Report 1:
Install Ubuntu 20.04 and OP

YU-TING CHUNG 2024/10/07

Install Ubuntu 20.04

I installed OP on Ubuntu **24.04**

Issue: I have Python 3.12 installed on my computer. I initially used 3.12, but later encountered version incompatibility issues. Therefore, I used the method from notes to resolve the problem.

Installed Poetry Successsfully

After following the steps, I successfully installed Poetry, but the version was different from teacher's.

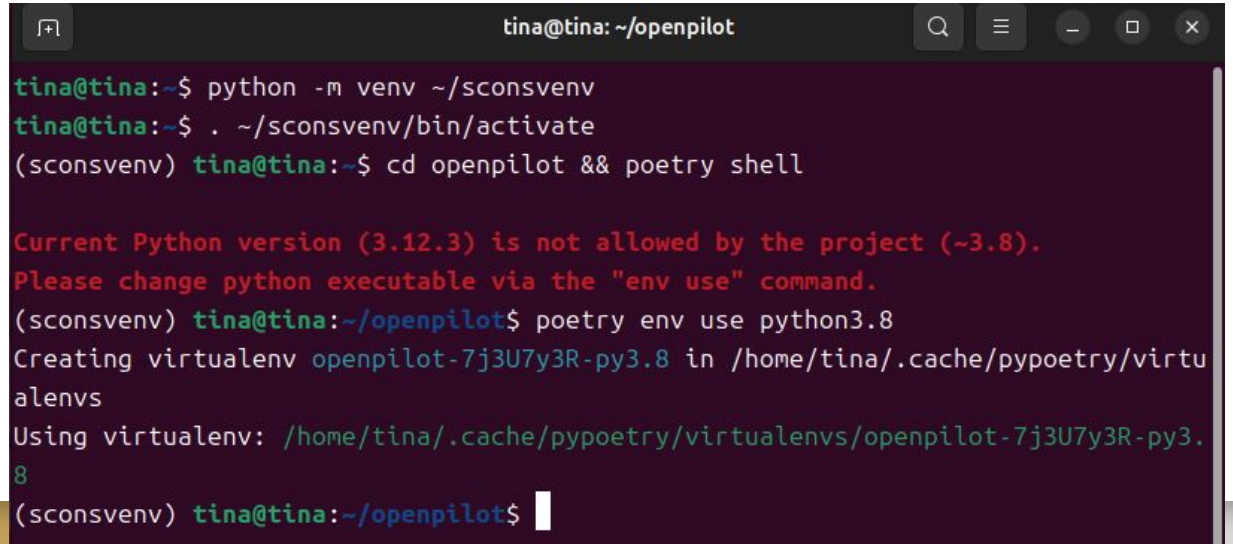
Mine was Poetry 1.8.3.

```
tina@tina:~$ gedit ~/.bashrc
tina@tina:~$ poetry --version
Poetry (version 1.8.3)
```

```
# Welcome to Poetry!

This will download and install the latest version of Poetry,
a dependency and package manager for Python.

It will add the `poetry` command to Poetry's bin directory, located at:

/home/tina/.local/bin

You can uninstall at any time by executing this script with the --uninstall option,
and these changes will be reverted.

Installing Poetry (1.8.3): Done

Poetry (1.8.3) is installed now. Great!

To get started you need Poetry's bin directory (/home/tina/.local/bin) in your `PATH`
environment variable.

Add `export PATH="/home/tina/.local/bin:$PATH"` to your shell configuration file.

Alternatively, you can call Poetry explicitly with `/home/tina/.local/bin/poetry`.

You can test that everything is set up by executing:

`poetry --version`

tina@tina:~$
```

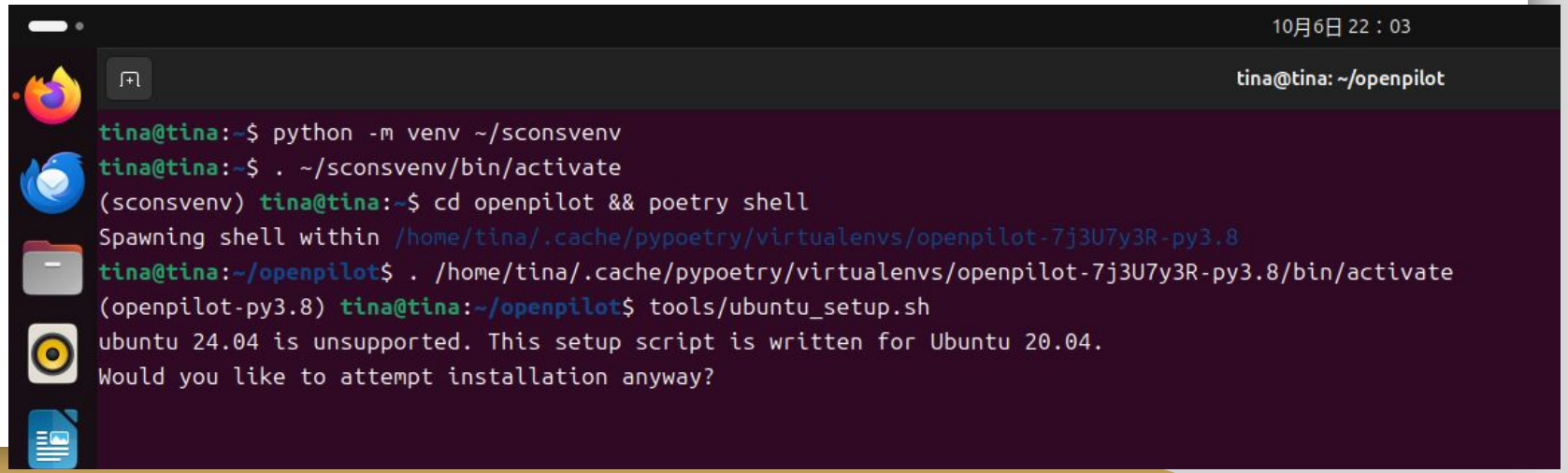
install OP => Get dataC
3.--- set up openpilot environment

Although I had previously used the method from my notes to solve the problem, a Python version incompatibility issue still appeared at this point. Therefore, I searched online for a solution. Following the instructions I found online, I typed `poetry env use python3.8`, and the red error messages stopped appearing. However, `(openpilot-py3.8)` now appears at the very beginning of my command prompt.



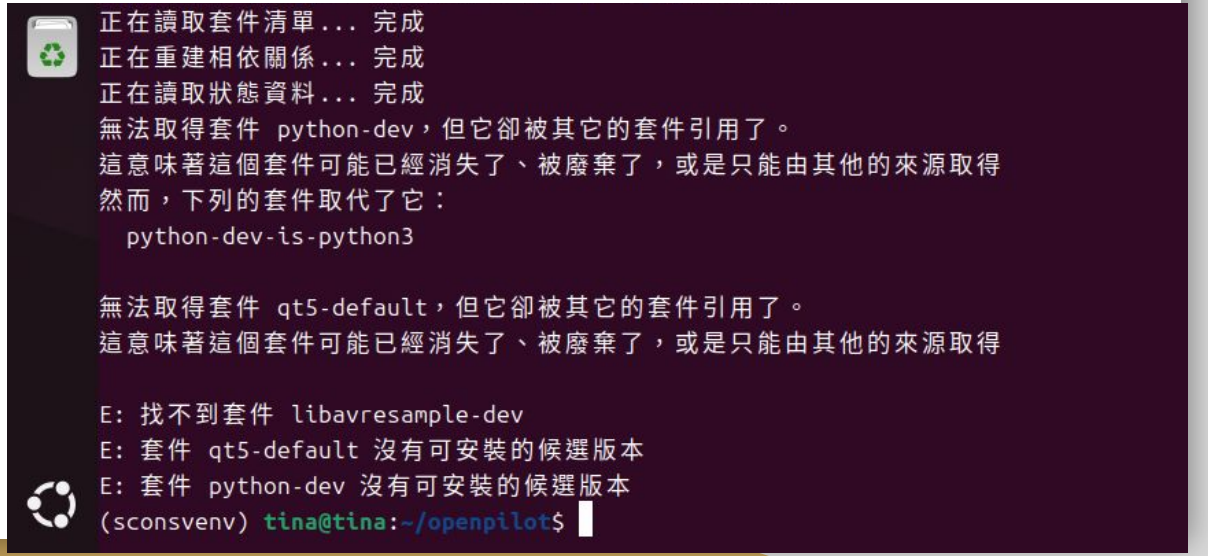
install OP => Get dataC
3.--- set up openpilot environment

Because the Ubuntu version was different from the teacher's, this command popped up. After I selected Yes, it seemed to work normally.



--- install OP => Get dataC
5.--- continue to set up: tools/ubuntu_setup.sh

An error occurred in this step where a package could not be found. I originally wanted to change to manual package installation, but the commands I found online also failed to install it.

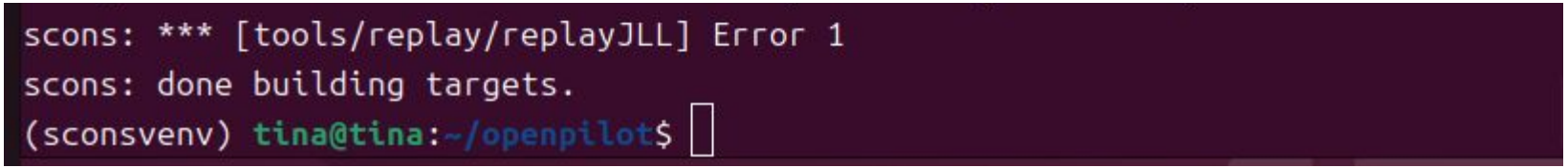


build OP

When (sconsvenv) jinn@ubuntu:~/openpilot$ scons -i, "scons: done building targets" appeared successfully, but there was also an Error.

Therefore, I searched online but could not find relevant solutions, so I proceeded to the next step.

*After asking the teacher, this error can be ignored.



Difficulties encountered so far

Next, when I entered (sconsvenv) tina@tina:~/openpilot$ scons -u -j$(nproc), the following error appeared. So I checked line 345 of SConstruct using the method from my notes, but it was already SConscript(['common/SConscript']).

*I have tried the steps in the teacher's notes, but the same error still appears.

*The teacher responded that no one has successfully installed OP on Ubuntu 24.04 yet, so the current solution might be to reinstall Ubuntu or continue searching online for a solution.

```
scons: *** [common/swaglog.o] Error 1
scons: building terminated because of errors.
```

Continue Report 1

Install Ubuntu 20.04 and OP

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Change Version

In Report 1, because the Ubuntu version was different from the teacher's, the installation failed. Therefore, in Report 2, the installation was changed to Ubuntu 20.04.

The Poetry version remained 1.8.3, and although it was different from the teacher's version, actual testing showed it did not affect the subsequent results.

