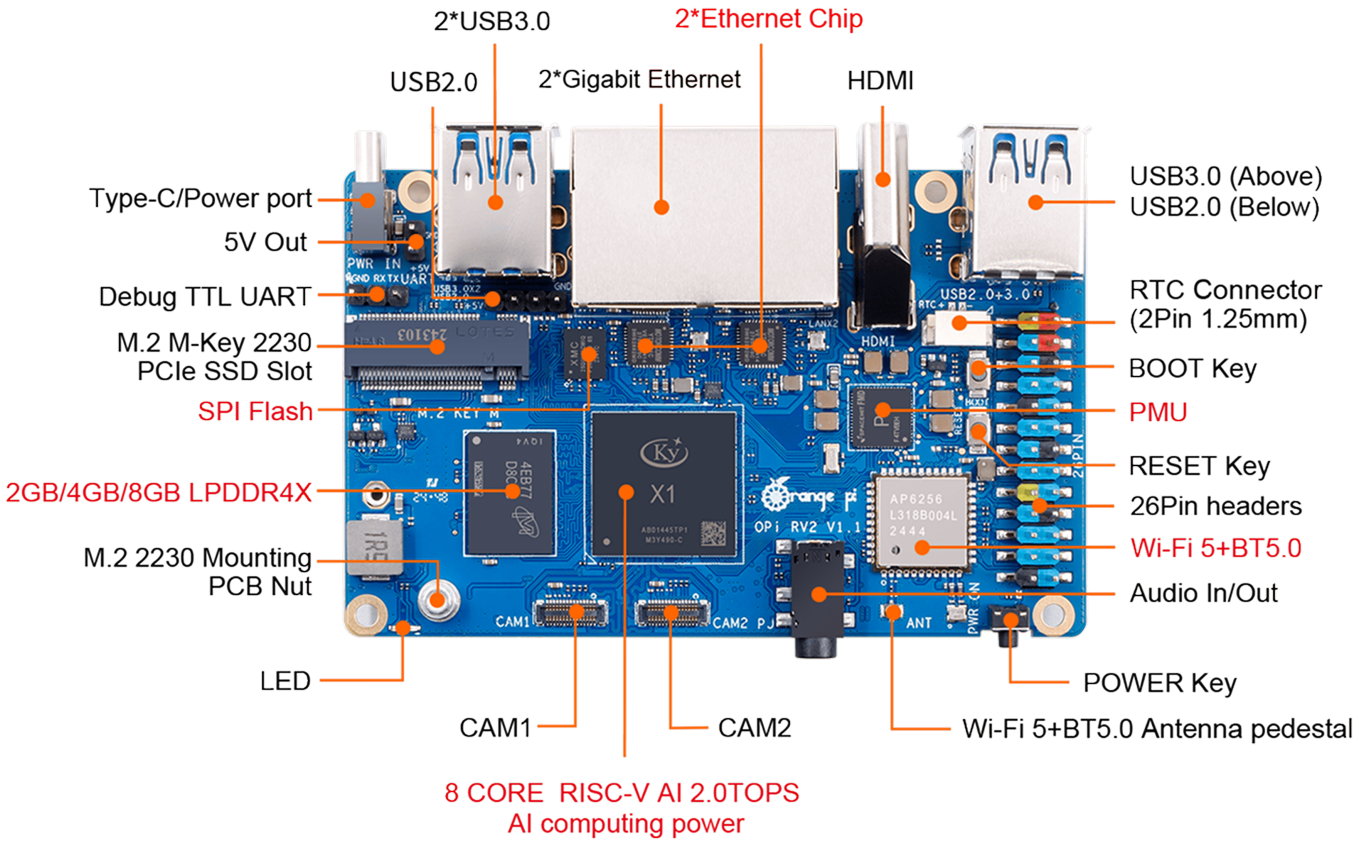
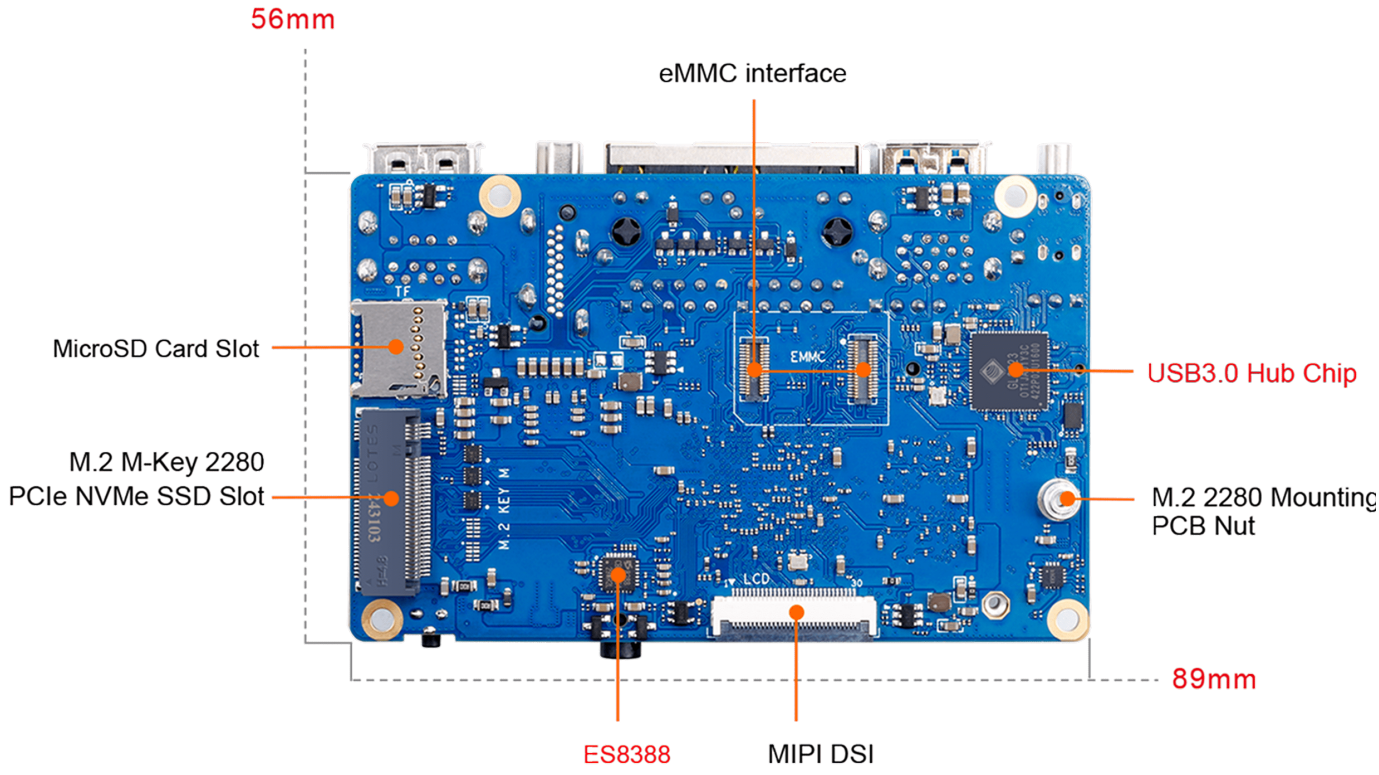
Orange Pi RV2: Complete Installation & First Boot Tutorial





