CV PRO

Meritus

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

CV Pro – The AI kit for Autonomous Navigation

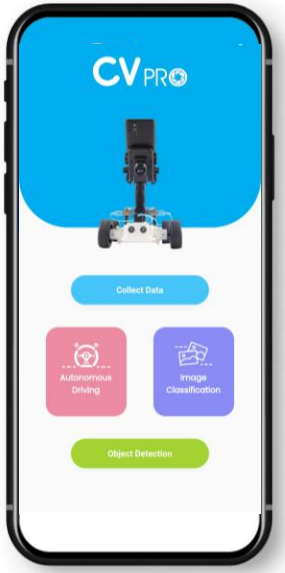
Introduction to CV Pro

Introduction to CV Pro

CV Pro is an AI-powered kit equipped with features such as:

- Simulate fully functional Self Driving Car using Computer Vision
- Achieve autonomous car driving in physical environment
- State of the art communication channels using smartphones
- Guided introduction to industry standard tools like OpenCV, Deep Learning, TensorFlow
- Learn to apply Computer Vision and deep learning techniques to identify lanes on a road

Compatibility of CV Pro



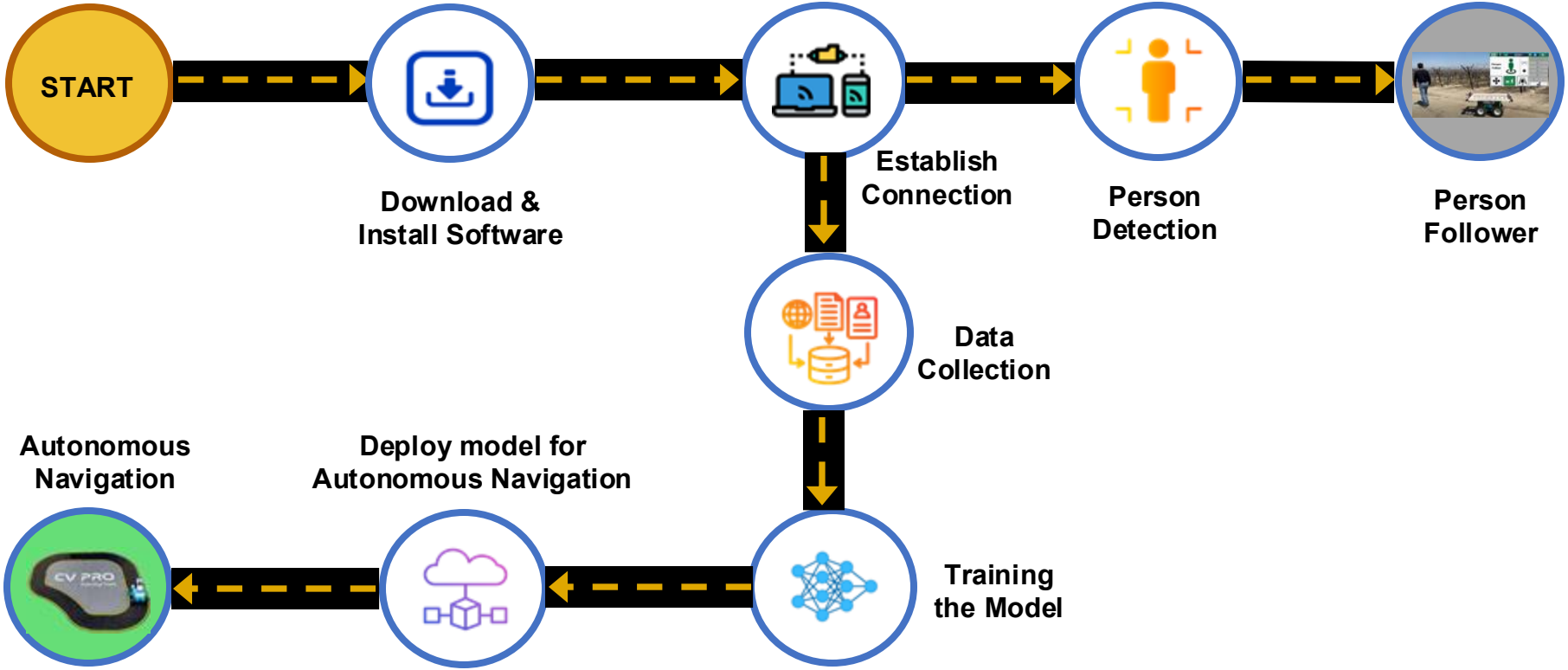
Compatible Versions (App's)

- Android - 10 & above
- iOS - 11 & above

Compatible Versions (Platforms)

- Windows OS – 10 , 11
- Ubuntu OS – 21 & above
- macOS – 14 & above

Software Configuration


START
Download &
Install Software
Establish
Connection
Person
Detection
Person
Follower
Data
Collection
Training
the Model
Deploy model for
Autonomous Navigation
Autonomous
Navigation

Downloading
&
Installing Software

Once the CV Pro kit has been assembled, it is imperative to download and install the requisite software in your computer and smartphone, to enable seamless operation with the kit. This step is vital for tasks such as data collection, training the machine learning model, and autonomous navigation of the CV Pro kit. Please adhere to the instructions provided to ensure the successful implementation of the CV Pro kit.