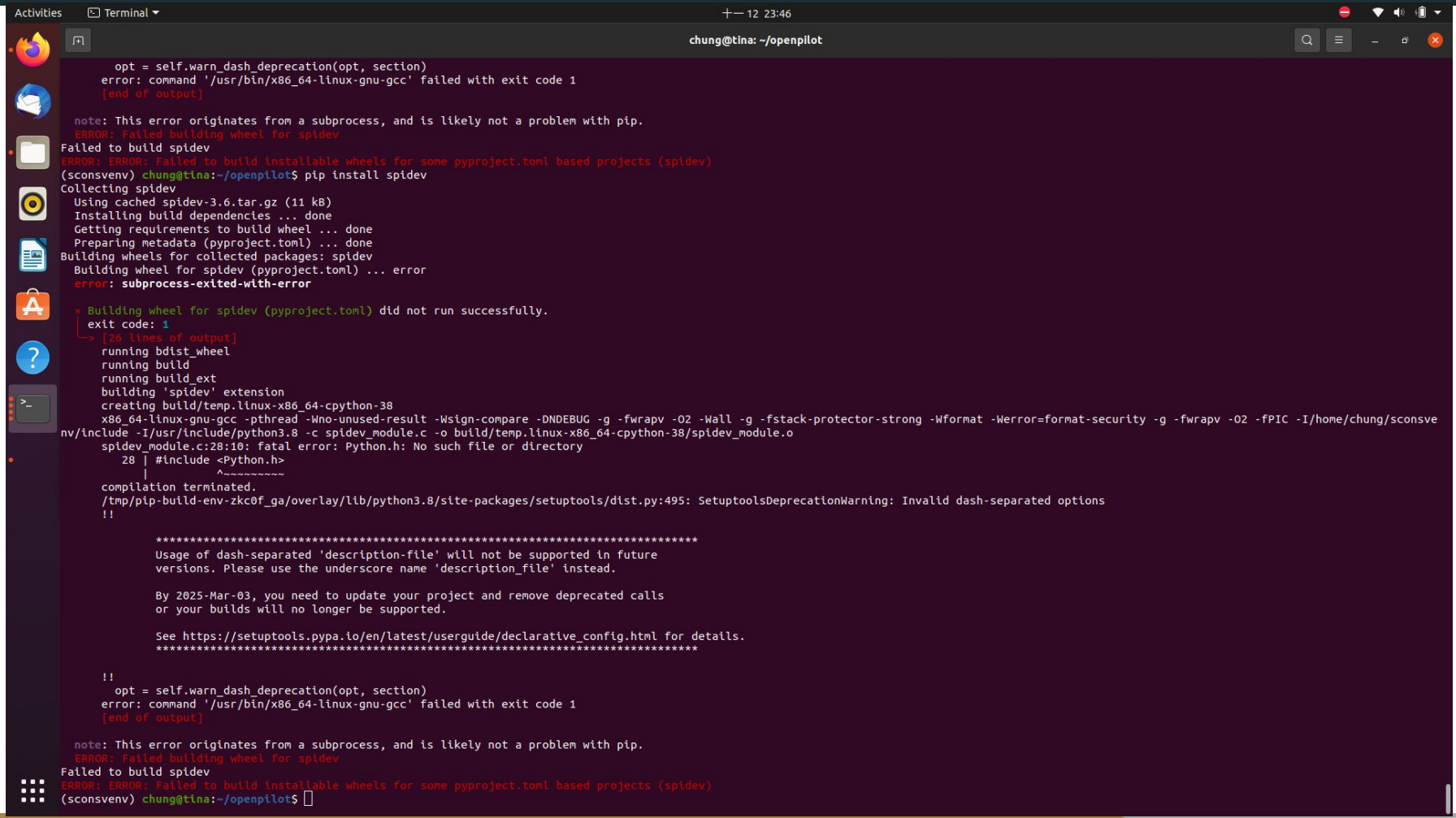
install poetry、install OP => Get dataC

- **install poetry** to **install OP => Get dataC** 3a. (sconsvenv) jinn@Liu:~$ cd openpilot && poetry shell can be installed smoothly.
- I did not use the teacher's update_requirements.sh because CalledProcessError, EnvcommandError, PoetryException, and other errors kept appearing. So I thought I would try not to use the teacher's update_requirements.sh。**It turned out that it had no effect, and the screen still appeared successfully later.**
- Before executing chmod +rwx update_requirements.sh, I first typed pip install --upgrade pip, which can avoid some errors that prevent files from being downloaded.
- poetry.lock used the teacher's file. It was not successful at first, but later I heard a classmate ask the teacher and found that the file in the notes was different from the one in the code folder. The teacher later also changed the notes.

```
  • Installing sphinx-rtd-theme (1.0.0)
  • Installing sphinx-sitemap (2.2.0)
  • Installing spidev (3.6): Failed

  CalledProcessError

  Command '['/home/chung/sconsvenv/bin/python', '-m', 'pip', 'install', '--use-pep517', '--disable-pip-version-check', '--prefix', '/home/chung/sconsvenv', '--no-deps', '/home/chung/.cache/pypoetry/artifacts/26/51/ca/a04145fb4e95d4cb56148d432fec55d14bdfe321ce9a351d169c384f3a/spidev-3.6.tar.gz']' returned non-zero exit status 1.

  at ~/.pyenv/versions/3.8.10/lib/python3.8/subprocess.py:516 in run
       512             # We don't call process.wait() as .__exit__ does that for us.
       513             raise
       514         retcode = process.poll()
       515         if check and retcode:
    →  516             raise CalledProcessError(retcode, process.args,
       517                                      output=stdout, stderr=stderr)
       518     return CompletedProcess(process.args, retcode, stdout, stderr)
       519
       520

The following error occurred when trying to handle this error:


  EnvCommandError

  Command ['/home/chung/sconsvenv/bin/python', '-m', 'pip', 'install', '--use-pep517', '--disable-pip-version-check', '--prefix', '/home/chung/sconsvenv', '--no-deps', '/home/chung/.cache/pypoetry/artifacts/26/51/ca/a04145fb4e95d4cb56148d432fec55d14bdfe321ce9a351d169c384f3a/spidev-3.6.tar.gz'] errored with the following return code 1, and output:
  Processing /home/chung/.cache/pypoetry/artifacts/26/51/ca/a04145fb4e95d4cb56148d432fec55d14bdfe321ce9a351d169c384f3a/spidev-3.6.tar.gz
    Installing build dependencies: started
    Installing build dependencies: finished with status 'done'
    Getting requirements to build wheel: started
    Getting requirements to build wheel: finished with status 'done'
    Preparing metadata (pyproject.toml): started
    Preparing metadata (pyproject.toml): finished with status 'done'
  Building wheels for collected packages: spidev
    Building wheel for spidev (pyproject.toml): started
    Building wheel for spidev (pyproject.toml): finished with status 'error'
    error: subprocess-exited-with-error

    × Building wheel for spidev (pyproject.toml) did not run successfully.
    │ exit code: 1
    ╰─> [26 lines of output]
        running bdist_wheel
        running build
        running build_ext
        building 'spidev' extension
        creating build/temp.linux-x86_64-cpython-38
        x86_64-linux-gnu-gcc -pthread -Wno-unused-result -Wsign-compare -DNDEBUG -g -fwrapv -O2 -Wall -g -fstack-protector-strong -Wformat -Werror=format-security -g -fwrapv -O2 -fPIC -I/home/chung/sconsvenv/include -I/usr/include/python3.8 -c spidev_module.c -o build/temp.linux-x86_64-cpython-38/spidev_module.o
        spidev_module.c:28:10: fatal error: Python.h: No such file or directory
           28 | #include <Python.h>
              |          ^~~~~~~~~~
        compilation terminated.
        /tmp/pip-build-env-2quxq38j/overlay/lib/python3.8/site-packages/setuptools/dist.py:495: SetuptoolsDeprecationWarning: Invalid dash-separated options
        !!
```

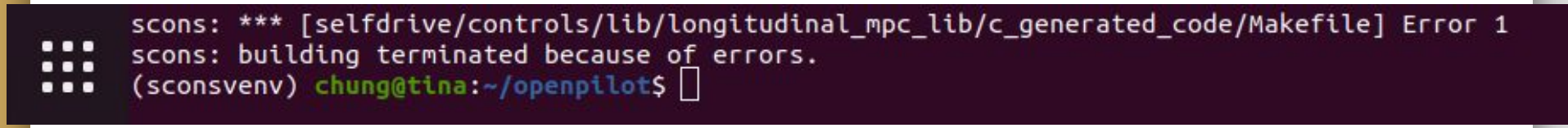
(sconsvenv) jinn@Liu:~/openpilot$ tools/ubuntu_setup.sh

- This was the step where I encountered the most errors. Initially, "Installing cryptography (37.0.4): Failed" appeared. The QA solution didn't work, and after searching online, I found that pip needed to be updated first. That's why pip was updated in the previous step.
- I encountered the error "Installing spidev (3.6): Failed". After using the QA solution, "ERROR: Failed building wheel for spidev" appeared. The QA solution still couldn't resolve the error, so I ignored it and continued. It turned out that it had no effect, and the screen still appeared successfully later.


Activities
Terminal
12 23:46
chung@tina: ~/openpilot
opt = self.warn_dash_deprecation(opt, section)
error: command '/usr/bin/x86_64-linux-gnu-gcc' failed with exit code 1
[end of output]
note: This error originates from a subprocess, and is likely not a problem with pip.
ERROR: Failed building wheel for spidev
Failed to build spidev
ERROR: ERROR: Failed to build installable wheels for some pyproject.toml based projects (spidev)
(sconsvenv) chung@tina:~/openpilot$ pip install spidev
Collecting spidev
Using cached spidev-3.6.tar.gz (11 kB)
Installing build dependencies ... done
Getting requirements to build wheel ... done
Preparing metadata (pyproject.toml) ... done
Building wheels for collected packages: spidev
Building wheel for spidev (pyproject.toml) ... error
error: subprocess-exited-with-error
× Building wheel for spidev (pyproject.toml) did not run successfully.
exit code: 1
[26 lines of output]
running bdist_wheel
running build
running build_ext
building 'spidev' extension
creating build/temp.linux-x86_64-cpython-38
x86_64-linux-gnu-gcc -pthread -Wno-unused-result -Wsign-compare -DNDEBUG -g -fwrapv -O2 -Wall -g -fstack-protector-strong -Wformat -Werror=format-security -g -fwrapv -O2 -fPIC -I/home/chung/sconsvenv/include -I/usr/include/python3.8 -c spidev_module.c -o build/temp.linux-x86_64-cpython-38/spidev_module.o
spidev_module.c:28:10: fatal error: Python.h: No such file or directory
28 | #include <Python.h>
| ^~~~~~~~~~
compilation terminated.
/tmp/pip-build-env-zkc0f_ga/overlay/lib/python3.8/site-packages/setuptools/dist.py:495: SetuptoolsDeprecationWarning: Invalid dash-separated options
!!
****
Usage of dash-separated 'description-file' will not be supported in future
versions. Please use the underscore name 'description_file' instead.
By 2025-Mar-03, you need to update your project and remove deprecated calls
or your builds will no longer be supported.
See https://setuptools.pypa.io/en/latest/userguide/declarative_config.html for details.
****
!!
opt = self.warn_dash_deprecation(opt, section)
error: command '/usr/bin/x86_64-linux-gnu-gcc' failed with exit code 1
[end of output]
note: This error originates from a subprocess, and is likely not a problem with pip.
ERROR: Failed building wheel for spidev
Failed to build spidev
ERROR: ERROR: Failed to build installable wheels for some pyproject.toml based projects (spidev)
(sconsvenv) chung@tina:~/openpilot$

build OP

- **(sconsvenv) jinn@Liu:~/openpilot$ scons -i, there was an error when doing this step. I skipped it at first, but then when running (sconsvenv) jinn@Liu:~/openpilot$ scons -u -j$(nproc), the following error appeared (as shown in the next slide).**
- **Finally, I found a PermissionError when running scons -i, so I used the QA solution and successfully executed scons -i.**
- **In the next step, when running scons -u -j$(nproc), the following situation occurred, but I ignored this error and continued.**