Hardware Parameters

CPU	**Ky X1 8-core RISC-V AI CPU 2TOPS AI power**
Memory	LPDDR4X: 2GB/4GB/**8GB**
Storage	eMMC module (optional): 16GB/32GB/64GB/128GB optional SPI FLASH: 128Mb (default), 256Mb optional 2*M.2 M-Key SOCKET: PCIe2.0 2 Lane NVMe SSD TF Card: Supports SDIO3.0 TF Card
Wi-Fi + Bluetooth	Wi-Fi + Bluetooth 2-in-1 Module: AP6256 Wi-Fi5.0+BT 5.0, BLE
Ethernet interface	2* Gigabit Ethernet, PHY Chip: YT8531C-CA
Display	Supports dual-screen heterodyne display, up to 1920*1440@60fPS 1* HDMI2.0 1* 4-lane MIPI DSI
Camera	2x 4-lane MIPI CSI camera interface
USB	1*USB2.0 HOST or DEVICE 3*USB3.0 HOST 1*USB2.0 HOST (4Pin header)
Audio	3.5mm headphone jack, audio input/output, HDMI audio output
Buttons	1* BOOT, 1*RESET, 1 *PWR ON
RTC	2Pin spare battery connector (Pitch=1.25mm)
26Pin	26Pin function expansion interface, supports the following interface types: GPIO, UART, I2C, SPI, PWM, etc.
DEBUG	3Pin debug serial port, 3.3V level
Power input/output	Power connector: 2-pin. Maximum 5V, 1A output, suitable for connecting a fan.
Power supply	Type-C 5V 5A DC IN
PCB size	895*6*1.6 mm
Supported OS	Ubuntu 24.04

1. What You Need

- Orange Pi RV2 board
- MicroSD card (16GB or larger, high quality recommended)
- SD card reader for your PC
- Power supply (5V/5A USB-C, non-PD)
- HDMI monitor, keyboard, and mouse (for desktop setup)
- USB to TTL adapter (for serial debugging, optional)
- Ethernet cable or Wi-Fi access
- (Optional) M.2 SSD for storage or OS boot

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2. Download the Operating System Image

- Go to the Orange Pi RV2 downloads page or the official GitHub/Google Drive links.
- Download the image:
  - **Ubuntu Noble Desktop** (with GUI)

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3. Flash the SD Card

- Insert your SD card into your PC.
- Use Balena Etcher or Raspberry Pi Imager to flash the downloaded `.img` file onto the SD card.
- Wait for the process to complete and safely eject the SD card.

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4. First Boot & Hardware Setup

- Insert the SD card into the Orange Pi RV2.
- Connect monitor, keyboard, and mouse (for desktop), or prepare your **USB-to-TTL adapter** for serial debugging (for headless/server).
- Plug in Ethernet or prepare for Wi-Fi setup.
- Connect the USB-C power supply (5V/5A, fixed voltage, not PD negotiation).

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5. Accessing the System

A. Desktop Version

- The system will boot to the Ubuntu desktop.
- Log in with the default credentials (usually `orangepi` / `orangepi`).

- You can now use the graphical interface, connect to Wi-Fi via the GUI, or open a terminal for further setup.

B. Server Version (Headless)

- Connect the USB-to-TTL adapter to the UART pins (GND, RX, TX) on the board and your PC.
- Use a serial terminal, such as PuTTY or minicom, at a baud rate of 115200.
- Log in with the default credentials.
- Alternatively, connect via Ethernet and use SSH once the board is on the network.

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6. Network Configuration

A. Wi-Fi (via terminal)

```
nmcli device wifi list
nmcli device wifi connect "YOUR_SSID" password "YOUR_PASSWORD"
```

- Check your IP address:

```
ip a
```

B. Ethernet

- Plug in the cable; DHCP will assign an IP automatically.

