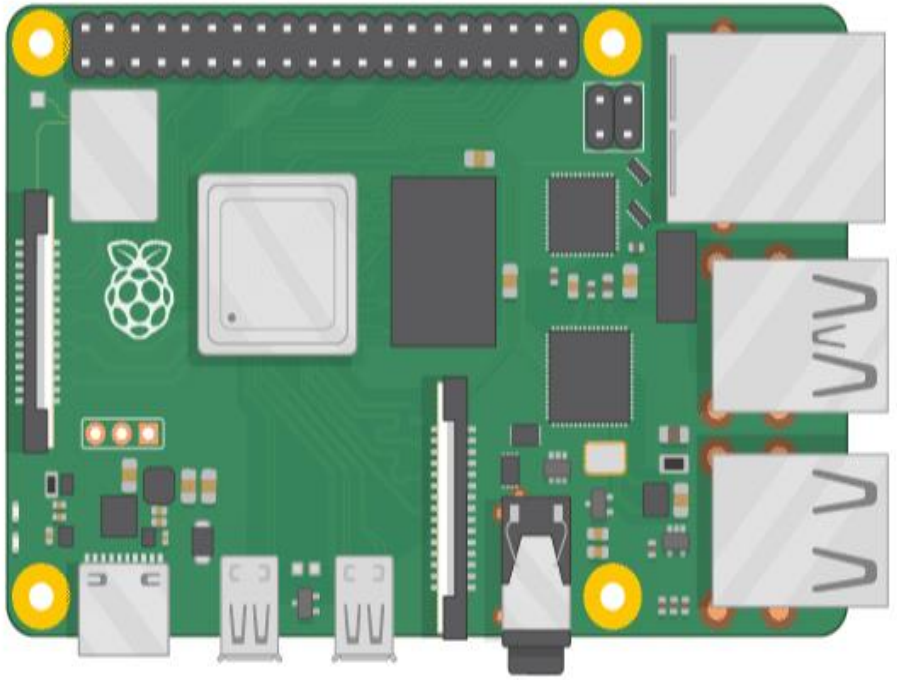
Fundamental of Cognitive Interaction with Robots

Lecture 2

Getting Started with Raspberry Pi

What do you need?

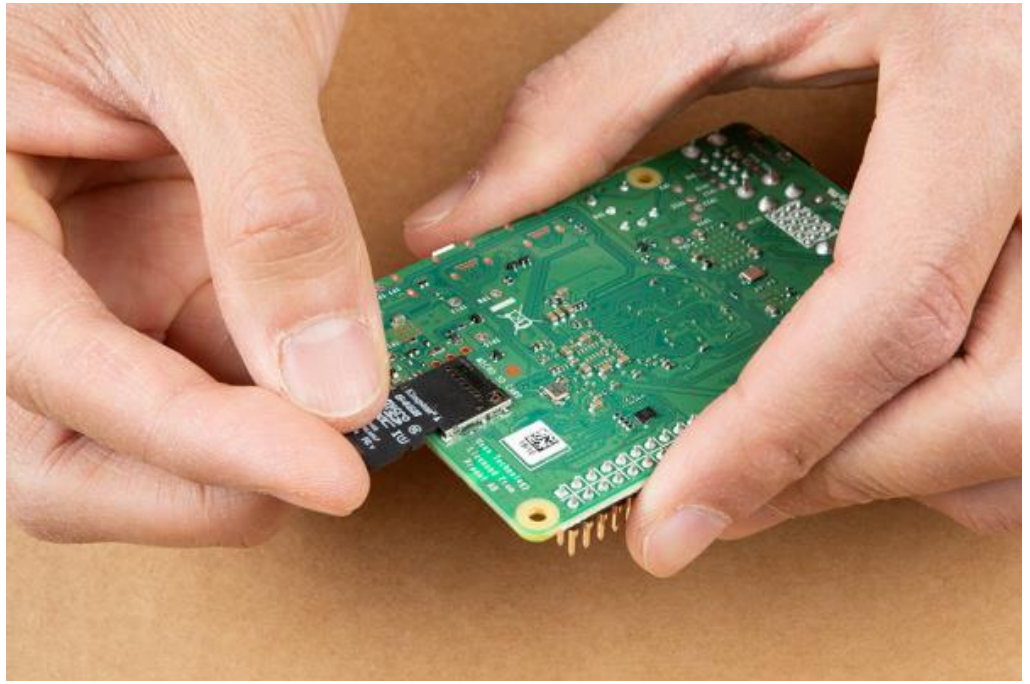
- **Raspberry Pi, which version?**
- **Power supply:**
- USB-C for Raspberry Pi 4
- micro USB for Raspberry Pi 3, 2, and 1.
- You need a power supply that provides:
- At least 3.0 amps for Raspberry Pi 4
- At least 2.5 amps for Raspberry Pi 3
- **A keyboard and a mouse**



Getting Started with Raspberry Pi (Cont.)

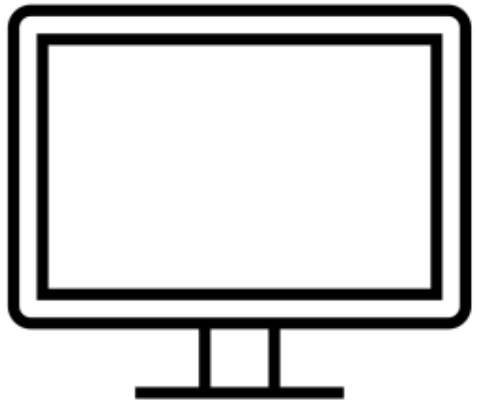
What do you need?

- **A microSD card**
- at least 8GB
- **A TV or computer screen**
- **HDMI cable**
- Raspberry Pi 4 has two micro HDMI ports, so you need a micro HDMI to HDMI cable.
- Raspberry Pi 1, 2, and 3 have a single full-size HDMI port, so you can connect them to a screen using a standard HDMI to HDMI cable.



microHDMI to HDMI Cable

Monitor



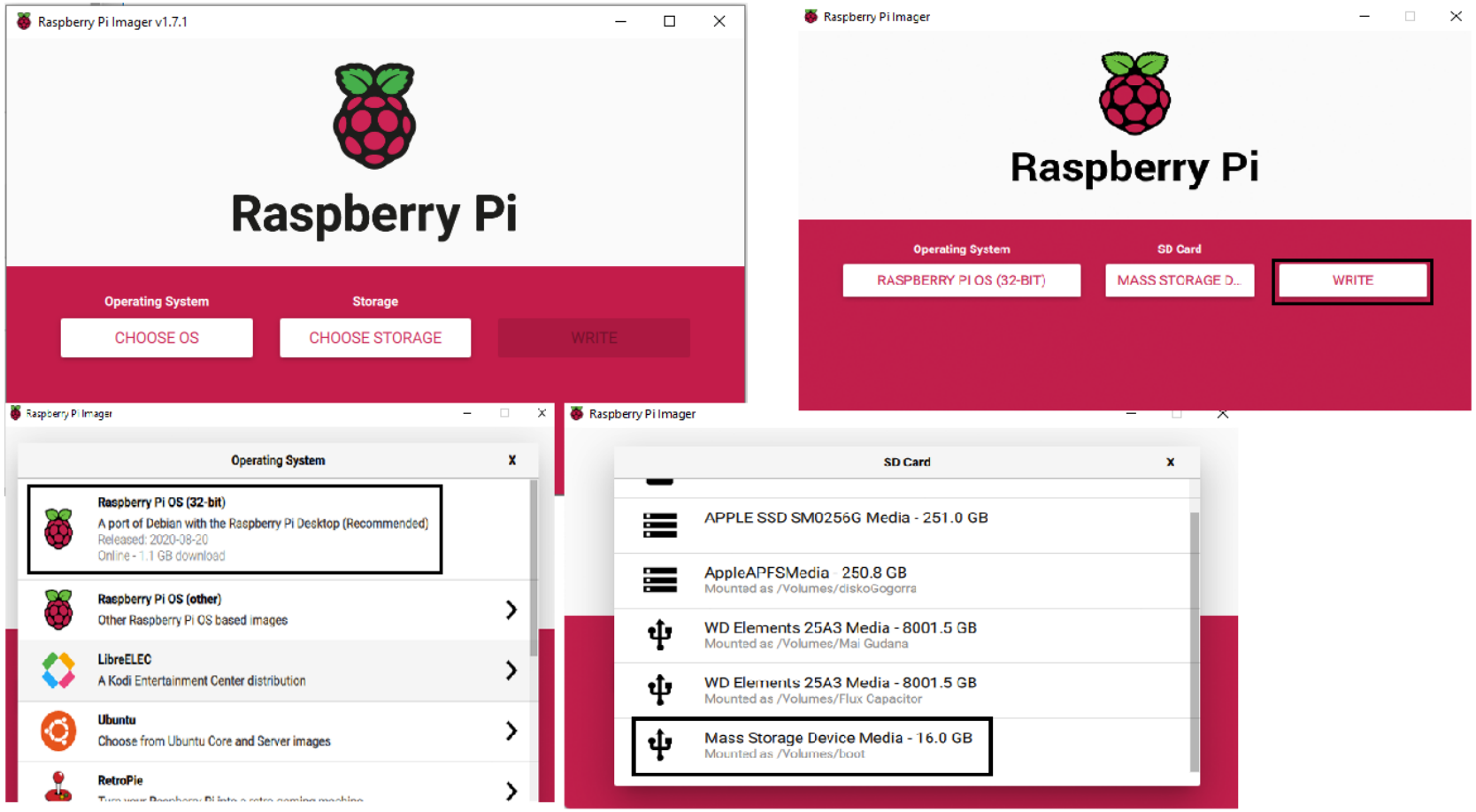
Raspberry Pi OS

- Raspberry Pi needs an operating system to work.
- The OS for Raspberry Pi is called “Raspberry Pi OS” (previously known as Raspbian), which is the official operating system for Raspberry Pi.
- The Raspberry Pi OS is a custom version of Debian, which is a Linux version.
- A microSD card is used to store the files and the Raspberry Pi OS.
- Then, “Raspberry Pi Imager“ is used to download the OS to the microSD card.
- Download the Raspberry Pi Imager from:

https://www.raspberrypi.com/software/

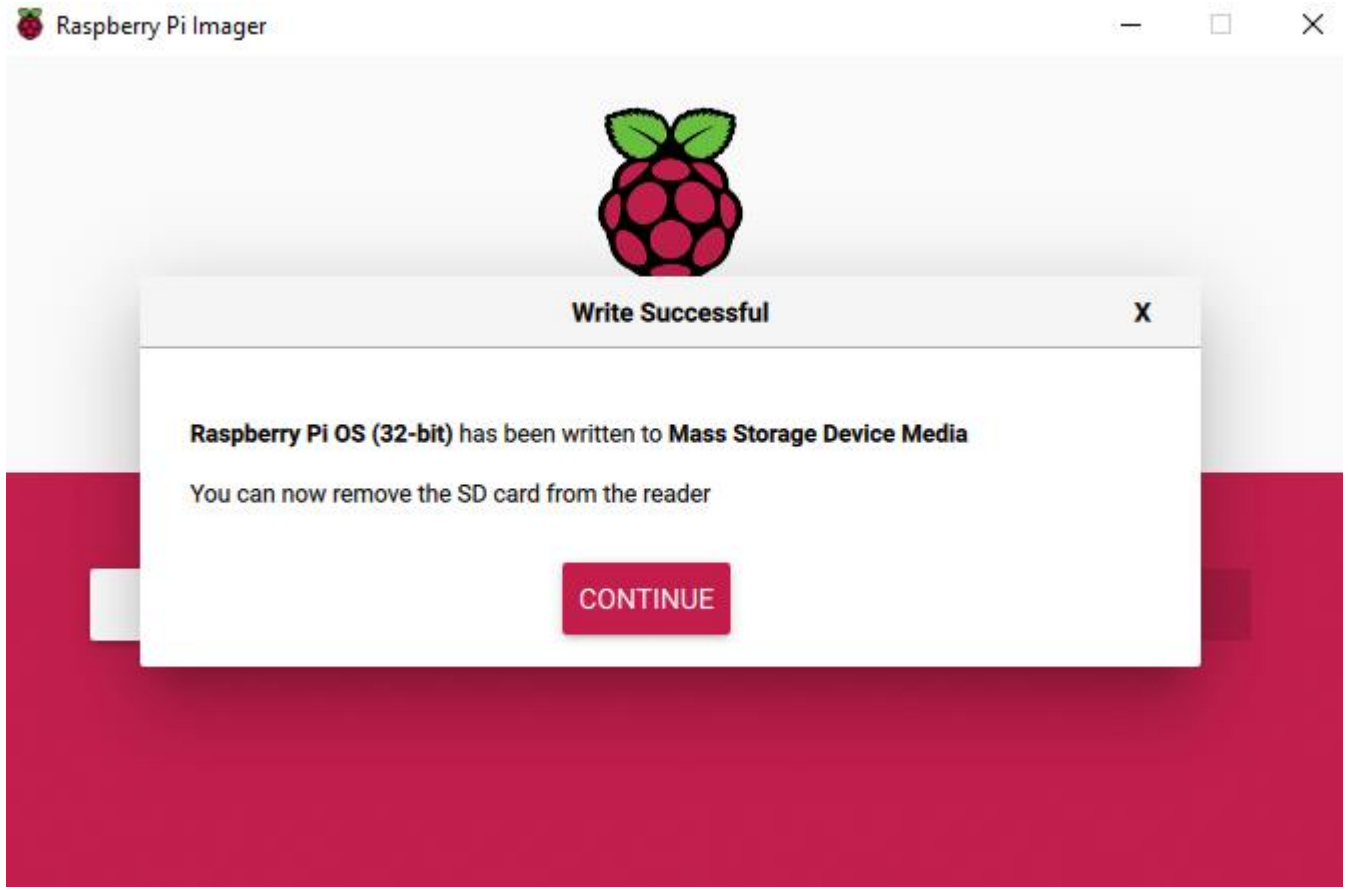
Raspberry Pi Imager

- Download and install Raspberry Pi Imager to a computer with an SD card reader.
- Put the SD card you'll use with your Raspberry Pi into the reader and run Raspberry Pi Imager.
- Select OS
- Select SD card
- Click Write button



Raspberry Pi Imager (Cont.)