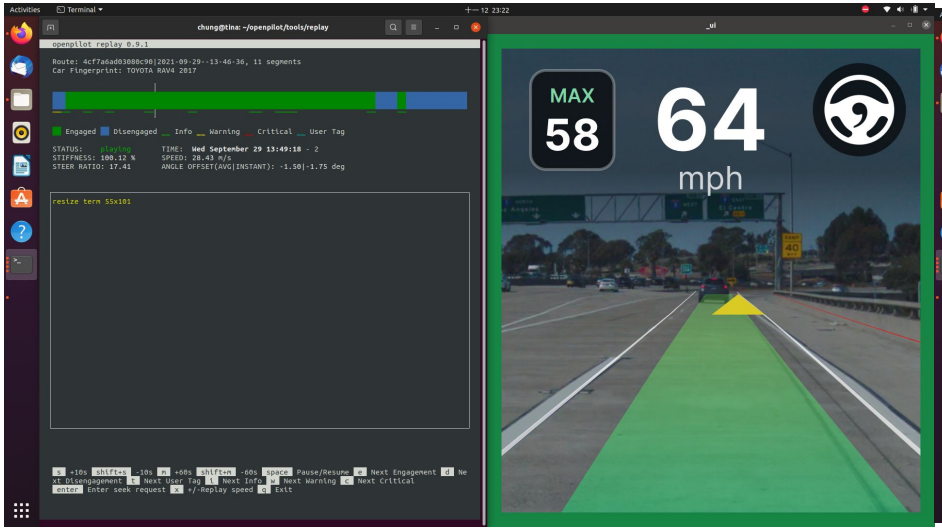
scons -i error

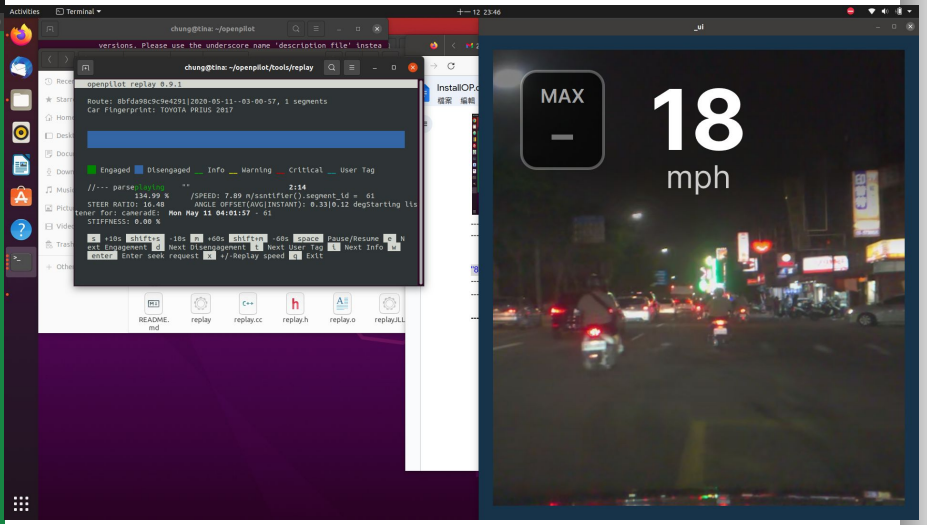
```
(sconsvenv) chung@tina:~/openpilot$ scons -i
scons: Reading SConscript files ...
fatal: detected dubious ownership in repository at '/home/chung/openpilot/body'
To add an exception for this directory, call:

        git config --global --add safe.directory /home/chung/openpilot/body
PermissionError: [Errno 13] Permission denied: 'obj/gitversion.h':
  File "/home/chung/openpilot/SConstruct", line 408:
    SConscript([
  File "/home/chung/sconsvenv/lib/python3.8/site-packages/SCons/Script/SConscript.py", line 660:
    return method(*args, **kw)
  File "/home/chung/sconsvenv/lib/python3.8/site-packages/SCons/Script/SConscript.py", line 597:
    return _SConscript(self.fs, *files, **subst_kw)
  File "/home/chung/sconsvenv/lib/python3.8/site-packages/SCons/Script/SConscript.py", line 285:
    exec(compile(scriptdata, scriptname, 'exec'), call_stack[-1].globals)
  File "/home/chung/openpilot/body/board/SConscript", line 125:
    with open("obj/gitversion.h", "w") as f:
```

scons -u -j$(nproc) error

```
(sconsvenv) chung@tina:~/openpilot$ scons -u -j$(nproc)
scons: Reading SConscript files ...
fatal: detected dubious ownership in repository at '/home/chung/openpilot/body'
To add an exception for this directory, call:

        git config --global --add safe.directory /home/chung/openpilot/body
PermissionError: [Errno 13] Permission denied: 'obj/gitversion.h':
  File "/home/chung/openpilot/SConstruct", line 408:
    SConscript([
  File "/home/chung/sconsvenv/lib/python3.8/site-packages/SCons/Script/SConscript.py", line 660:
    return method(*args, **kw)
  File "/home/chung/sconsvenv/lib/python3.8/site-packages/SCons/Script/SConscript.py", line 597:
    return _SConscript(self.fs, *files, **subst_kw)
  File "/home/chung/sconsvenv/lib/python3.8/site-packages/SCons/Script/SConscript.py", line 285:
    exec(compile(scriptdata, scriptname, 'exec'), call_stack[-1].globals)
  File "/home/chung/openpilot/body/board/SConscript", line 125:
    with open("obj/gitversion.h", "w") as f:
(sconsvenv) chung@tina:~/openpilot$
```

Final Results





Report 2 Step 5&6

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No CUDA + insufficient Ubuntu space

(sconsvenv) jinn@Liu:~/openpilot/aJLL/ModelB6$ python simulatorB6.py

Error：E tensorflow/compiler/xla/stream_executor/cuda/cuda_driver.cc:268] failed call to cuInit: CUDA_ERROR_NO_DEVICE: no CUDA-capable device is detected

Therefore, I downloaded CUDA, but there was insufficient space and I couldn't download CUDA. Also, because the space was full, Ubuntu went black and I couldn't log in, so I first searched online for how to open Ubuntu. The following is the website with the solution: https://cynthiachuang.github.io/Fix-Ubuntu-does-not-Boot-due-to-Disk-Space-Full/ I successfully opened Ubuntu using the steps on the website.

No CUDA + insufficient Ubuntu space

- **Problem to be solved:** After turning on the computer, clear up space to avoid a black screen.

- **Solution:** Since the D drive in the computer has more space, I want to put the trained model and data into the D drive. So I linked the D drive in the Windows system to the mnt folder in Ubuntu's Other Location. I moved the original data in Home to mnt and cleared up space in Home.

- **Result:** Because the system's default folder is Home, many errors appeared when running the model in mnt. After a long time of troubleshooting, I finally managed to train the model and downloaded CUDA. However, when testing the model, the same error from the previous slide still appeared, and the images could not be displayed.

No CUDA + insufficient Ubuntu space

- **Problem to be solved:** When testing the model, the error from the previous slide still appeared, and the images could not be displayed.

- **Solution: Use CPU instead of GPU. Add the following command to simulatorB6:**
  import os
  os.environ['CUDA_VISIBLE_DEVICES']="0"

- **Result:** The error could still not be resolved, and the images still did not appear. I also saw online that another command without GPU could be added to bashr, but it was still ineffective.

- **Solution:** Go back home on the weekend and reinstall Ubuntu on a family member's computer, starting from scratch.

python simulatorB6.py

After switching to a computer with a GPU:

Downloaded CUDA, cuDNN, and the driver.

Downloaded TensorFlow.

It was found that the CUDA and TensorFlow versions were incompatible, and even after upgrading TensorFlow, an error still occurred. Initially, it was thought that the download order was incorrect, preventing the driver from detecting the software. However, after restarting and trying again, the images appeared!

python train_modelB6.py

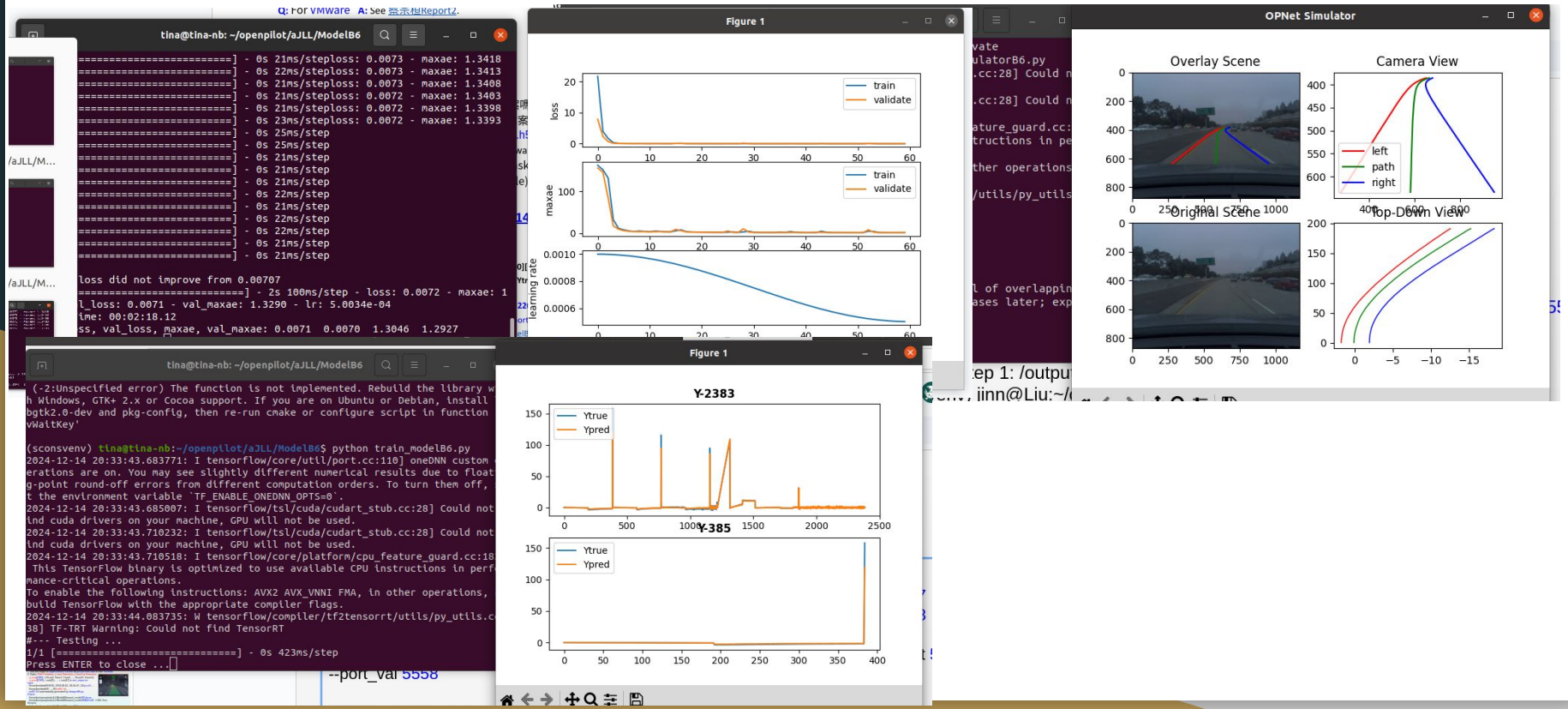
Error:

FileNotFoundError: [Errno 2] Unable to synchronously open file (unable to open file: name = '/home/tina/dataB6/UHD--2018-08-02--08-34-47--37/outSC.h5', errno = 2, error message = 'No such file or directory', flags = 0, o_flags = 0)

The above files were generated, but in /home/tina/dataB6/UHD--2018-08-02--08-34-47--32.

