_4.10.3-Windows-x86.exe	55.3 MiB	2021-07-22 00:14
Miniconda3-py39_4.10.3-Windows-x86_64.exe	58.1 MiB	2021-07-22 00:14
Miniconda3-py39_4.9.2-Linux-aarch64.sh	76.2 MiB	2021-05-14 22:53

```
wget https://mirrors.tuna.tsinghua.edu.cn/anaconda/miniconda/Miniconda3-py38_4.9.2-Linux-x86_64.sh
```

```
zhangkeer@zhangkeer-virtual-machine:~$ uname -a
Linux zhangkeer-virtual-machine 5.11.0-36-generic #40-20.04.1-Ubuntu SMP Sat Sep 10 02:14:19 UTC 2021 x86_64 x86_64 x86_64 GNU/Linux
zhangkeer@zhangkeer-virtual-machine:~$ wget https://mirrors.tuna.tsinghua.edu.cn/anaconda/miniconda/Miniconda3-py38_4.9.2-Linux-x86_64.sh
--2021-09-25 14:38:03-- https://mirrors.tuna.tsinghua.edu.cn/anaconda/miniconda/Miniconda3-py38_4.9.2-Linux-x86_64.sh
Resolving mirrors.tuna.tsinghua.edu.cn (mirrors.tuna.tsinghua.edu.cn)... 101.6.15.130, 2402:f000:1:400::2
Connecting to mirrors.tuna.tsinghua.edu.cn (mirrors.tuna.tsinghua.edu.cn)|101.6.15.130|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 94235922 (90M) [application/octet-stream]
Saving to: 'Miniconda3-py38_4.9.2-Linux-x86_64.sh'

Miniconda3-py38_4.9.2-Linux-x86_64.sh 100%[=====] 89.87M 4.03MB/s in 22s

2021-09-25 14:38:25 (4.09 MB/s) - 'Miniconda3-py38_4.9.2-Linux-x86_64.sh' saved [94235922/94235922]

zhangkeer@zhangkeer-virtual-machine:~$
```

在文件所在目录打开终端

```
chmod 777 Miniconda3-latest-Linux-x86_64.sh
sh Miniconda3-latest-Linux-x86_64.sh
```

然后一路yes

```
zhangkeer@zhangkeer-virtual-machine: ~  
pyparser      pkgs/main/noarch::pyparser-2.20-py_2  
pyopenssl      pkgs/main/noarch::pyopenssl-19.1.0-pyhd3eb1b0_1  
pysocks        pkgs/main/linux-64::pysocks-1.7.1-py38h06a4308_0  
python         pkgs/main/linux-64::python-3.8.5-h7579374_1  
readline       pkgs/main/linux-64::readline-8.0-h7b6447c_0  
requests       pkgs/main/noarch::requests-2.24.0-py_0  
ruamel_yaml    pkgs/main/linux-64::ruamel_yaml-0.15.87-py38h7b6447c_1  
setuptools     pkgs/main/linux-64::setuptools-50.3.1-py38h06a4308_1  
six            pkgs/main/linux-64::six-1.15.0-py38h06a4308_0  
sqlite         pkgs/main/linux-64::sqlite-3.33.0-h62c20be_0  
tk             pkgs/main/linux-64::tk-8.6.10-hbc83047_0  
tqdm           pkgs/main/noarch::tqdm-4.51.0-pyhd3eb1b0_0  
urllib3        pkgs/main/noarch::urllib3-1.25.11-py_0  
wheel          pkgs/main/noarch::wheel-0.35.1-pyhd3eb1b0_0  
xz             pkgs/main/linux-64::xz-5.2.5-h7b6447c_0  
yaml           pkgs/main/linux-64::yaml-0.2.5-h7b6447c_0  
zlib           pkgs/main/linux-64::zlib-1.2.11-h7b6447c_3  
  
Preparing transaction: done  
Executing transaction: done  
Installation finished.  
Do you wish the installer to initialize Miniconda3  
by running conda init? [yes/no]  
[no] >>> yes  
Miniconda3-py38 4.9.2-Linux-x86_64.sh: 494: [: not found  
no change      /home/zhangkeer/miniconda3/condabin/conda  
no change      /home/zhangkeer/miniconda3/bin/conda  
no change      /home/zhangkeer/miniconda3/bin/conda-env  
no change      /home/zhangkeer/miniconda3/bin/activate  
no change      /home/zhangkeer/miniconda3/bin/deactivate  
no change      /home/zhangkeer/miniconda3/etc/profile.d/conda.sh  
no change      /home/zhangkeer/miniconda3/etc/fish/conf.d/conda.fish  
no change      /home/zhangkeer/miniconda3/shell/condabin/conda.ps1  
no change      /home/zhangkeer/miniconda3/lib/python3.8/site-packages/xontrib/conda.xsh  
no change      /home/zhangkeer/miniconda3/etc/profile.d/conda.csh  
modified       /home/zhangkeer/.bashrc  
  
==> For changes to take effect, close and re-open your current shell. <==  
  
If you'd prefer that conda's base environment not be activated on startup,  
set the auto_activate_base parameter to false:  
  
conda config --set auto_activate_base false  
  
Thank you for installing Miniconda3!  
zhangkeer@zhangkeer-virtual-machine:~$
```

