CV PRO

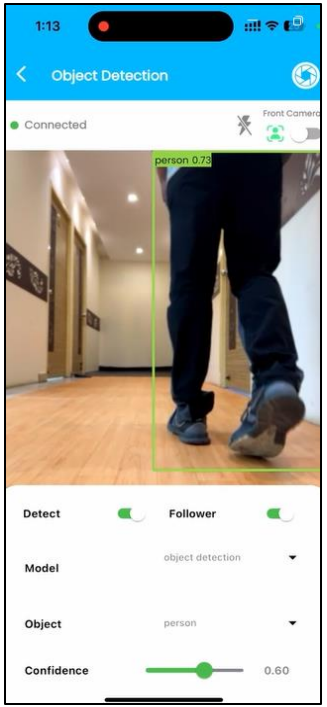
Meritus

CV Pro – AI Kit to build your own Self-Driving Car

CV Pro – The AI kit for Autonomous Navigation

Connection Establishment
&
Initiate MQTT Server Instance

Now that the required software has been installed on both the computer and smartphone, the next step is to **establish** a **connection** between the **CV Pro kit** and these **devices**. Once the connection is established, the CV Pro kit can be activated to detect objects ahead using the **'Object detection**' feature. It is crucial to follow the instructions outlined in the manual during this process to ensure the successful detection of objects by the CV Pro kit.



The order of connection:

1. The correct sequence of connections is crucial for optimal CV Pro AI kit performance.
2. The **CV Pro AI kit** functions as a Wi-Fi hotspot with the IP address **192.168.4.1**.
3. Your computer should establish the first connection, followed by your phone.
4. After connecting your **computer**, it will have the IP address **192.168.4.2**.
5. Once your **phone** is connected, it will be assigned the IP address **192.168.4.3**.
6. To confirm the successful connections, you can use the following verification method, as shown in the slides – 11 (for computer) and 19 (for smartphone).

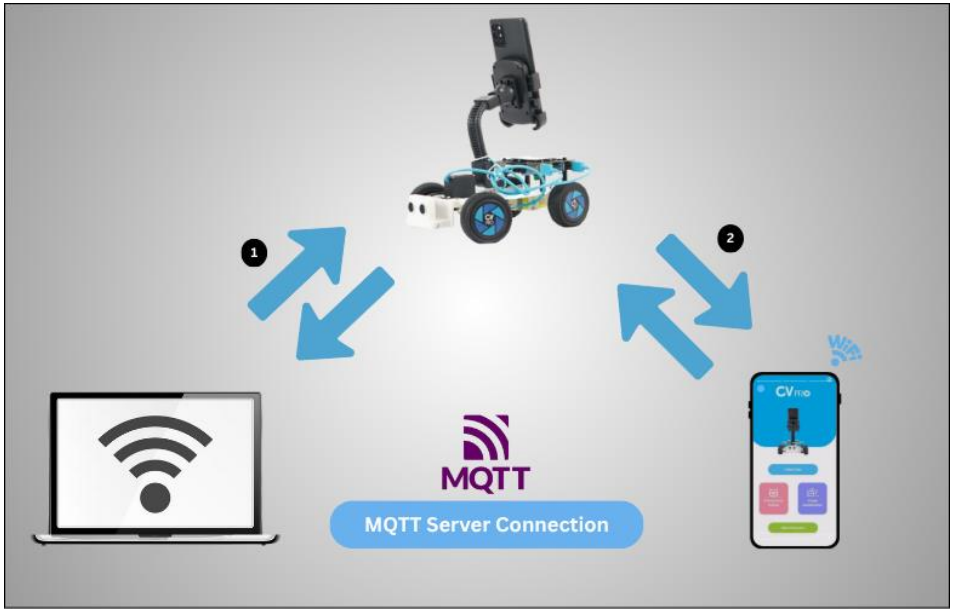
Establishing Connections

For establishing connections, follow the given order:

Step 1: Connect between the CV Pro Kit and the computer.