- The files need to be moved to the correct folder, but each time the model is retrained, the files need to be pulled back to the correct folder.

pictures


tina@tina-nb: ~/openpilot/aJLL/ModelB6
loss did not improve from 0.00707
Figure 1
train
validate
loss
maxae
learning rate
OPNet Simulator
Overlay Scene
Camera View
Original Scene
Top-Down View
left
path
right
tina@tina-nb: ~/openpilot/aJLL/ModelB6
(sconsvenv) tina@tina-nb:~/openpilot/aJLL/ModelB6$ python train_modelB6.py
Press ENTER to close ...
Figure 1
Y-2383
Y-385
Ytrue
Ypred

Report 3

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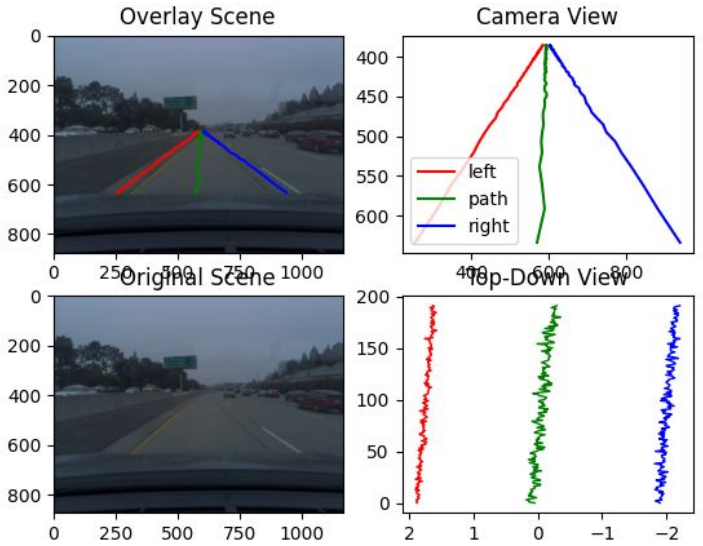
Problem solved

My Report 2 mentioned that my outSC.h5 was being generated in the wrong folder.

Additionally, no matter how the values were changed, the same graph on the right always appeared.

I later found out that my random shuffle was different from the teacher's.

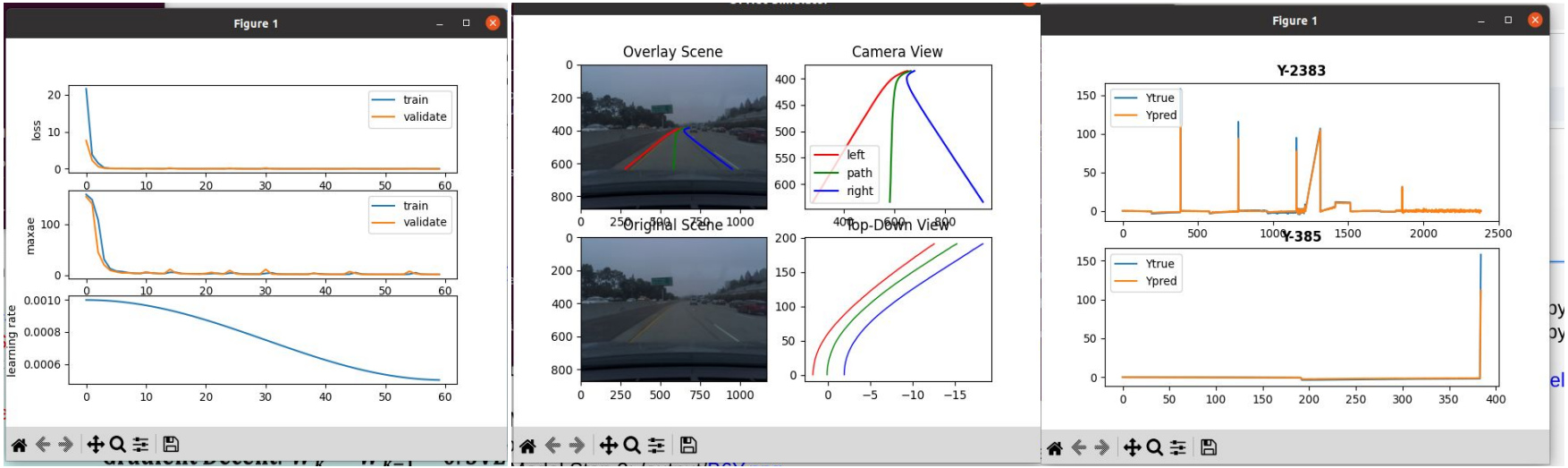
My sequence was 2, 3, 7, while the teacher's was 7, 2, 3.



use supercombo to train and test

Minimum loss, val_loss, maxae, val_maxae: 0.0060 0.0059 1.3559 1.3521

Initially, I wasn't sure if my understanding of the code was correct, so I practiced training and testing with supercombo when making changes.



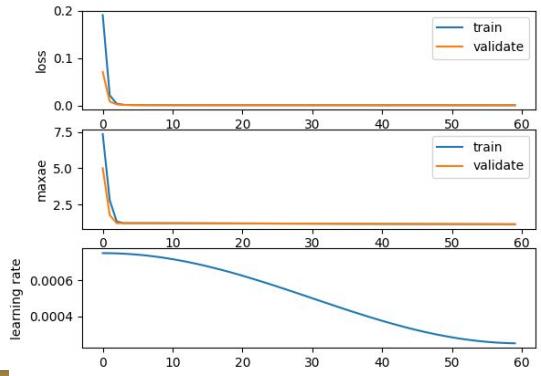
train and test by 37

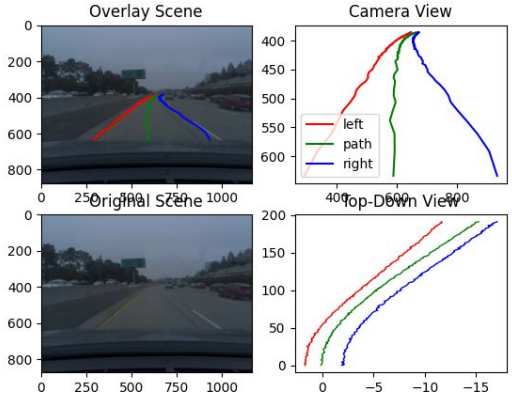
Minimum loss, val_loss, maxae, val_maxae: 0.0073 0.0072 1.5720 1.561

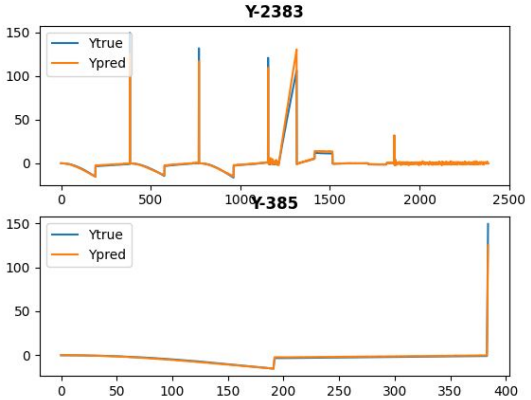
Because the teacher demonstrated changing values, I was curious what would happen if I trained and tested with the same video.

As the teacher said today, even though 37 is a video mostly biased to the left, it can still predict the graph on the right.

Also, I was curious what would happen if I kept training this model. I originally expected the middle graph to become more accurate and perfectly fit, but it doesn't seem to be the case.

