

# Use Jupyter Lab

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## 1. Jupyter Lab installation

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### 1.1. Jupyter Lab

Use the following command to install Jupyter Lab: If the download speed of Jupyter Lab is slow, you can use the specified source to install it

```
sudo apt update  
sudo apt install python3-pip -y  
sudo pip3 install --upgrade pip
```

```
sudo pip3 install jupyterlab  
# Tsinghua source: pip3 install jupyterlab -i  
https://pypi.tuna.tsinghua.edu.cn/simple  
# Alibaba Cloud source: sudo pip3 install jupyterlab -i  
https://mirrors.aliyun.com/pypi/simple/
```

```
Activities Terminal Dec 26 14:10 jetson@yahboom: ~
jetson@yahboom: $ Sudo apt install python3-pip -y
[sudo] password for jetson:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
python3-pip is already the newest version (22.0.2+dfsg-1ubuntu0.5).
The following packages were automatically installed and are no longer required:
  gdal-data libaec0 libarmadillo0 libarpack2 libavcodec-dev libavformat-dev libavutil-dev libblosc1 libcfitsio9 libcharls2
  libdc1394-dev libdeflate-dev libdouble-conversion3 libexif-dev libfreexl1 libfyba0 libgda130 libgdcm-dev libgdcm3.0 libgeos-c1v5
  libgeos3.10.2 libgeotiff5 libgl2ps1.4 libglew2.2 libgphoto2-dev libhdf4-0-alt libhdf5-103-1 libhdf5-hl-100 libheif1
  liblame-dev libljpeg-dev libljpeg-turbo8-dev libljpeg8-dev libmkmlbase libmkmldom1 libmkmlenglne1 libolept5 libminizip1
  libmysqlclient21 libnetcdf19 libodbc2 libodbcinst2 libodbc14.1 libopencv-calib3d4.5 libopencv-contrib4.5 libopencv-dnn4.5d
  libopencv-features2d4.5d libopencv-flann4.5d libopencv-highgui4.5d libopencv-imgcodecs4.5d libopencv-improc4.5d
  libopencv-ml4.5d libopencv-objectdetect4.5d libopencv-photo4.5d libopencv-shape4.5d libopencv-stitching4.5d libopencv-superres4.5d
  libopencv-video4.5d libopencv-videoio4.5d libopencv-videostab4.5d libopencv-viz4.5d libopenexr-dev libpng-dev libpq5 libproj22
  libraw1394-dev librttopo1 libsoxr++1 libspatialite7 libsuperlu5 libswresample-dev libwscale-dev libs22 libtbb-dev
  libtesseract4 libtiff-dev libtiffxx5 liburiparser1 libvtk9.1 libxerces-c-3.2 mysql-common proj-data unixodbc-common
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
jetson@yahboom: $ Sudo pip3 install --upgrade pip
Requirement already satisfied: pip in /usr/lib/python3/dist-packages (22.0.2)
Collecting pip
  Downloading pip-24.3.1-py3-none-any.whl (1.8 MB) 1.8/1.8 MB 128.7 kB/s eta 0:00:00
Installing collected packages: pip
  Attempting uninstall: pip
    Found existing installation: pip 22.0.2
    Not uninstalling pip at /usr/lib/python3/dist-packages, outside environment /usr
    Can't uninstall 'pip'. No files were found to uninstall.
Successfully installed pip-24.3.1
WARNING: Running pip as the 'root' user can result in broken permissions and conflicting behaviour with the system package manager.
It is recommended to use a virtual environment instead: https://pip.pypa.io/warnings/venv
jetson@yahboom: $ sudo pip3 install jupyterlab
Collecting jupyterlab
  Downloading jupyterlab-4.3.4-py3-none-any.whl.metadata (16 kB)
Collecting async-lru>=1.0.0 (from jupyterlab)
  Downloading async_lru-2.0.4-py3-none-any.whl.metadata (4.5 kB)
Collecting httpx>=0.25.0 (from jupyterlab)
  Downloading httpx-0.28.1-py3-none-any.whl.metadata (7.1 kB)
Collecting ipykernel>=6.5.0 (from jupyterlab)
```

```
Activities Terminal Dec 26 14:26 MAXN
jetson@yahboom: ~
Installing collected packages: webencodings, wcwidth, pure-eval, fastjsonschema, websocket-client, webcolors, uri-template, typing-extensions, types-python-dateutil, traitlets, tornado, toml, tinycss2, soupsieve, sniffio, send2trash, rpds-py, rfc3986-validator, rfc339-validator, pyzmq, python-json-logger, python-dateutil, pygments, pycparser, psutil, prompt_toolkit, prometheus-client, piafotools, parso, pandocfilters, packaging, overrides, nest-asyncio, mistune, jupyterlab-pygments, jsonpointer, json5, jinja2, h11, fqdn, executing, exceptiongroup, defusedxml, debugpy, charset-normalizer, bleach, babel, attrs, asttokens, terminado, stack_data, requests, referencing, matplotlib-inline, jupyter-core, jedi, httpcore, comm, cffi, beautifulsoup4, async-lru, arrow, anyio, jupyter-server-terminals, jupyter-client, jsonschema-specifications, isoduration, ipython, httpx, argon2-cffi-bindings, jsonschema, ipykernel, aargon2-cffi, nbformat, nbclient, jupyter-events, nbconvert, jupyter-server, notebook-shim, jupyterlab-server, jupyter-lsp, jupyterlab

Attempting uninstall: python-dateutil
Found existing installation: python-dateutil 2.8.1
Uninstalling python-dateutil-2.8.1:
Successfully uninstalled python-dateutil-2.8.1

Attempting uninstall: packaging
Found existing installation: packaging 21.3
Uninstalling packaging-21.3:
Successfully uninstalled packaging-21.3

Attempting uninstall: attrs
Found existing installation: attrs 21.2.0
Uninstalling attrs-21.2.0:
Successfully uninstalled attrs-21.2.0

Attempting uninstall: requests
Found existing installation: requests 2.25.1
Uninstalling requests-2.25.1:
Successfully uninstalled requests-2.25.1

Successfully installed anyio-4.7.0 argon2-cffi-23.1.0 argon2-cffi-bindings-21.2.0 arrow-1.3.0 asttokens-3.0.0 async-lru-2.0.4 attrs-24.3.0 babel-2.16.0 beautifulsoup4-4.12.3 bleach-6.2.0 cffi-1.17.1 charset-normalizer-3.4.1 comm-0.2.2 debugpy-1.8.11 defusedxml-0.7.1 exceptiongroup-1.2.2 executing-2.1.0 fastjsonschema-2.21.1 fqdn-1.5.1 h11-0.14.0 httpcore-1.0.7 httpx-0.28.1 ipykernel-6.29.5 ipython-8.31.0 isoduration-20.11.0 jedi-0.19.2 jinja2-3.1.5 json5-0.10.0 jsonpointer-3.0.0 jsonschema-4.23.0 jsonschema-specifications-2024.10.1 jupyter-client-8.6.3 jupyter-core-5.7.2 jupyter-events-0.11.0 jupyter-lsp-2.2.5 jupyter-server-2.15.0 jupyter-server-terminals-0.5.3 jupyterlab-4.3.4 jupyterLab-pygments-0.3.0 jupyterserver-2.27.3 matplotlib-inline-0.1.7 mistune-3.0.2 nbclient-0.10.2 nbconvert-7.16.4 nbformat-5.10.4 nest-asyncio-1.6.0 notebook-shim-0.2.4 overrides-7.7.0 packaging-24.2 pandocfilters-1.5.1 parso-0.8.4 platformdirs-4.3.6 prometheus-client-0.21.1 prompt_toolkit-3.0.4 psutil-6.1.1 pure-eval-0.2.3 pycparser-2.22 pygments-2.18.0 python-dateutil-2.9.0.post0 python-json-logger-3.2.1 pyzmq-26.2.0 referencing-0.35.1 requests-2.32.3 rfc339-validator-0.1.4 rfc3986-validator-0.1.1 rpds-py-0.22.3 send2trash-1.8.3 sniffio-1.3.1 soupsieve-2.6 stack_data-0.6.3 terminado-0.18.1 tinycss2-1.4.0 toml-2.1 tornado-6.4.2 traitlets-5.14.3 types-python-dateutil-2.9.0.20241206 typing-extensions-4.12.2 uri-template-1.3.0 wcidw-0.2.13 wcolorcs-24.11.1 webencodings-0.5.1 websocket-client-1.8.0

WARNING: Running pip as the 'root' user can result in broken permissions and conflicting behaviour with the system package manager, possibly rendering your system unusable. It is recommended to use a virtual environment instead: https://pypa.io/warnings/venv. Use the --root-user-action option if you know what you are doing and want to suppress this warning.
jetson@yahboom: ~
```