- Wait for the Raspberry Pi Imager to finish writing. It needs Internet to download the OS.
- Once you get the following message, you can eject your SD card.

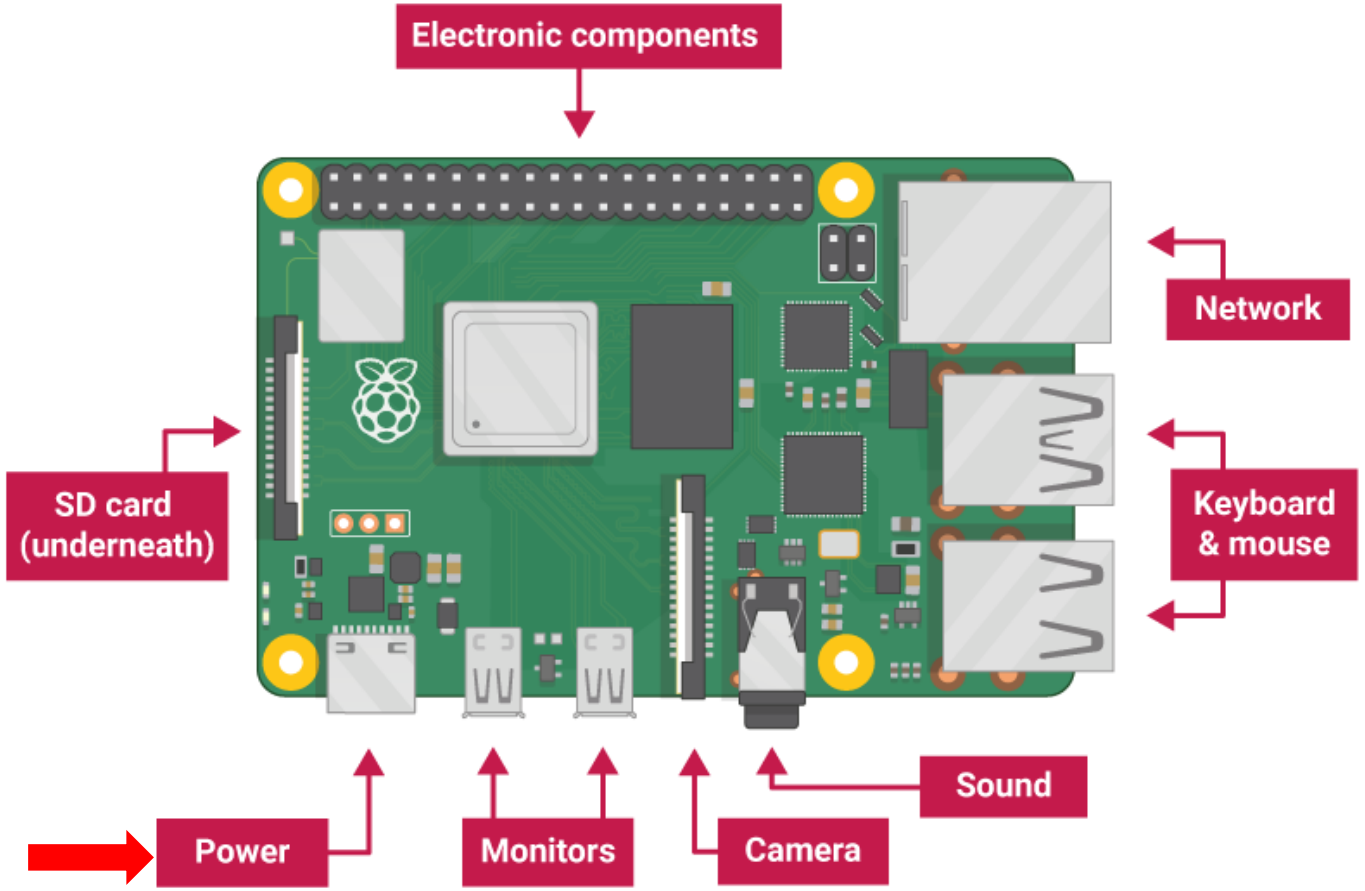


Connect your Raspberry Pi

- It’s important to do this in the right order, so that all your components are safe.

- Insert the SD card you’ve set up with Raspberry Pi OS into the microSD card slot.
- Connect the mouse and keyboard
- Connect the screen, and make sure it is powered on.
- For Raspberry Pi 4, connect the screen to the first HDMI port, labelled HDMI0 (nearest the power in port).
- You can connect an optional second screen to HDMI1.
- Connect Ethernet, camera,

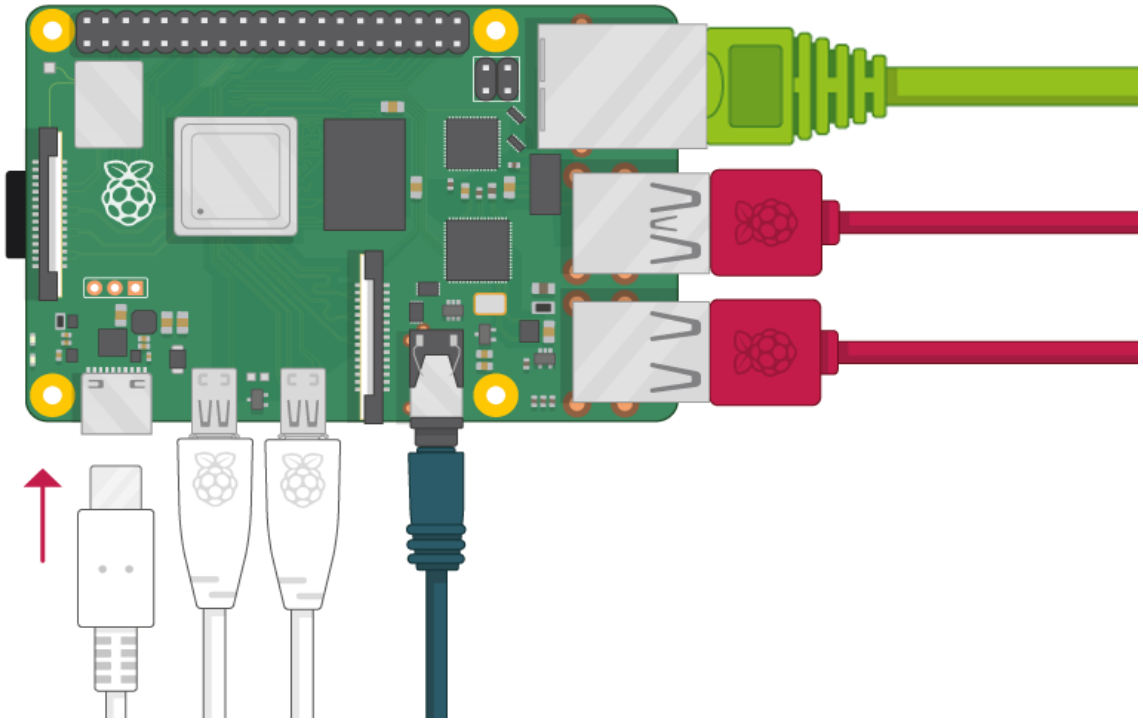
  and speakers



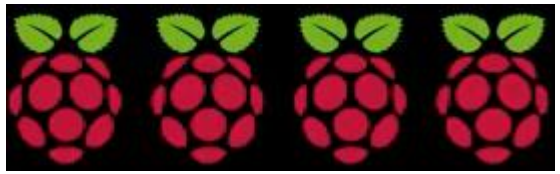
Connect the power at the last step

Power up the Raspberry Pi

- Raspberry Pi doesn’t have a power switch. As soon as you connect it to a power outlet, it will turn on.
- Plug the power supply into a socket and connect it to your Raspberry Pi’s power port.
- After that, the Raspberry Pi is booting, raspberries appear at the top of the screen. After a few seconds the Raspberry Pi OS desktop will appear.



Booting



Finishing the setup

- When you start the Raspberry Pi for the first time, the Welcome to Raspberry Pi screen will appear.

Choose country and language

*Necessary step to configure the WiFi

Finishing the setup

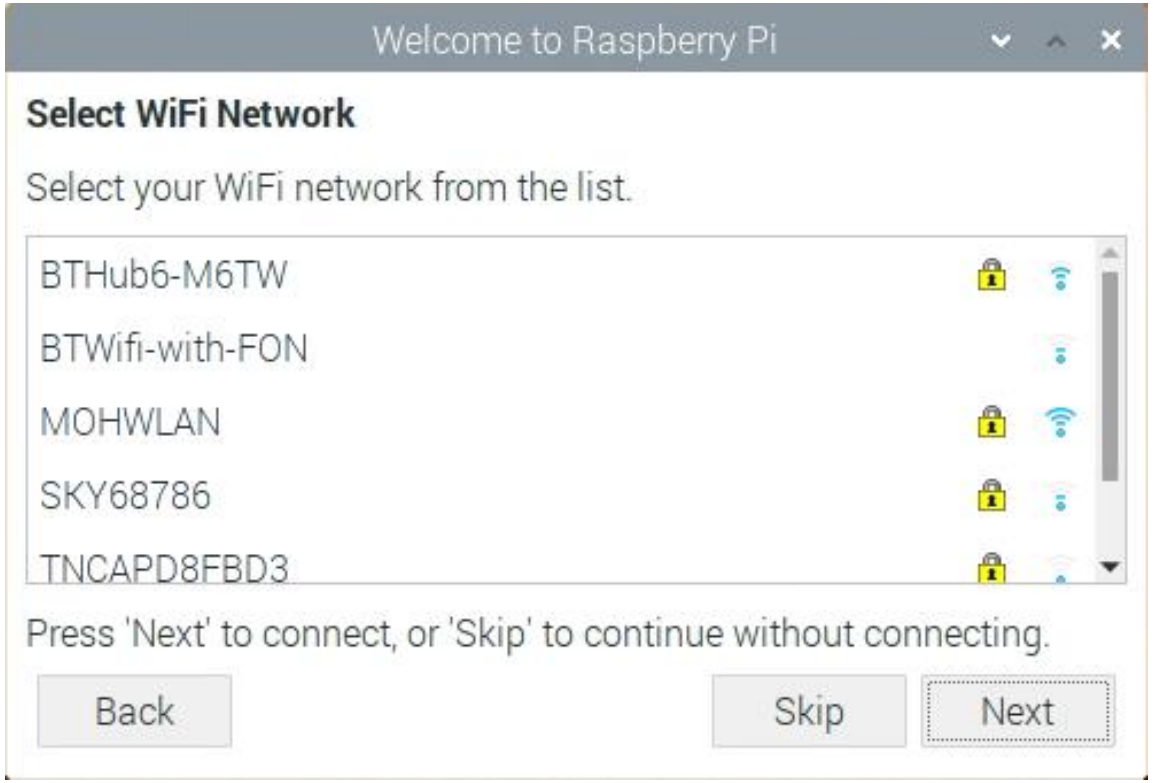
Change the password

- The default username is ‘pi’, and the default password is ‘raspberry’. You can change the default password in this screen, and clicking on Next.