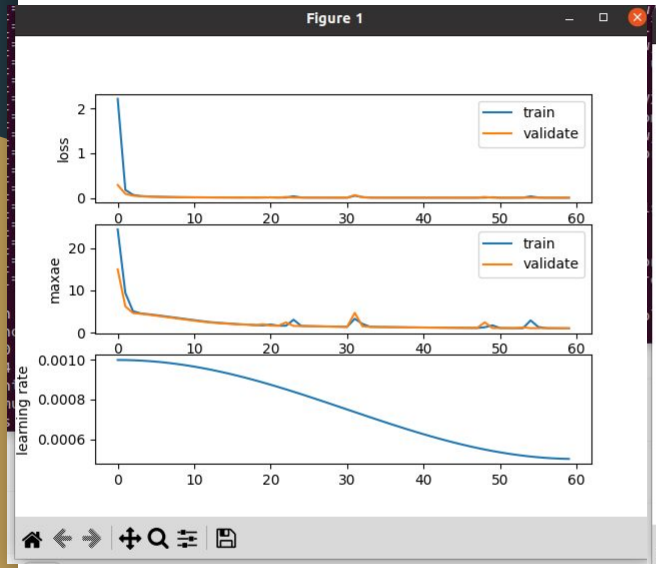


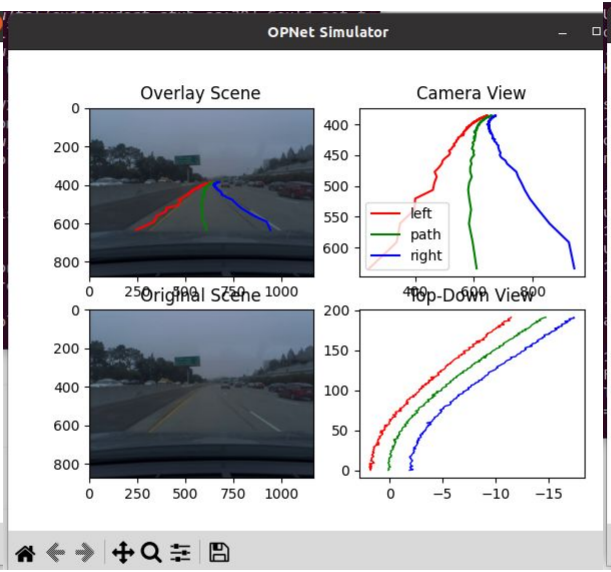


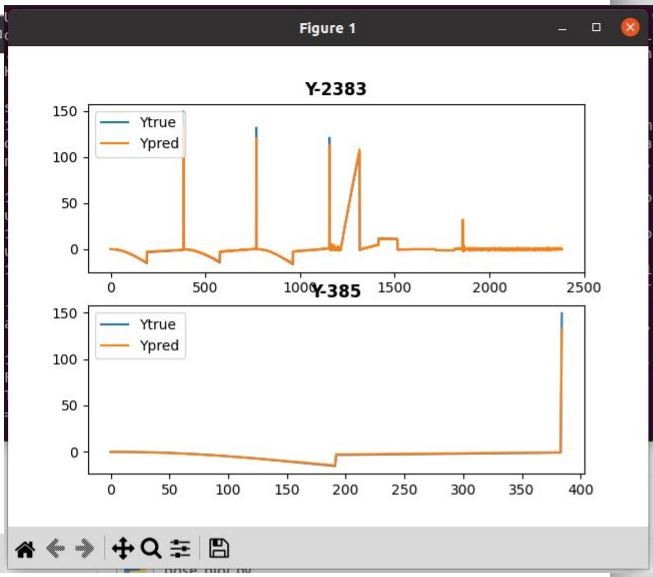


train 2

Minimum loss, val_loss, maxae, val_maxae: 0.0031 0.0031 1.0294 1.0234





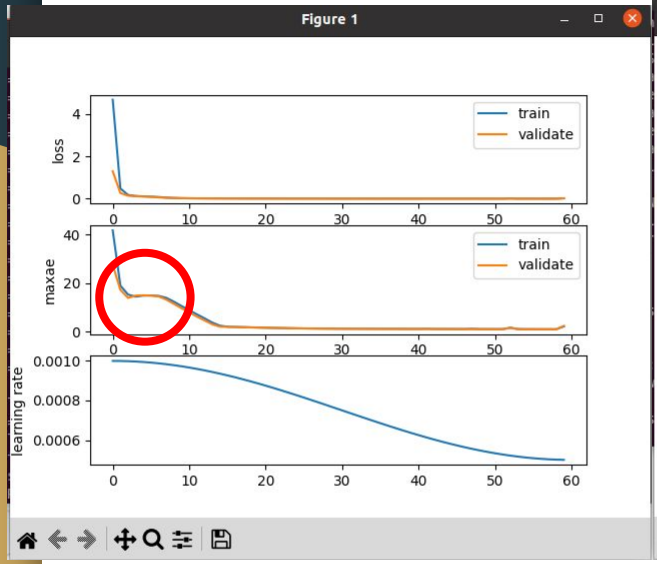


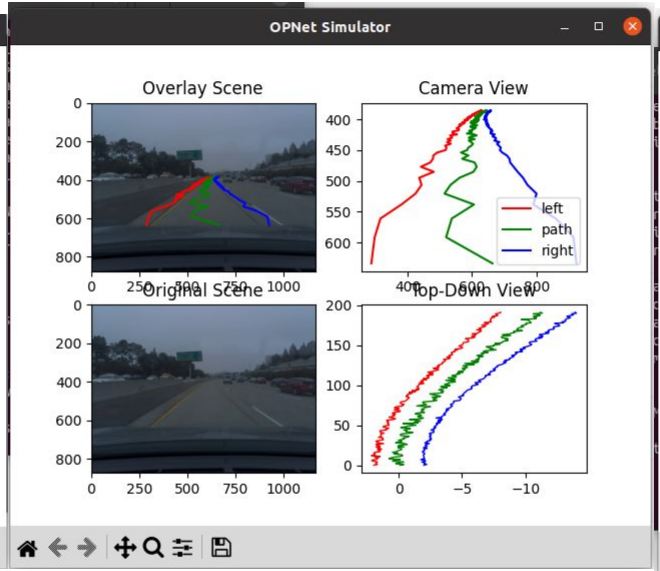
train 3

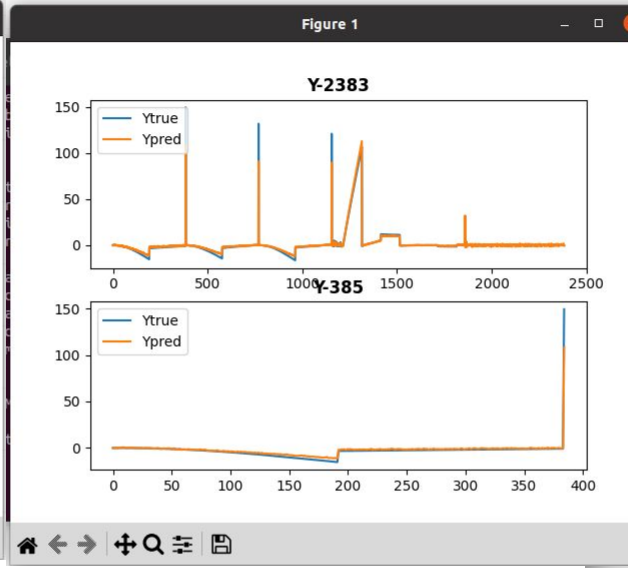
Minimum loss, val_loss, maxae, val_maxae: 0.0027 0.0027 1.0014 0.9982

Compared to train2, the values have decreased, but the trained model graph is not smooth.

The simulator test graph in the middle is also less accurate than before.