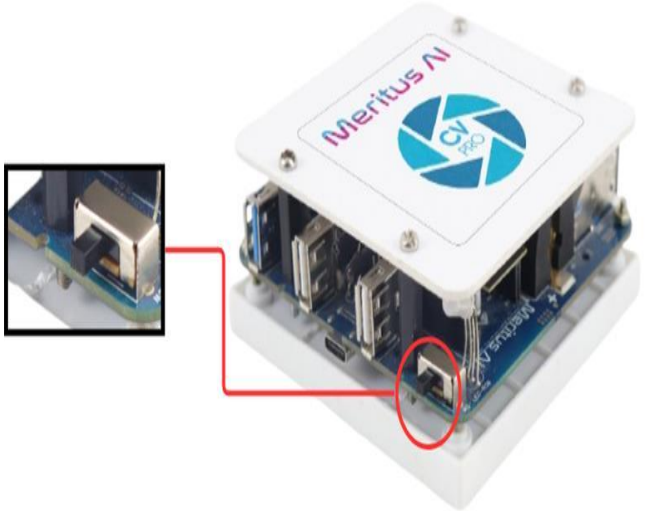
Step 2: Connect between the CV Pro Kit and the phone.

Do not change the order



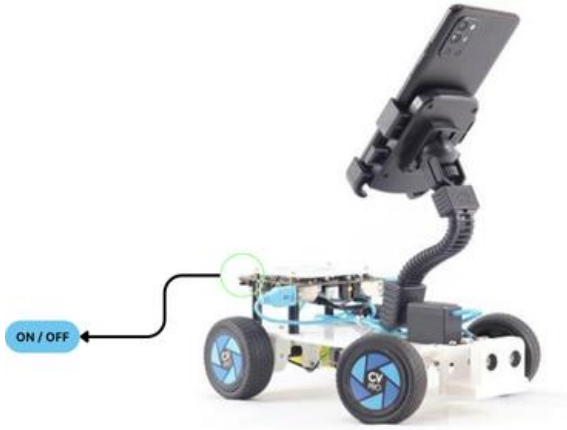
In ON State, The Kit's LED indications (**near ON-OFF switch**) are given below:

- **Yellow LED** - Ready to connect with server
- **Blue LED** - MQTT server activated
- **Green LED** - Connected with server through laptop
- **Red LED** - Low battery and hence server disconnects (if the operating voltage is below 3.7 V)



Establishing Connections – CV Pro Kit and Computer

1. Disconnect the internet connection to your computer.
2. Power On the CV Pro AI kit:
    - Turn on the CV Pro AI kit by sliding the ON/OFF switch to the '**ON**' position.
3. Enable Wi-Fi on Your Computer:
    - Utilize CV Pro WiFi for establishing a connection between the CV Pro AI Kit and the computer.
    - Ensure that your computer's Wi-Fi feature is turned on. Keep the CV Pro AI kit within close proximity for a more reliable connection.



Unique Device Identification:

- Each CV Pro AI kit, is assigned a unique ID. Locate this ID on the main brick of the CV Pro kit.

- Check if your computer's Wi-Fi connections list displays the device name as "CVPro<unique-id>". If you see this name, proceed to the next step.

- To connect, enter the security key as "12345678“ as shown in figure (1).

Figure 1

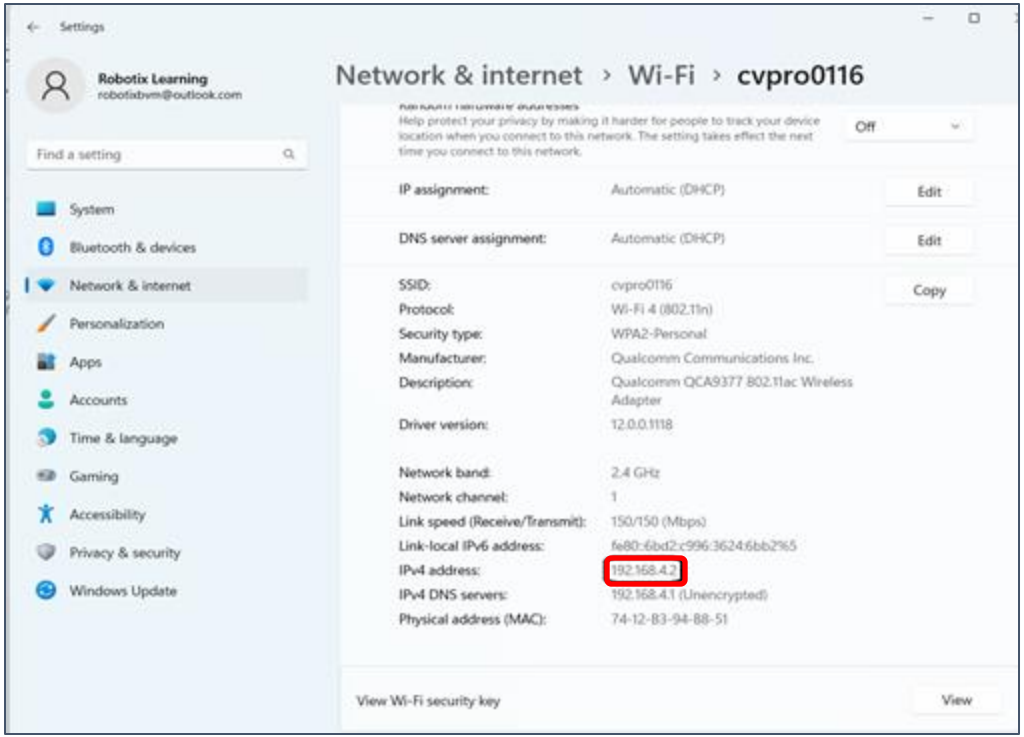
Next step is to start the **Mosquitto broker** instance. This differs based on the Operating System of your computer.

