IESTI05 – Edge AI

Machine Learning System Engineering

3. Raspberry Pi Setup Walkthrough
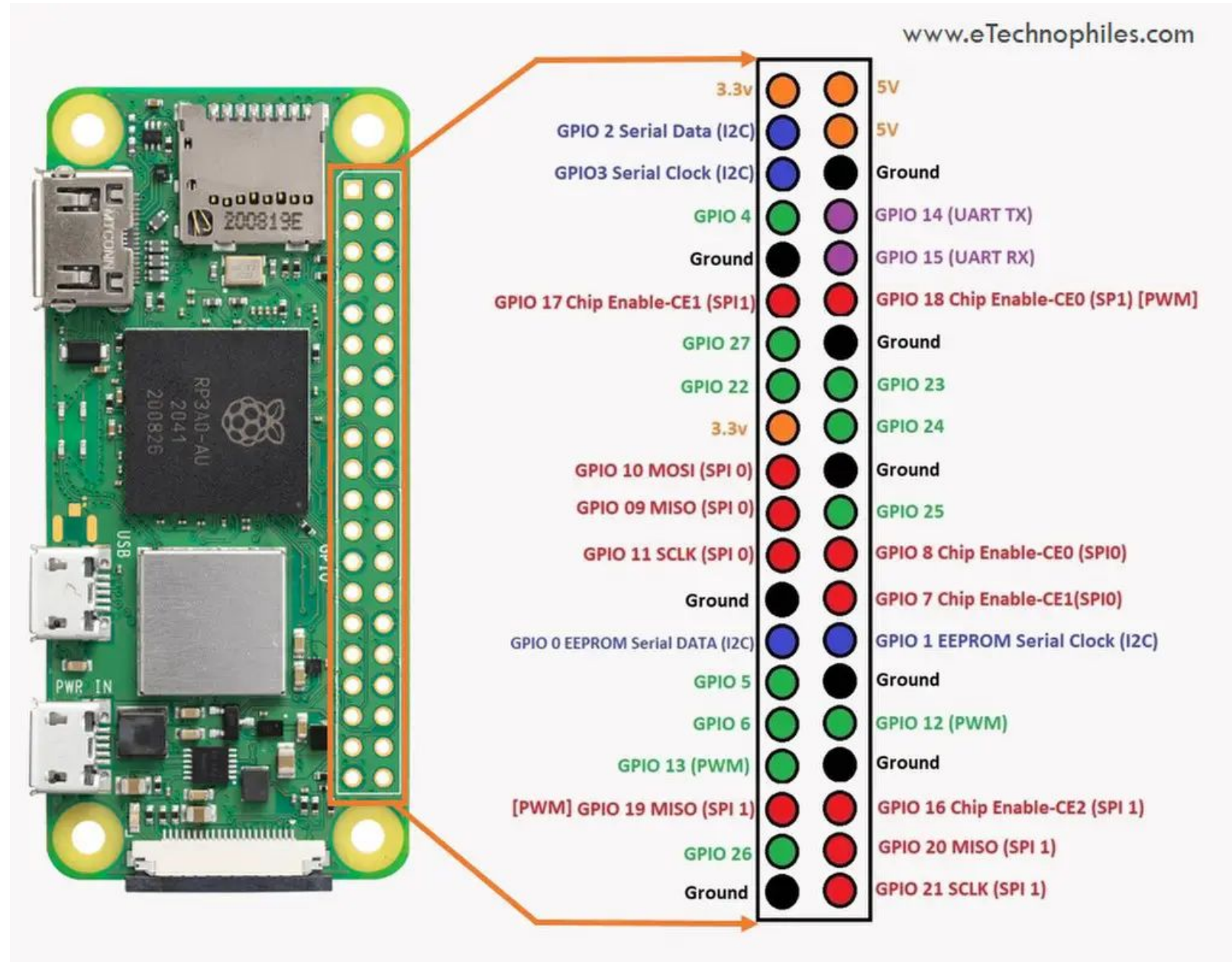
UNIFEI

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Professor Honoris Causa
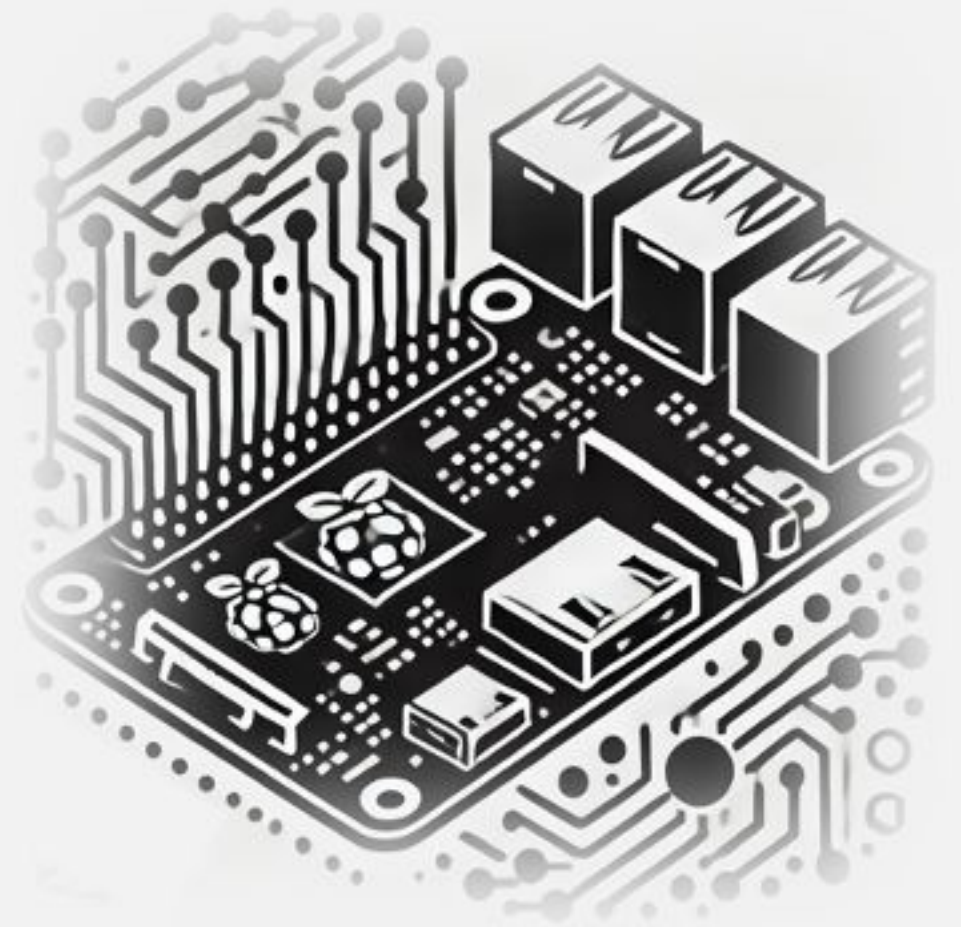
Raspberry Pi W2

Board Layout

40 pin GPIO header

RP3A0: SIP chip with 1 GHz quad-core 64-bit ARM Cortex-A53 processor & 512 MB of SDRAM

2.4 GHz 802.11 b/g/n WiFi & Bluetooth 4.2

www.eTechnophiles.com

MicroSD card slot

CSI connector

Mini HDMI Port

Micro USB 2.0(for peripherals)

Micro USB 2.0(for power)