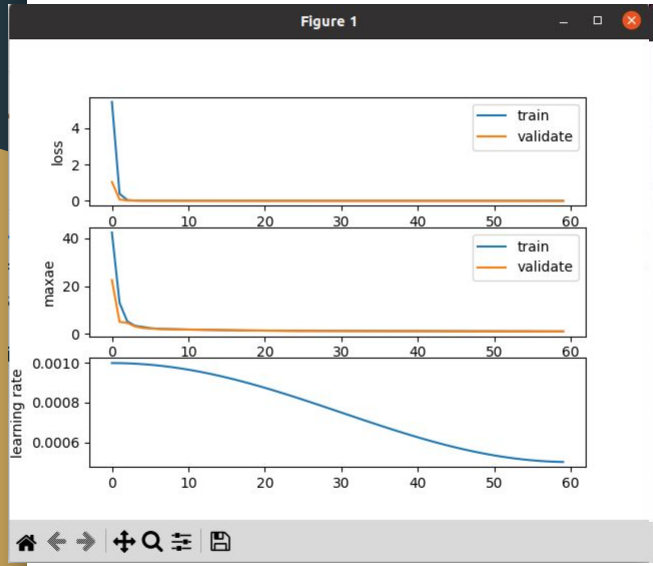


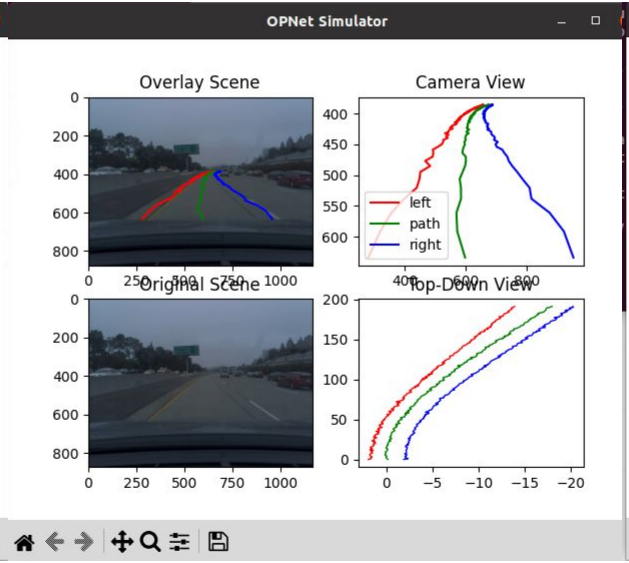


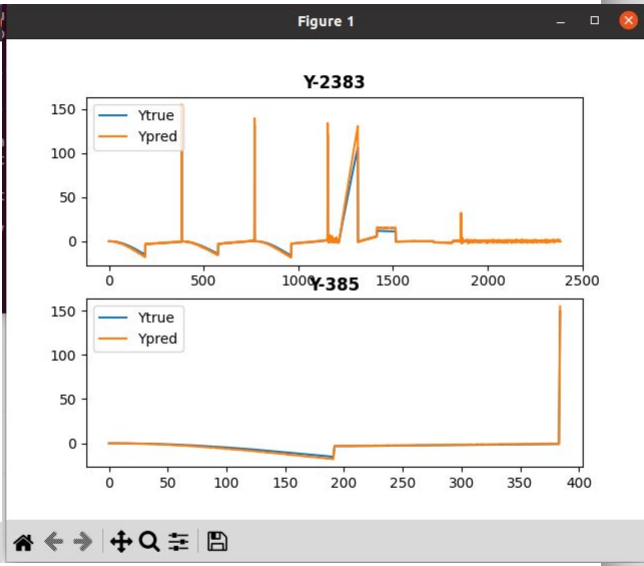


train 4

Minimum loss, val_loss, maxae, val_maxae: 0.0028 0.0028 1.0354 1.0323

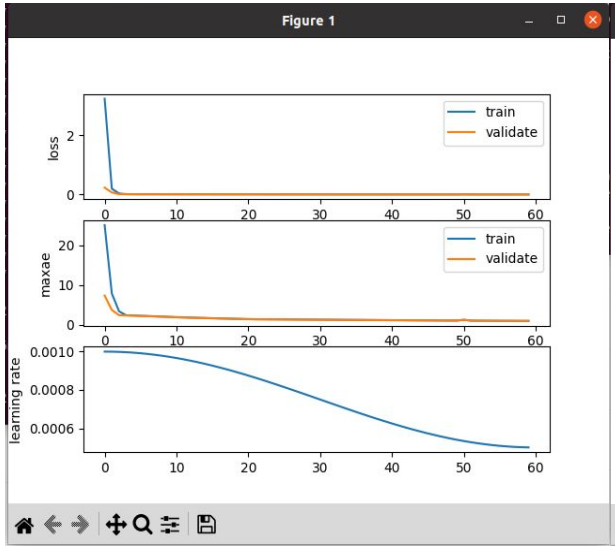


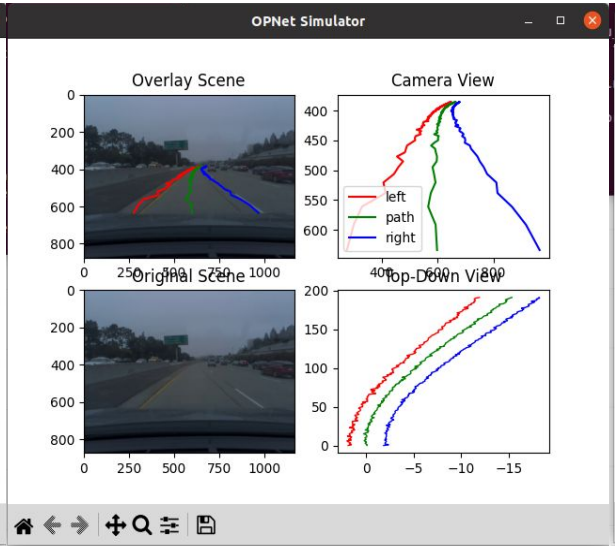


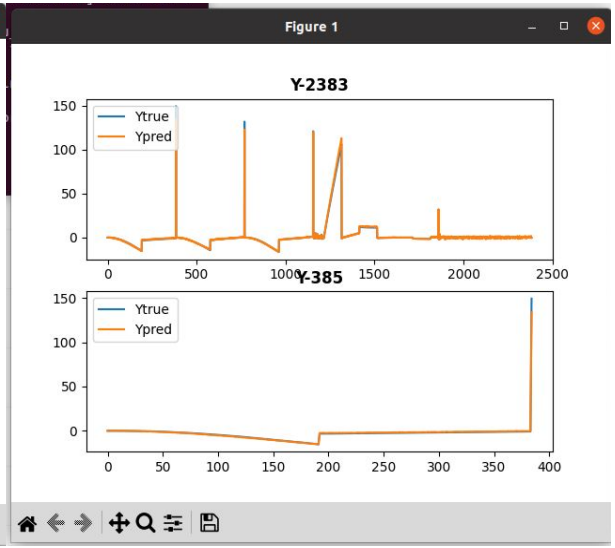


train 5

Minimum loss, val_loss, maxae, val_maxae: 0.0023 0.0023 0.9601 0.9561



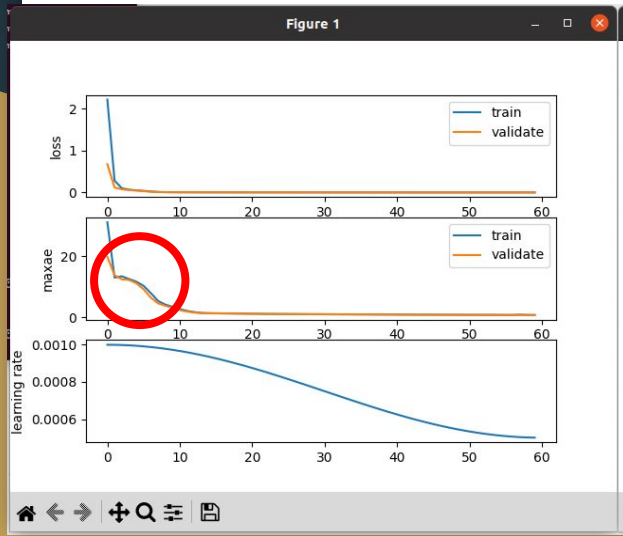


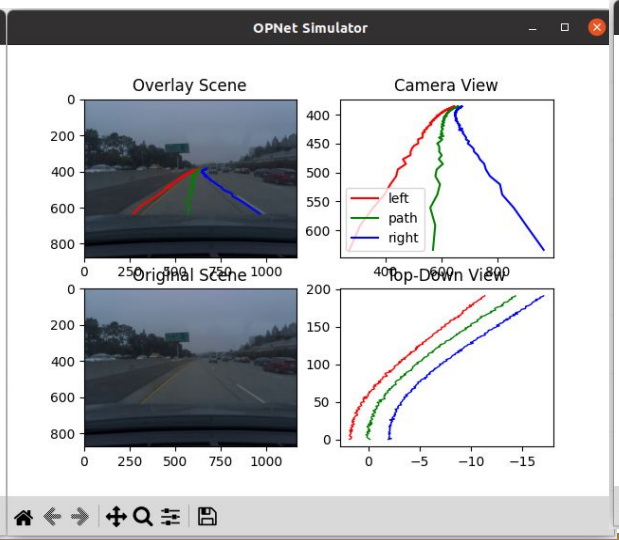


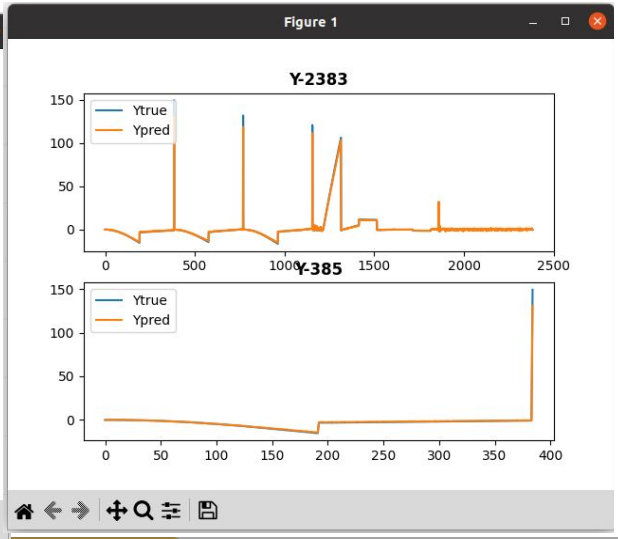
train6

Minimum loss, val_loss, maxae, val_maxae: 0.0015 0.0015 0.7594 0.7547

train 4 and 5 became stable, but by train 6, the training graph became an uneven, downward curve again.

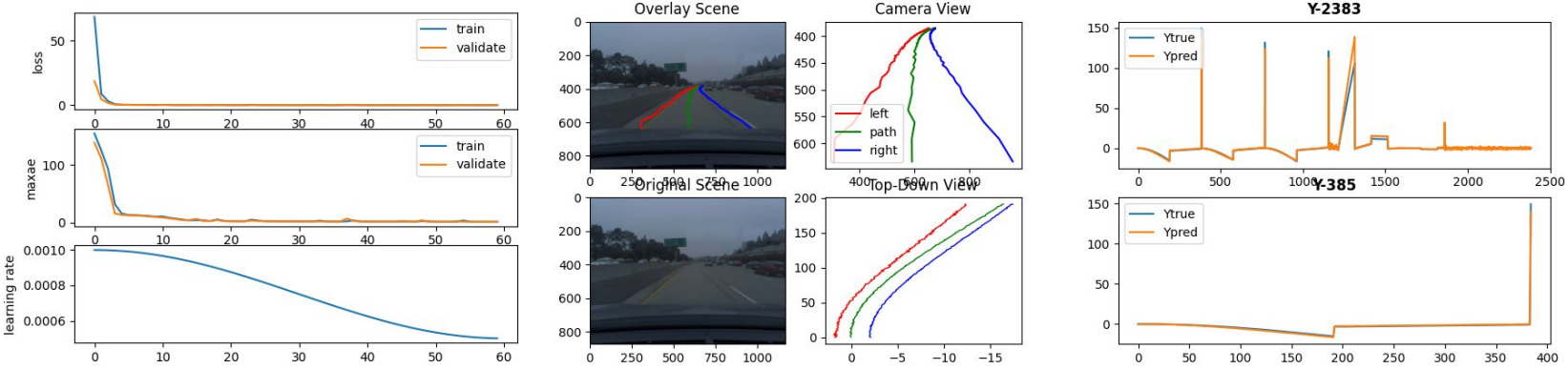






change learning rate
all parameters are 0.25

I changed the learning rate and set all parameters to 0.25 to see what would happen with the average weights. However, because I used 37 for both training and testing, I realized today in class that there was an overfitting issue, which I will correct in the final version.

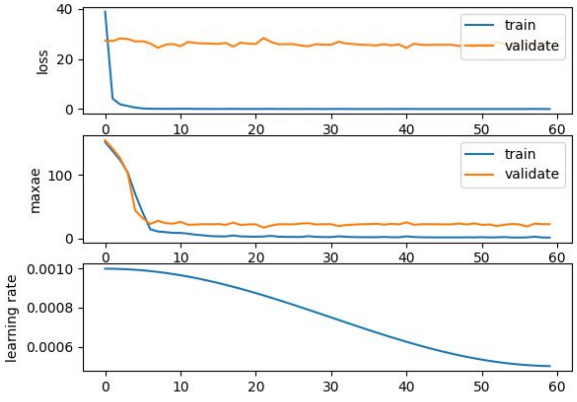


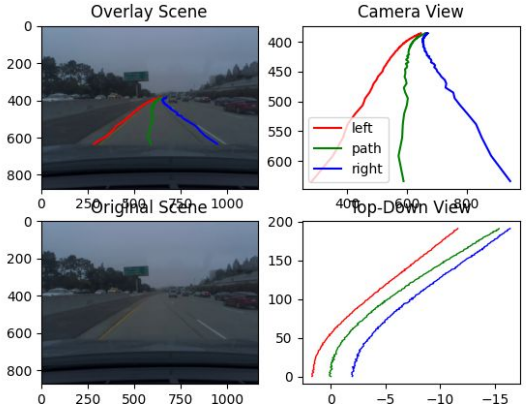
train 37, valid 32, test 37

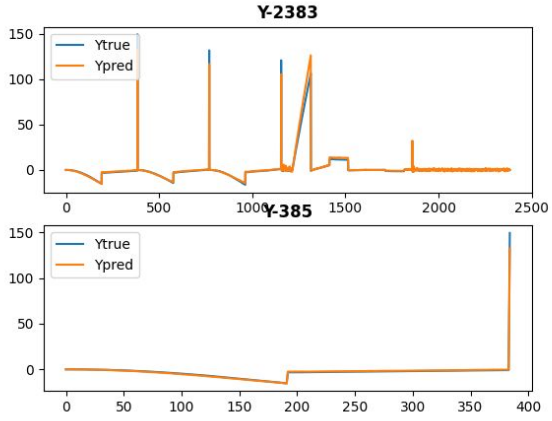
The teacher mentioned in class today that if the first graph is parallel and has a height difference, this is also a type of overfitting.

I originally expected the simulator graph to be very different, but it wasn't. I think this might be because I only used video 37 for training and also tested with video 37.

Therefore, I will change to using video 32 for testing in the next slide.

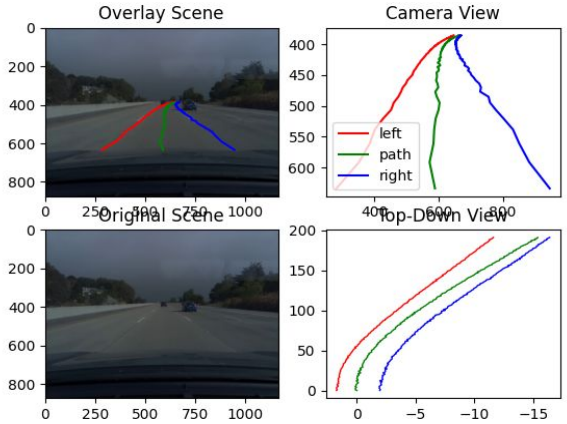


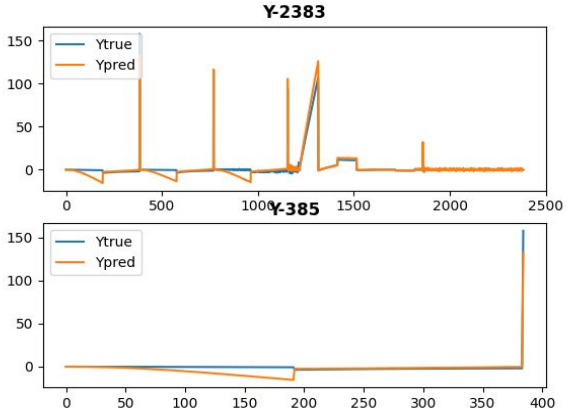




train 37, valid 32, test 32

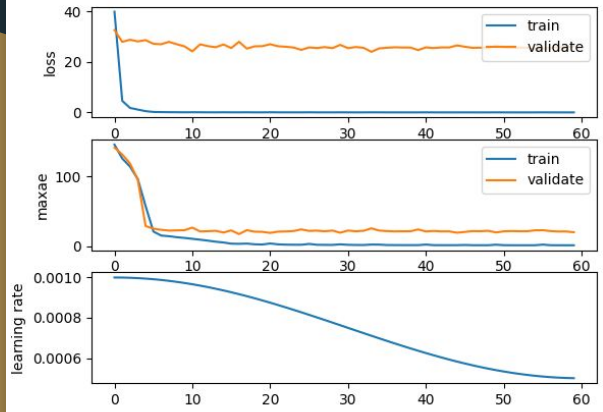
It was found that there was indeed an error in the test graph of train_B6, but the simulator graph did not have much difference or fluctuation. Therefore, three videos will be used for training, and 32 for validation and testing, to see if there is any difference.

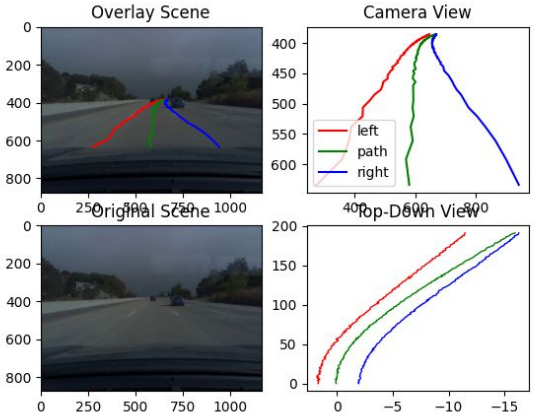


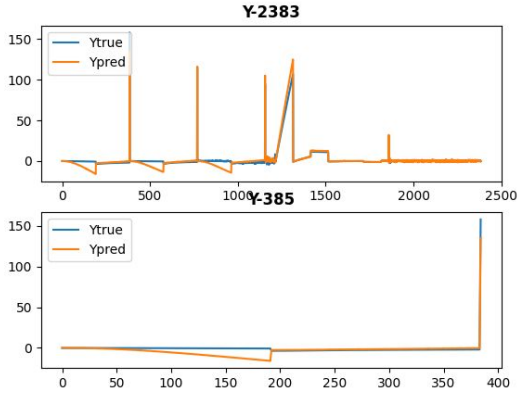


Use 3 videos for training, and use 32 for validation and testing.