*Ensure to **disable** Wi-Fi and mobile data on your computer and smartphone before establishing the connection.*

CV Pro kit and computer

To confirm your computer's connection as the second device, with the CV Pro AI kit as the first, follow these steps:

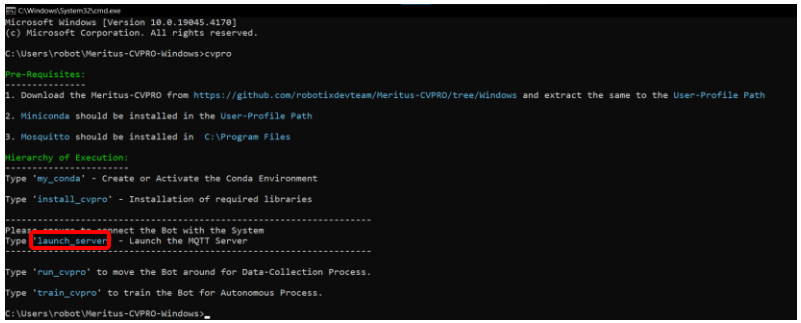
1. Access your Network & Internet settings.
2. Locate the IPv4 address.
3. If it displays as 192.168.4.2, this verifies that your computer is connected as the second device, as shown in the figure aside.



- Navigate to the working terminal and enter the command '**cvpro**'.
- Begin by entering the following command :

➢ '**launch_server**' – to start MQTT server. (ensure that CV Pro kit is connected with your computer)

The server will be launched now, ready to connect CV Pro kit with your computer, as shown in the figure (2).



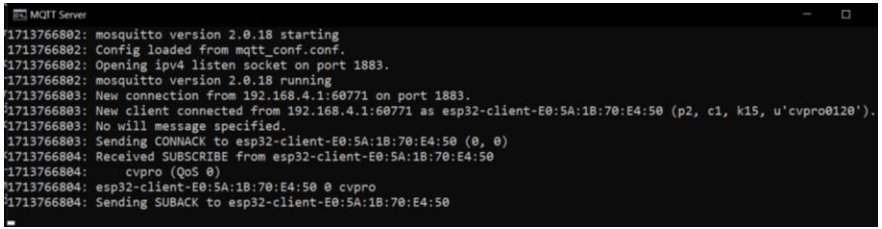


Figure (2)

❖ The server should commence and the output should be as shown. The appearance of the message, '**cvpro (QoS 0)**' as shown below in figure (3), indicates that the connection is established.

Figure 3

❖ If the server is not connected refer to the troubleshooting ppt (slide#)

Establishing Connections – CV Pro Kit and Phone

Establishing Connections – CV Pro AI Kit and Phone

IMPORTANT

Ensure to disable Wi-Fi and mobile data on your smartphone before establishing the connection.

1. **Connect Wi-Fi:**

   After successfully connecting your CVPro AI Kit to your computer, make sure your smartphone is connected to the CV Pro Wi-Fi network. Use the corresponding CV Pro ID and security key, such as 'cvpro0116' and '12345678.'

2. **Launch the CV Pro App:**

   Open the CV Pro app on your smartphone. In the top-right corner, locate and tap the settings button to access the 'Server connection' option.

3. **Access Server Connection Settings:**

   To access the next page for configuring the connection details with the CV Pro AI kit, tap on the context menu labeled 'Server Connection.' Refer to the figure (4).