GPIO pinout

3.3v	🟠	🟠	5V
GPIO 2 Serial Data (I2C)	🔵	🟠	5V
GPIO3 Serial Clock (I2C)	🔵	⚫	Ground
GPIO 4	🟢	🟣	GPIO 14 (UART TX)
Ground	⚫	🟣	GPIO 15 (UART RX)
GPIO 17 Chip Enable-CE1 (SPI1)	🔴	🔴	GPIO 18 Chip Enable-CE0 (SP1) [PWM]
GPIO 27	🟢	⚫	Ground
GPIO 22	🟢	🟢	GPIO 23
3.3v	🟠	🟢	GPIO 24
GPIO 10 MOSI (SPI 0)	🔴	⚫	Ground
GPIO 09 MISO (SPI 0)	🔴	🟢	GPIO 25
GPIO 11 SCLK (SPI 0)	🔴	🔴	GPIO 8 Chip Enable-CE0 (SPI0)
Ground	⚫	🔴	GPIO 7 Chip Enable-CE1(SPI0)
GPIO 0 EEPROM Serial DATA (I2C)	🔵	🔵	GPIO 1 EEPROM Serial Clock (I2C)
GPIO 5	🟢	⚫	Ground
GPIO 6	🟢	🟢	GPIO 12 (PWM)
GPIO 13 (PWM)	🟢	⚫	Ground
[PWM] GPIO 19 MISO (SPI 1)	🔴	🔴	GPIO 16 Chip Enable-CE2 (SPI 1)
GPIO 26	🟢	🔴	GPIO 20 MISO (SPI 1)
Ground	⚫	🔴	GPIO 21 SCLK (SPI 1)