即安装成功。

查看版本号:

```
(base) zhangkeer@zhangkeer-virtual-machine:~$ conda -V  
conda 4.9.2  
(base) zhangkeer@zhangkeer-virtual-machine:~$
```

给conda 添加清华源, 这样安装其他包的时候, 下载速度会很快

```
conda config --add channels  
https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgsg/free/  
conda config --add channels  
https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgsg/main/  
conda config --add channels  
https://mirrors.tuna.tsinghua.edu.cn/anaconda/cloud/conda-forge/  
conda config --add channels  
https://mirrors.tuna.tsinghua.edu.cn/anaconda/cloud/bioconda/  
conda config --set show_channel_urls yes  
conda config --get channels
```

配置完成后 主目录文件夹多了个隐藏文件 .condarc

这里要注意: .condarc 文件打开后里面有 - default 一定要删除掉

```
Open .condarc Save

1 channels:
2 - https://mirrors.tuna.tsinghua.edu.cn/anaconda/cloud/bioconda/
3 - https://mirrors.tuna.tsinghua.edu.cn/anaconda/cloud/conda-forge/
4 - https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkg/main/
5 - https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkg/free/
6
7 show_channel_urls: true
```

创建虚拟环境：

```
conda create --name=opentuner python=3.8
```

```
python anaconda/cloud/conda-forge/linux-64::python-3.8.12-hb7a2770_0_cpython
python_abi anaconda/cloud/conda-forge/linux-64::python_abi-3.8-2_cp38
readline anaconda/cloud/conda-forge/linux-64::readline-8.1-h4c0c6b4_0
setup tools anaconda/cloud/conda-forge/linux-64::setup tools-58.0.4-py38h578d9bd_1
sqlite anaconda/cloud/conda-forge/linux-64::sqlite-3.36.0-h9cd32fc_1
tk anaconda/cloud/conda-forge/linux-64::tk-8.6.11-h27826a3_1
wheel anaconda/cloud/conda-forge/linux-64::wheel-0.37.0-pyhd8ed1ab_1
xz anaconda/cloud/conda-forge/linux-64::xz-5.2.5-h516909a_1
zlib anaconda/cloud/conda-forge/linux-64::zlib-1.2.11-h516909a_1010

Proceed ([y]/n)? y

Downloading and Extracting Packages
openmp_mutex-4.5 22 KB |#####| 100%
libgcc_mutex-0.1 3 KB |#####| 100%
readline-8.1 295 KB |#####| 100%
libgomp-11.2.0 428 KB |#####| 100%
python-3.8.12 26.2 MB |#####| 100%
libgcc-ng-11.2.0 892 KB |#####| 100%
python_abi-3.8 4 KB |#####| 100%
openssl-1.1.1l 2.1 MB |#####| 100%
tk-8.6.11 3.3 MB |#####| 100%
libffi-3.4.2 57 KB |#####| 100%
plp-21.2.4 1.1 MB |#####| 100%
xz-5.2.5 343 KB |#####| 100%
ca-certificates-2021 136 KB |#####| 100%
ld_impl_linux-64-2.3 607 KB |#####| 100%
wheel-0.37.0 31 KB |#####| 100%
ncurses-6.2 985 KB |#####| 100%
zlib-1.2.11 106 KB |#####| 100%
sqlite-3.36.0 1.4 MB |#####| 100%
setup tools-58.0.4 964 KB |#####| 100%
libstdc++-ng-11.2.0 4.2 MB |#####| 100%
Preparing transaction: done
Verifying transaction: done
Executing transaction: done
#
# To activate this environment, use
#
# $ conda activate opentuner
#
# To deactivate an active environment, use
#
# $ conda deactivate
#
(base) zhangkeer@zhangkeer-virtual-machine:~$
```

激活环境：

```
conda activate opentuner
```

```
(base) zhangkeer@zhangkeer-virtual-machine:~$ conda activate opentuner
(opentuner) zhangkeer@zhangkeer-virtual-machine:~$
```