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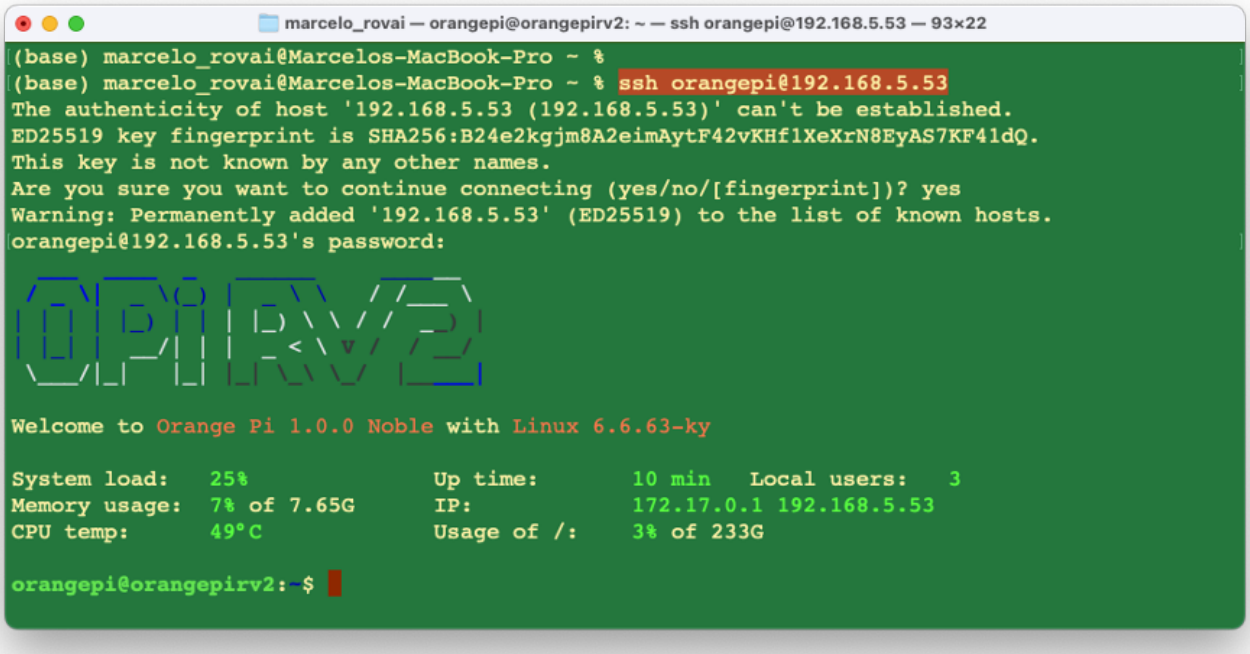
7. Enable SSH for Remote Access

- SSH is usually enabled by default. If not:

```
sudo systemctl enable ssh
sudo systemctl start ssh
```

- Find your Orange Pi's IP address and connect from your PC:

```
ssh orangepi@<IP_ADDRESS>
```



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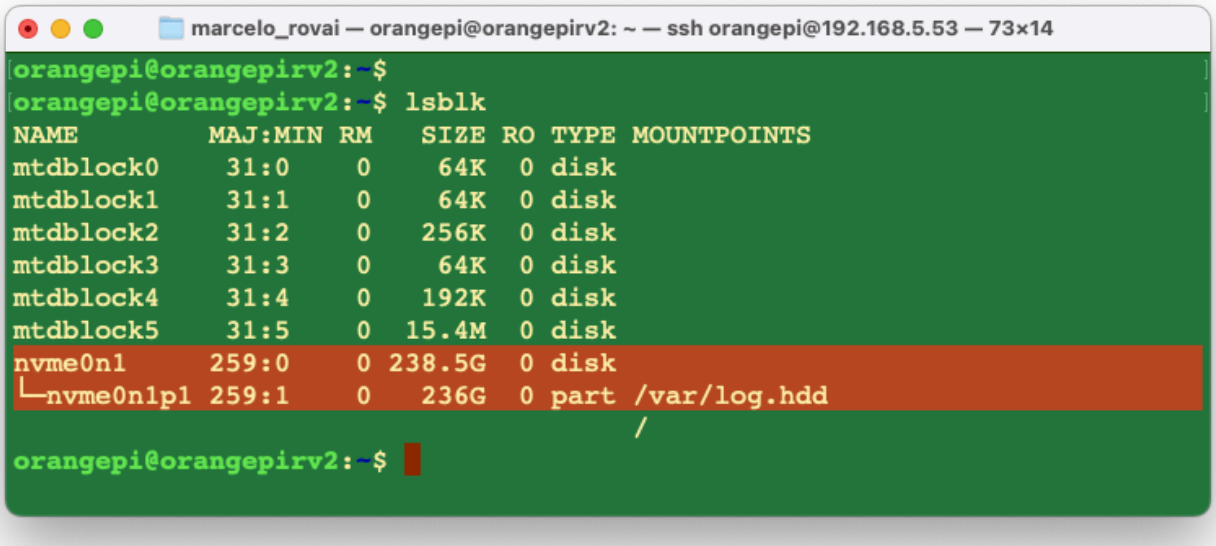
8. (Optional) Install and Use M.2 SSD

- Power off the board, insert the SSD into the M.2 slot, and power back on.
- Check SSD detection:

```
lsblk
```

(The below image is after SSD installation.)



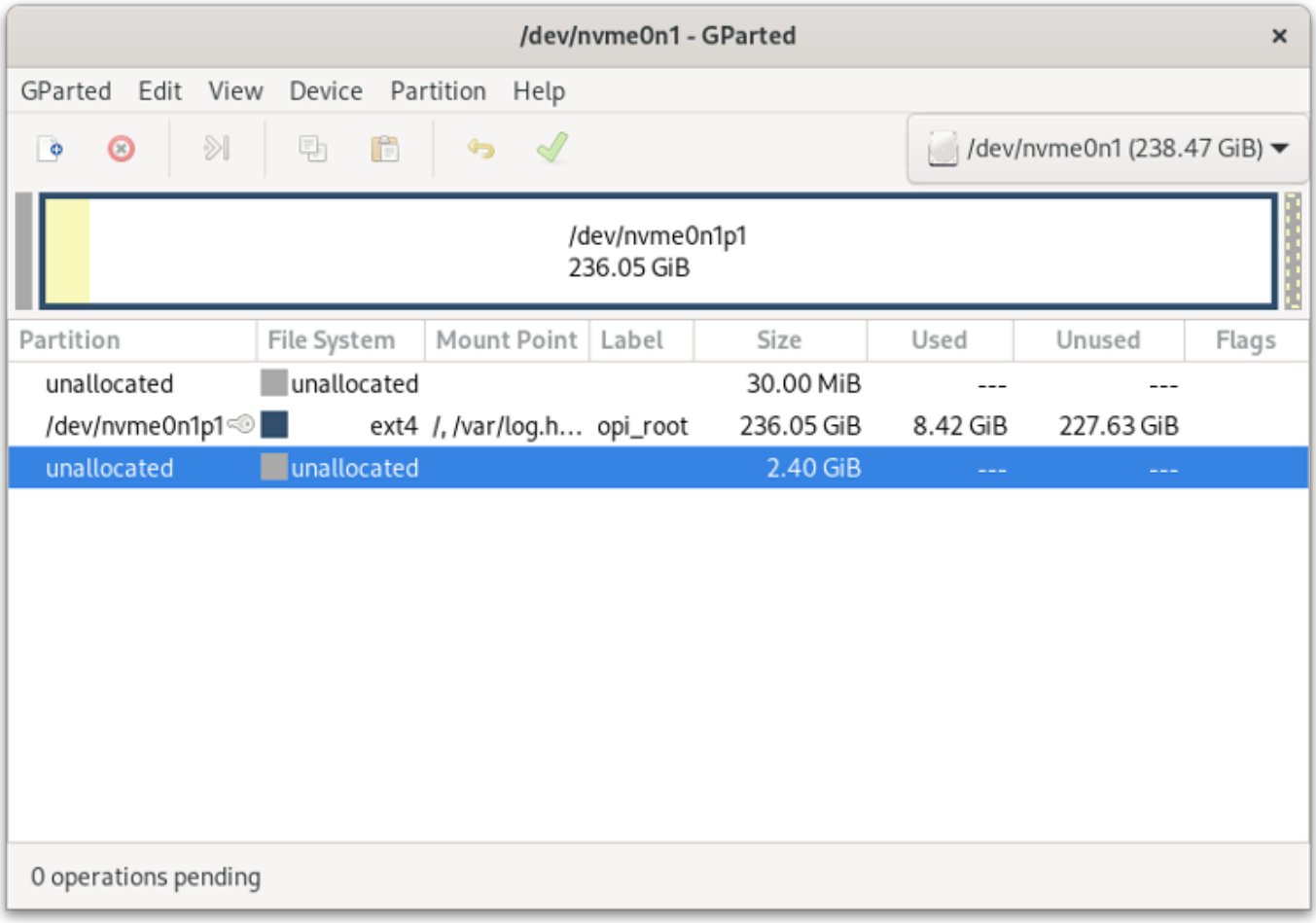
- Partition and format the SSD:

```
sudo fdisk /dev/nvme0n1
sudo mkfs.ext4 /dev/nvme0n1p1
sudo mkdir /mnt/ssd
sudo mount /dev/nvme0n1p1 /mnt/ssd
```