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Installing the OS
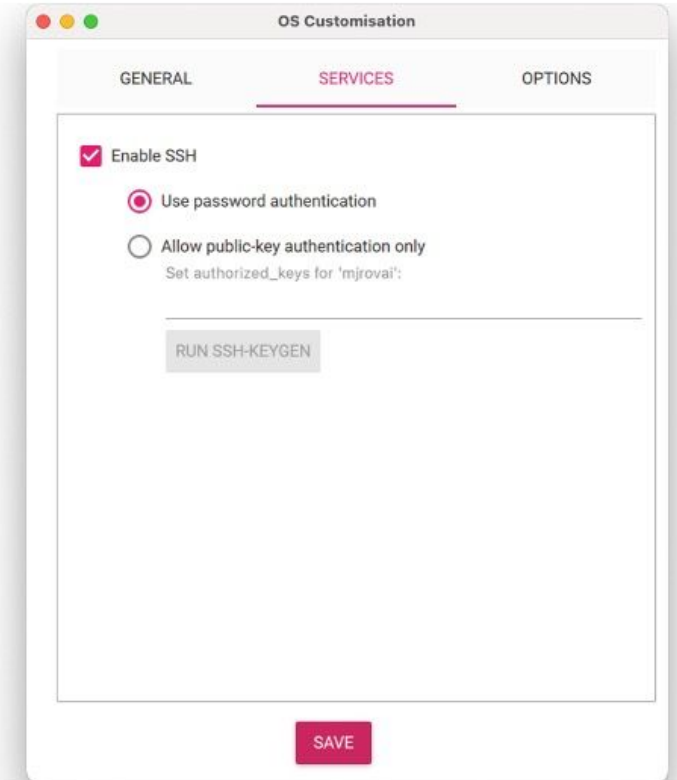
Use Raspberry Pi Imager
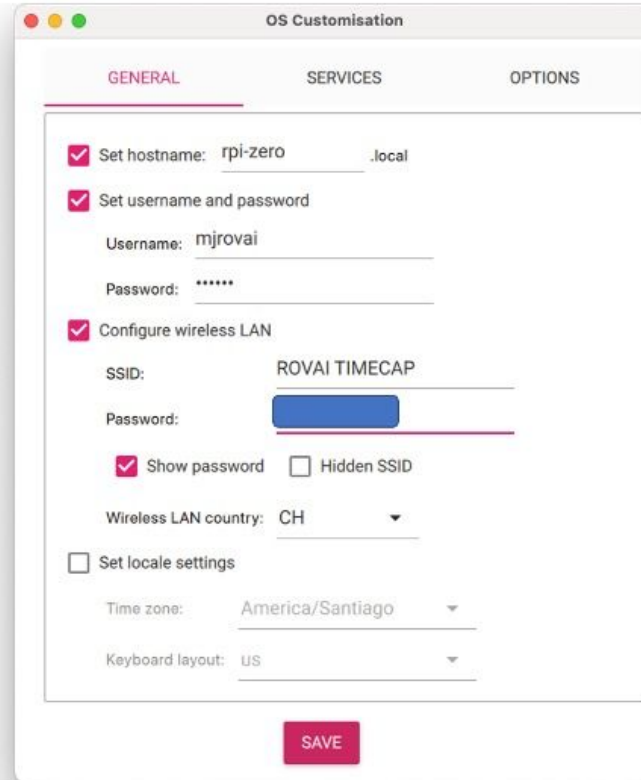