Finishing the setup

Connect to a WiFi Network

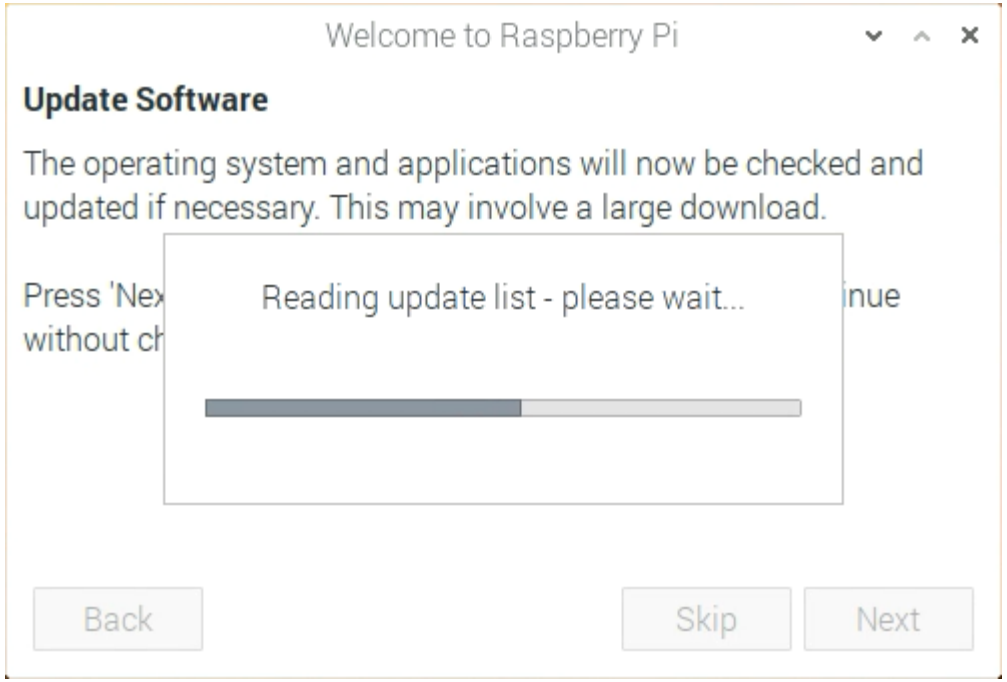
- You can connect to your wireless network by selecting its name, entering the password, and clicking on Next.



Finishing the setup

Update the software

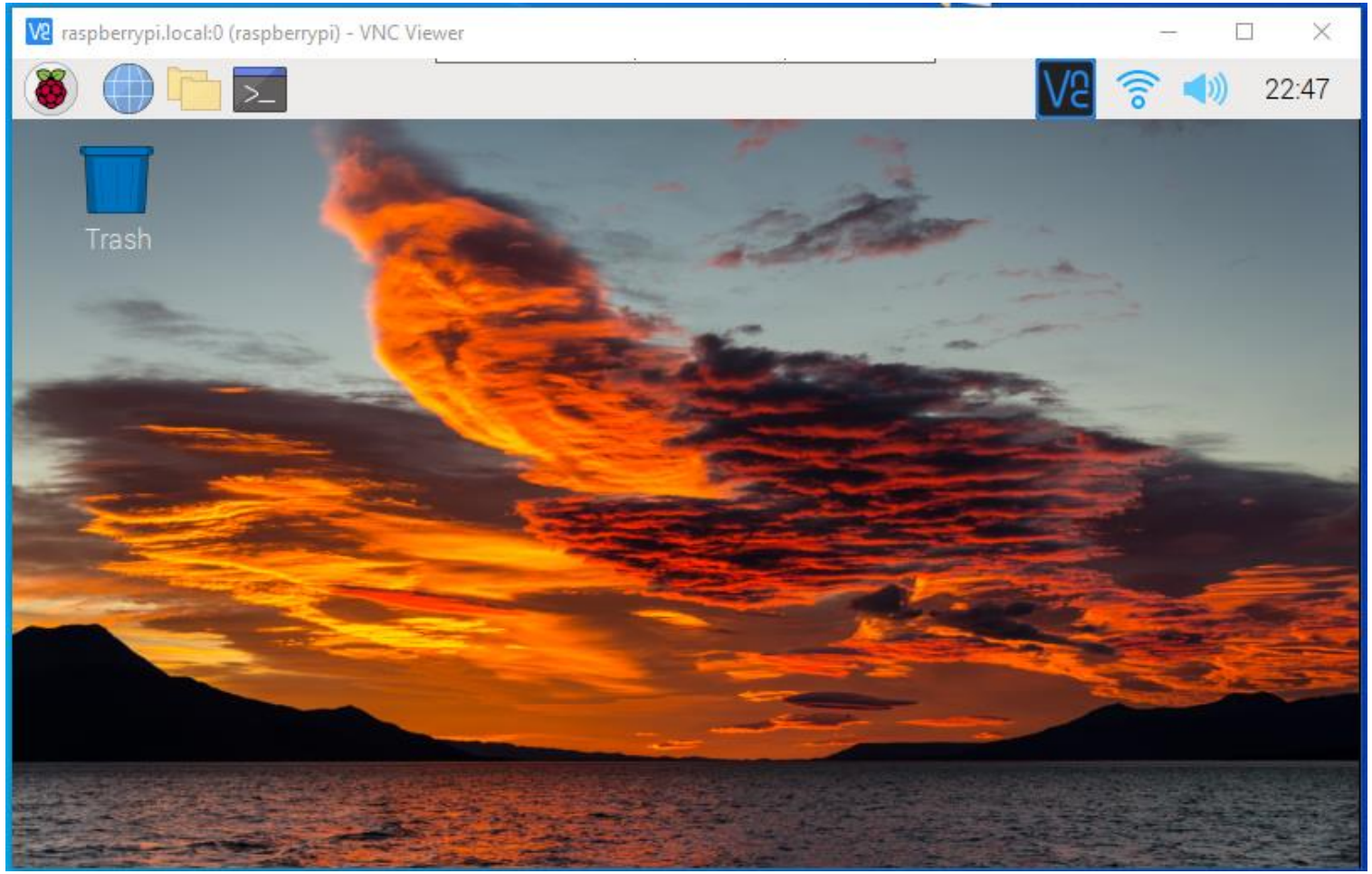
- After successful connection to a WiFi network, the system will check for updates to Raspberry Pi OS and install them.



- Click on Restart to finish the setup.

Finishing the setup

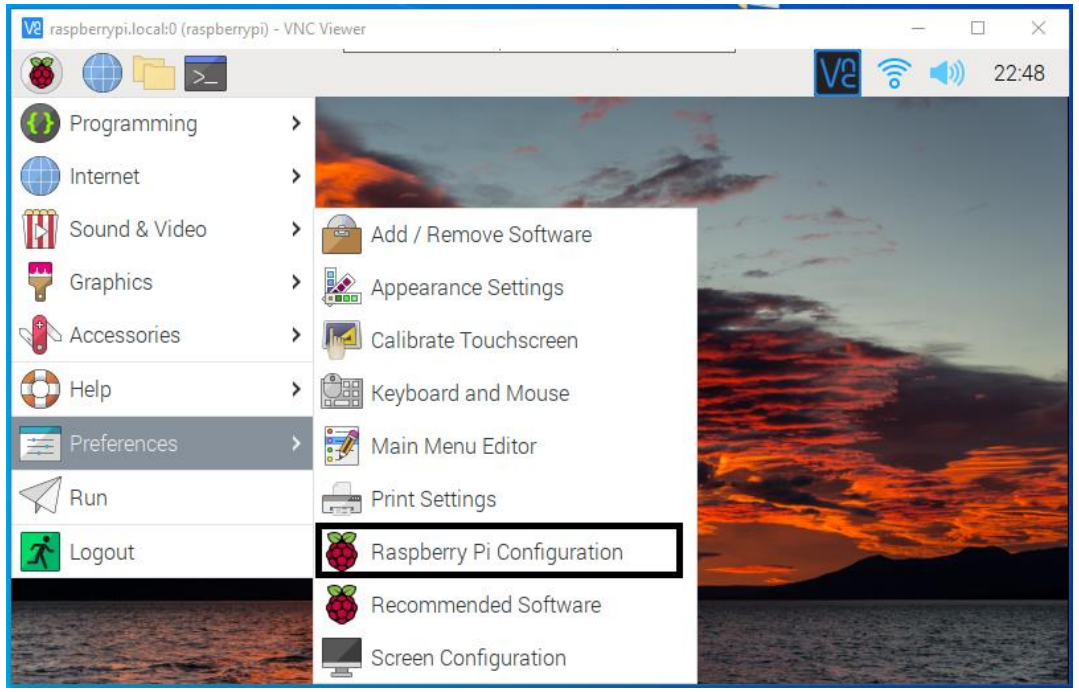
Raspberry Pi OS desktop

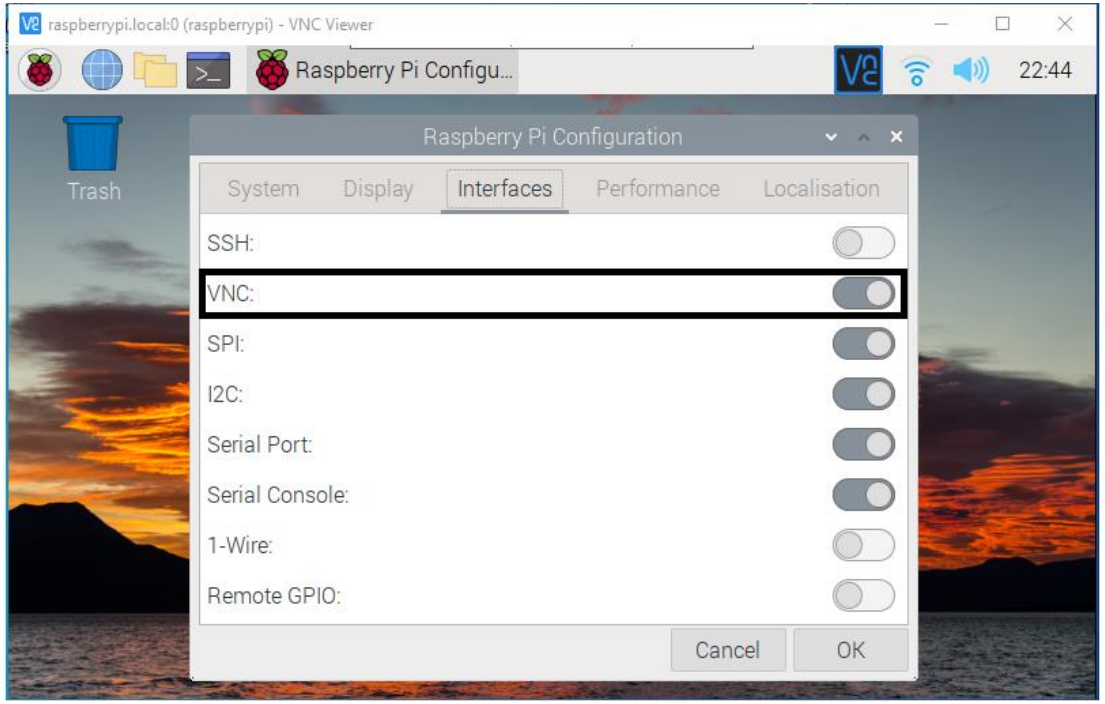


Enable VNC

- VNC is a tool for accessing your Raspberry Pi desktop remotely.
- By using VNC, you don’t have to connect a screen to the Raspberry Pi, you can access from another computer that is on the same network as your Raspberry Pi.

