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Set up development environment

To start, here we first say little about different platforms:

1. Linux
2. MacOS
3. Windows

Linux and MacOS are platforms developers favor, for their Unix-based operating frameworks. Considering the usage habits of everyone, and the future usage of `cuda`, to be novice friendly, we set up our development environments on the most complicated platform for development – Windows.

Terminal

In Windows 10, you can download the app **Terminal Preview** from the Microsoft Store to use as your terminal. However, in Windows 11, you can use the default app **Terminal**.

In the top menu bar, click on the sign `V` next to the plus sign `+`, and you can find three shells: **Windows PowerShell**, **Command Prompt**, and **Azure Cloud Shell**.

Next let's go to another shell: `git bash`, which can be added into **Terminal**. With it, you could have almost the same experience as in Linux and MacOS.

Git Bash

Go to the website <https://git-scm.com/download/win>, and select the version **64-bit Git for Windows Setup**. During installation, select **Add a Git Bash Profile to Windows Terminal**; then you can use `git bash` in **Terminal**.

Now you can see another shell `git bash` under the above three shells. Click on the **Settings**, and in **Startup** select `git bash` as the default shell. Then you can see the `git bash` shell when you open **Terminal**.

Zsh

Next we go to a very advanced and programmable command interpreter (shell) for UNIX: `zsh`.

Go to the download link https://mirror.msys2.org/msys/x86_64/zsh-5.9-2-x86_64.pkg.tar.zst and gunzip the file. Then copy the two folders and four files to the path of your Git repository `C:\Git`. If prompted for permissions, grant them. In case of conflicts with duplicate names, simply overwrite the existing files.

First we digress a little to say where you are when you open **Terminal**. You can use the command `pwd` to see the current directory. In Windows, the default directory is `C:\Users\yourname`. And this time I highly recommend this powerful editor VScode to you. You can download it from the official website, quickly install it. Then you can open `.bashrc` file by VScode, and fill in the following content:

```
if [ -t 1 ]; then
    exec zsh
fi
```

Then you can see the **zsh** shell when you reopen **Terminal**. You may encounter warnings such as “`bash_profile` not found” or similar files. You can safely ignore them, and they should not appear again in the future.

Oh My Zsh

After installing **zsh** terminal, it may appear similar to the **bash** terminal without any significant differences, as we haven’t made any configurations. However, **Oh My Zsh** can be used to manage **zsh** configurations. It bundles thousands of useful features, helpers, plugins, themes, and more.

You could install **Oh My Zsh** by running the following command in **zsh** by `curl`

```
sh -c "$(curl -fsSL https://gitee.com/mirrors/oh-my-zsh/raw/master/tools/install.sh)"
```

or by `wget`

```
sh -c "$(wget -O- https://gitee.com/pocmon/mirrors/raw/master/tools/install.sh)"
```

After installation, the default theme used is “`robbyrussell`”. You can modify the `ZSH_THEME` field in the `.zshrc` configuration file. Next, you need to install two plugins: **zsh-autosuggestions** and **zsh-syntax-highlighting**:

```
git clone https://github.com/zsh-users/zsh-autosuggestions
${ZSH_CUSTOM:--/.oh-my-zsh/custom}/plugins/zsh-autosuggestions
```

and

```
git clone https://github.com/zsh-users/zsh-syntax-highlighting.git
${ZSH_CUSTOM:--/.oh-my-zsh/custom}/plugins/zsh-syntax-highlighting
```

The **zsh-autosuggestions** plugin allows you to find and highlight history commands that match your current input, and you can use the right arrow key to complete them directly. The **zsh-syntax-highlighting** plugin recognizes shell commands and highlights them.

Then you can open `.zshrc` file by VScode, and fill in the following text near line 80:

```
plugins=(git
          zsh-syntax-highlighting
          zsh-autosuggestions)
```

Powerlevel10k theme

The default theme used is “`robbyrussell`”, which is not very beautiful. We can use the “`Powerlevel10k`” theme to make it more beautiful:

```
git clone --depth=1 https://gitee.com/romkatv/powerlevel10k.git
${ZSH_CUSTOM:-$HOME/.oh-my-zsh/custom}/themes/powerlevel10k
```

To use the theme, font **MesloLGS NF** is recommended. After fonts installation, it will be available to all applications on your system. Make sure that **Terminal** and integrated terminal in VScode are using the same font. Then you can open `.zshrc` file by VScode, and fill in the following text near line 20:

```
ZSH_THEME="powerlevel10k/powerlevel10k"
```

After that, interactive information for **p10k** configuration will be displayed. Enter **y** and configure it according to your preferences. If you wish to reconfigure it in the future, you can execute the command

```
p10k configure
```

Here, I will use an image to demonstrate the successful configuration on all three platforms; see Figure 1.