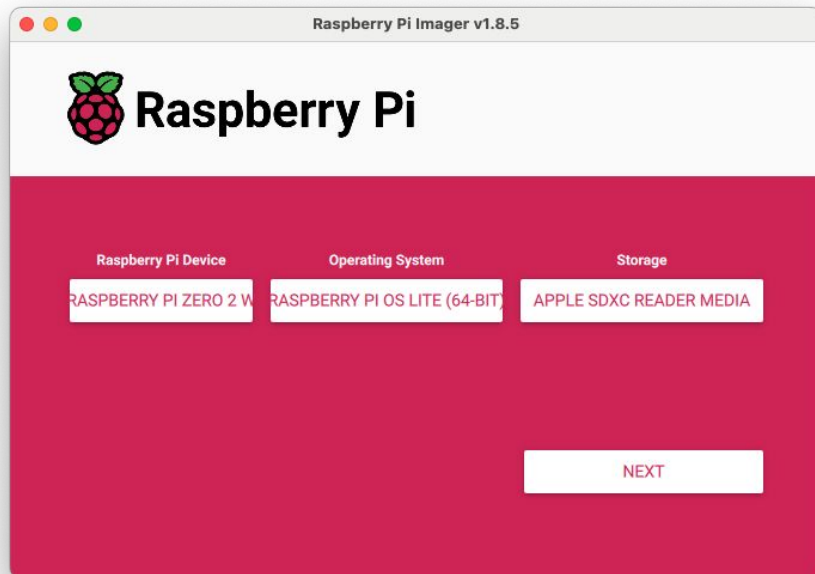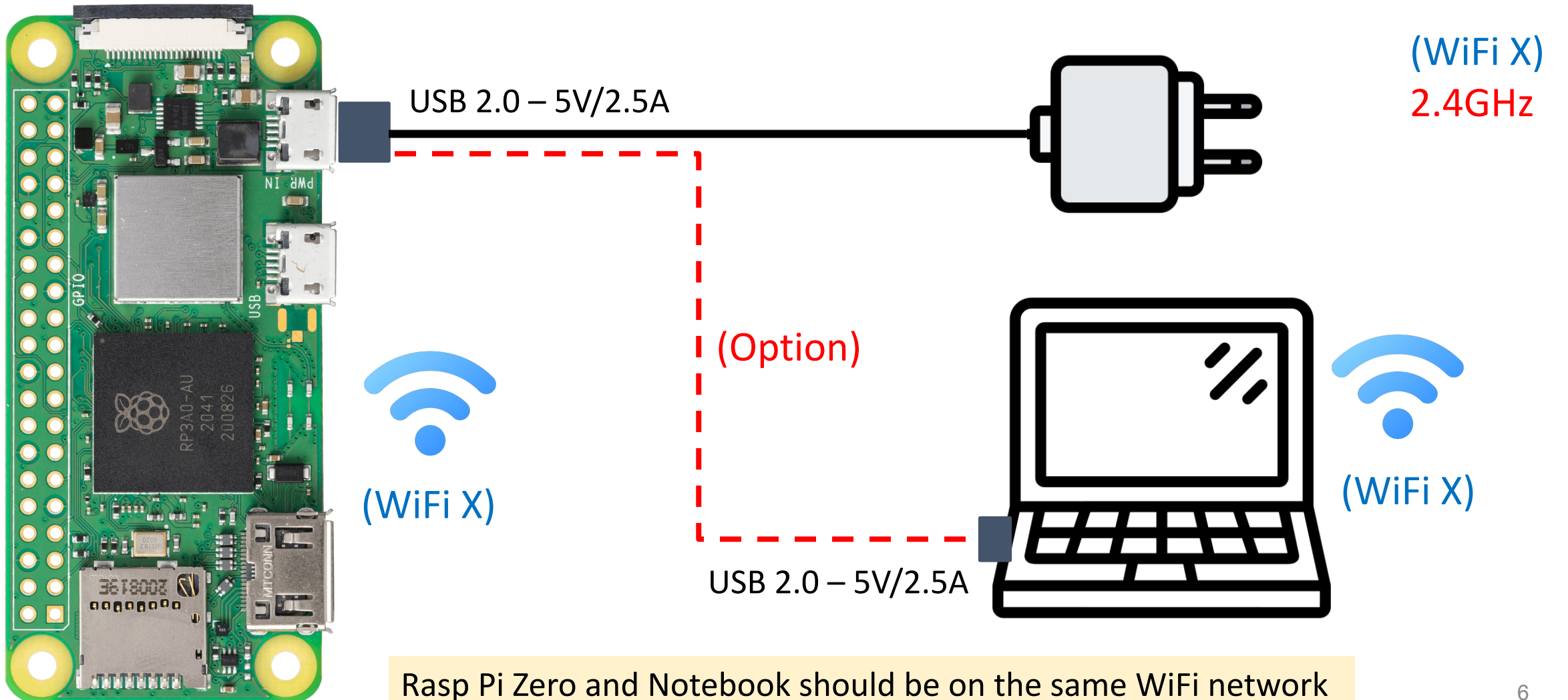https://www.raspberrypi.com/software/
and select:
- RASPBERRY PI ZERO 2W
- RASPBERRY PI OS LITE (64-BIT)