下载opentuner：

```
wget https://github.com/jansel/opentuner
```

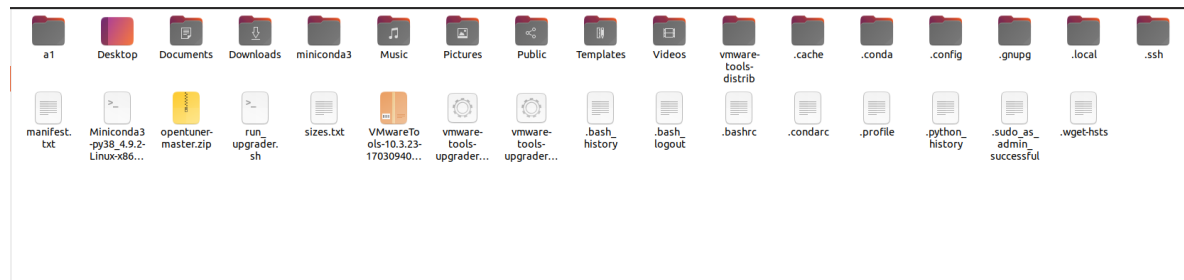
```
(opentuner) zhangkeer@zhangkeer-virtual-machine:~$ wget https://github.com/jansel/opentuner
--2021-09-25 15:00:04-- https://github.com/jansel/opentuner
Resolving github.com (github.com)... 20.205.243.166
Connecting to github.com (github.com)|20.205.243.166|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: unspecified [text/html]
Saving to: 'opentuner'

opentuner [ <> ] 193.21K 390KB/s in 0.5s

2021-09-25 15:00:06 (390 KB/s) - 'opentuner' saved [197852]
(opentuner) zhangkeer@zhangkeer-virtual-machine:~$
```

这种方式是错误的，最后下载的是html网页。

我选择了先将zip下载到本地主机，再复制粘贴到虚拟机里



解压：

```
unzip opentuner-master.zip
```

安装opentuner：

```
pip install -r requirements.txt -r optional-requirements.txt
```

```
Terminal
9月 25 15:11
zhangkeer@zhangkeer-virtual-machine: ~/opentuner-master

Collecting python-dateutil<=2.7
  Downloading python-dateutil-2.8.2-py2.py3-none-any.whl (247 kB)
Collecting pillow<=6.2.0
  Downloading Pillow-8.3.2-cp38-cp38-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (3.0 MB)
Collecting pyparsing<=2.2.1
  Downloading pyparsing-2.4.7-py3-none-any.whl (67 kB)
Collecting cyclers<=0.10
  Downloading cyclers-0.10.0-py2.py3-none-any.whl (6.5 kB)
Collecting attrs<=19.2.0
  Downloading attrs-21.2.0-py3-none-any.whl (53 kB)
Collecting py<=1.8.2
  Downloading py-1.10.0-py2.py3-none-any.whl (97 kB)
Collecting pluggy<2.0,>=0.12
  Downloading pluggy-1.0.0-py3-none-any.whl (13 kB)
Collecting toml
  Downloading toml-0.10.2-py2.py3-none-any.whl (16 kB)
Collecting packaging
  Downloading packaging-21.0-py3-none-any.whl (40 kB)
Collecting iniconfig
  Downloading iniconfig-1.1.1-py2.py3-none-any.whl (5.0 kB)
Requirement already satisfied: setuptools in /home/zhangkeer/miniconda3/envs/opentuner/lib/python3.8/site-packages (from pypandoc->r optional-requirements.txt (line 4)) (58.0.4)
Requirement already satisfied: pip>=8.1.0 in /home/zhangkeer/miniconda3/envs/opentuner/lib/python3.8/site-packages (from pypandoc->r optional-requirements.txt (line 4)) (21.2.4)
Requirement already satisfied: wheel>=0.25.0 in /home/zhangkeer/miniconda3/envs/opentuner/lib/python3.8/site-packages (from pypandoc->r optional-requirements.txt (line 4)) (0.37.0)
Collecting six
  Downloading six-1.16.0-py2.py3-none-any.whl (11 kB)
Building wheels for collected packages: fn, future, pypandoc
  Building wheel for fn (setup.py) ... done
  Created wheel for fn: filename=fn-0.4.3-py3-none-any.whl size=28238 sha256=448bca7813fe4c763f64b83b1452ef21e3c8c82c5a5150b93f5b24b4c7b8943f
  Stored in directory: /home/zhangkeer/.cache/pip/wheels/5d/3a/c0/2de7dc84e4b39a4705dfbd284e4c14dc1fe0011b7369101b0
  Building wheel for future (setup.py) ... done
  Created wheel for future: filename=future-0.18.2-py3-none-any.whl size=491070 sha256=91425cadabc329e6786edbd90ff315241a1bc619cf1550a4832ebd98dc3d71c
  Stored in directory: /home/zhangkeer/.cache/pip/wheels/8e/70/28/3d6ccdd6e315f65f245da085482a2e1c7d14b90b30f239e2c4
  Building wheel for pypandoc (setup.py) ... done
  Created wheel for pypandoc: filename=pypandoc-1.6.4-py3-none-any.whl size=17427 sha256=b58e023ff0191af588e04d419be9cc29ab9f72d5eae25b4d15c71233cbd519f
  Stored in directory: /home/zhangkeer/.cache/pip/wheels/1d/e4/65/4bccab1dbf6dbae3f943a3c3bbf04c348ac3f3094520eb1375
Successfully built fn future pypandoc
Installing collected packages: six, pyparsing, toml, sqlparse, pytz, python-dateutil, py, pluggy, pillow, packaging, numpy, kiwisolver, iniconfig, greenlet, cyclers, attrs, asgiref, SQLAlchemy, pytest, pypandoc, matplotlib, future, fn, django, argparse
Successfully installed SQLAlchemy-1.4.25 argparse-1.4.0 asgiref-3.4.1 attrs-21.2.0 cyclers-0.10.0 django-3.2.7 fn-0.4.3 future-0.18.2 greenlet-1.1.1 iniconfig-1.1.1 kiwisolver-1.3.2 matplotlib-3.4.3 numpy-1.21.2 packaging-21.0 pillow-8.3.2 pluggy-1.0.0 py-1.10.0 pypandoc-1.6.4 pyparsing-2.4.7 pytest-6.2.5 python-dateutil-2.8.2 pytz-2021.1 six-1.16.0 sqlparse-0.4.2 toml-0.10.2
(opentuner) zhangkeer@zhangkeer-virtual-machine:~/opentuner-master$
```

```
python setup.py develop
```