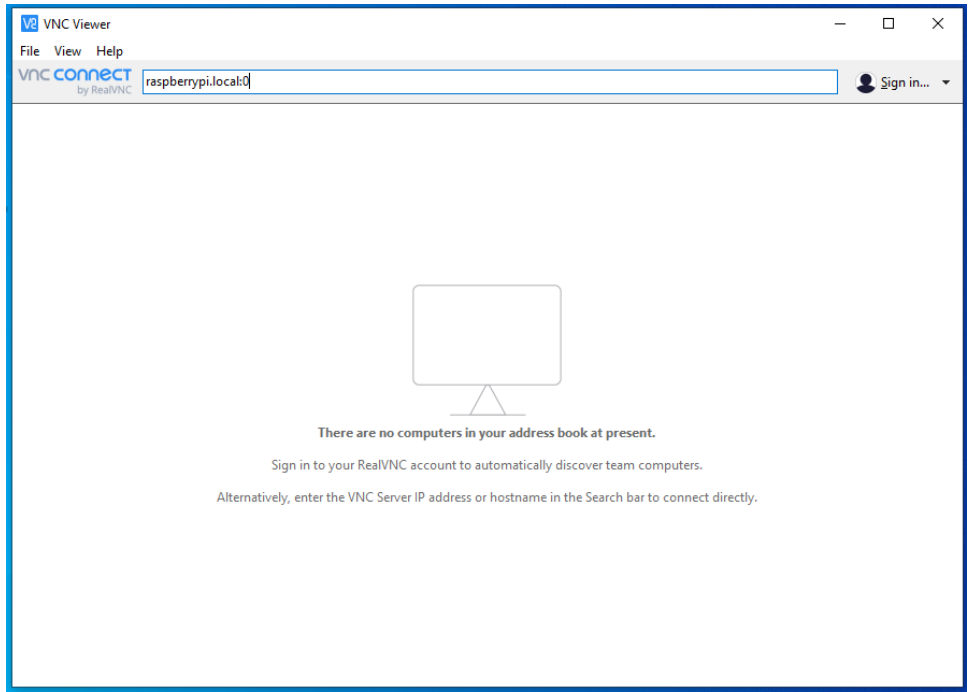
Enabling VNC Server on the Raspberry Pi:

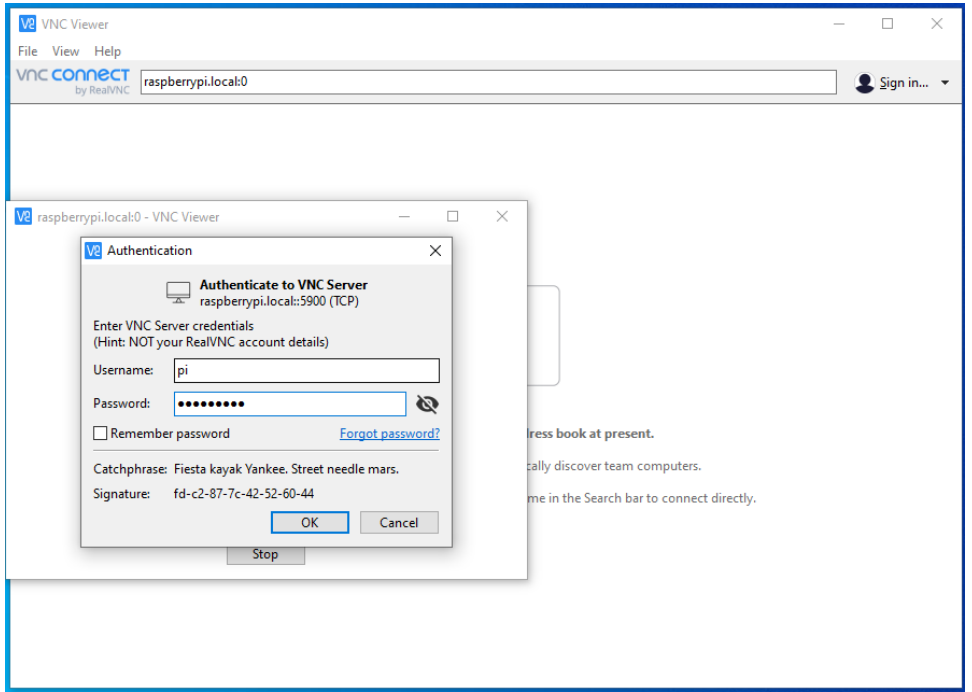




Installing VNC Viewer on your Computer

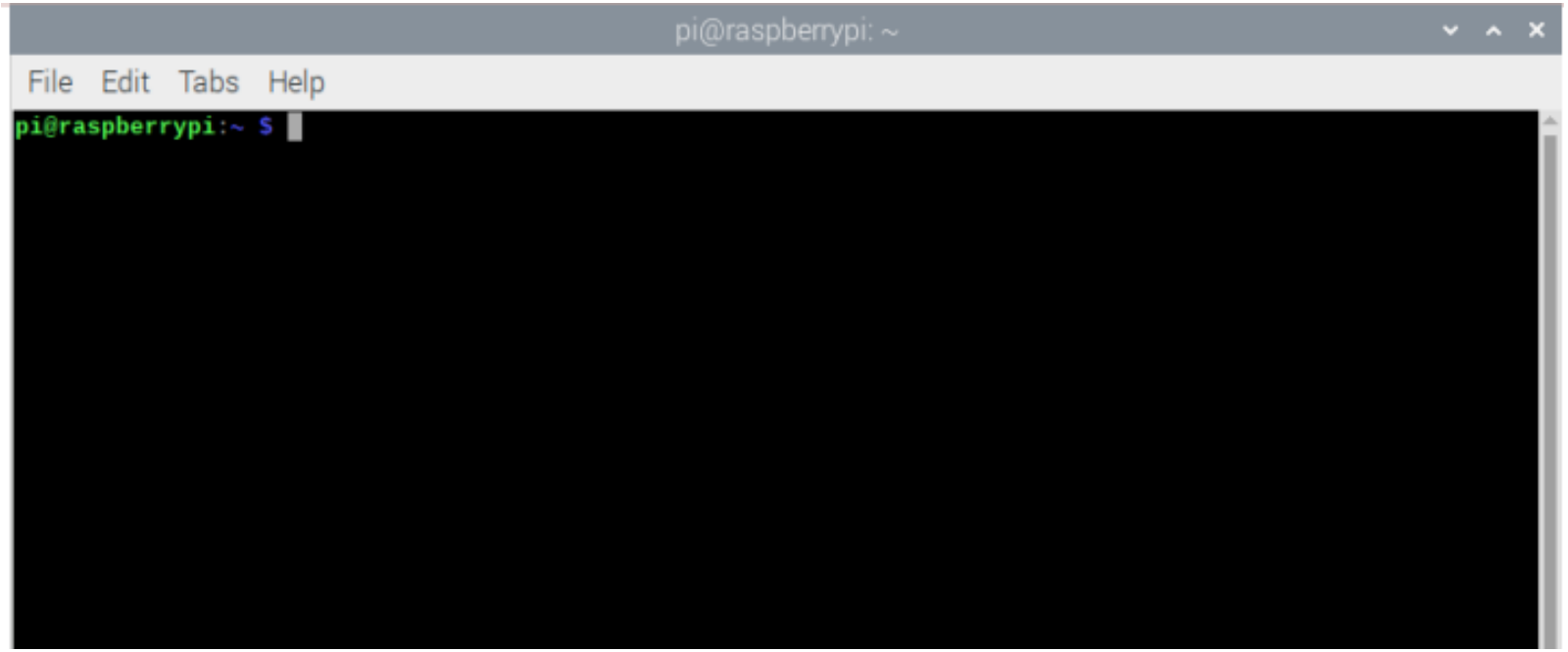
- There are a number of viewers available, but the easiest to set up is Real VNC Viewer.
- You can download Windows, Mac, Android, and IOS installers from here: https://www.realvnc.com/en/connect/download/viewer/
- After installation, you can connect using the IP address, or the local address of the Raspberry Pi: “raspberrypi.local:0”





The Terminal

- The Raspberry Pi OS is a Linux based OS and comes with a GUI with limited features.
- So very often you need to type commands using the Terminal
- The Linux terminal is a powerful tool for executing operations on the OS



Update Raspberry Pi OS

Run the following commands in the Terminal window:

- First,

```
sudo apt update
```

- Then,

```
sudo apt full-upgrade
```

- `sudo apt update` **downloads the update,**
- `sudo apt upgrade` **installs the update.**
- **It is a good idea to do a** `sudo reboot` **after upgrading.**

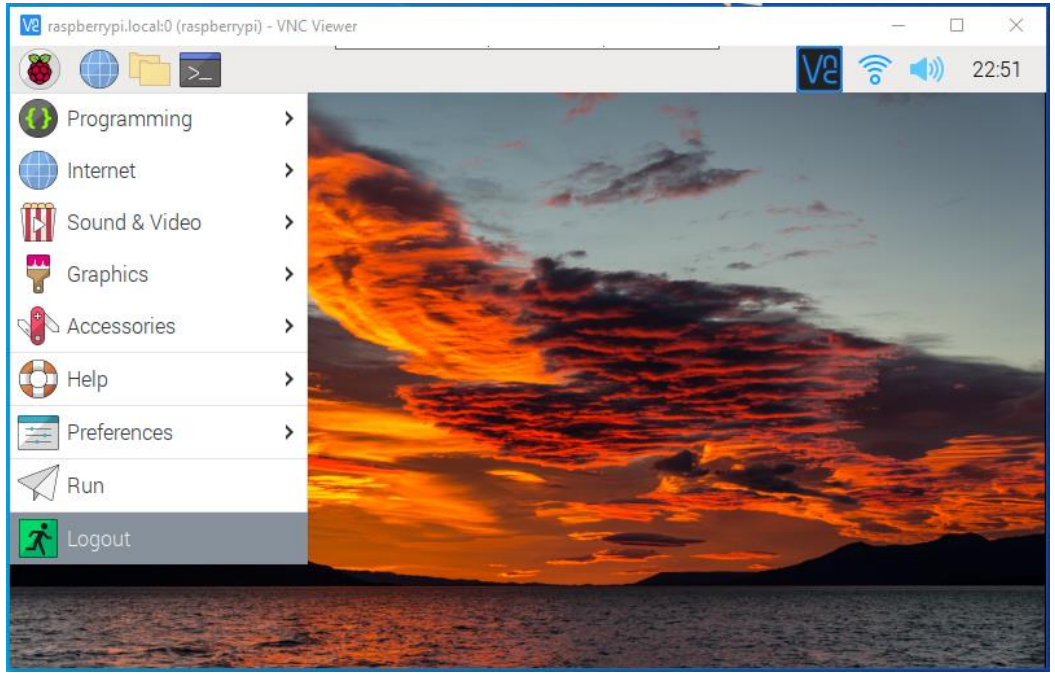
sudo

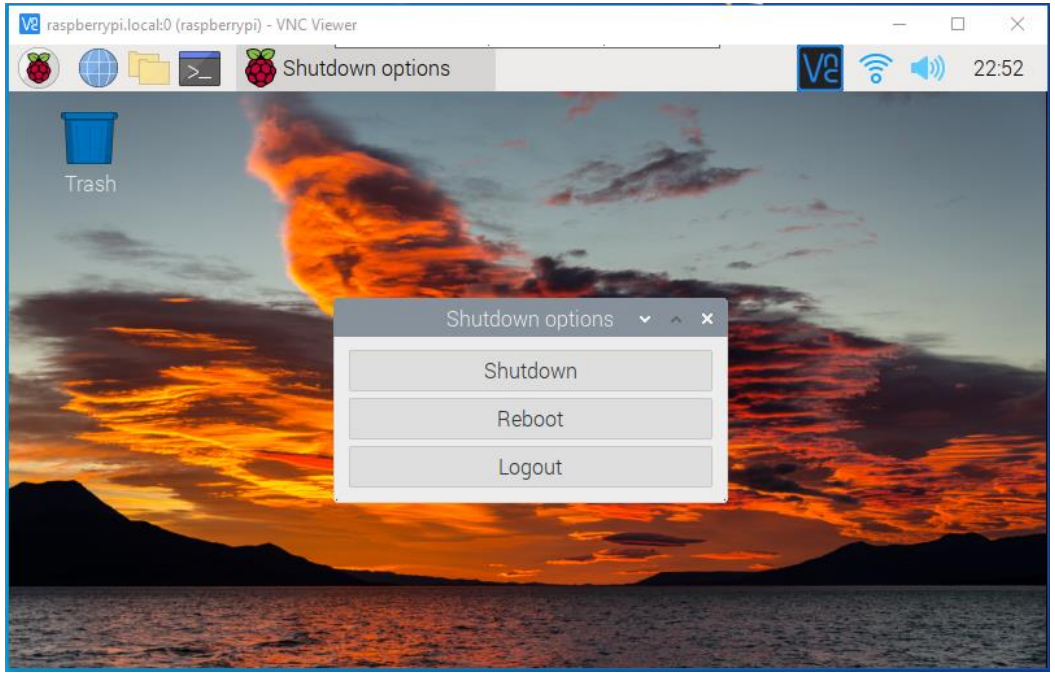
- sudo is a program for Linux OS that allows users to run programs with the security privileges of the superuser.
- It originally stood for "superuser do”
- Some commands that make permanent changes to the state of your system require you to have root privileges to run.
- The command sudo temporarily gives your account (if you're not already logged in as root) the ability to run these commands
- You typically use it in your Terminal window for installing/upgrading software, etc.