Headless setup: enable SSH, Wi-Fi config
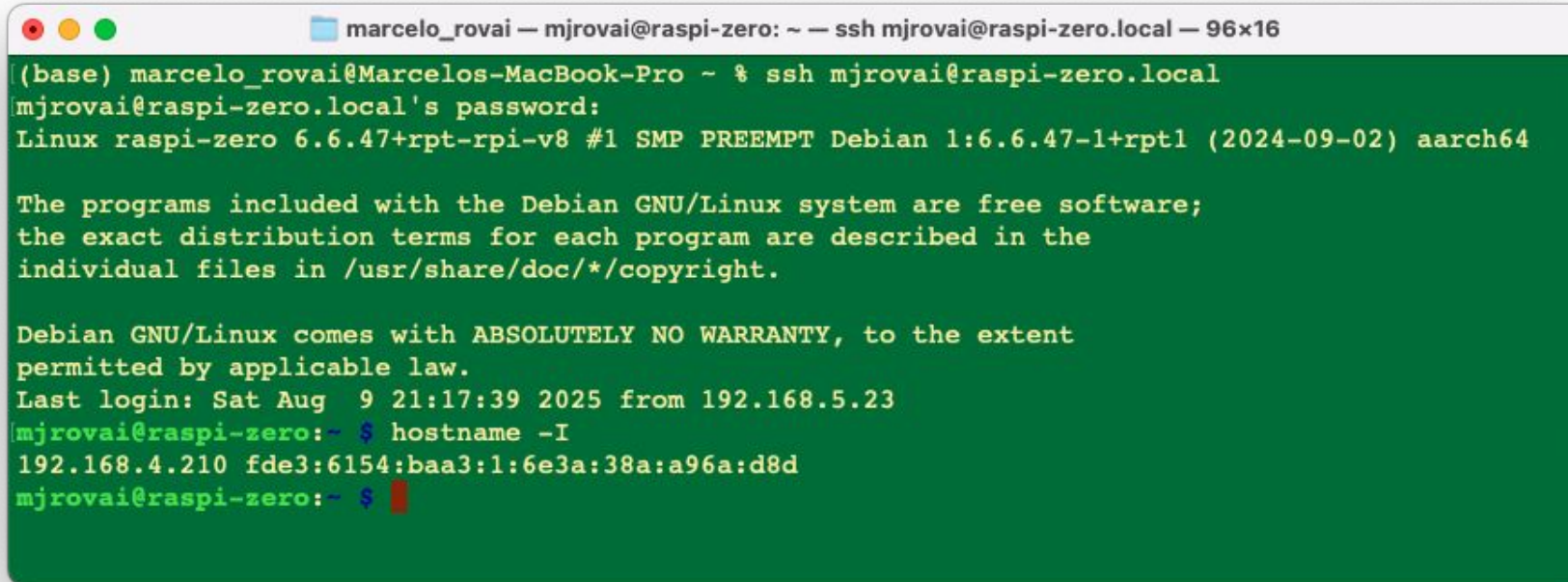- Define hostname, username, and password