报错：

```
(opentuner) zhangkeer@zhangkeer-virtual-machine:~/opentuner-master$ python setup.py develop
setup.py:13: DeprecationWarning: Due to possible ambiguity, 'convert()' is deprecated. Use 'convert_file()' or 'convert_text()'.
  read_md = lambda f: convert(f, 'rest')
Maybe try:

    sudo apt-get install pandoc
See http://johnmacfarlane.net/pandoc/installing.html
for installation options
-----
Traceback (most recent call last):
  File "setup.py", line 30, in <module>
    long_description=read_md('README.md'),
  File "setup.py", line 13, in <lambda>
    read_md = lambda f: convert(f, 'rest')
  File "/home/zhangkeer/miniconda3/envs/opentuner/lib/python3.8/site-packages/pypandoc/_init_.py", line 67, in convert
    return _convert_input(source, format, input_type, to, extra_args=extra_args,
  File "/home/zhangkeer/miniconda3/envs/opentuner/lib/python3.8/site-packages/pypandoc/_init_.py", line 260, in _convert_input
    _ensure_pandoc_path()
  File "/home/zhangkeer/miniconda3/envs/opentuner/lib/python3.8/site-packages/pypandoc/_init_.py", line 570, in _ensure_pandoc_path
    raise OSError("No pandoc was found: either install pandoc and add it to
OSError: No pandoc was found: either install pandoc and add it to your PATH or call pypandoc.download_pandoc(...) or install pypandoc wheels with included pandoc.
(opentuner) zhangkeer@zhangkeer-virtual-machine:~/opentuner-master$
```

按提示安装pandoc:

```
sudo apt-get install pandoc
```

重新运行setup.py 成功:

```
reading manifest file 'opentuner.egg-info/SOURCES.txt'
reading manifest template 'MANIFEST.in'
adding license file 'LICENSE.txt'
adding license file 'AUTHORS.txt'
writing manifest file 'opentuner.egg-info/SOURCES.txt'
running build_ext
Creating /home/zhangkeer/miniconda3/envs/opentuner/lib/python3.8/site-packages/opentuner.egg-link (link to .)
Adding opentuner 0.8.7 to easy-install.pth file

Installed /home/zhangkeer/opentuner-master
Processing dependencies for opentuner==0.8.7
Searching for SQLAlchemy==1.4.25
Best match: SQLAlchemy 1.4.25
Adding SQLAlchemy 1.4.25 to easy-install.pth file

Using /home/zhangkeer/miniconda3/envs/opentuner/lib/python3.8/site-packages
Searching for numpy==1.21.2
Best match: numpy 1.21.2
Adding numpy 1.21.2 to easy-install.pth file
Installing f2py script to /home/zhangkeer/miniconda3/envs/opentuner/bin
Installing f2py3 script to /home/zhangkeer/miniconda3/envs/opentuner/bin
Installing f2py3.8 script to /home/zhangkeer/miniconda3/envs/opentuner/bin

Using /home/zhangkeer/miniconda3/envs/opentuner/lib/python3.8/site-packages
Searching for future==0.18.2
Best match: future 0.18.2
Adding future 0.18.2 to easy-install.pth file
Installing futurize script to /home/zhangkeer/miniconda3/envs/opentuner/bin
Installing pasteurize script to /home/zhangkeer/miniconda3/envs/opentuner/bin

Using /home/zhangkeer/miniconda3/envs/opentuner/lib/python3.8/site-packages
Searching for fn==0.4.3
Best match: fn 0.4.3
Adding fn 0.4.3 to easy-install.pth file

Using /home/zhangkeer/miniconda3/envs/opentuner/lib/python3.8/site-packages
Searching for argparse==1.4.0
Best match: argparse 1.4.0
Adding argparse 1.4.0 to easy-install.pth file

Using /home/zhangkeer/miniconda3/envs/opentuner/lib/python3.8/site-packages
Searching for greenlet==1.1.1
Best match: greenlet 1.1.1
Adding greenlet 1.1.1 to easy-install.pth file

Using /home/zhangkeer/miniconda3/envs/opentuner/lib/python3.8/site-packages
Finished processing dependencies for opentuner==0.8.7
(opentuner) zhangkeer@zhangkeer-virtual-machine:~/opentuner-master$
```