## 1.2、Node.js

Use the following command to install the latest Node.js:

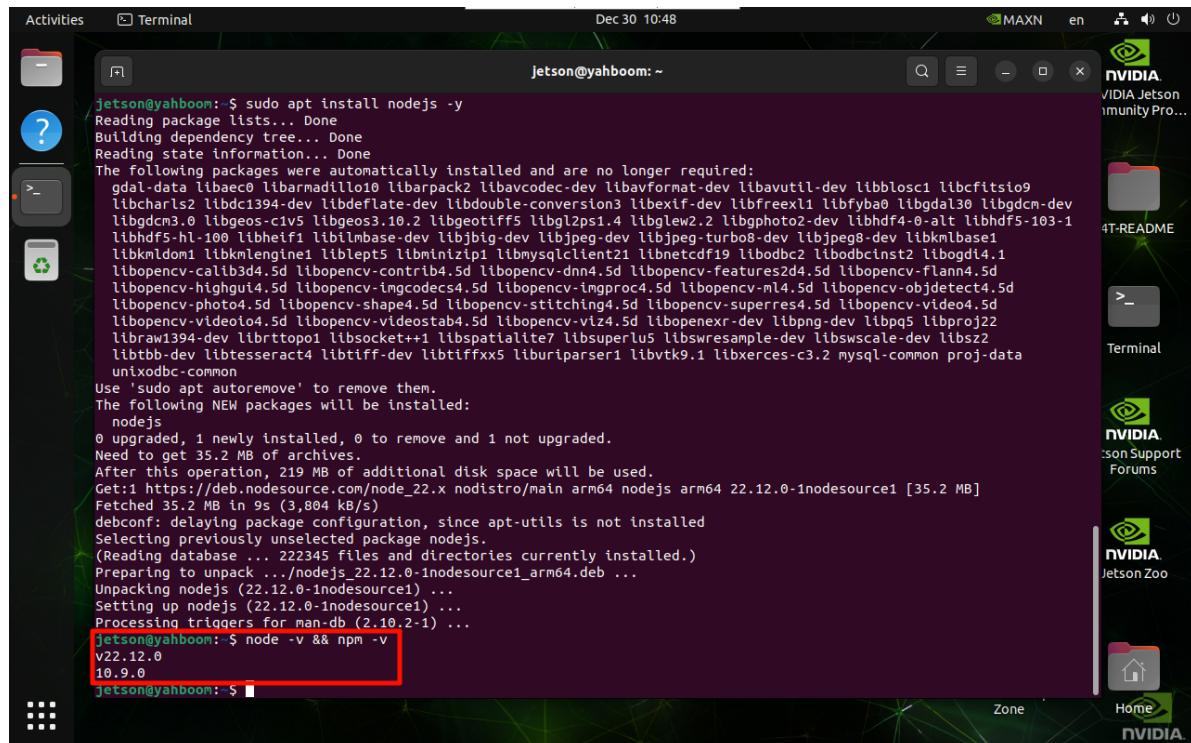
```
sudo apt install curl -y
```

```
sudo curl -fsSL https://deb.nodesource.com/setup_22.x | sudo -E bash -
```

```
sudo apt install nodejs -y
```