Power Supply and WiFi Network

(WiFi X)
2.4GHz

USB 2.0 – 5V/2.5A

(Option)

(WiFi X)

(WiFi X)

USB 2.0 – 5V/2.5A

Rasp Pi Zero and Notebook should be on the same WiFi network

Connecting to the Pi – SSH Via Terminal

- Enter with: ssh username@hostname.local (i.e., mjrovai@raspi-zero.local)
  - Once in the Raspi-Zero, use hostname –I to get the IP Address

Note: On Windows, use Command Prompt (cmd) or PowerShell.

- Knowing the IP address: Enter with:

ssh username@ip_address (i.e., mjrovai@ 192.168.4.210)

Initial Linux Commands

1. Package mgmt:
   - sudo apt update && upgrade
   - sudo reboot

2. System: (Open in a new terminal window)
   - htop

Increasing SWAP Memory

1. First, turn off the swap-file:
    `sudo dphys-swapfile swapoff`

2. Next, open and modify the file /etc/dphys-swapfile. For that, we will use the **nano** text editor:
    `sudo nano /etc/dphys-swapfile`

    a. Search for the **CONF_SWAPSIZE** variable (default is 200) and
    b. update it to **2000**: `CONF_SWAPSIZE=2000`, and
        c. save the file: `CTRL+X  -> Y => Enter`.

3. Next, turn on the swapfile again and reboot the Raspberry Pi:
    `sudo dphys-swapfile setup`
    `sudo dphys-swapfile swapon`
    `sudo reboot`

Linux: Basic Commands

- clear -> Clear the terminal

- pwd -> Show the current directory: /home/mjrovai

- ls -> Lists the current directory content: (empty)

- Mkdir <name> -> Creates a directory: mkdir Documents

- cd <dir> -> Change to a directory cd Documents

```
marcelo_rovai — mjrovai@raspi-zero: ~/Documents — ssh mjrovai@192.168.4....
[mjrovai@raspi-zero:~ $ pwd
/home/mjrovai
[mjrovai@raspi-zero:~ $ ls
[mjrovai@raspi-zero:~ $ mkdir Documents
[mjrovai@raspi-zero:~ $ ls
Documents
[mjrovai@raspi-zero:~ $ cd Documents
mjrovai@raspi-zero:~/Documents $
```