检查是否安装成功:

```
pytest tests/*
```

```
(opentuner) zhangkeer@zhangkeer-virtual-machine:~/opentuner-master$ pytest tests/*
===== test session starts =====
platform linux -- Python 3.8.12, pytest-6.2.5, py-1.10.0, pluggy-1.0.0
rootdir: /home/zhangkeer/opentuner-master
collected 23 items

tests/test_manipulator.py ..... [ 82%]
tests/test_technique.py ..... [100%]

===== warnings summary =====
../miniconda3/envs/opentuner/lib/python3.8/site-packages/future/standard_library/__init__.py:65
  /home/zhangkeer/miniconda3/envs/opentuner/lib/python3.8/site-packages/future/standard_library/__init__.py:65: DeprecationWarning: the imp module is deprecated in favour of importlib; see the module's documentation for alternative uses
    import imp

../miniconda3/envs/opentuner/lib/python3.8/site-packages/fn/liters.py:2
  /home/zhangkeer/miniconda3/envs/opentuner/lib/python3.8/site-packages/fn/liters.py:2: DeprecationWarning: Using or importing the ABCs from 'collections' instead of from 'collections.abc' is deprecated since Python 3.3, and in 3.10 it will stop working
    from collections import deque, Iterable

-- Docs: https://docs.pytest.org/en/stable/warnings.html
===== 23 passed, 2 warnings in 0.80s =====
(opentuner) zhangkeer@zhangkeer-virtual-machine:~/opentuner-master$
```

```
./examples/rosenbrock/rosenbrock.py
```

```

(opentuner) zhangke@zhangkeer-virtual-machine: /opentuner-master$ ./examples/rotenbrock/rotenbrock.py
[ 65] INFO opentuner.search.metatechniques: AUCBanditMetaTechniqueA: [('NormalGreedyMutation', 236), ('RandomNelderMead', 116), ('UniformGreedyMutation', 75), ('DifferentialEvolutionAlt', 74)]
[ 115] INFO opentuner.search.plugin.DisplayPlugin: tests=944, best (0: 0.9999999999993438, 1: 0.99999999461913376), cost time=0.0000, found by RandomNelderMead
[ 175] INFO opentuner.search.metatechniques: AUCBanditMetaTechniqueA: [('NormalGreedyMutation', 126), ('DifferentialEvolutionAlt', 126), ('RandomNelderMead', 125), ('UniformGreedyMutation', 124)]
[ 215] INFO opentuner.search.plugin.DisplayPlugin: tests=1900, best (0: 0.9999999999998863, 1: 0.9999999999998863), cost time=0.0000, found by RandomNelderMead
[ 225] INFO opentuner.search.metatechniques: AUCBanditMetaTechniqueA: [('UniformGreedyMutation', 173), ('DifferentialEvolutionAlt', 165), ('NormalGreedyMutation', 163)]
[ 265] INFO opentuner.search.metatechniques: AUCBanditMetaTechniqueA: [('NormalGreedyMutation', 182), ('DifferentialEvolutionAlt', 162), ('UniformGreedyMutation', 157)]
[ 315] INFO opentuner.search.plugin.DisplayPlugin: tests=2952, best (0: 0.9999999999998863, 1: 0.9999999999998863), cost time=0.0000, found by RandomNelderMead
[ 315] INFO opentuner.search.metatechniques: AUCBanditMetaTechniqueA: [('DifferentialEvolutionAlt', 169), ('NormalGreedyMutation', 167), ('UniformGreedyMutation', 165)]
[ 365] INFO opentuner.search.metatechniques: AUCBanditMetaTechniqueA: [('UniformGreedyMutation', 175), ('DifferentialEvolutionAlt', 174), ('NormalGreedyMutation', 152)]
[ 415] INFO opentuner.search.plugin.DisplayPlugin: tests=3984, best (0: 0.9999999999998863, 1: 0.9999999999998863), cost time=0.0000, found by RandomNelderMead
[ 415] INFO opentuner.search.metatechniques: AUCBanditMetaTechniqueA: [('NormalGreedyMutation', 183), ('DifferentialEvolutionAlt', 159), ('UniformGreedyMutation', 159)]
[ 465] INFO opentuner.search.metatechniques: AUCBanditMetaTechniqueA: [('UniformGreedyMutation', 168), ('NormalGreedyMutation', 168), ('DifferentialEvolutionAlt', 165)]
[ 515] INFO opentuner.search.plugin.DisplayPlugin: tests=4992, best (0: 0.9999999999998863, 1: 0.9999999999998863), cost time=0.0000, found by RandomNelderMead
[ 515] INFO opentuner.search.metatechniques: AUCBanditMetaTechniqueA: [('DifferentialEvolutionAlt', 179), ('UniformGreedyMutation', 179), ('NormalGreedyMutation', 143)]
[ 565] INFO opentuner.search.metatechniques: AUCBanditMetaTechniqueA: [('NormalGreedyMutation', 185), ('DifferentialEvolutionAlt', 158), ('UniformGreedyMutation', 158)]
[ 615] INFO opentuner.search.plugin.DisplayPlugin: tests=5976, best (0: 0.9999999999998863, 1: 0.9999999999998863), cost time=0.0000, found by RandomNelderMead
[ 615] INFO opentuner.search.metatechniques: AUCBanditMetaTechniqueA: [('NormalGreedyMutation', 175), ('DifferentialEvolutionAlt', 164), ('UniformGreedyMutation', 162)]
[ 665] INFO opentuner.search.metatechniques: AUCBanditMetaTechniqueA: [('UniformGreedyMutation', 176), ('DifferentialEvolutionAlt', 176), ('NormalGreedyMutation', 145)]
[ 715] INFO opentuner.search.plugin.DisplayPlugin: tests=6908, best (0: 0.9999999999998863, 1: 0.9999999999998863), cost time=0.0000, found by RandomNelderMead
[ 725] INFO opentuner.search.metatechniques: AUCBanditMetaTechniqueA: [('NormalGreedyMutation', 177), ('UniformGreedyMutation', 163), ('DifferentialEvolutionAlt', 161)]
[ 775] INFO opentuner.search.metatechniques: AUCBanditMetaTechniqueA: [('NormalGreedyMutation', 178), ('DifferentialEvolutionAlt', 163), ('UniformGreedyMutation', 160)]