Figure 1: Successful configuration of the final prompt if you have the same taste as Ang. Platforms from top to bottom: Linux(Ubuntu), MacOS, Windows.

Python3 deployment

Python3 installation

Here we talk about how to install **python3** on Windows. It's easy to install **python3** from the official website. But the command in the terminal is initially "python". If you want to change it to "python3", you should do as follows:

Use the following command to find the installation path of python3,

```
import sys
sys.executable
```

*Once you have located the python3 installation path, navigate to that directory, and rename the **python.exe** file to **python3.exe**, with the **pythonw.exe** file to **pythonw3.exe**.*

After renaming, the **pip** or **pip3** command may encounter errors, and one potential solution is

```
> python3 -m pip install --upgrade --force-reinstall pip
```

Python3 virtual environment

We highly recommend you to have **venv** named **yourenv** (decided by you) available, since it's terse for you to manage those python packages. There are two methods to meet such needs: **conda** and **pip/pip3**.

Using conda We recommend Anaconda, using the free distribution installation. And then you can make a conda environment in the terminal:

```
(path of current directory).....(hh:mm:ss)
> conda create -n yourenv python=3.x
```

Then you can find the Conda Env `yourenv` to run both `*.py` and `*.ipynb` files in VScode. In terminal or integrated terminal, you can activate by

```
(path of current directory).....(hh:mm:ss)
> conda activate yourenv
```

and deactivate by

```
(path of current directory).....(yourenv) (hh:mm:ss)
> conda deactivate
```

But `conda` environments come with a set of pre-installed Python libraries, which can sometimes conflict with newly installed libraries. Thus we recommend the following method.

Using pip/pip3 Using `pip/pip3` to make a virtual environment with:

```
(path of current directory).....(hh:mm:ss)
> python3 -m venv yourenv
```

In terminal or integrated terminal on Windows, you can activate by

```
(path of current directory).....(hh:mm:ss)
> source [path of yourenv]/yourenv/Scripts/activate
```

If can't, run the terminal as an administrator

```
(path of current directory).....(hh:mm:ss)
> set-ExecutionPolicy RemoteSigned
```

then **Enter**, and chose **Y** to confirm. And you can deactivate the `venv` by

```
(path of current directory).....(yourenv) (hh:mm:ss)
> deactivate
```

Third-party libraries When first deploying a `venv`, there're two libraries, and you can look them up with

```
(path of current directory).....(yourenv) (hh:mm:ss)
> pip3 list
```

and you can see

Package	Version
-----	-----
<code>pip</code>	22.0.4
<code>setuptools</code>	58.1.0

Here `pip` and `setuptools` are built-in with `yourenv`. If you want to install other third-party libraries like `numpy`, you can install them with

```
(path of current directory).....(yourenv) (hh:mm:ss)
> pip3 install numpy
```

or

```
(path of current directory).....(yourenv) (hh:mm:ss)
> pip3 install numpy -i https://pypi.tuna.tsinghua.edu.cn/simple/
```

The option `-i` is used to specify the index source from where the package will be installed. Here we can use the index source from `tuna`, Tsinghua University open source software mirror. By default, `pip3` downloads

packages from the Python Package Index (PyPI). Then you can see

```
Package      Version
-----
numpy        1.25.0
pip          22.0.4
setuptools   58.1.0
```

To export the dependencies used in `yourenv` to a `requirements.txt` file, you can use the following command:

```
(path of current directory).....(yourenv) (hh:mm:ss)
> pip3 freeze -> requirements.txt
```

If you want to transfer `yourenv` to your code collaborators, just send them the `requirements.txt` file and tell them to use the command:

```
(path of current directory).....(hisenv) (hh:mm:ss)
> pip3 install -r requirements.txt -i https://pypi.tuna.tsinghua.edu.cn/simple/
```

Select python interpreter With VScode, we usually deal with two kinds of python files: `.py` file and `.ipynb` file.

When opening a `.py` file, you can

- Enter `shift+control+P` to open Command Palette
- Click `Python: Select Interpreter` and then + Enter interpreter path...
- Input `[python3 path of yourenv]`

Then you can enter the button ►, and run the `.py` file. After doing so, you can open a `.ipynb` file, and

- Click `Select Kernel`
- Select `Select Another Kernel...` and `Python Environments...`
- Choose `yourenv`

With this, the configuration process for Python starting from the Terminal is complete. Arm yourself with Python and embark on a wonderful journey!