Minimum loss, val_loss, maxae, val_maxae: 0.0067 24.0513 1.4763 17.5044

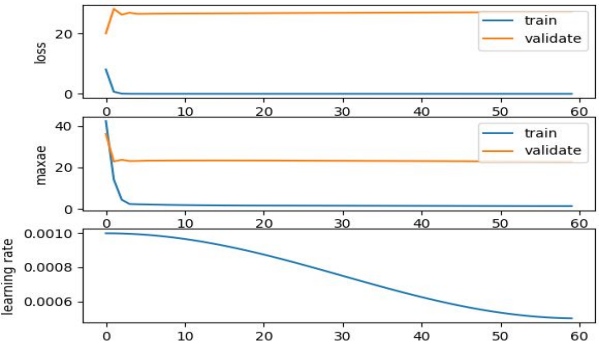


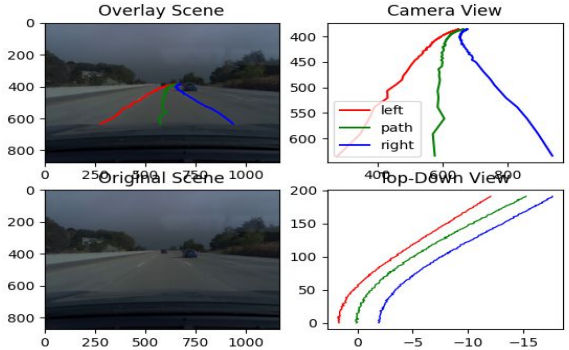


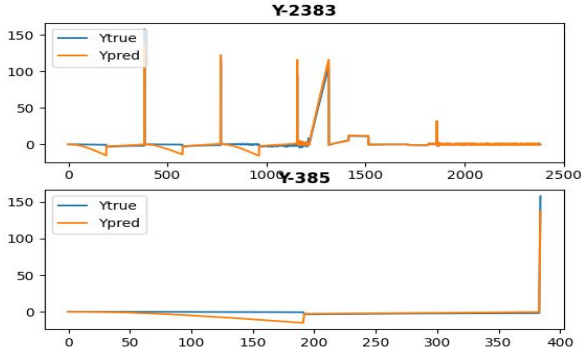


Use 3 videos for training, and use 32 for validation and testing.
train 2

Minimum loss, val_loss, maxae, val_maxae: 0.0047 20.0680 1.4490 22.8090

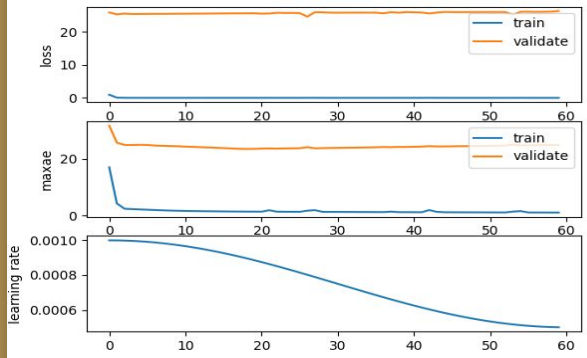


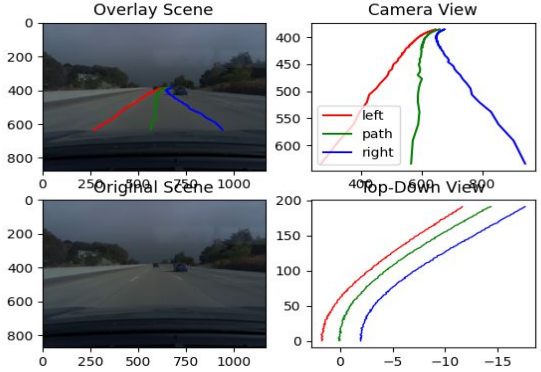


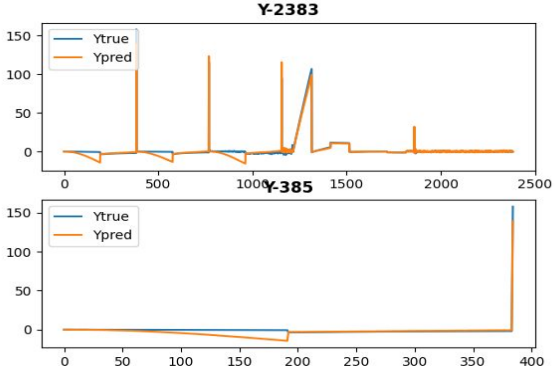


Use 3 videos for training, and use 32 for validation and testing.
train 3

Minimum loss, val_loss, maxae, val_maxae: 0.0019 24.6671 1.0563 23.4610

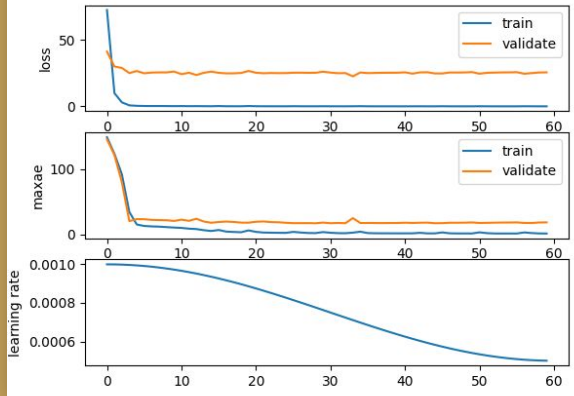


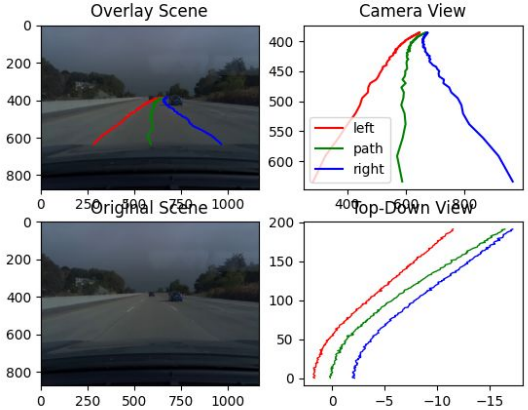


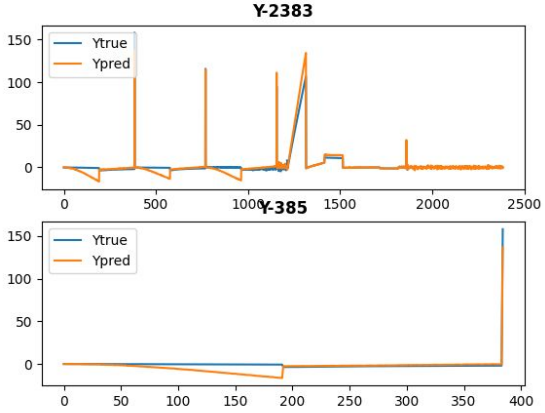


Use 3 videos for training, and use 32 for validation and testing, with all learning rate parameters set to 0.25.