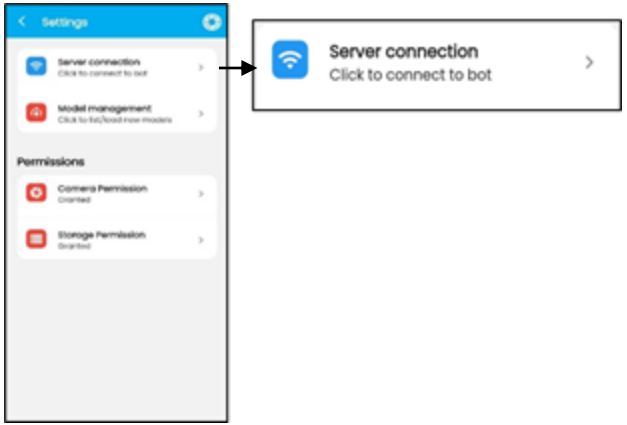


Figure 4

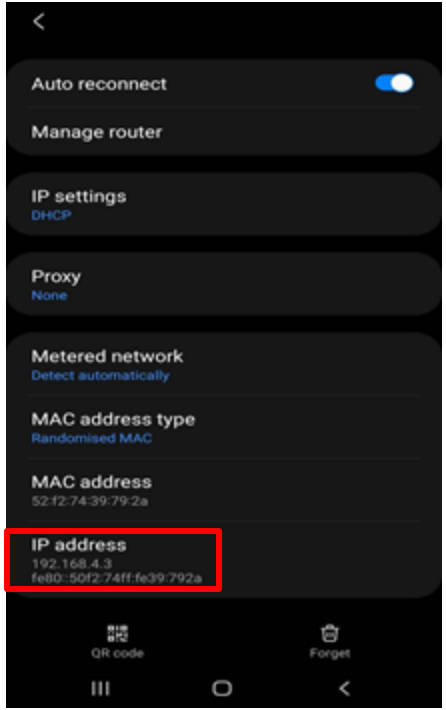
CV Pro kit and smart phone

To confirm your phone's connection as the third device, with the CV Pro AI kit as the first, follow these steps:

1. Access your phone's Wi-Fi settings.

2. Find the IP address.

3. If it appears as 192.168.4.3, this confirms that your phone is connected as the third device, as shown in the figure aside.



4. **Configure Connection Details:**

   On the following page, enter the IP address '**192.168.4.2**' in the 'IP address' field, and '**cvpro**' in the next field.

   After entering the details, tap '**Connect**' to establish the connection.

5. **Confirm Connection:**

   Verify the connection status on your smartphone. Check the connection status indicator.

   Additionally, observe the 'Connect' button; it will change to 'Disconnect' when the connection is active, indicating that you can disconnect by tapping it. Refer to figure (5).

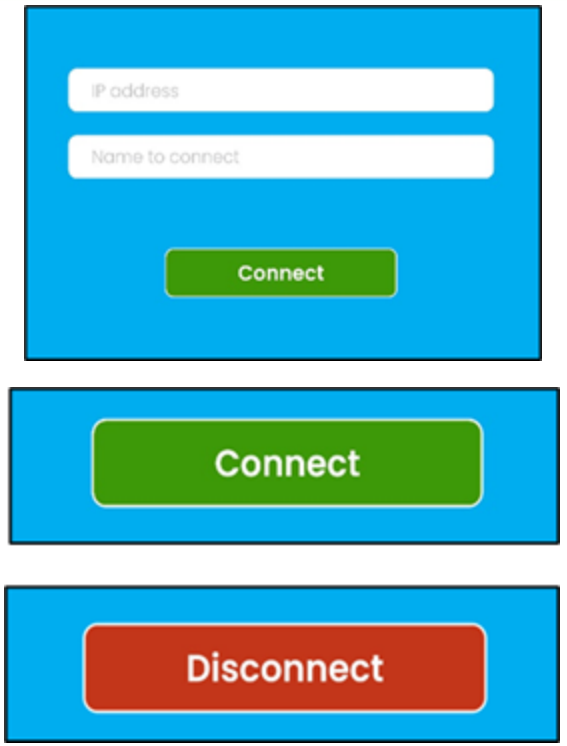


Figure 5

Object Detection

Detecting Objects by CV Pro AI kit

So far, we have completed the following:

1. Assembling the CV Pro AI Kit
2. Install software on devices
3. Create work environments
4. Establish connections

Next, we shall detect objects using the CV Pro AI Kit by following steps given next slide.