```

## 2.阅读论文

介绍了OpenTuner这一开源框架的原理、有效性及其通用性。OpenTuner在autotuning中引入了搜索技术集成的概念，允许搜索技术协同工作来找到最佳方案，它实现了7个autotuners。同时，任何人可以以往这一开源项目中添加新的技术。在程序自动调整领域，OpenTuner发挥了很大的作用。

## 3.练习 Optimizing Block Matrix Multiplication教程

Save the sample code below to examples/tutorials/mmm\_block.cpp

```

#include <stdio.h>
#include <cstdlib>

#define N 100

int main(int argc, const char** argv)
{
    int n = BLOCK_SIZE * (N/BLOCK_SIZE);
    int a[N][N];
    int b[N][N];
    int c[N][N];
    int sum=0;
    for(int k1=0;k1<n;k1+=BLOCK_SIZE)
    {
        for(int j1=0;j1<n;j1+=BLOCK_SIZE)
        {
            for(int k1=0;k1<n;k1+=BLOCK_SIZE)
            {
                for(int i=0;i<n;i++)
                {
                    for(int j=j1;j<j1+BLOCK_SIZE;j++)
                    {
                        sum = c[i][j];
                        for(int k=k1;k<k1+BLOCK_SIZE;k++)
                        {
                            sum += a[i][k] * b[k][j];
                        }
                        c[i][j] = sum;
                    }
                }
            }
        }
    }
}

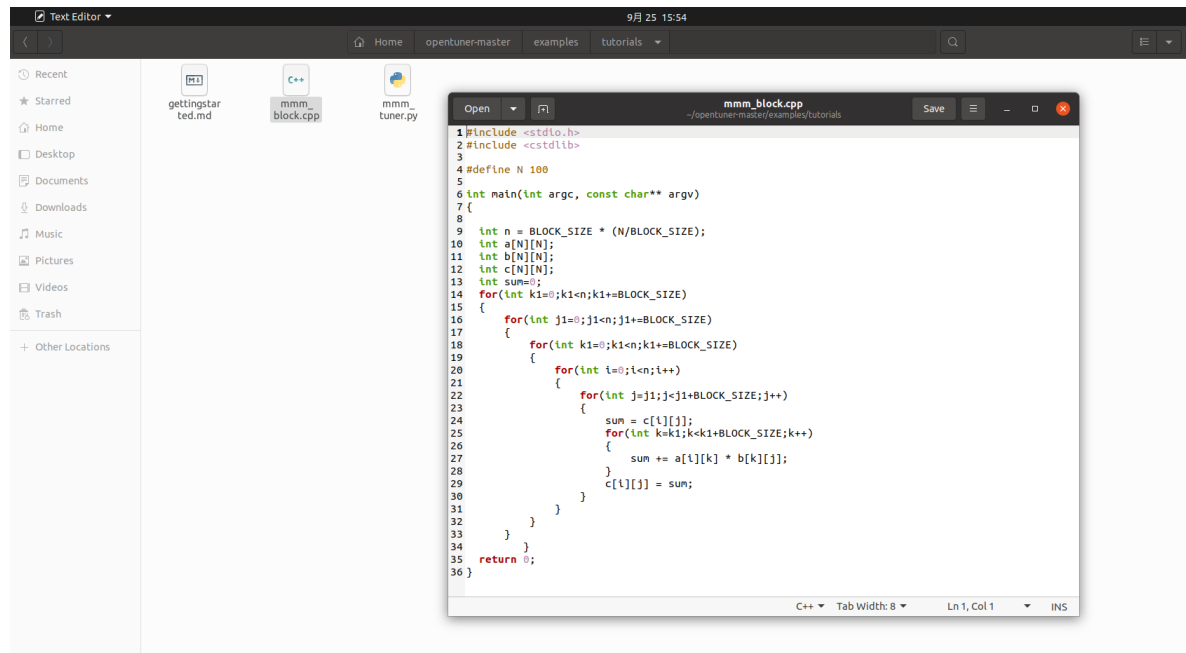
```

```

    }
    return 0;
}