- To boot from SSD, flash the OS image to the SSD and update the SPI flash bootloader using `orangepi-config` (see reference).

For Storage visualization, install and run GParted

```
sudo apt install gparted
gparted
```



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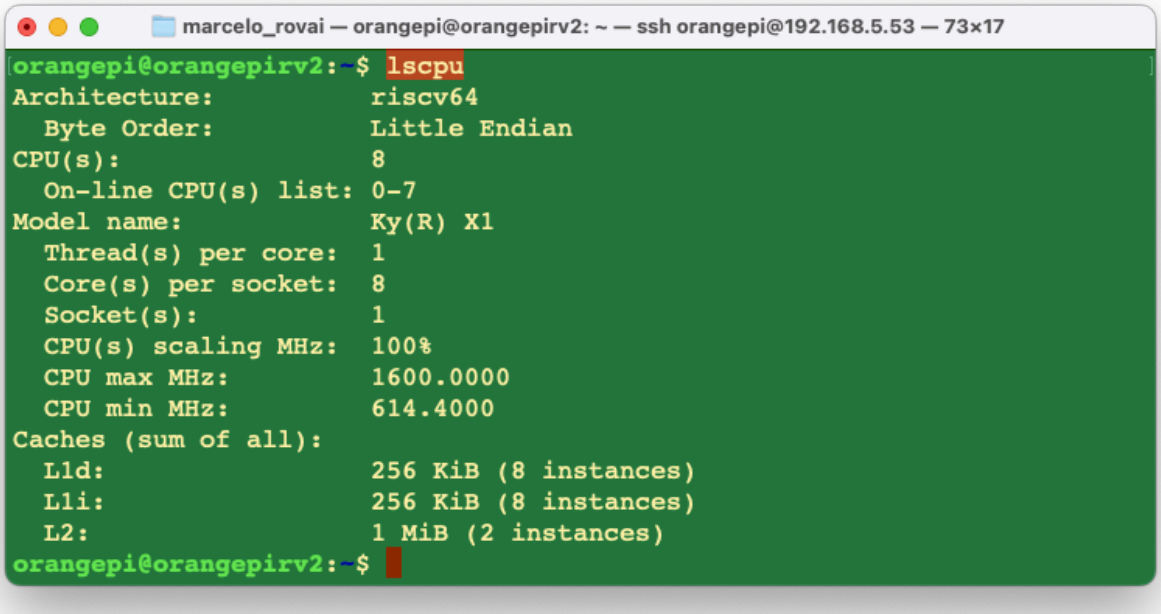
9. Useful First Commands

- To open a new Terminal window:

  `Shift` + `Ctrl` + `N`

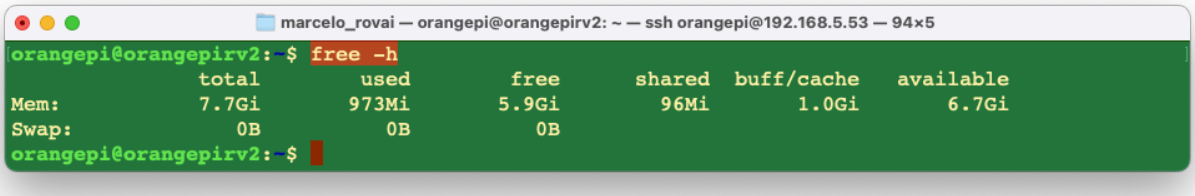
- Check CPU info:

  ```
  lscpu
  ```



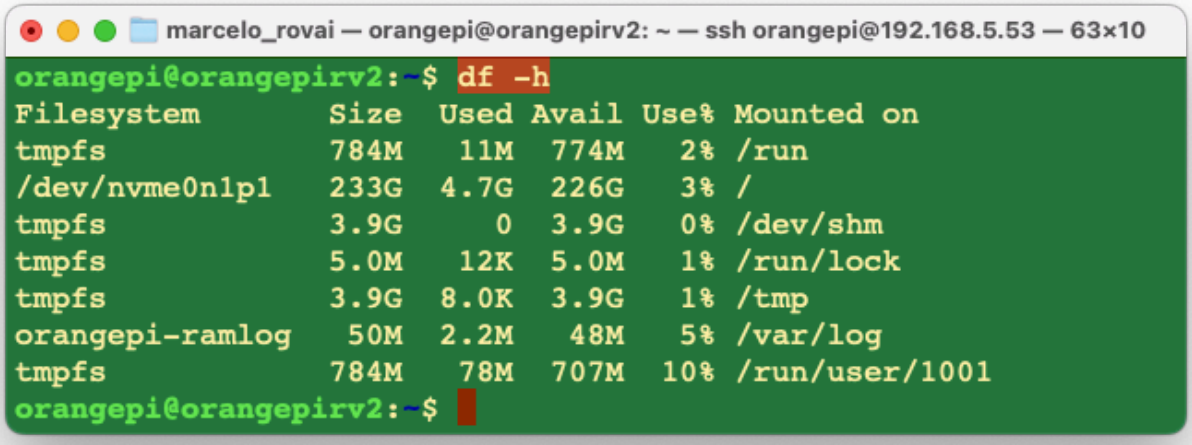
- Check RAM:

```
free -h
```



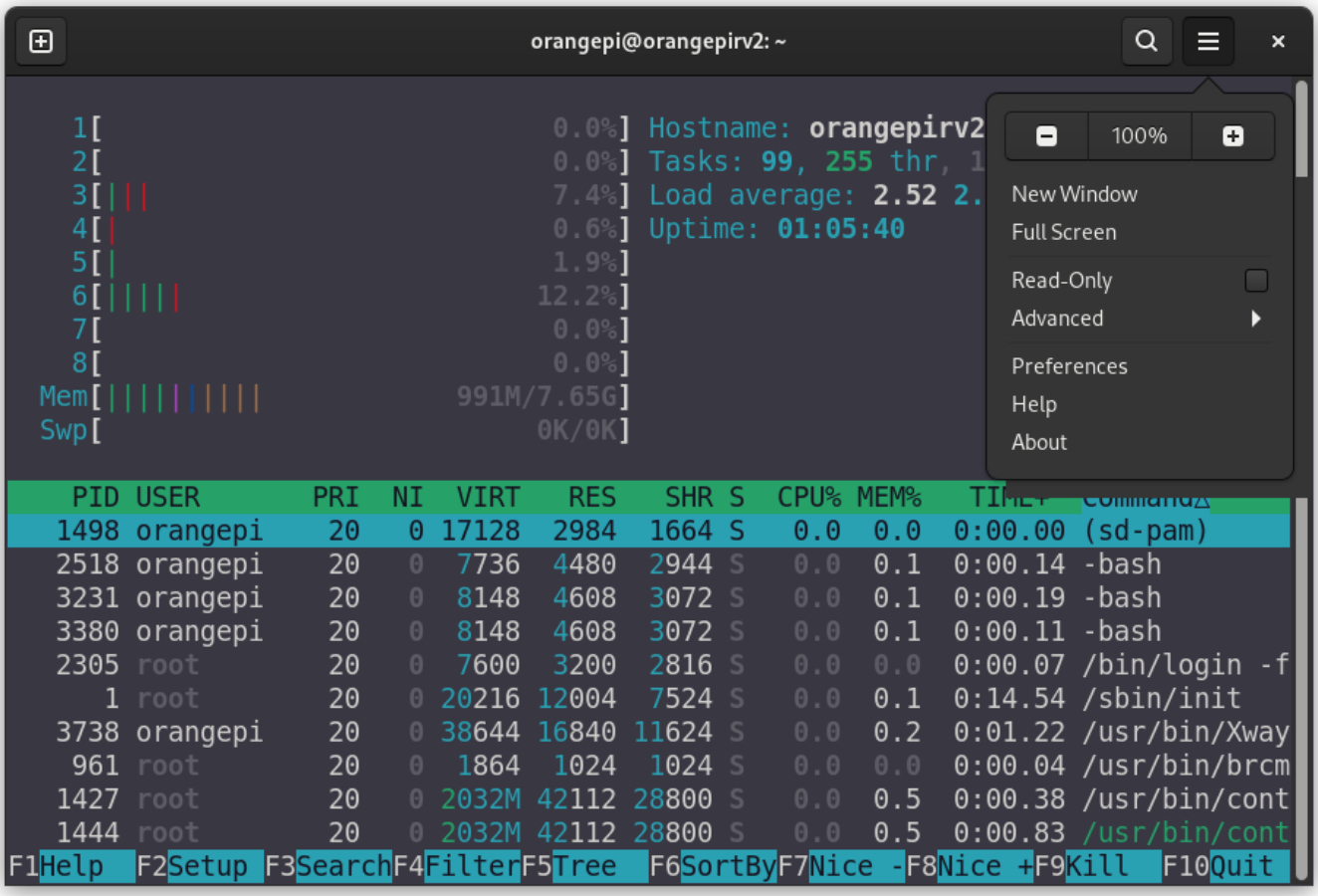
- Check storage:

```
df -h
lsblk
```



- Use htop for system monitoring

```
htop
```



10. Additional Tips

- To install software:

```
sudo apt update
sudo apt install <package>
```

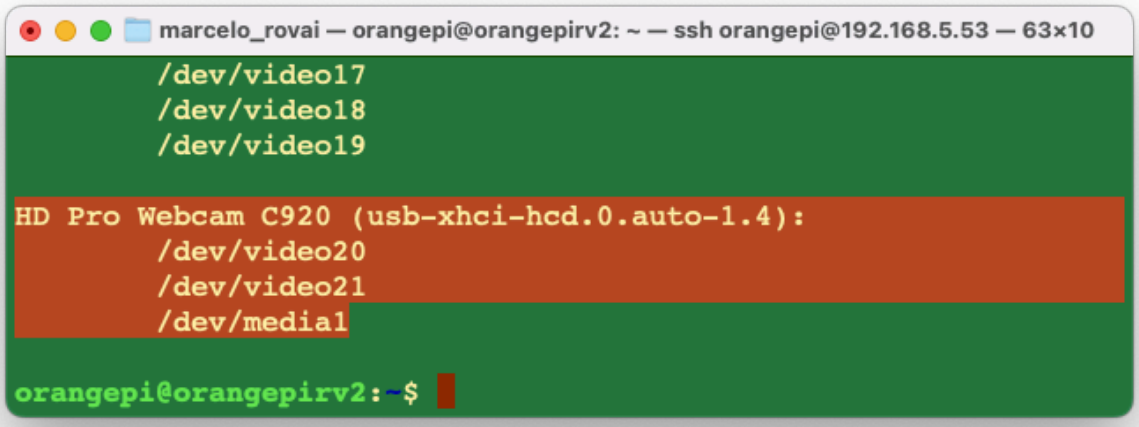
- For a webcam:

