Tianqi Liu, Yangge Li,
Minghao Jiang and
Sayan Mitra, Last updated
August 27 2020

ECE498SMA "Safe Autonomy" Lab Manual

1. Logistics

For our course, due to the Covid-19 pandemic, we are holding virtual lab sessions over Zoom on Tuesdays and Thursdays at 5-6 PM. Zoom link is here:
https://illinois.zoom.us/j/96908504700?pwd=K2ZsbzZSYjF5TXlNcVd5SzdHZDB6dz09.

Every student will be assigned to a lab time and a group containing ~4 members. The group arrangement is published on course website → Policies. All students are required to show up in the lab in the following week after each MP is released. In the second week, only one member needs to attend the lab session.

2. Lab setup

ECEB5072 has 7 machines running Ubuntu 16.04 for our course to use. Students in ECE498SMA should use FastX to connect the machine to finish their MPs.

All students are required to back up their code regularly. Cloud platforms such as Github or Google Drive are recommended. You cannot use system failure as excuse to avoid MP submission. **Course staff members may have to delete all the student users and reimage the hard drives in these computers to fix hardware and software issues. So, you cannot assume anything about persistent storage in these machines.**

TAs have admin access to all the machines. If something goes wrong, contact the TAs and we will try to help. The solution may be to do the above.

3. Programming assignments (MPs)

We will have 5-6 MPs this semester. For each MP, your group will get roughly 2 weeks. Every member in the group is supposed to contribute roughly equally to every MP. In the report, you will have to specify how much time each student is spending on this MP on each week in the following table format. Equal contribution does not necessarily mean equal number of hours

	Student 1	Hours	Student 2	Hours	Student 3	Hours
Week 1	*Tasks*	*Hours spent*	*Tasks*	*Hours spent*	*Tasks*	*Hours spent*
Week 2	*Tasks*	*Hours spent*	*Tasks*	*Hours spent*	*Tasks*	*Hours spent*

Tianqi Liu, Yangge Li,
Minghao Jiang and
Sayan Mitra, Last updated
August 27 2020

The deadline for MPs is normally Friday 11:59PM. Only one of the members need to submit the required items on Compass. Late submissions will lose 4 points for every hour delayed until deducted to 0.

The following week after the deadline. The whole group need to demo the code to TA. You can either choose to demo right after the lab (6:00-6:30PM), or demo at any of the office hour (check schedule on website). TA will ask some questions during the demo and call on one of the students to answer.

4. ROS

ROS is already installed in root directory so there is no need to install it again. However, when a user logs in to a machine the first time after the machine has been shut down, the person needs to set up some environment variables. Copy and run the following two lines to the command console.

```
echo "source /opt/ros/kinetic/setup.bash" >> ~/.bashrc
```

```
source ~/.bashrc
```

Note that the changes above will also change the path to python packages and direct it to ros directory, which might cause problem when running python code outside of ROS. If that is the case, just run:

```
unset PYTHONPATH
```

Then inside that terminal the PYTHON PATH will reset to the default python directory.

To start a ROS master node just run:

```
roscore
```

Note that at any time we can only have one master node on a machine. If one user starts a ros master node and just leave it there and log out, other users will not be able to start their own ros master. Hence, before you log out, remember to **shut down the master node**. Simply close all the terminals would also work.

5. Python

Since each Linux machine will be shared by multiple groups, it is important that whatever you have done won't cause problem to others. TAs should have installed all the python packages that you need to finish the MPs. However, you are still encouraged to explore other tools. There are two possible ways to manage the risks of compatibility issues:

(1) When install new packages or switch to a specific version of existing package, you need to install to the user directory, not the root. So that your changes will only be applied to yourself. For example:

```
pip install –user numpy
```

Tianqi Liu, Yangge Li,
Minghao Jiang and
Sayan Mitra, Last updated
August 27 2020

(2) You can also use python virtual environment. You will be able to set specific versions of python and python packages just for that project. And all changes will be stored inside a folder under that project directory.

Here you can name your virtual environment (venv in our case):

virtualenv -p /usr/bin/python2.7 venv

Then activate the virtual environment:

source venv/bin/activate

When you are done, don't forget to close the virtual environment:

Deactivate

6. Shared folder

To save some hard drive space on the machines, we created a shared folder to store large files such as videos and rosbags on each machine. Students will have read and execute access to the folder. To access the folder:

cd /var/www/ECE498SM/

7. Nvidia Driver Issue

If you see error messages like:

No protocol specified

[VGL] ERROR: Could not open display: 0.

Please notify TAs immediately by sending an email. This is an issue with Nvidia driver on the lab machines, and let TAs handle them.