```

已存在:



Save the following code to examples/tutorials/mmm\_tuner.py

```

#!/usr/bin/env python
#
# Optimize blocksize of apps/mmm_block.cpp
#
# This is an extremely simplified version meant only for tutorials
#
import adddeps # fix sys.path

import opentuner
from opentuner import ConfigurationManipulator
from opentuner import IntegerParameter
from opentuner import MeasurementInterface
from opentuner import Result

class GccFlagsTuner(MeasurementInterface):

    def manipulator(self):
        """
        Define the search space by creating a
        ConfigurationManipulator
        """
        manipulator = ConfigurationManipulator()
        manipulator.add_parameter(
            IntegerParameter('blockSize', 1, 10))
        return manipulator

```

```

def run(self, desired_result, input, limit):
    """
    Compile and run a given configuration then
    return performance
    """

    cfg = desired_result.configuration.data

    gcc_cmd = 'g++ mmm_block.cpp '
    gcc_cmd += '-DBLOCK_SIZE='+ cfg['blockSize']
    gcc_cmd += ' -o ./tmp.bin'

    compile_result = self.call_program(gcc_cmd)
    assert compile_result['returncode'] == 0

    run_cmd = './tmp.bin'

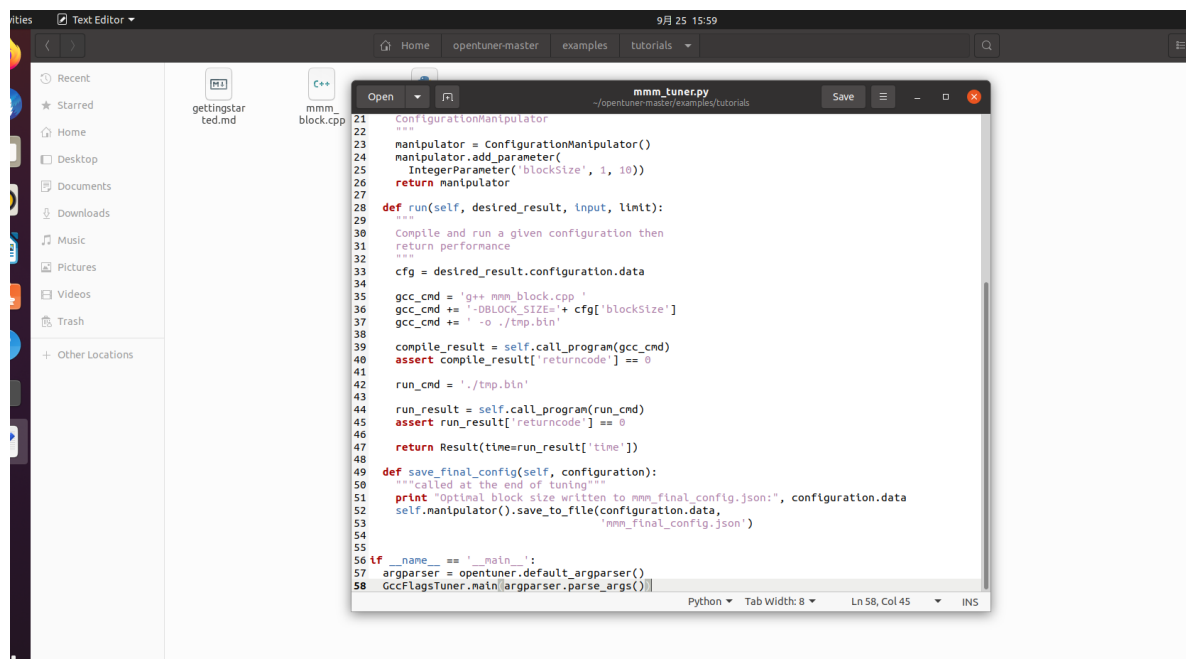
    run_result = self.call_program(run_cmd)
    assert run_result['returncode'] == 0

    return Result(time=run_result['time'])

def save_final_config(self, configuration):
    """called at the end of tuning"""
    print "Optimal block size written to mmm_final_config.json:",
configuration.data
    self.manipulator().save_to_file(configuration.data,
                                    'mmm_final_config.json')

if __name__ == '__main__':
    argparser = opentuner.default_argparser()
    GccFlagsTuner.main(argparser.parse_args())