  Check the camera:

```
lsusb
```

Check the video device:

```
v4l2-ctl --list-devices
```

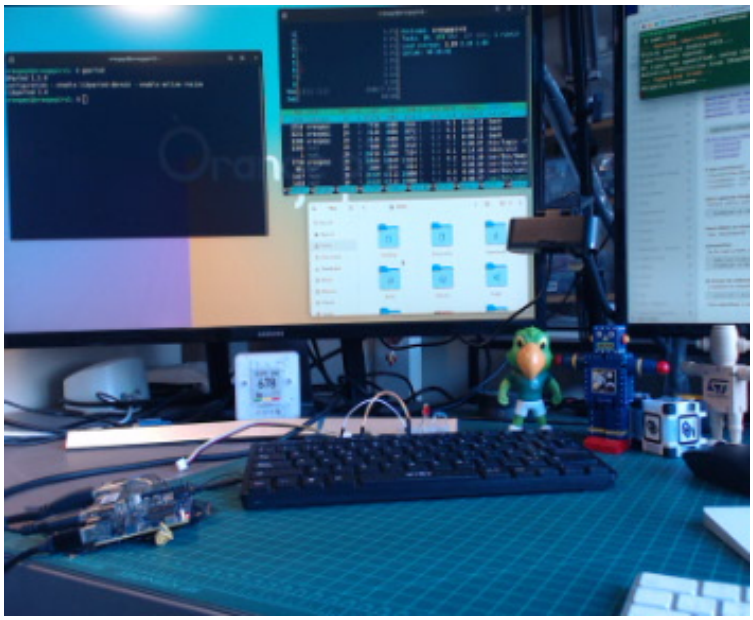



```
sudo apt install fswebcam
fswebcam -d /dev/videoX --no-banner -S 5 test.jpg
```

(Replace `/dev/videoX` with your actual video device.)

```
marcelo_rovai — orangepi@orangepirv2: ~ — ssh orangepi@192.168.5.53 — 84×13
orangepi@orangepirv2:~$ fswebcam -d /dev/video20 --no-banner -S 5 test.jpg
--- Opening /dev/video20...
Trying source module v4l2...
/dev/video20 opened.
No input was specified, using the first.
Adjusting resolution from 384x288 to 352x288.
--- Capturing frame...
Skipping 5 frames...
Capturing 1 frames...
Captured 6 frames in 0.17 seconds. (35 fps)
--- Processing captured image...
Disabling banner.
Writing JPEG image to 'test.jpg'.
```

The result:



- For CPU temperature check:

```
sensors
```

```
marcelo_rovai — orangepi@orangepirv2: ~ — ssh orangepi@192.168.5.53 — 84×10
orangepi@orangepirv2:~$ sensors
cluster0_thermal-virtual-0
Adapter: Virtual device
temp1:        +53.0°C

cluster1_thermal-virtual-0
Adapter: Virtual device
temp1:        +53.0°C

orangepi@orangepirv2:~$
```

- For automatic monitoring (each 2 seconds:)

```
watch sensors
wa
```

Ollama Installation

> Official Ollama instalation for Linux is based on ARM and will not work for Risc-V.

For installation, follow the instructions on this website:

https://www.jeffgeerling.com/blog/2025/how-build-ollama-run-llms-on-risc-v-linux

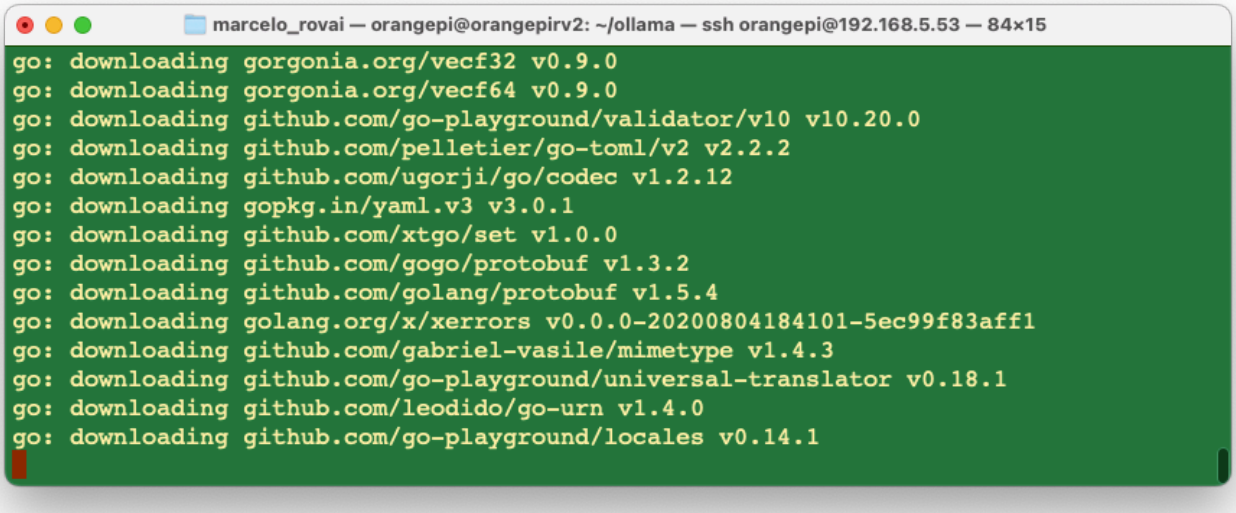
```
# Install Go (download link is under 'Unstable versions')
wget https://go.dev/dl/go1.24rc3.linux-riscv64.tar.gz
sudo rm -rf /usr/local/go && sudo tar -C /usr/local -xzf go1.24rc3.linux-riscv64.tar.gz
```

```
# check the version
go version
```

```
go version go1.24rc3 linux/riscv64
```

```
# Build ollama (This is an old version)
git clone --recurse-submodules https://github.com/mengzhuo/ollama.git
cd ollama
go build .
```

> After downloding files, the terminal will stay several minutes (more than 10) building Ollama, but there is no indication. **Wait for its end**.