Verify the version:

```
node -v && npm -v
```



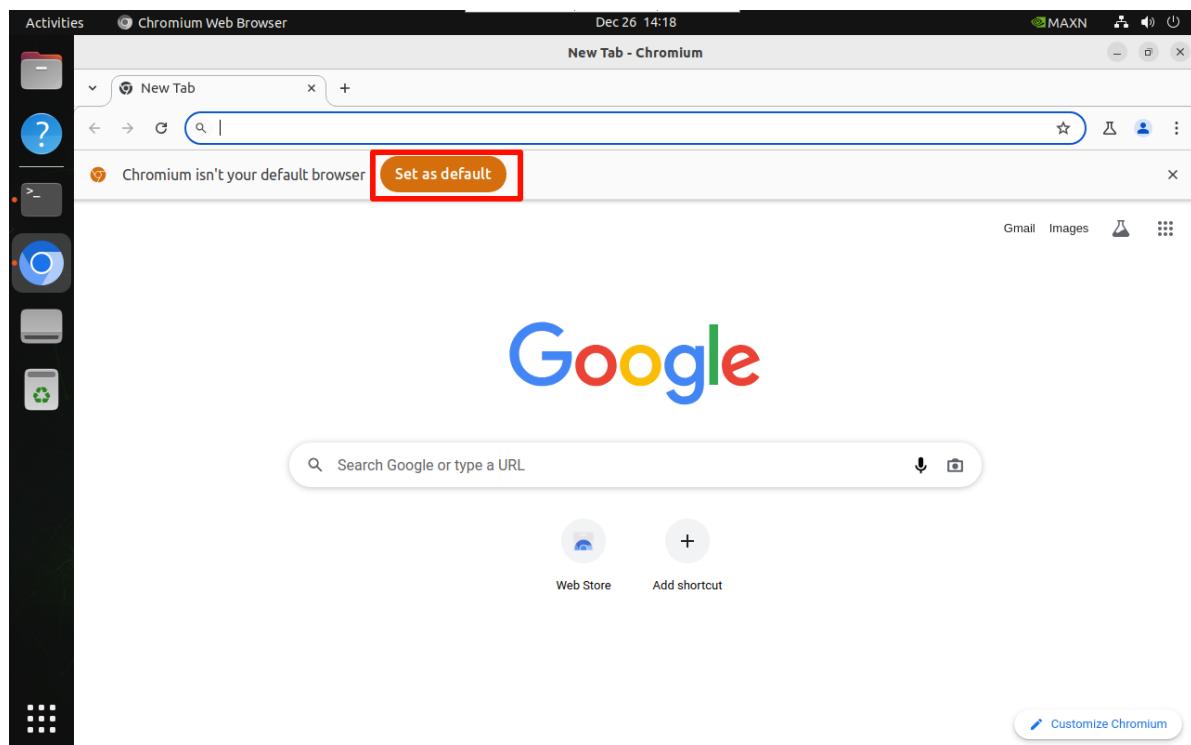
```
jetson@yahboom: ~
jetson@yahboom: $ sudo apt install nodejs -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no longer required:
gdal-data libaec0 libarmadillo0 libarpack2 libavcodec-dev libavformat-dev libavutil-dev libbbiosci libcfitsio9
libcharls2 libdc1394-dev libdeflate-dev libdouboole-conversion3 libexif-dev libfreeexif libfyba0 libgdal30 libgdcm-dev
libgdm3.0 libgeos-civ5 libgeos3.10.2 libgeotiff5 libgl2ps1.4 libglew2.2 libgphoto2-dev libhdf4-0-alt libhdf5-103-1
libhdf5-hl-100 libheif1 libilmbase-dev libjbig-dev libjpeg-dev libjpeg-turbo8-dev libjpeg8-dev libkmlbase1
libkmldom1 libkmengine1 libminizip1 libmysqlclient21 libnetcdf19 libodbc2 libodbcinst2 libogdi4.1
libopencv-calib3d4.5d libopencv-contrib4.5d libopencv-dnn4.5d libopencv-features2d4.5d libopencv-flann4.5d
libopencv-highgui4.5d libopencv-imgcodecs4.5d libopencv-improc4.5d libopencv-objectdetect4.5d
libopencv-photo4.5d libopencv-shape4.5d libopencv-stitching4.5d libopencv-superres4.5d libopencv-video4.5d
libopencv-videoio4.5d libopencv-videostab4.5d libopencv-viz4.5d libopenexr-dev libpng-dev libpq5 libproj22
libraw1394-dev librtp01 libsocket++1 libsuperlu5 libswresample-dev libswscale-dev libsz2
libtbb-dev libtesseract4 libtiff-dev libtiffxx5 liburiparser1 libvtk9.1 libxerces-c3.2 mysql-common proj-data
unixodbc-common
Use 'sudo apt autoremove' to remove them.
The following NEW packages will be installed:
  nodejs
0 upgraded, 1 newly installed, 0 to remove and 1 not upgraded.
Need to get 35.2 MB of archives.
After this operation, 219 MB of additional disk space will be used.
Get:1 https://deb.nodesource.com/node_22.x nodistro/main arm64 nodejs arm64 22.12.0-1nodesource1 [35.2 MB]
Fetched 35.2 MB in 9s (3,804 kB/s)
debconf: delaying package configuration, since apt-utils is not installed
Selecting previously unselected package nodejs.
(Reading database ... 222345 files and directories currently installed.)
Preparing to unpack .../nodejs_22.12.0-1nodesource1_arm64.deb ...
Unpacking nodejs (22.12.0-1nodesource1) ...
Setting up nodejs (22.12.0-1nodesource1) ...
Processing triggers for man-db (2.18.2-1) ...
jetson@yahboom: $ node -v && npm -v
V22.12.0
10.9.0
jetson@yahboom: $
```

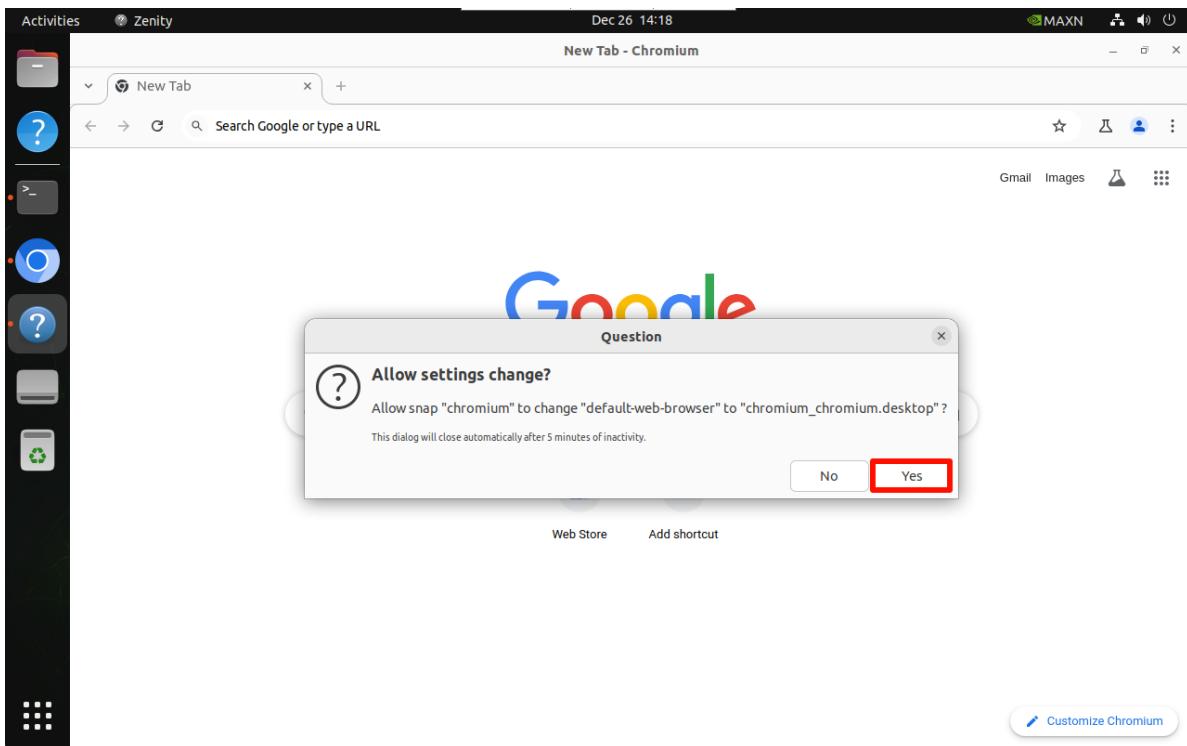
## 2. Jupyter Lab startup

Before starting Jupyter Lab, you need to set the system default browser, otherwise some prompts will appear when starting the terminal.