1. Access the 'Object Detection' Screen:

- Start by navigating to the 'Home' screen within the app.
- Tap on **'Object Detection'** to access the corresponding screen. Refer to figure (6(a) & (b)).

2. Initiate Object Detection:

- Position the phone, in object detection mode, onto the C-clamp of the phone mount. Securely tighten the screw to place it firmly.
- To begin object detection, enable the 'Detect' button.
- Confirm that the 'Object Detection' option is selected in the 'Model' menu..

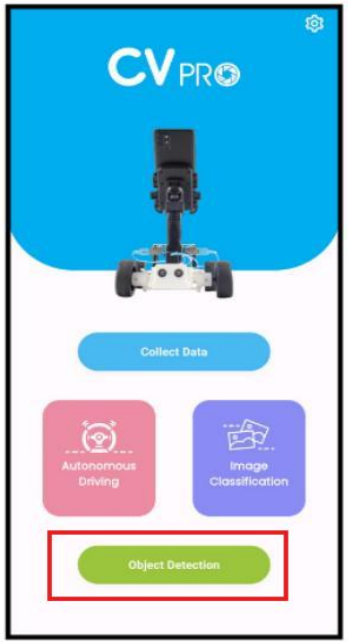


Figure 6 (a)

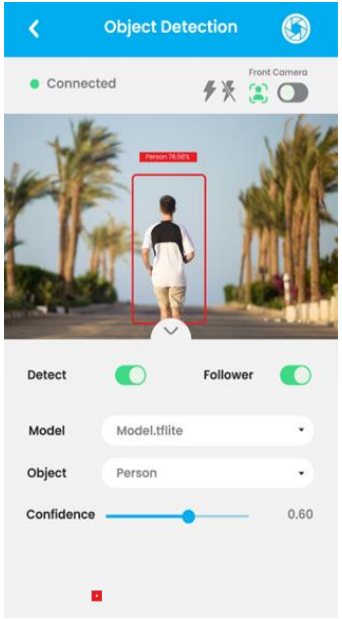


Figure 6 (b)

3. Choose the Object:

- In the 'Object' menu, choose the object you want the bot to detect, like 'person,' 'mouse,' 'bag,' or 'bottle.'
- Ensure the selected object is nearby the bot's assembly for better tracking.
- If the 'Follower' button is turned off, enable it to allow the bot to follow the detected object

4. Object detection:

- The bot will detect the object and start following, if the detected object starts moving forward.

5. Detection accuracy:

- Detection accuracy can be enhanced by adjusting the 'Confidence' level using the slider.

App Features Guide:

- **Camera switching:** Switch between the smartphone's cameras by toggling the 'Front Camera' button.
- **Flashlight option:** Enhance visibility in low-light situations by using the 'Flashlight' button.
- **Connectivity Status:** Keep an eye on the status indicator at the top of the app window when performing tasks like object detection or data collection. 'Connected' will be displayed prominently, as shown in the image. If it shows 'Disconnected,' there is a loss of connection. To restore it, follow the steps outlined in 'Establishing connections between CV Pro AI Kit and phone'. Refer to figure (7).

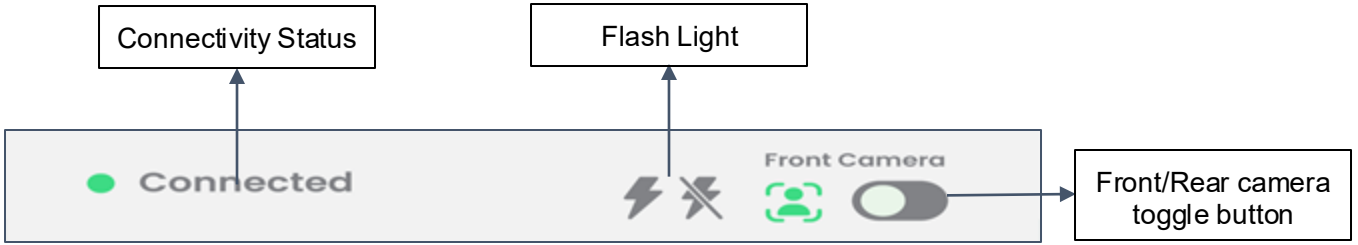


Figure 7

CV Pro AI Kit - Self Driving

- This bot will also collect data, similar to tracking a person, by following a physical track.
- The data collected can be used for creating a deep learning model and deploy the same.
- This can be done by making the bot to navigate around a track similar to the one provided, collect data and enable the autonomous navigation of the CV Pro AI kit.


Thank you!