The temperature went to aprox. 67oC during instalation, with all 8 cores running (part of the time).

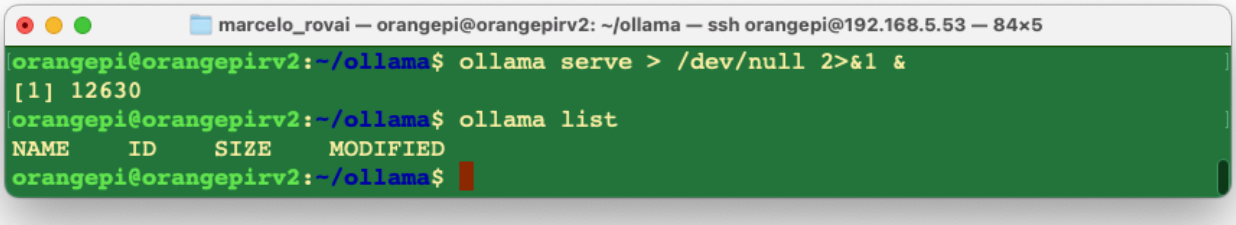
```
sudo ln -s `pwd`/ollama /usr/local/bin/ollama
```

Run Ollama

```
# Run ollama and test a tiny model (approx. 400 MB)
ollama serve > /dev/null 2>&1 &
```

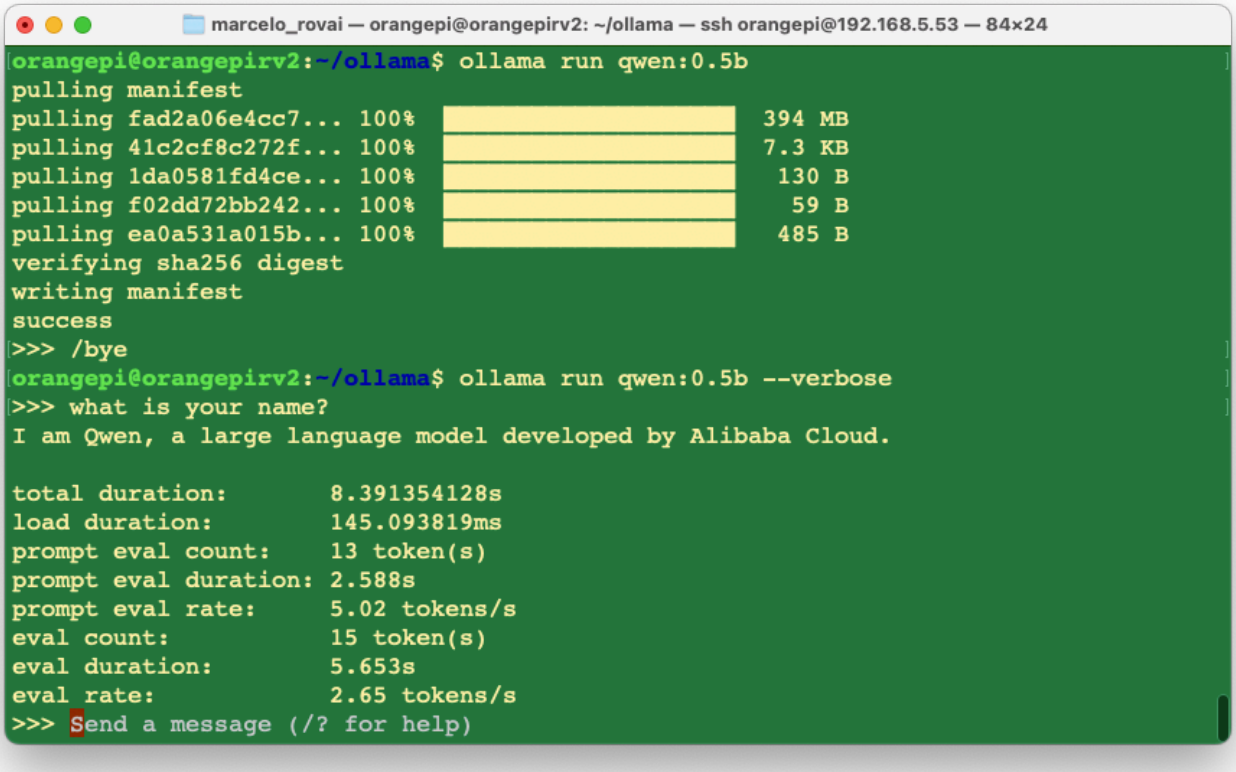
Check if it is running, for example listing the models (should be empty):

```
Ollama list
```



Let's pull a small model for testing:

```
ollama run qwen:0.5b
```



> It is important to constantly monitor the temperature. Running a SLM model, the temperature can easily fo over 90oC (without Heatsink and fan). So, installing heatsinks and a fan **is mandatory** to run SLMs.

This Ollama version is not uptodate, so some of recent model could not work.

Troubleshooting

- If you see no display, check the power, the SD card, and the monitor connections.
- For Wi-Fi issues, check `nmcli` output and ensure your SSID/password are correct.
- For SSD issues, ensure the SSD is inserted correctly and supported by the kernel.