Shut-down Raspberry Pi

- Unlike your other electronic devices, Raspberry Pi doesn’t come with an “off” switch.
- You should not just “pull out the plug“

To shutdown Raspberry Pi , select the Raspberry Pi icon in upper left corner and select “Logout“



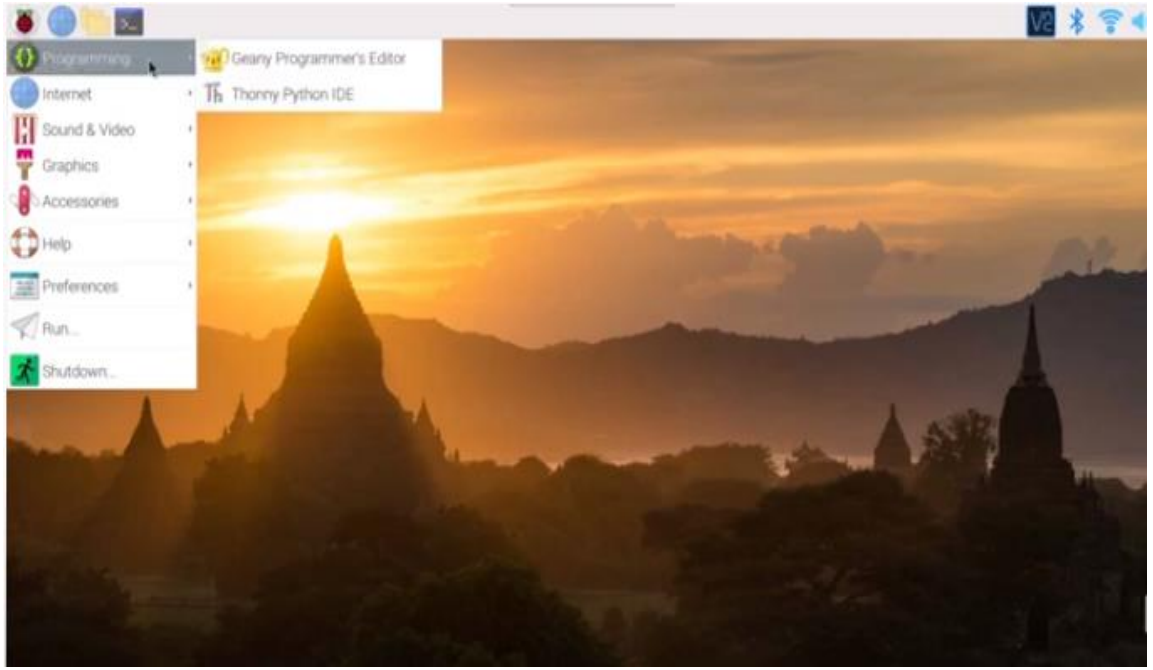


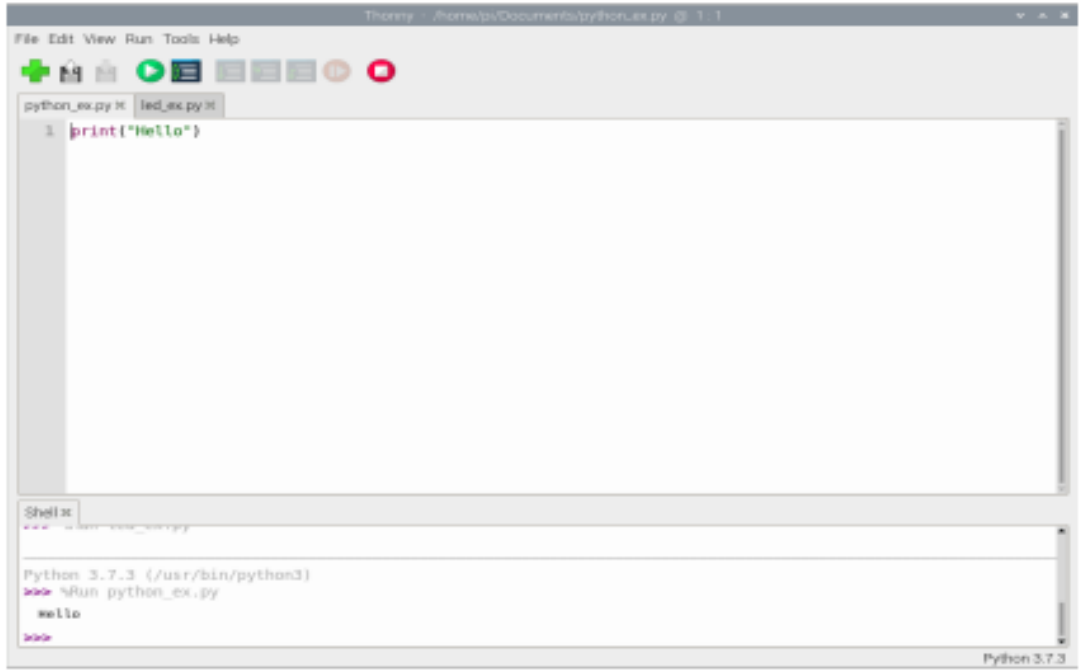
Or enter the following in the Terminal: `sudo poweroff`

After that, you can unplug the Raspberry Pi .

Python with Raspberry Pi

- Today, Python has become one of the most popular Programming Languages.
- The Raspberry Pi OS comes with a basic Python Editor called “Thonny”

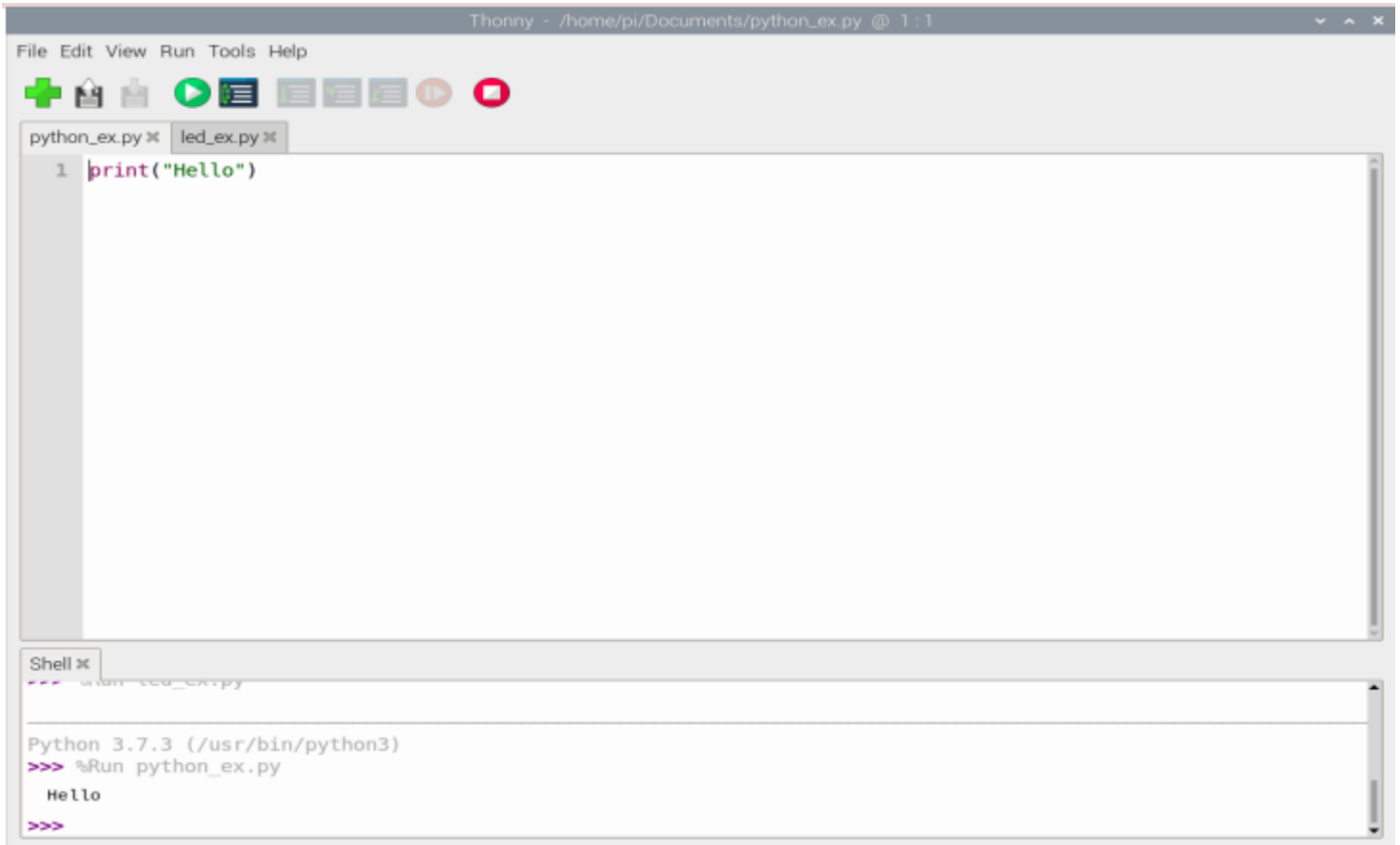




- But you can install and use other Python Editors if you prefer

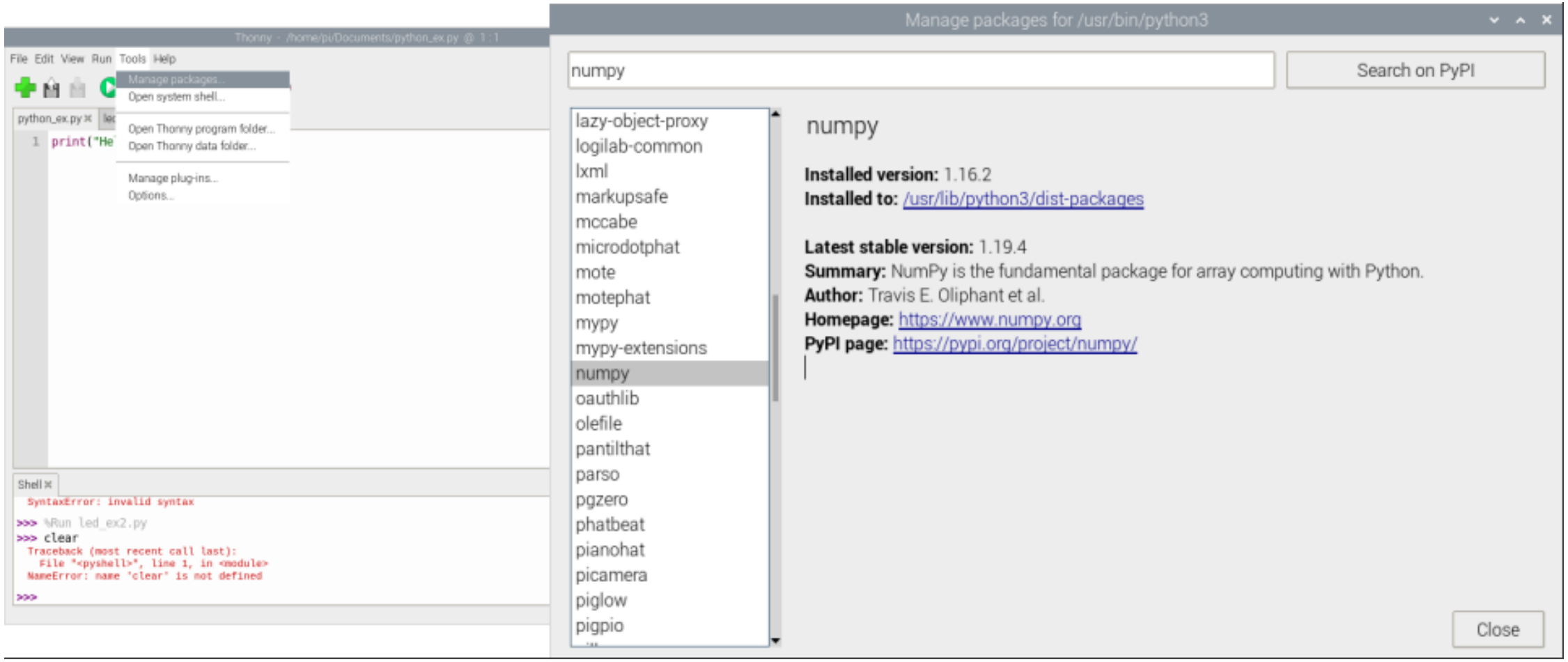
Hello World

- Write a python code:
  `print ("Hello")`
- Click Run



Python Packages with Thonny

- Tools -> Manage packages…



Installing Python Packages

There are multiple ways to install Python Libraries/ Packages on Raspberry Pi

- apt (advanced package tool): Some Python packages can be found in the Raspberry Pi OS archives and can be installed using apt. Example:

```
sudo apt update
sudo apt install python3-picamera
```