### 2.1. Set the default browser

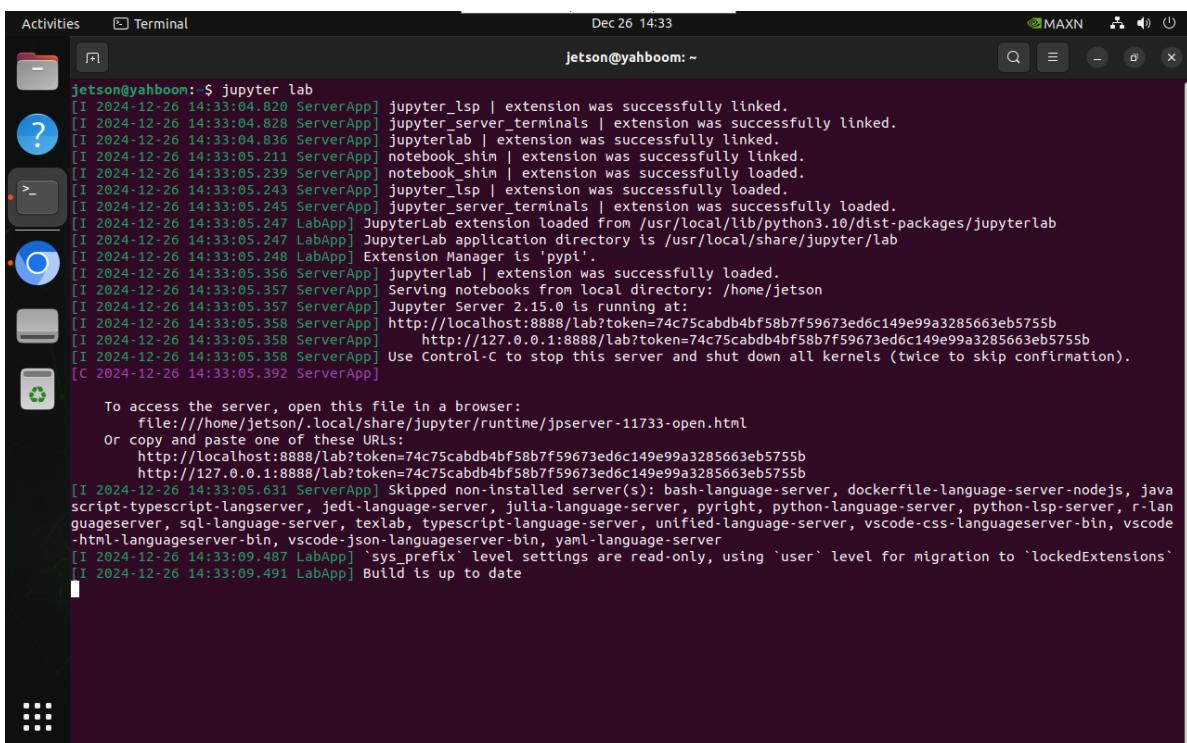
Open the system Chromium browser and select Set the default browser:

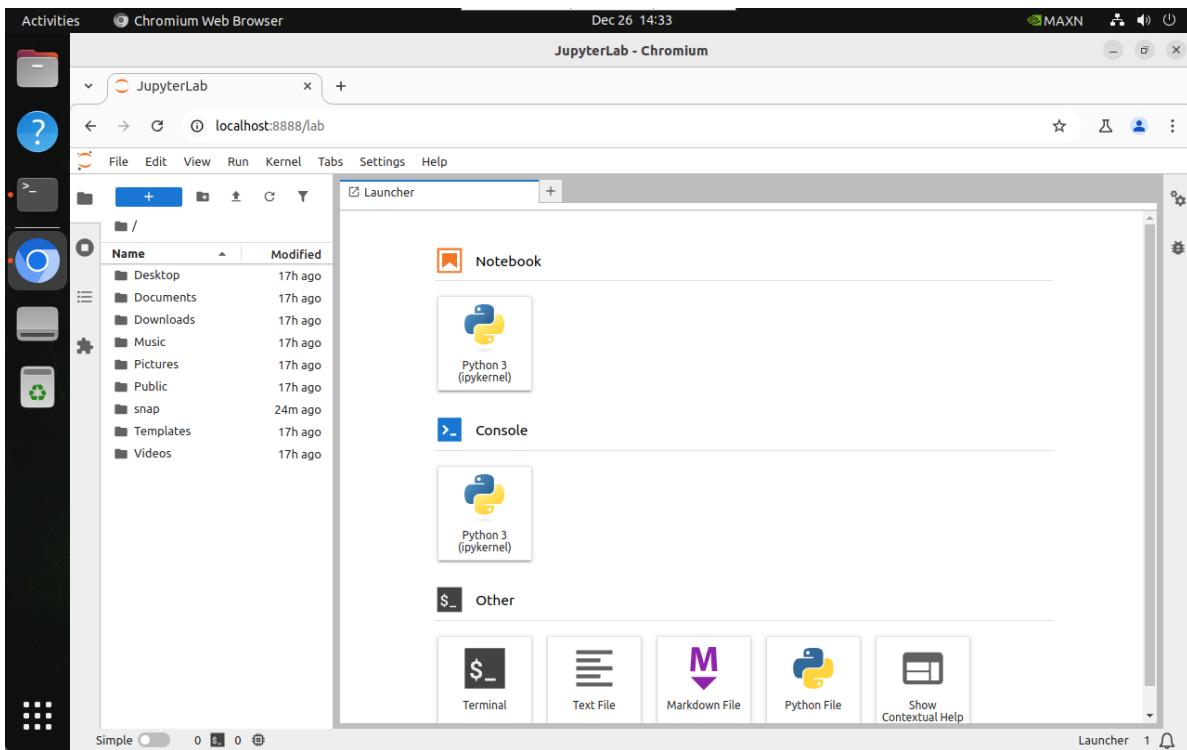




## 2.2. Start Jupyter Lab

```
jupyter lab  
# Start without browser jupyter lab --no-browser  
# Start as administrator sudo jupyter lab --allow-root
```

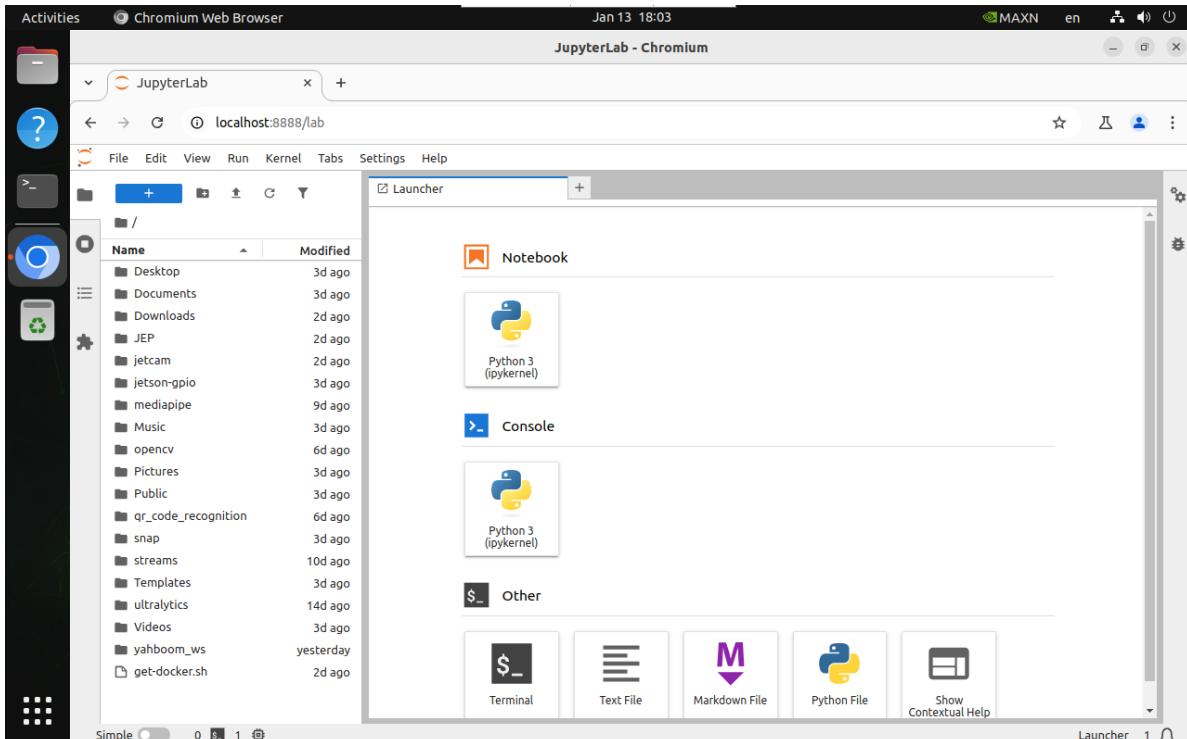




## 2.3. Host access

The host refers to the Jetson motherboard system access, which can be accessed directly through <http://localhost:8888/>:

`http://localhost:8888/`



## 3. Jupyter Lab configuration

Configure LAN access, access password, and auto-start for Jupyter Lab.