Transferring files using FTP

1. Install FileZila Client in the Desktop
   https://filezilla-project.org/download.php?type=client
2. Enter with Host Credentials
   (i.e., sftp://192.168.4.210)
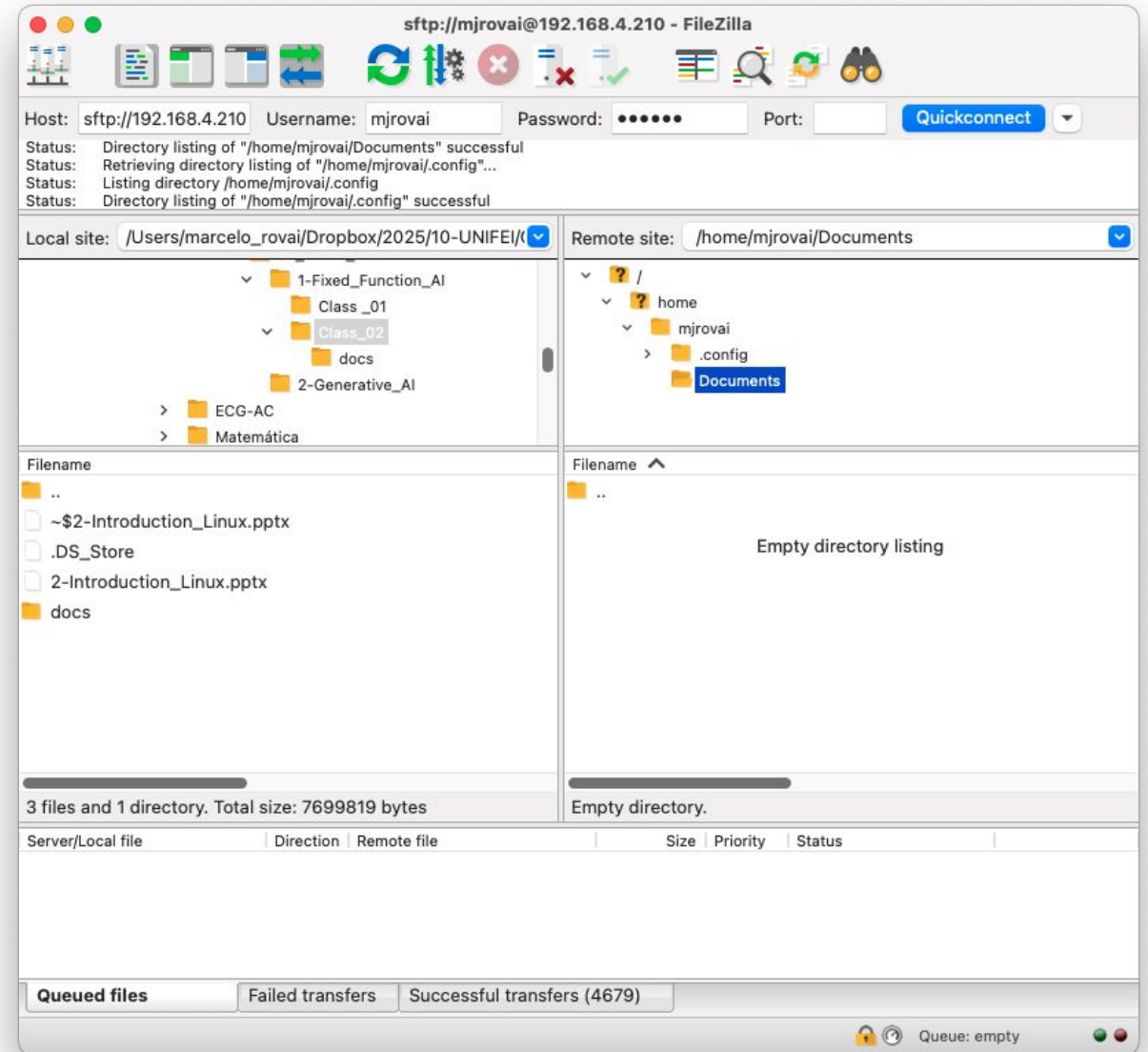
Using the Camara Module

1. Install camera software (if not pre-installed):
   `sudo apt-get install libcamera-apps`

2. List the installed cameras:
   `rpicam-hello --list-cameras`

3. Capture a 640x480 JPEG image:
   `rpicam-jpeg --output test_cli_camera.jpg --width 640 --height 480`

4. Use the command `ls` to check if the image was saved in the current directory and transfer it to your desktop with FileZilla.

Tips

- Connecting the Raspberry Pi to the Computer via USB can be unstable for heavy use. Prefer a 5V/2.5 Power Supply (same as used for mobile phones)

- The WiFi Network should be 2.4GHz

- Always turn off the Raspberry Pi, using the command:
  `sudo shutdown -h now`

- Install packages using
  `sudo apt install <package name>`

Questions?

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