- pip: Not all Python packages are available in the Raspberry Pi OS archives, and those that are can sometimes be out-of-date. If you can't find a suitable version in the Raspberry Pi OS archives, you can install packages from the Python Package Index (PyPI) or piwheels. To do so, use the pip tool. Example:

```
sudo pip install libraryname
```

- piwheels: piwheels is a Python package repository specifically for the Raspberry Pi

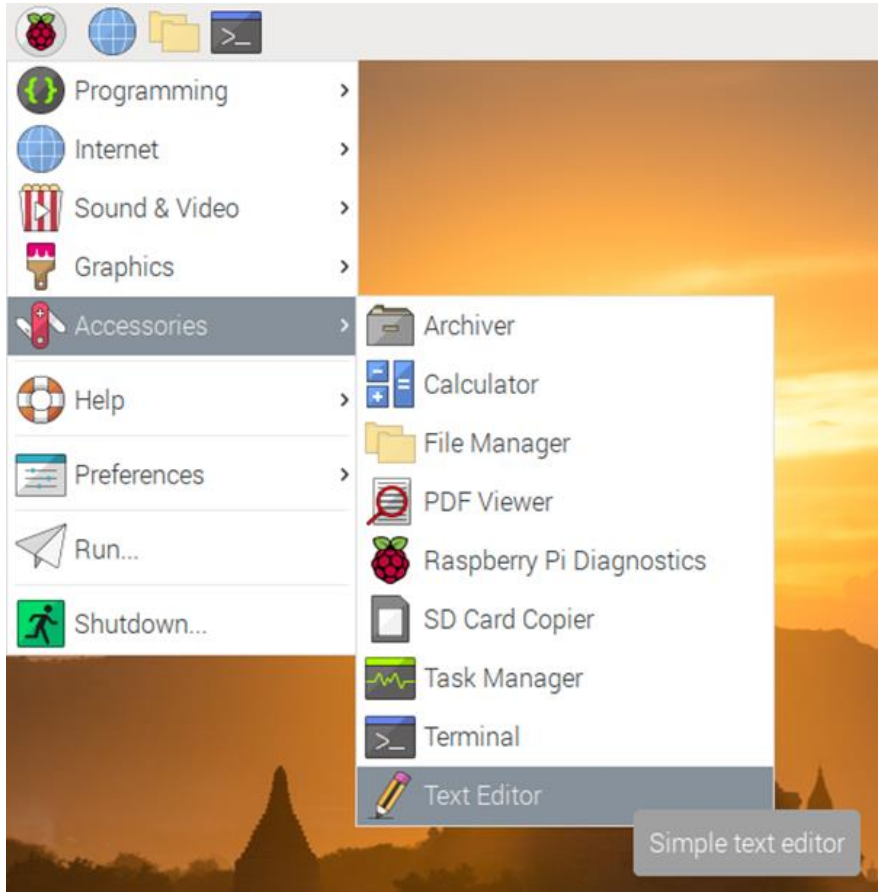
Raspberry Pi Desktop

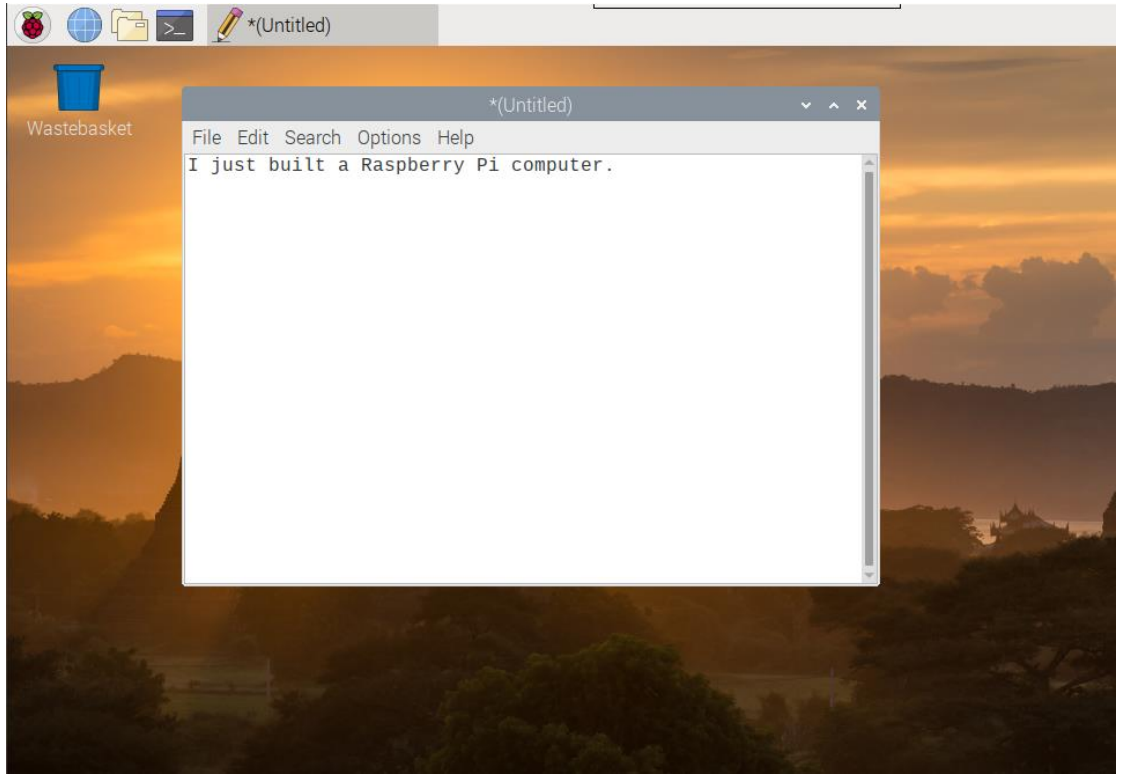
- After Raspberry Pi OS starts up, you will see the Desktop appear.

  - The Raspberry Pi icon in the top left-hand corner is where you access the menu.
  - Click on it to find lots of applications, including Programming applications.

Raspberry Pi Desktop

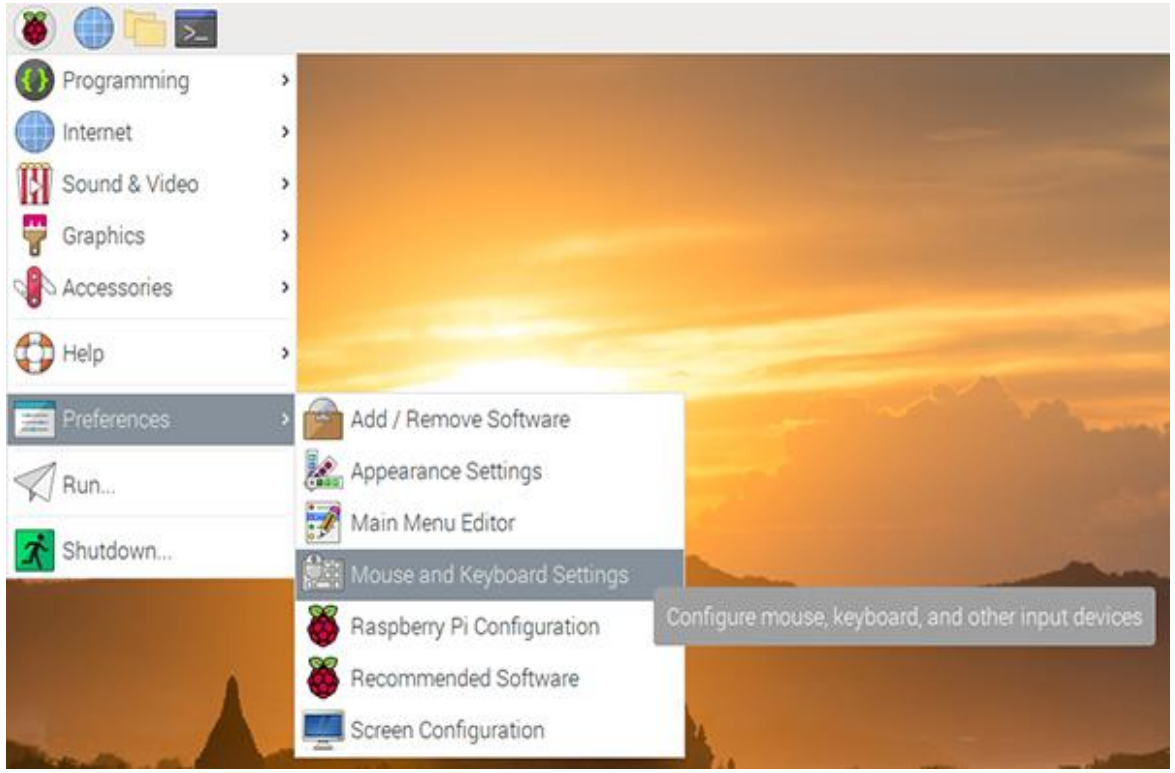
- To open a text editor, click on Accessories and choose Text Editor.

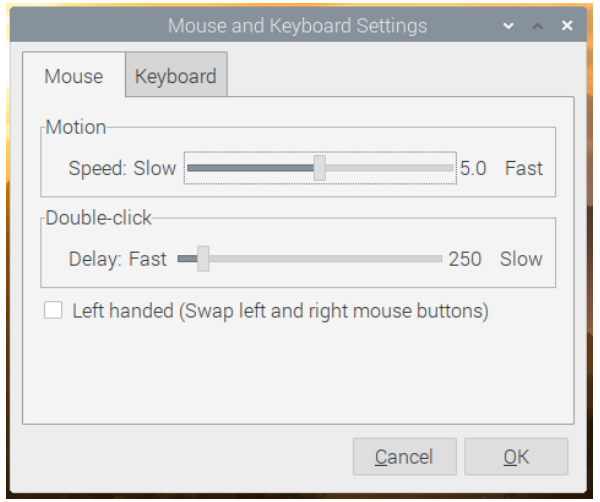


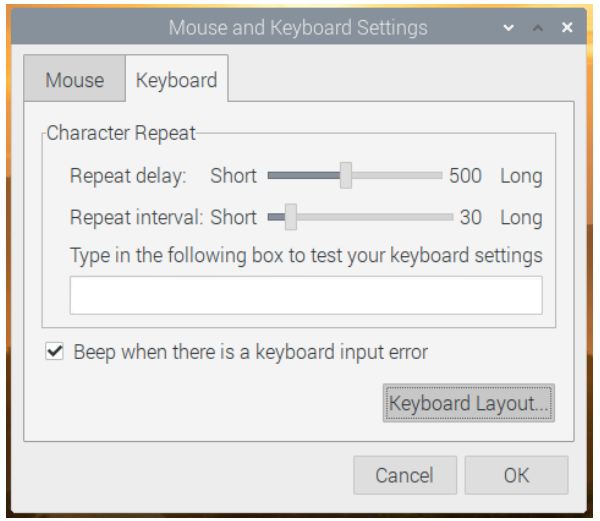


Keyboard and mouse settings

- Select Preferences and then Mouse and Keyboard Settings from the menu.