## 3.1. LAN access

Device in the same LAN can be accessed by entering IP:8888 in the browser!

**Note: The LAN of the campus network is generally inaccessible. You can change the laptop/mobile phone hotspot to test**

For example, the motherboard IP: 192.168.2.114; we can enter 192.168.2.114:8888 through the browser in the same LAN to perform Jupyter Lab on the motherboard

### 3.1.1, create a configuration file

```
sudo jupyter lab --generate-config
```

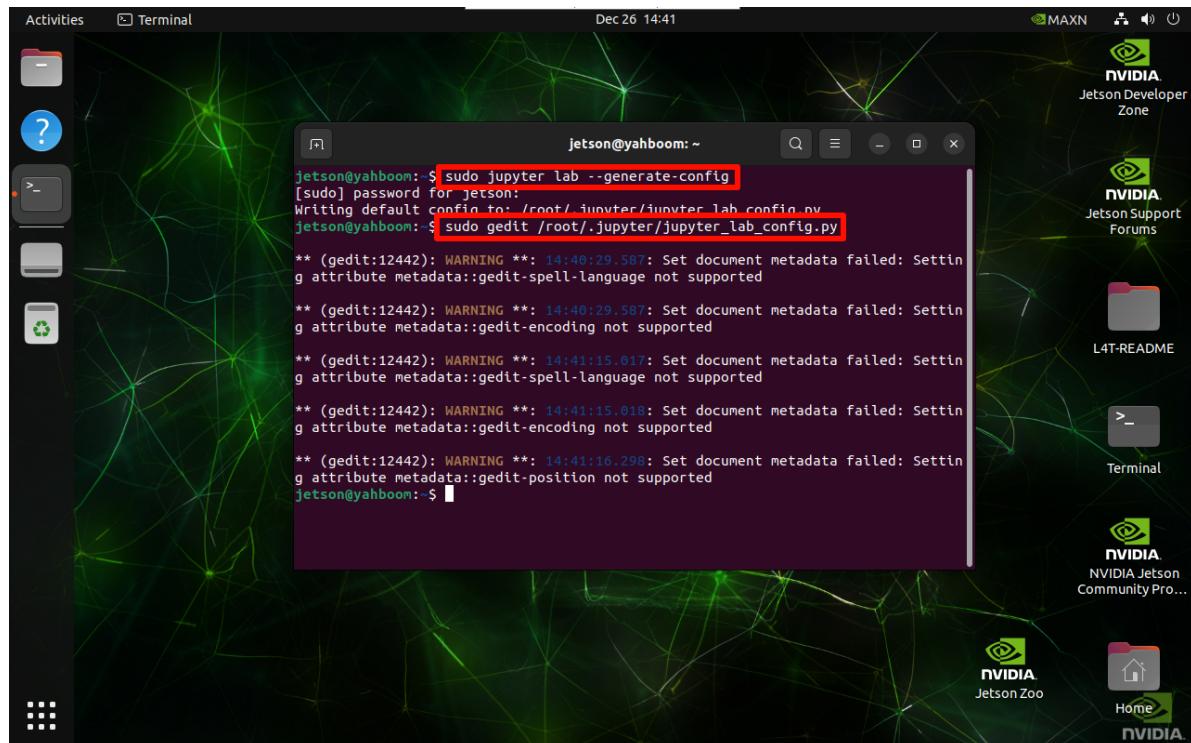
The location of the automatically generated configuration file: Writing default config to: /root/.jupyter/jupyter\_lab\_config.py

### 3.1.2, modify the configuration file

```
sudo gedit /root/.jupyter/jupyter_lab_config.py
```

Modified content: After modification, click Save and close the file

```
# Allow requests from any source to access the Jupyter Lab server
c.ServerApp.allow_origin = '*'
# 0.0.0.0 means binding all available network interfaces and allowing access from
any address
c.ServerApp.ip = '0.0.0.0'
# Allow Jupyter Lab server to be started as root user
c.ServerApp.allow_root = True
# Modify the default port to avoid conflicts
c.ServerApp.port = 8888
```

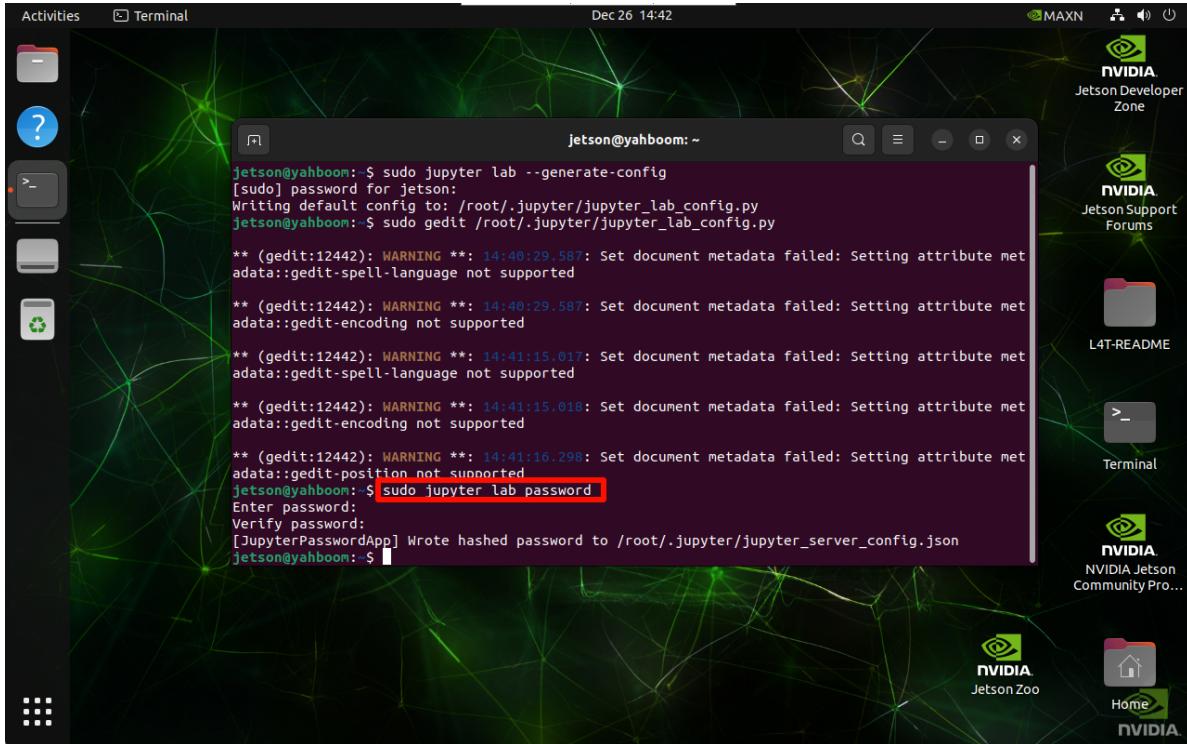


## 3.2, Configure access password

Enter the command to set the password in the terminal twice, and the input will not be displayed when entering the password!

```
sudo jupyter lab password
```