Minimum loss, val_loss, maxae, val_maxae: 0.0156 22.5371 1.5226 17.1388

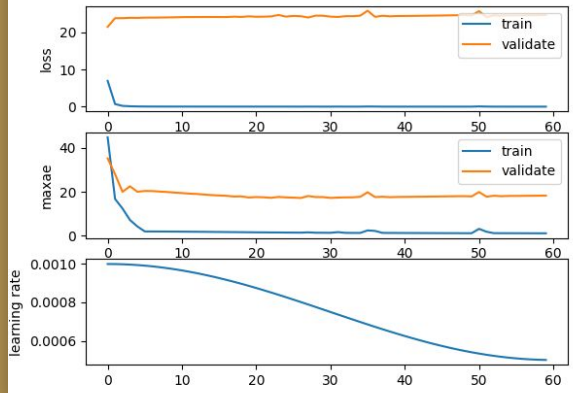


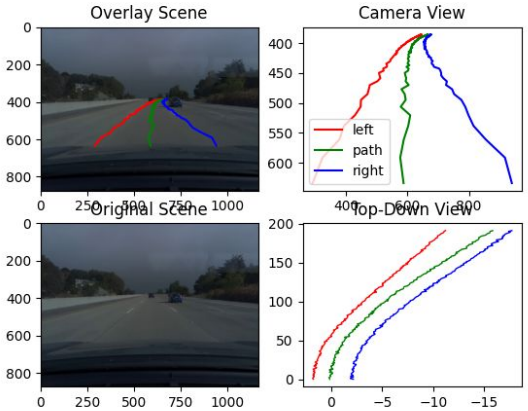


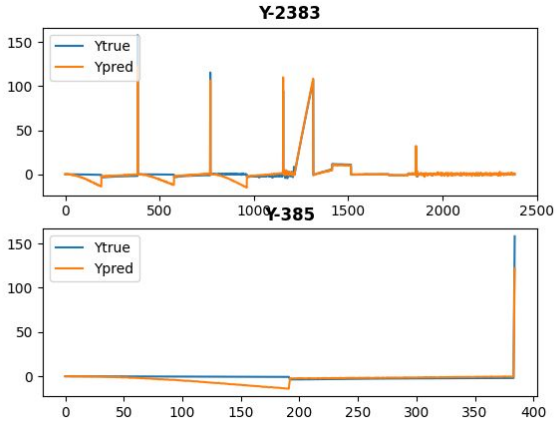


train 2

Minimum loss, val_loss, maxae, val_maxae: 0.0067 21.4957 1.1750 17.2302

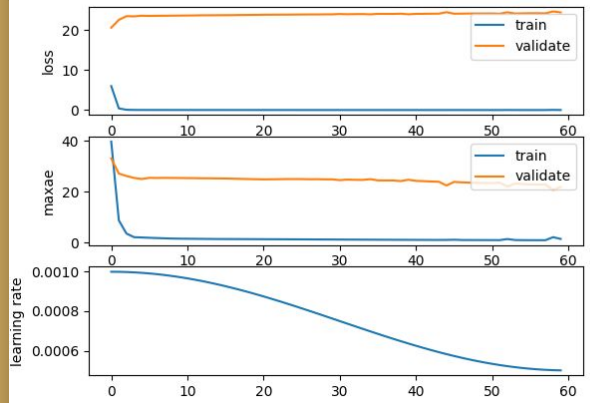


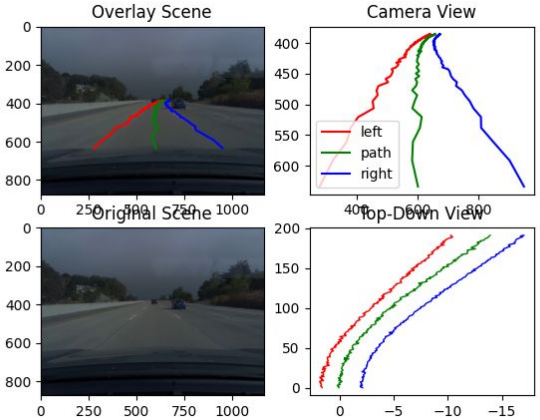


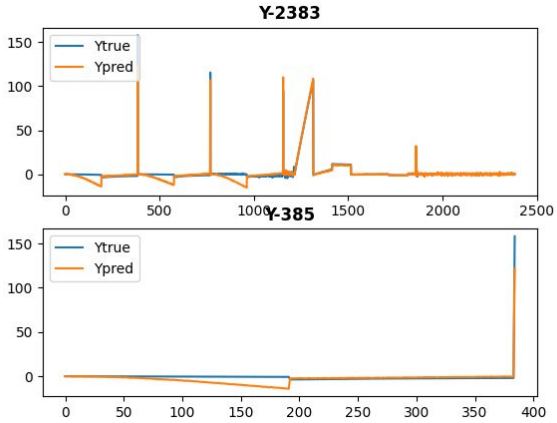


train 3

Minimum loss, val_loss, maxae, val_maxae: 0.0044 20.6349 1.0351 20.7822

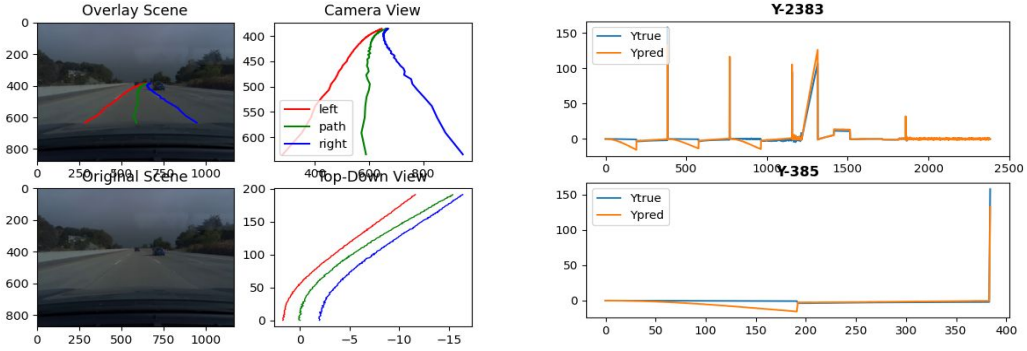




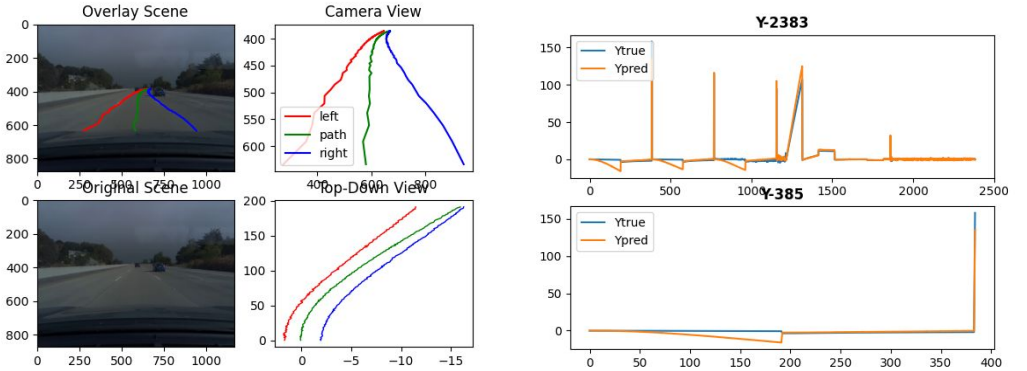


train data change comparison

37 train



all train

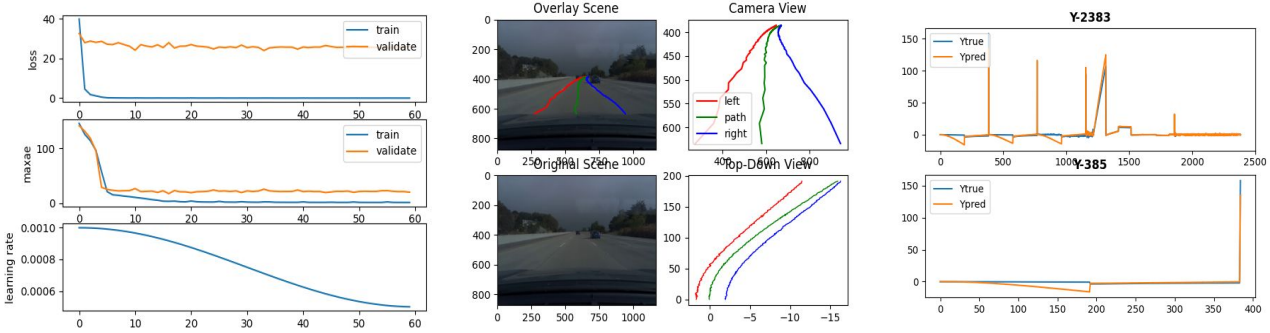


It appears similar, indicating that the data might be too small and with too little variation.

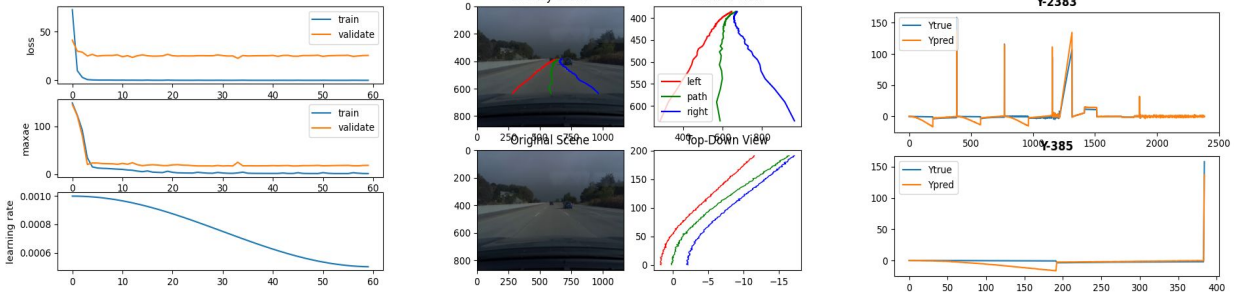
Therefore, even with different amounts of data for training, the results remain similar.

learning rate comparison-1

0.3_0.3_0.3_0.1



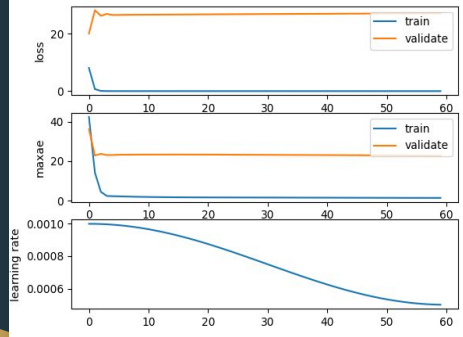
all 0.25

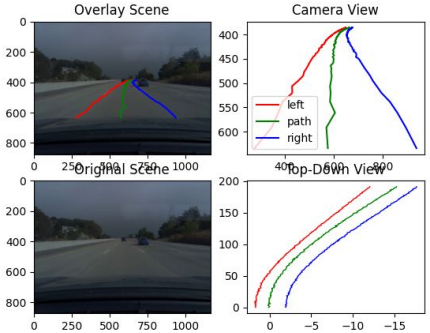


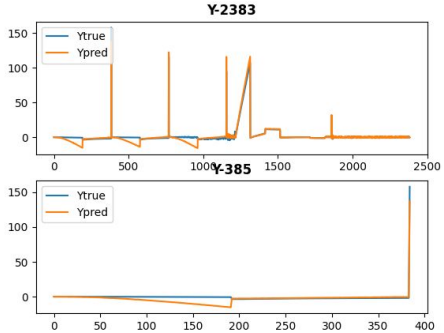
From the graphs, the results are actually similar, and both have overfitting issues.

learning rate comparison-2

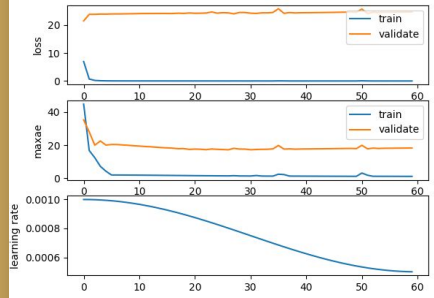
0.3_0.3_0.3_0.1

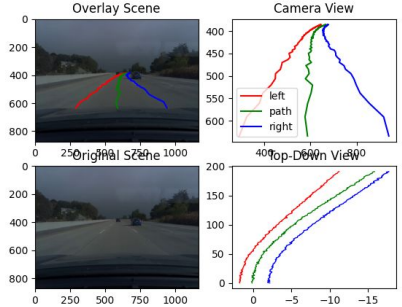


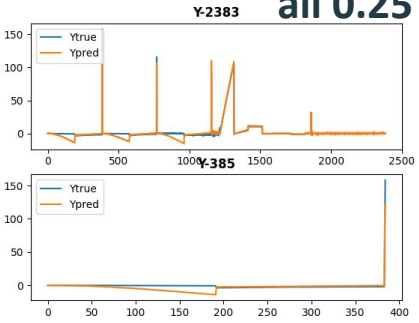




all 0.25



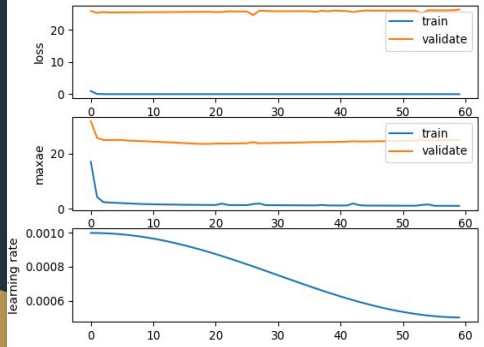


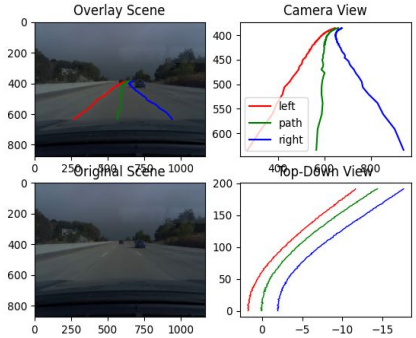


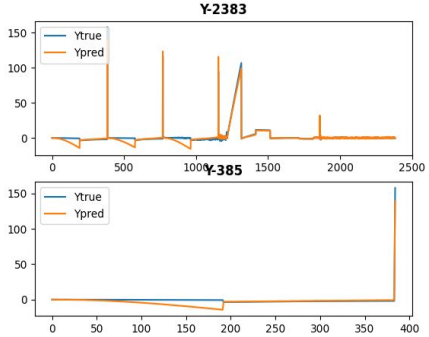
After the second training, the situations of both groups were similar.

learning rate comparison-3

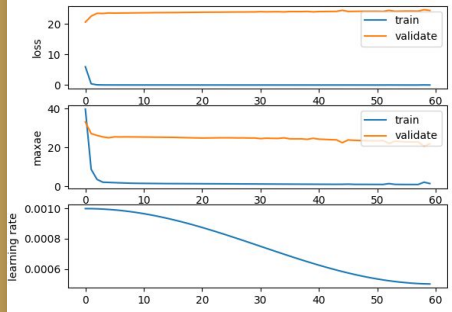
0.3_0.3_0.3_0.1

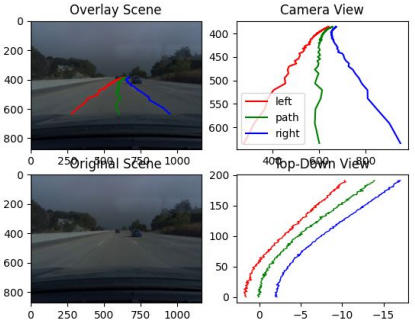


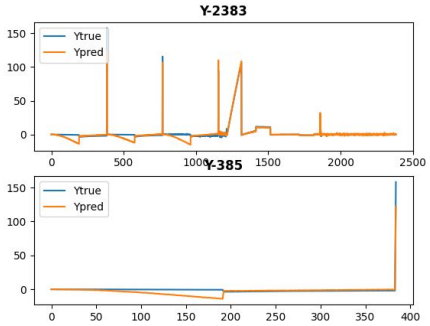




all 0.25







After the third training, although the maxae graphs of both groups were different, both showed overfitting.

Conclusion

Because the data is too small, with only 3 video tapes, overfitting still occurs even if the learning rate and training model are changed.