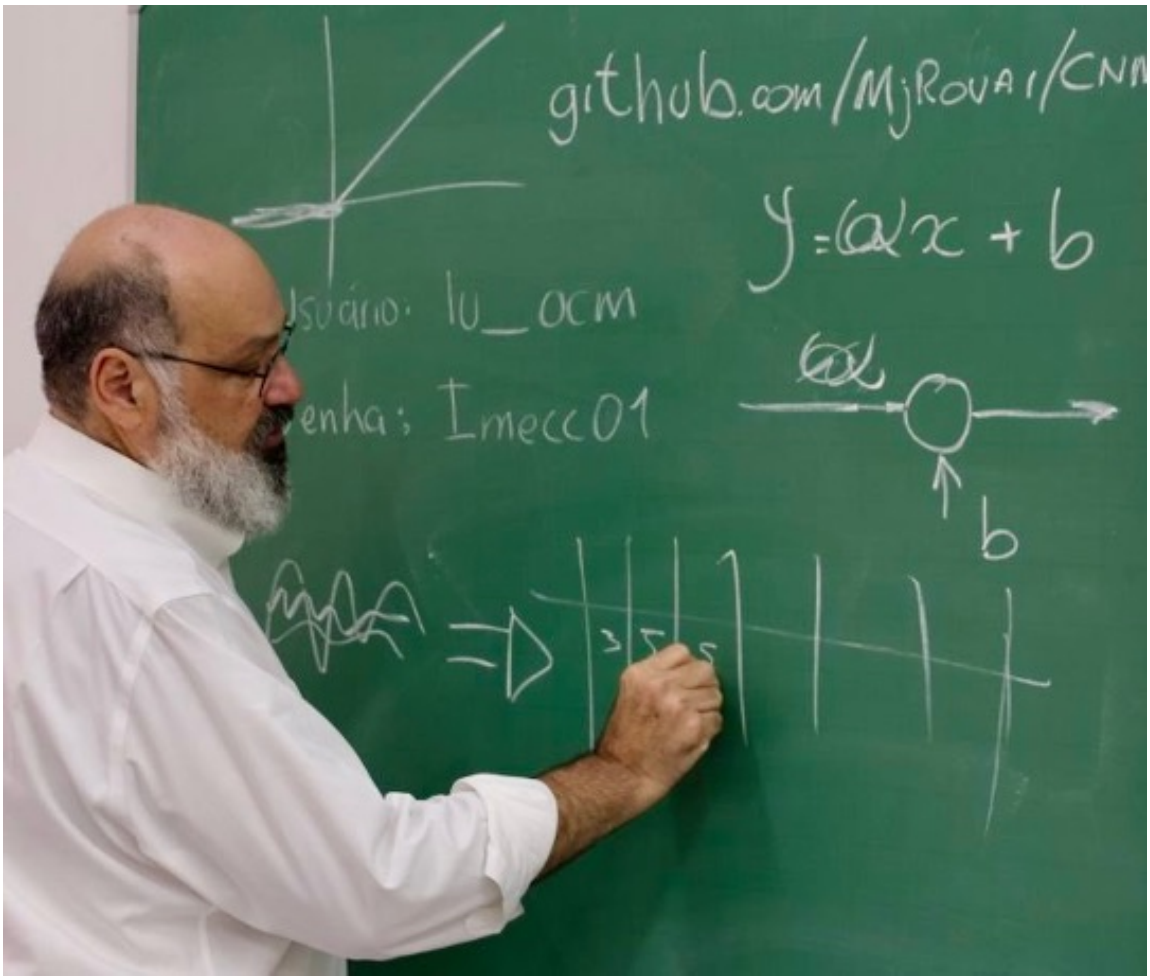
References

- Getting Started Video Guide
- Orange Pi RV2 Ubuntu Desktop Setup
- Orange Pi 5 SSD Boot Reference
- Orange Pi RV2 Unboxing

This guide covers the whole process from flashing the OS to first boot, networking, remote access, and using additional hardware like SSDs and webcams. For any advanced configurations or troubleshooting, refer to the official Orange Pi forums and documentation.

Sources
[1] Getting Started with Orange Pi RV2 | Flashing Ubuntu Noble Server https://www.youtube.com/watch?v=gAnhCtJ5HpI
[2] Getting Started with Orange Pi RV2 | Flash Ubuntu Noble Desktop ... https://www.youtube.com/watch?v=25aIsHlkOig
[3] Orange Pi 5 - Easy Setup and Overview! - YouTube https://www.youtube.com/watch?v=cBqV4QWj0lE
[4] OrangePi RV2 unboxing - getting started with RISC/V Linux - YouTube https://www.youtube.com/watch?v=lCgpn_SE22o
[5] Orange Pi RV2 - 8 Núcleos RISC-V // Todo lo que necesitas saber https://www.youtube.com/watch?v=UoW8b_yrFdY
[6] OrangePi RV2 http://www.orangepi.org/html/hardWare/computerAndMicrocontrollers/service-and-support/Orange-Pi-RV2.html
[7] Getting Started with Orange Pi RV2 | Flash Ubuntu Noble Desktop ... https://www.reddit.com/r/OrangePI/comments/1jrs7sp/getting_started_with_orange_pi_rv2_flash_ubuntu/
[8] My first impression of the Orange Pi RV2 with Ubuntu - Reddit https://www.reddit.com/r/RISCV/comments/1k267ts/my_first_impression_of_the_orange_pi_rv2_with/
[9] Orange Pi RV2 Review: A Complete Detailed Look - AndroidPIMP https://www.androidpimp.com/embedded/orange-pi-rv2/
[10] Xunlong Orange Pi RV2 (xunlong-orangepi-rv2) - postmarketOS Wiki https://wiki.postmarketos.org/wiki/Xunlong_Orange_Pi_RV2_(xunlong-orangepi-rv2)

About the author



Marcelo Rovai, a Brazilian living in Chile, is an educator and professional in the field of engineering and technology, holding the title of Professor Honoris Causa from the Federal University of Itajubá (UNIFEI), Brazil. His educational background includes an Engineering degree from UNIFEI and a specialization from the Polytechnic School of São Paulo University (POLI/USP). Further enhancing his expertise, he earned an MBA from IBMEC (INSPER) and a Master's in Data Science from the Universidad del Desarrollo (UDD) in Chile.

With a career spanning several high-profile technology companies such as AVIBRAS Airspace, AT&T, NCR, and IGT, where he served as Vice President for Latin America, he brings industry experience to his academic endeavors. He is a prolific writer on electronics-related topics and shares his knowledge through open platforms like Hackster.io.

In addition to his professional pursuits, he is dedicated to educational outreach, serving as a volunteer professor at UNIFEI and engaging with the TinyML4D group and the EDGE AIP – the Academia-Industry Partnership of EDGEAI Foundation as a Co-Chair, promoting TinyML education in developing countries. His work underscores a commitment to leveraging technology for societal advancement.

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Lectures, books, papers, and tutorials: https://github.com/Mjrovai/TinyML4D