Automatically generated configuration file location: [JupyterPasswordApp] Wrote hashed password to /root/.jupyter/jupyter\_server\_config.json



## 3.3, Start the service automatically at boot

### 3.3.1, Edit the service file

```
sudo gedit /etc/systemd/system/jupyterlab.service
```

Add content: Click Save and close the file after adding

```
[Unit]
Description=jupyterlab
After=network.target
[Service]
Type=simple
ExecStart=/usr/local/bin/jupyter-lab
config=/root/.jupyter/jupyter_lab_config.py --no-browser
User=root
Group=root
WorkingDirectory=/home/jetson/
Restart=always
RestartSec=10
[Install]
WantedBy=multi-user.target
```

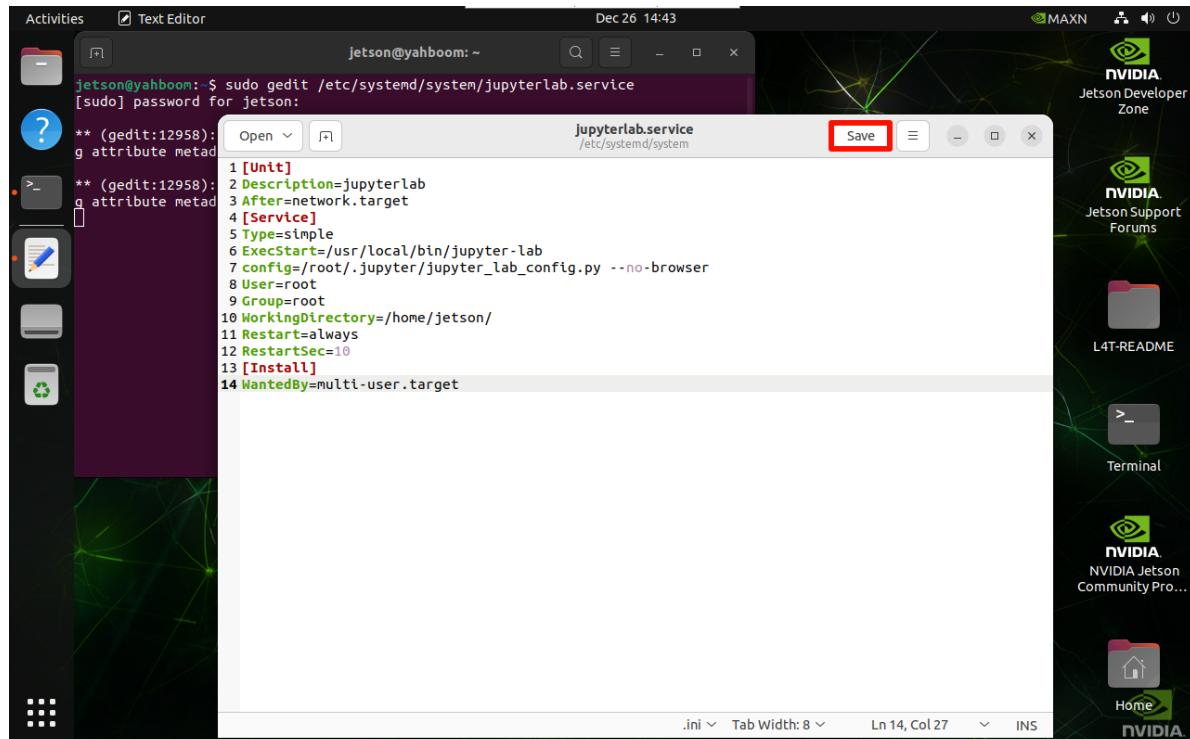
root: system user name

ExecStart: command to start Jupyter lab, change to JupyterLab installation path

config: change to JupyterLab configuration file path

WorkingDirectory: the working directory opened by starting Jupyter-lab, which can be changed by yourself (it is recommended to change to the user directory)

Check Jupyter-lab installation path: which jupyter-lab  
Configuration file path: refer to the path of the configuration file generated above



### 3.3.2, set up the self-start service

Startup service automatically

```
sudo systemctl enable jupyterlab
# Disable startup systemctl disable jupyterlab
```

Start service

```
sudo systemctl start jupyterlab
# Stop service sudo systemctl stop jupyterlab
```

Check service status

```
systemctl status jupyterlab
```

The screenshot shows a terminal window titled "jetson@yahboom: ~" running on a Linux system. The user has run several commands to manage the JupyterLab service:

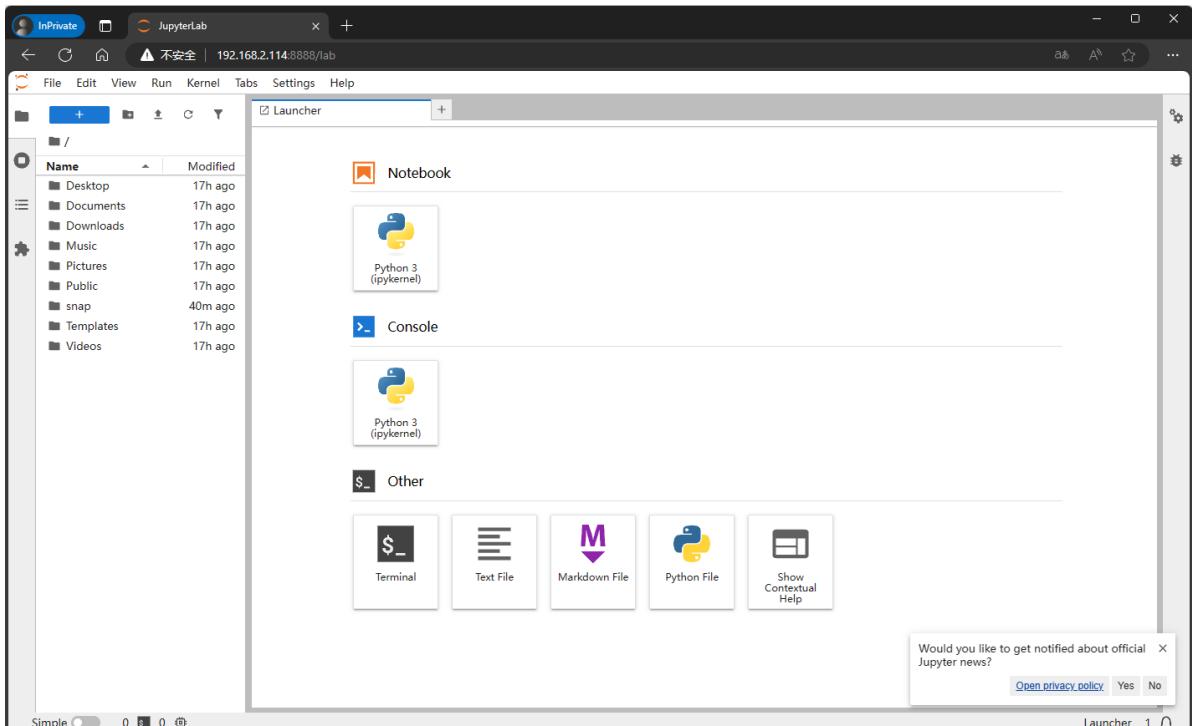
```
jetson@yahboom: $ sudo systemctl enable jupyterlab
[sudo] password for jetson:
Created symlink /etc/systemd/system/multi-user.target.wants/jupyterlab.service → /etc/systemd/system/jupyterlab.service.
jetson@yahboom: $ sudo systemctl start jupyterlab
jetson@yahboom: $ systemctl status jupyterlab
● jupyterlab.service - jupyterlab
   Loaded: loaded (/etc/systemd/system/jupyterlab.service; enabled; vendor preset: enabled)
   Active: active (running) since Thu 2024-12-26 14:47:06 CST; 5s ago
     Main PID: 13074 (jupyter-lab)
       Tasks: 1 (limit: 8809)
      Memory: 66.4M
        CPU: 2.503s
       CGroup: /system.slice/jupyterlab.service
               └─13074 /usr/bin/python3 /usr/local/bin/jupyter-lab

Dec 26 14:47:08 yahboom jupyter-lab[13074]: [I 2024-12-26 14:47:08.947 LabApp] JupyterLab application directory is 'pypti'.
Dec 26 14:47:08 yahboom jupyter-lab[13074]: [I 2024-12-26 14:47:08.948 LabApp] Extension Manager is 'pypti'.
Dec 26 14:47:09 yahboom jupyter-lab[13074]: [I 2024-12-26 14:47:09.053 ServerApp] jupyterlab | extension was loaded
Dec 26 14:47:09 yahboom jupyter-lab[13074]: [I 2024-12-26 14:47:09.054 ServerApp] Serving notebooks from local directory: http://yahboom:8888/lab
Dec 26 14:47:09 yahboom jupyter-lab[13074]: [I 2024-12-26 14:47:09.054 ServerApp] Jupyter Server 2.15.0 is running at:
Dec 26 14:47:09 yahboom jupyter-lab[13074]: [I 2024-12-26 14:47:09.054 ServerApp] http://127.0.0.1:8888
Dec 26 14:47:09 yahboom jupyter-lab[13074]: [I 2024-12-26 14:47:09.054 ServerApp] Use Control-C to stop this server.
Dec 26 14:47:09 yahboom jupyter-lab[13074]: [W 2024-12-26 14:47:09.066 ServerApp] No web browser found: Err...
Dec 26 14:47:09 yahboom jupyter-lab[13074]: [I 2024-12-26 14:47:09.276 ServerApp] Skipped non-installed ser...
lines 1-20/20 (END)
```

## Verify startup

After restarting the system, use the same LAN device to access the motherboard IP:8888 based on the system IP.

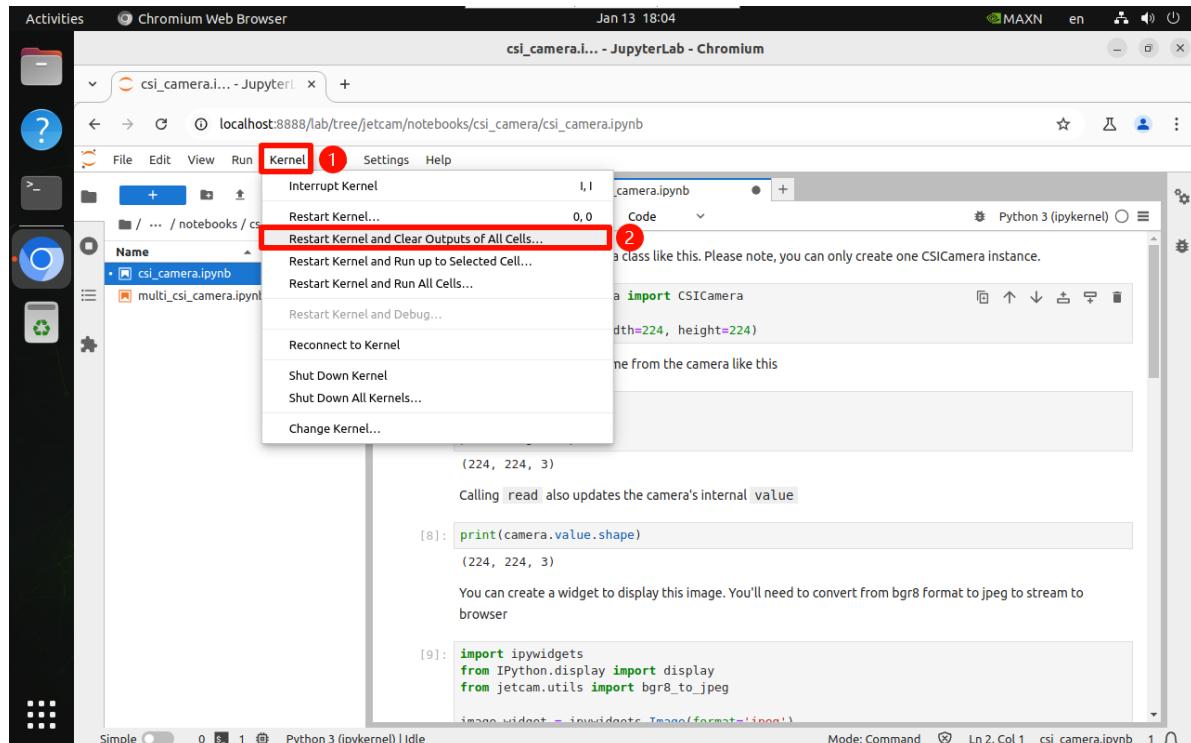
You need to enter a password for the first access, which is the information set in the previous step;  
when taking the screenshot, the IP of the motherboard is 192.168.2.114, so devices in the same LAN can access 192.168.2.114:8888



## 4. Use Jupyter Lab

## 4.1. Kernel

It is recommended to restart the kernel and clear all unit block output information every time you run a program or the program is abnormal:

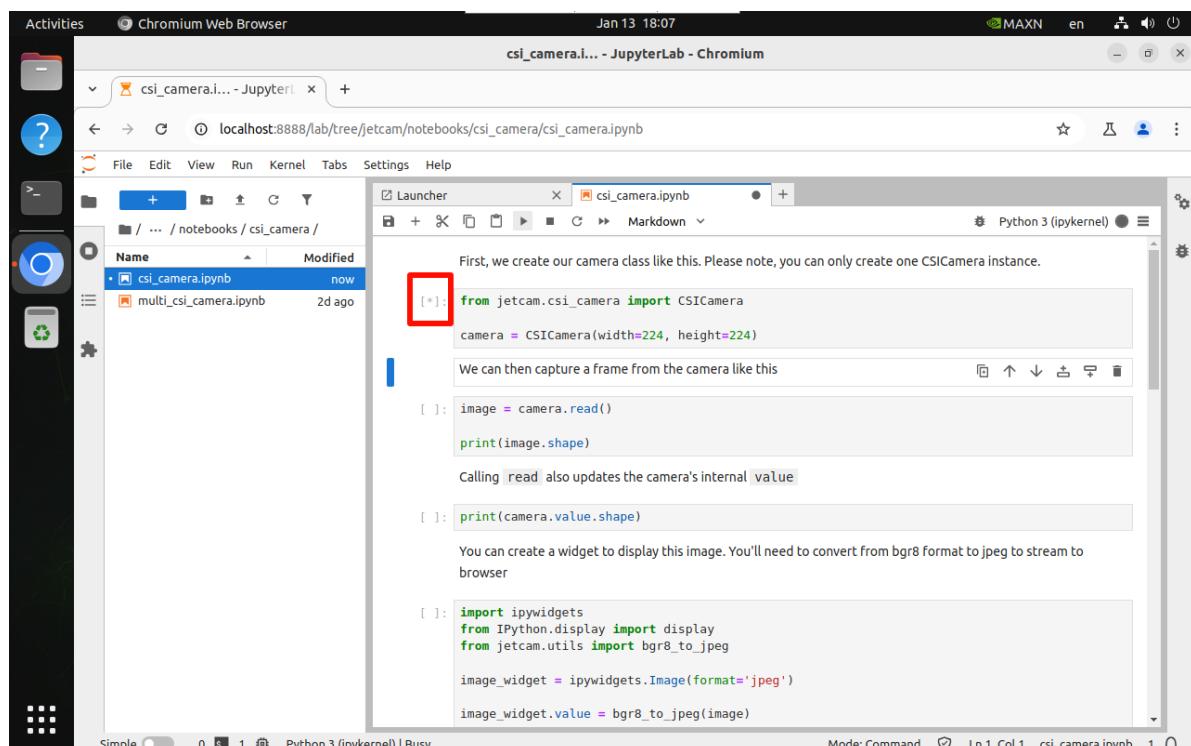


## 4.2. Run the program

Through Jupyter Open the program file to be run in Lab, and run the program from top to bottom to run the unit blocks in sequence:

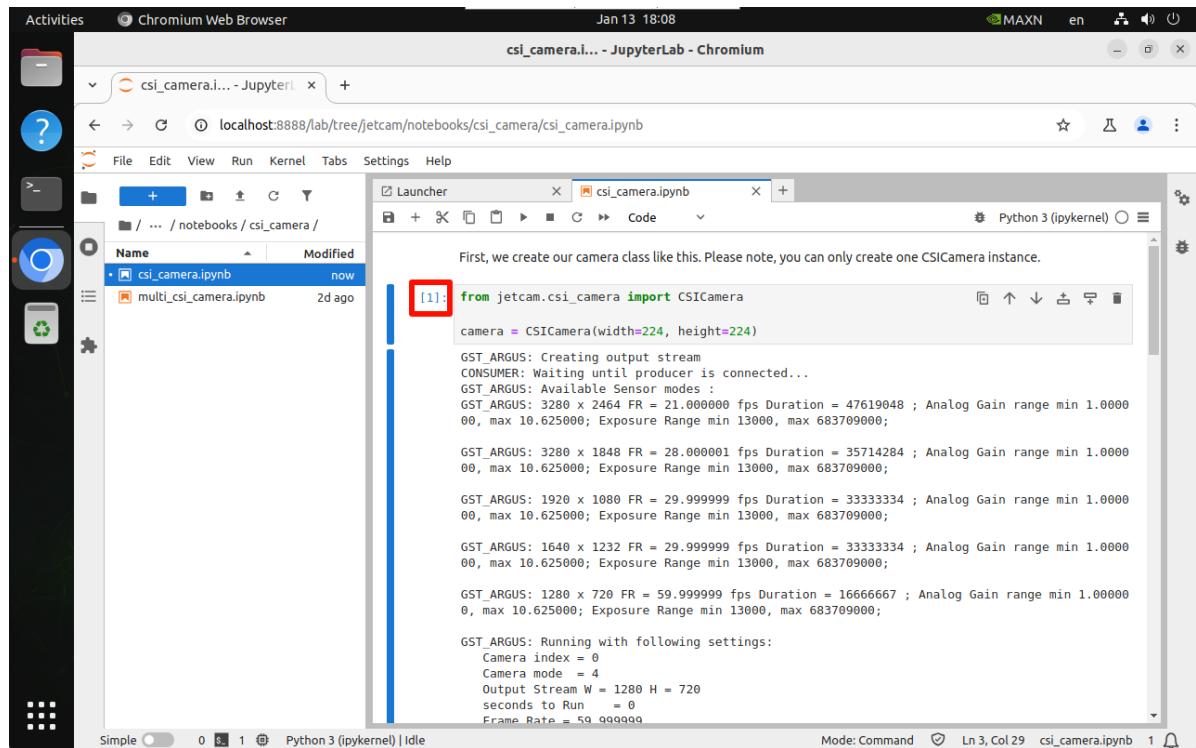
### 4.2.1. Running

[\*] is displayed in the upper left corner of the unit block to indicate that it is running:



## 4.2.2. Running completed

[Number] is displayed in the upper left corner of the unit block to indicate the number of times it has been run: for example, [1] → the program has run the unit block code for the first time



The screenshot shows a JupyterLab environment running on a Chromium Web Browser. The title bar indicates the session is titled "csi\_camera.i... - JupyterLab - Chromium" and the date and time are "Jan 13 18:08". The top navigation bar includes "File", "Edit", "View", "Run", "Kernel", "Tabs", "Settings", and "Help". On the left, there's a file tree showing two files: "csi\_camera.ipynb" (modified now) and "multi\_csi\_camera.ipynb" (modified 2d ago). The main area is a terminal window titled "Launcher" with the command "CSI Camera" entered. The output shows the following text:

```
First, we create our camera class like this. Please note, you can only create one CSICamera instance.  
[1]: from jetcam.csi_camera import CSICamera  
camera = CSICamera(width=224, height=224)  
  
GST_ARGUS: Creating output stream  
CONSUMER: Waiting until producer is connected...  
GST_ARGUS: Available Sensor modes:  
GST_ARGUS: 3280 x 2464 FR = 21.000000 fps Duration = 47619048 ; Analog Gain range min 1.0000  
00, max 10.625000; Exposure Range min 13000, max 683709000;  
  
GST_ARGUS: 3280 x 1848 FR = 28.000001 fps Duration = 35714284 ; Analog Gain range min 1.0000  
00, max 10.625000; Exposure Range min 13000, max 683709000;  
  
GST_ARGUS: 1920 x 1080 FR = 29.999999 fps Duration = 33333334 ; Analog Gain range min 1.0000  
00, max 10.625000; Exposure Range min 13000, max 683709000;  
  
GST_ARGUS: 1640 x 1232 FR = 29.999999 fps Duration = 33333334 ; Analog Gain range min 1.0000  
00, max 10.625000; Exposure Range min 13000, max 683709000;  
  
GST_ARGUS: 1280 x 720 FR = 59.999999 fps Duration = 16666667 ; Analog Gain range min 1.00000  
0, max 10.625000; Exposure Range min 13000, max 683709000;  
  
GST_ARGUS: Running with following settings:  
    Camera index = 0  
    Camera mode = 4  
    Output Stream W = 1280 H = 720  
    seconds to Run = 0  
    Frame Rate = 59.999999
```