```



Run the following command to autotune our program(The `-no-dups` flag hides warnings about duplicate results and the `-stop-after` parameter specifies that we are running opentuner for a maximum of 30 seconds):



```
python mmm_tuner.py --no-dups --stop-after=30
```

运行报错:

因为print 没有括号是python2的语法

```
(base) zhangkeer@zhangkeer-virtual-machine:~/opentuner-master/examples/tutorials$ python mmm_tuner.py --no-dups --stop-after=30
File "mmm_tuner.py", line 51
    print "Optimal block size written to mmm_final_config.json:", configuration.data
    ^
SyntaxError: Missing parentheses in call to 'print'. Did you mean print("Optimal block size written to mmm_final_config.json:", configuration.data)?
(base) zhangkeer@zhangkeer-virtual-machine:~/opentuner-master/examples/tutorials$
```

报错: 未找到模块

```
(base) zhangkeer@zhangkeer-virtual-machine:~/opentuner-master/examples/tutorials$ python mmm_tuner.py --no-dups --stop-after=30
Traceback (most recent call last):
  File "mmm_tuner.py", line 7, in <module>
    import adddeps # fix sys.path
ModuleNotFoundError: No module named 'adddeps'
(base) zhangkeer@zhangkeer-virtual-machine:~/opentuner-master/examples/tutorials$
```

安装命令:

```
pip install adddeps
```

上面对找不到模块的错误处理都不对, 因为作业不是连贯完成的, 这才注意到没有使用conda的 opentuner环境

修改环境后报错:

```
(opentuner) zhangkeer@zhangkeer-virtual-machine:~/opentuner-master/examples/tutorials$ python mmm_tuner.py --no-dups --stop-after=30
Traceback (most recent call last):
  File "mmm_tuner.py", line 58, in <module>
    GccFlagsTuner.main(argparser.parse_args())
  File "/home/zhangkeer/opentuner-master/opentuner/measurement/interface.py", line 300, in main
    return TuningRunMain(cls(args, *pargs, **kwargs), args).main()
  File "/home/zhangkeer/opentuner-master/opentuner/tuningrunmain.py", line 201, in main
    self.search_driver.main()
  File "/home/zhangkeer/opentuner-master/opentuner/search/driver.py", line 287, in main
    self.run_generation_results(offset=self.args.pipelining)
  File "/home/zhangkeer/opentuner-master/opentuner/search/driver.py", line 239, in run_generation_results
    self.wait_for_results(self.generation + offset)
  File "/home/zhangkeer/opentuner-master/opentuner/tuningrunmain.py", line 219, in results_wait
    self.measurement_driver.process_all()
  File "/home/zhangkeer/opentuner-master/opentuner/measurement/driver.py", line 217, in process_all
    self.run_desired_result(dr)
  File "/home/zhangkeer/opentuner-master/opentuner/measurement/driver.py", line 134, in run_desired_result
    result = self.interface.compile_and_run(desired_result, input,
  File "/home/zhangkeer/opentuner-master/opentuner/measurement/interface.py", line 131, in compile_and_run
    return self.run(desired_result, input, limit)
  File "mmm_tuner.py", line 36, in run
    gcc_cmd += '-DBLOCK_SIZE='+ cfg['blockSize']
TypeError: can only concatenate str (not "int") to str
(opentuner) zhangkeer@zhangkeer-virtual-machine:~/opentuner-master/examples/tutorials$
```

将36行的gcc\_cmd += '-DBLOCK\_SIZE='+ cfg['blockSize']修改为gcc\_cmd += '-DBLOCK\_SIZE='+ str(cfg['blockSize'])

运行结果:

```
Optimal block size written to mmm_final_config.json: {'blockSize': 3}
(opentuner) zhangkeer@zhangkeer-virtual-machine:~/opentuner-master/examples/tutorials$
```