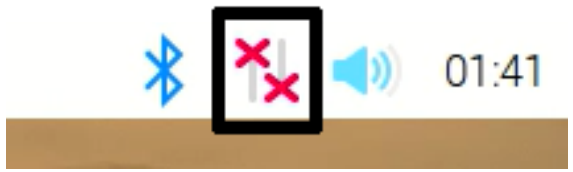






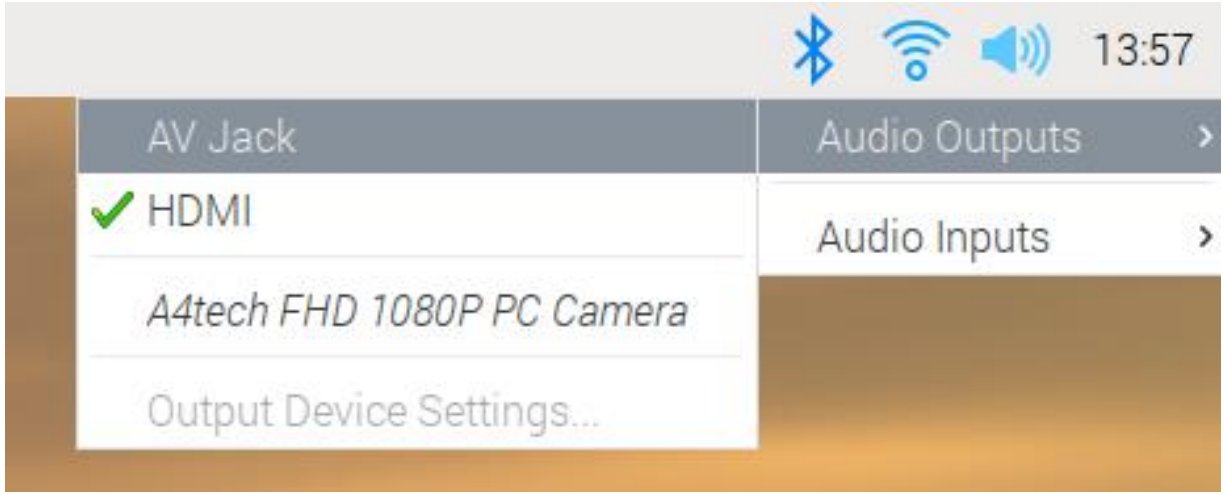
Connecting to the internet

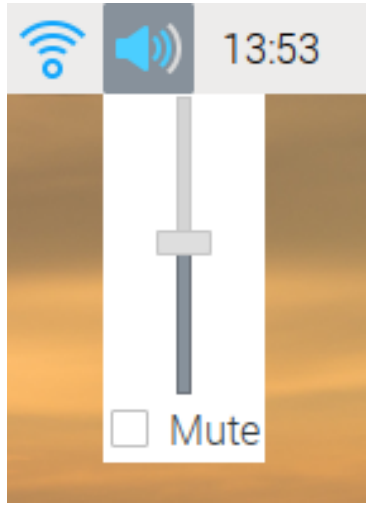
- You can plug an Ethernet cable into RP (if you have a Raspberry Pi Zero, you'll need a USB-to-Ethernet adapter as well).
- If your model is a Raspberry Pi 4, Raspberry Pi 3, or Raspberry Pi Zero W, you can also connect to a wireless network.
- Click on the wireless network icon in the top right-hand corner of the screen, and select your network from the drop-down menu.
- Type in the password for your wireless network, then click on OK.
- Once your Raspberry Pi is connected to the internet, you will see a wireless LAN symbol instead of the red crosses.



Setting up the sound

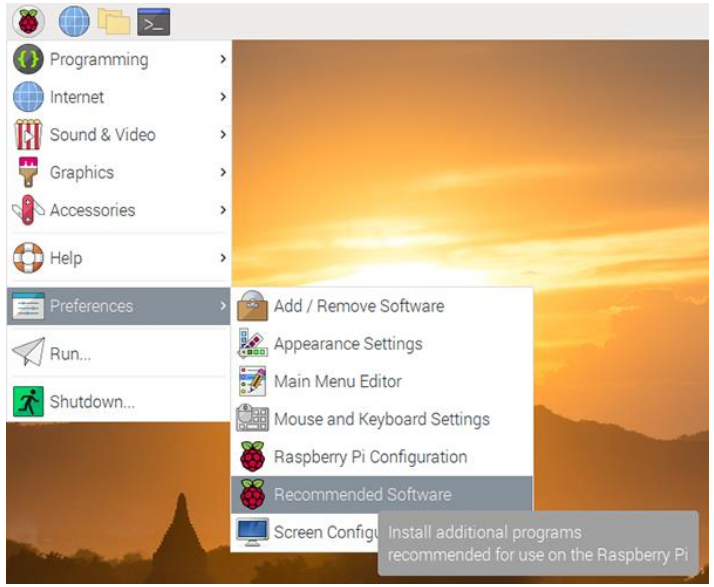
- The Raspberry Pi can either send sound to the screen's built-in speakers through the HDMI connection (if your screen has speakers), or to the analogue headphone jack.
- Right-click on the speaker icon in the top right-hand corner, and select Audio Outputs, to choose whether your Raspberry Pi should use the HDMI or the AV Jack connection for sound.
- Click on the speaker icon to adjust the volume by moving the slider up or down.

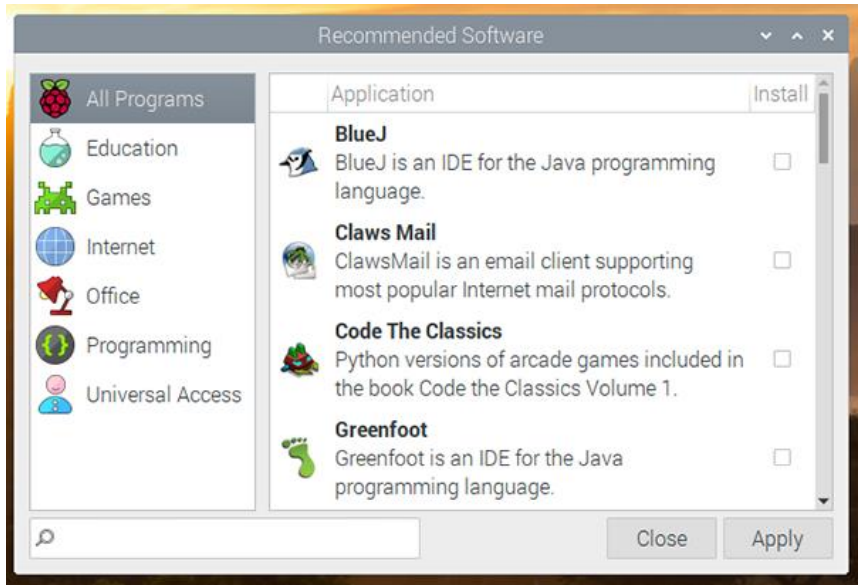




Installing software

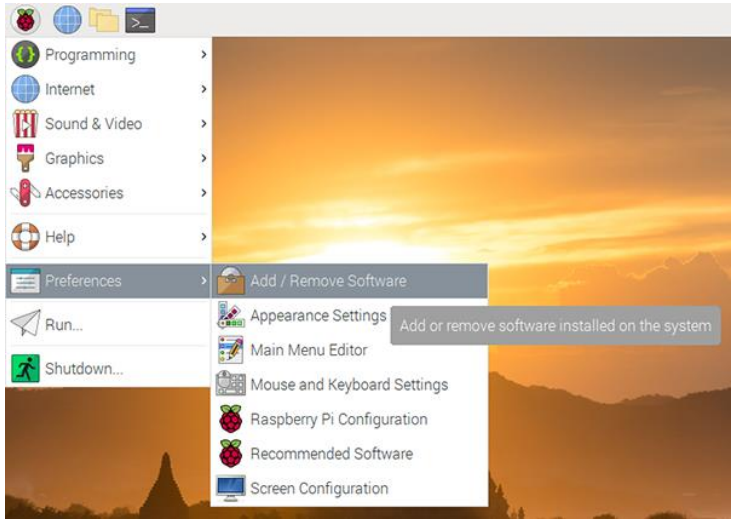
- There are many software programs and applications you can download and install on Raspberry Pi.
- Note: Raspberry Pi has to be connected to the internet before you can install software.
- In the menu, click on Preferences and then on Recommended Software.
- You can browse all the recommended software, or filter it by category.
- To install a software, click to mark the checkbox to its right, then click on OK .

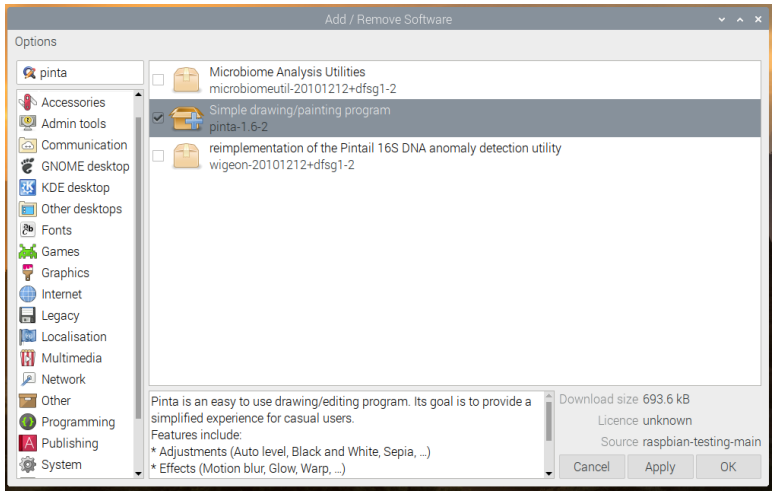


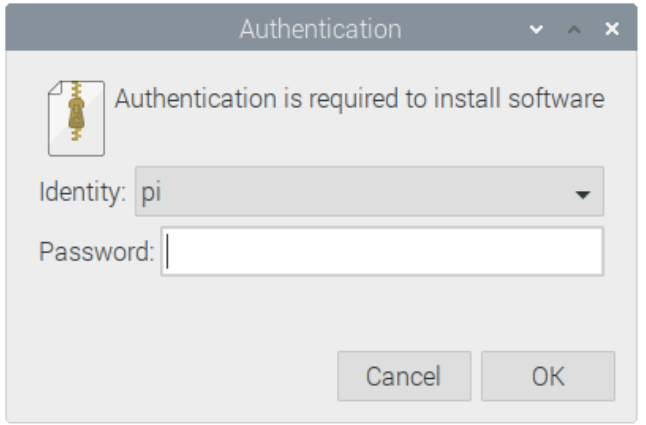


Installing software

- In addition to the Raspberry Pi's recommended software, there's a huge library of other available programs and applications.
- Click on Preferences and then on Add / Remove Software in the menu.
- You can search for software, or browse by selecting a category from the menu on the left.
- Select the program in the list that appears, then click on OK .
- Enter your password; if you haven't changed the password, it will be 'raspberry'.

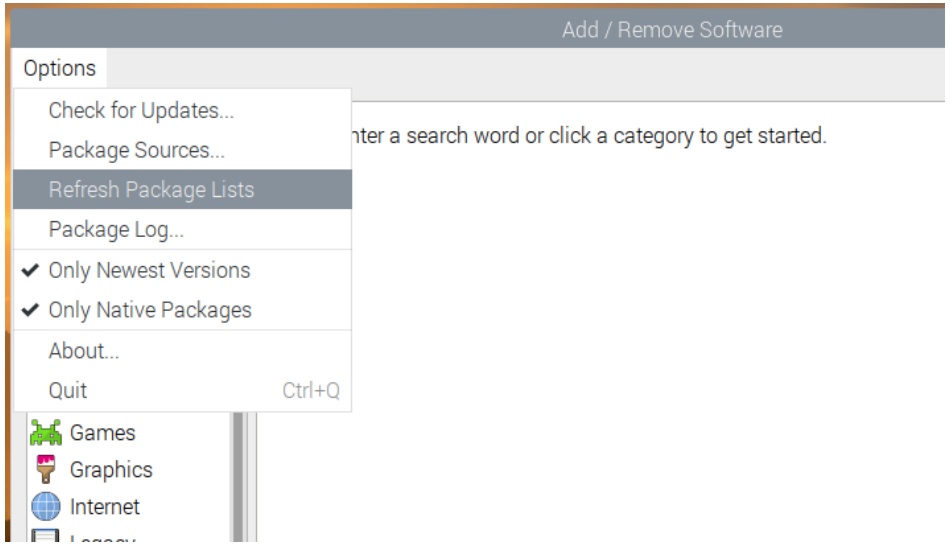


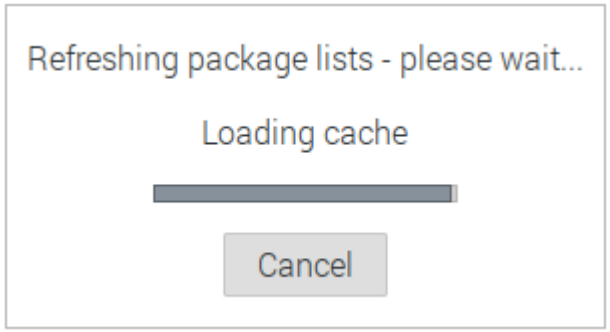




Updating your Raspberry Pi

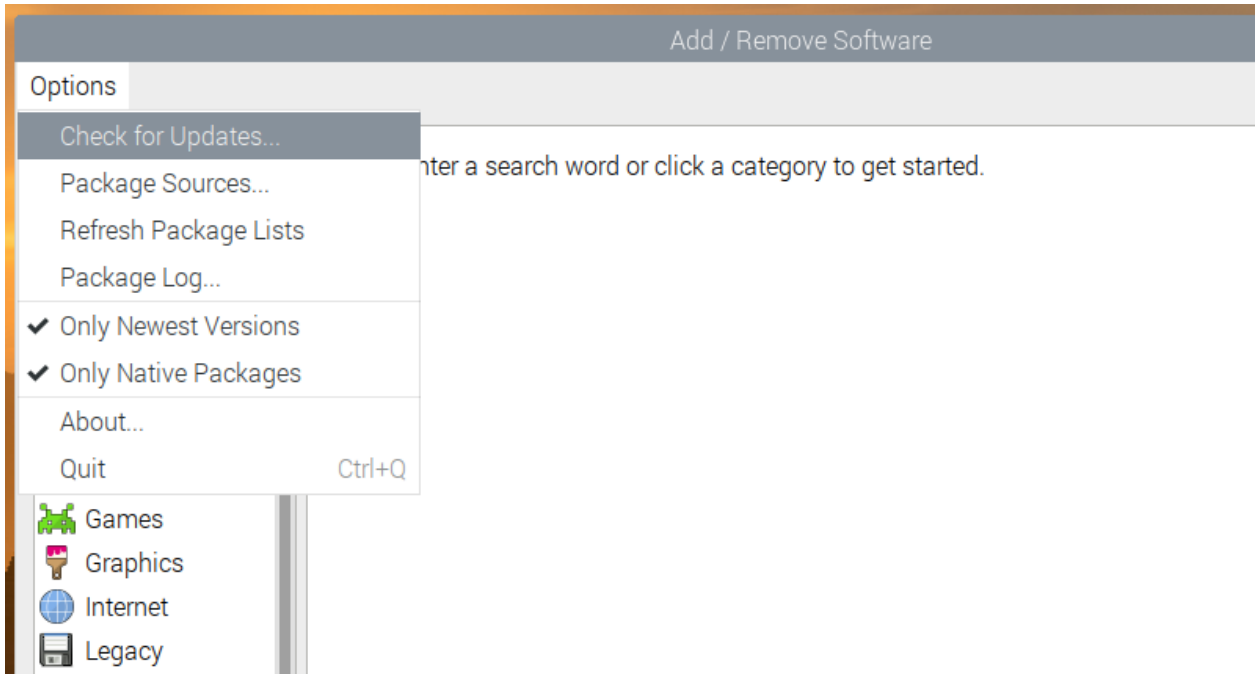
- It’s a good idea to regularly update the software on your Raspberry Pi with the latest features and fixes.
- You can update your Raspberry Pi using the Add / Remove Software application: open it by selecting it from the Preferences section of the menu.
- Before you check and install any updates, you should refresh the software package lists on your Raspberry Pi.
- Click on Options in the top left-hand corner, and select Refresh Package Lists.
- Your Raspberry Pi will then update all lists of packages.





Updating your Raspberry Pi

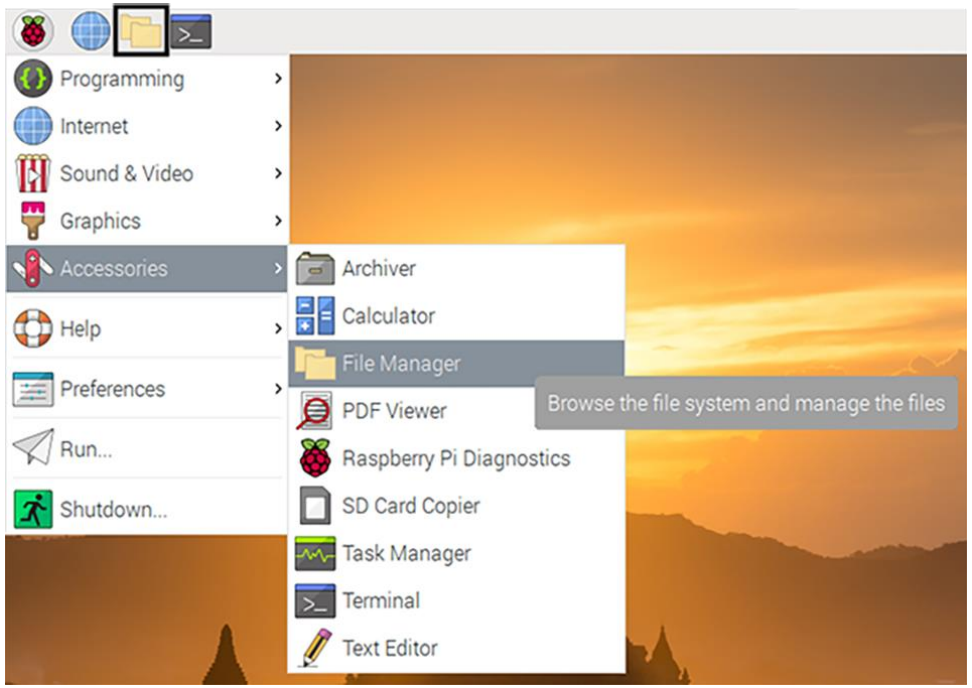
- When this is done, click on Options and select Check for Updates.

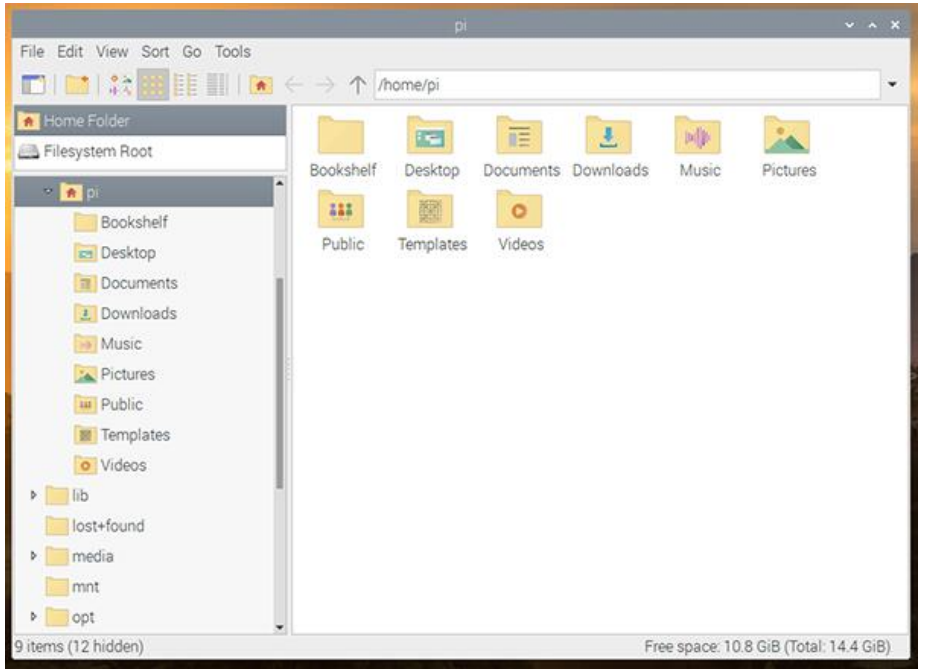


- Click on Install Updates to install all the available updates.
- When prompted, enter your password; if you haven't changed the password, it will be 'raspberry'. After that, the updates will then be downloaded and installed.

Accessing the Files

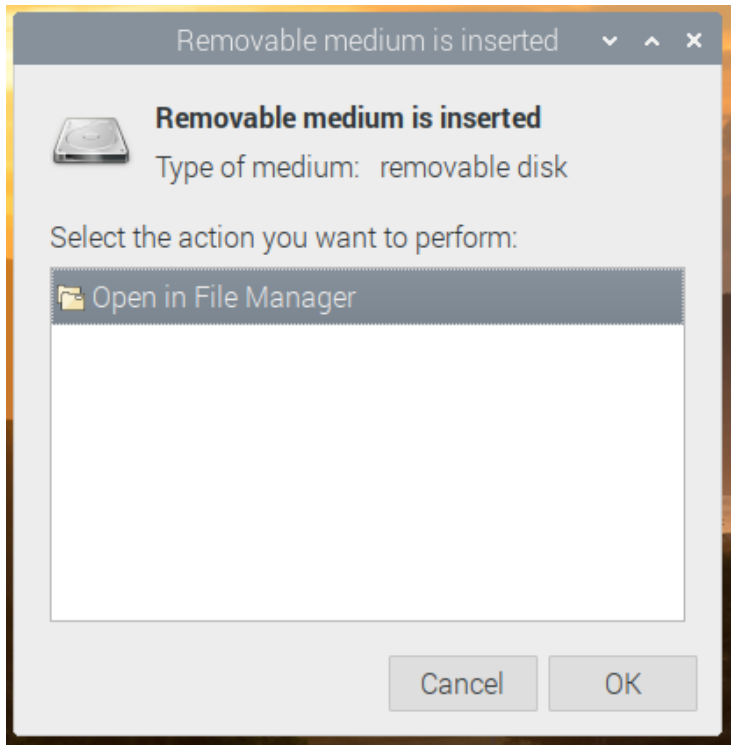
- All the files on your Raspberry Pi, including the ones you create yourself, are stored on the SD card. You can access your files using the File Manager application.
- Click on Accessories and then on File Manager in the menu, or select the File Manager icon on the menu bar.
- When the File Manager opens, you will be shown the **pi** directory — this is where you can store your files and create new subfolders.

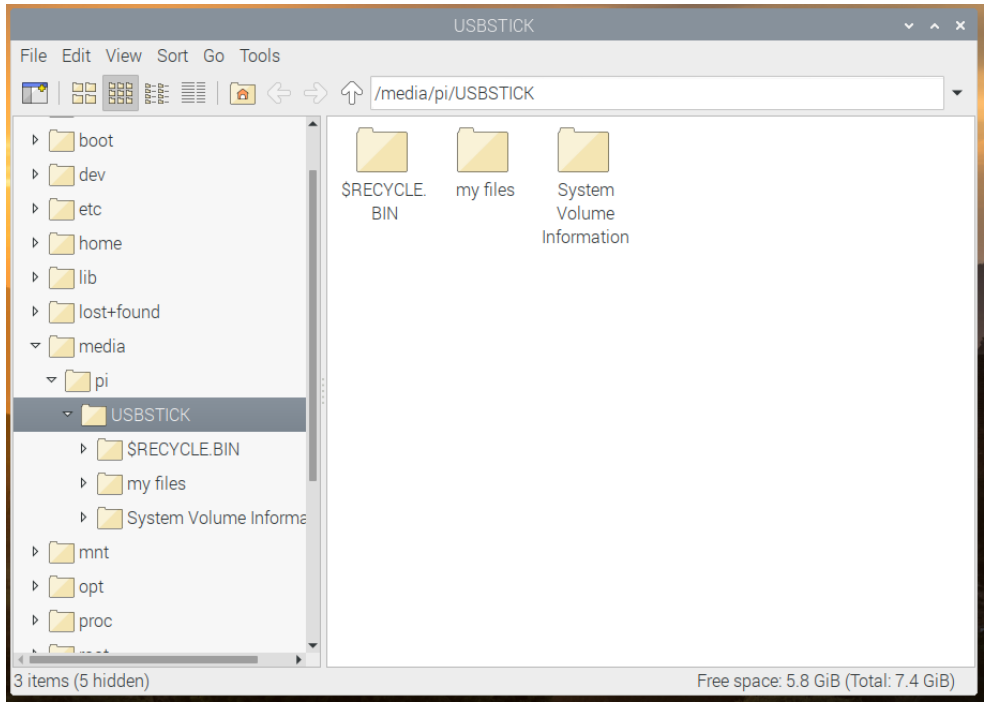




Accessing the Files

- You can use USB drives and sticks with your Raspberry Pi. This is a convenient way of backing up your files and copying them to other computers.
- Insert a USB stick into your Raspberry Pi. A window will pop up, asking what action you want to perform.
- Click on OK to Open in File Manager.






Any Questions