A guide to downloading and installing software

Here is an overview of the process to be followed:

1. Acquire the '**Meritus-CVPro'** GitHub resource package by downloading it.
2. Establish **'Miniconda'** package in the default user directory.
3. Install the **'Mosquitto broker package'** in C:\Program Files, for Windows OS and in 'User Profile' path for the other operating systems. Refer to figure (1).

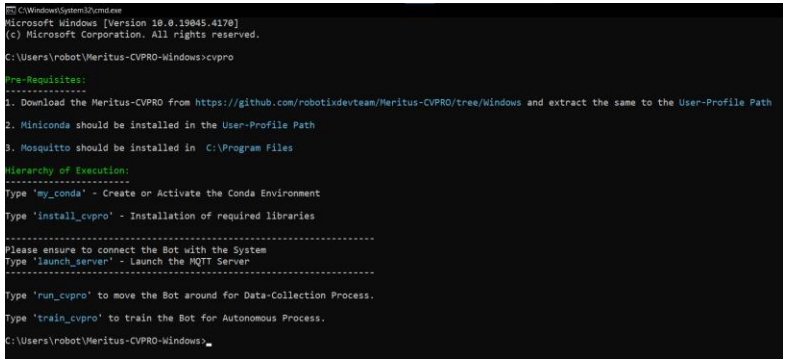


Figure 1

Downloading files from GitHub

Download Resource Package from the link provided below: This is required to obtain and utilize relevant Python packages, for execution of the processes (data collection and model training).

- Visit https://github.com/robotixdevteam/Meritus-CVPRO
- Select the download resource based on your operating system. Click on the branch tree and choose the resource to download depending on your operating system.
- If you're using Windows, select the Windows download option, and for Ubuntu and macOS, choose the respective options. You can refer to figure (2).

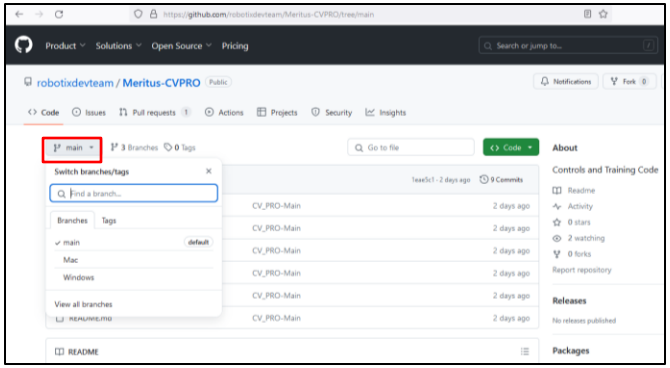


Figure 2

- So far, we've successfully downloaded the GitHub resource repository and incorporated it into our system.
- Next, we shall move on to installing the necessary software.
- To start, let us install '**Miniconda**' software.

Installing the Miniconda software

Objective of Miniconda – This is required to control the bot and create machine learning model using the collected data.

- Visit the download link - https://repo.anaconda.com/miniconda/

- Select the Miniconda distribution package suitable for your operating system (e.g., *Windows*, *macOS*, *Linux*). Refer to figure (3).

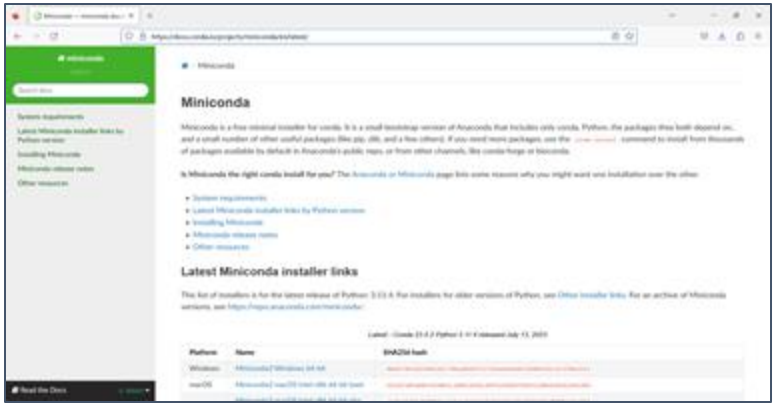


Figure 3

Installing the Miniconda software

- After the download is complete, locate the downloaded file and execute the installation process.

- The package should be installed only in the ‘User Profile’ path, irrespective of your operating system:, whether it is Windows, Ubuntu or macOS.

Installing the Miniconda software for Windows OS

Installing the Miniconda software for Ubuntu OS

Installing the Miniconda software for macOS

1:55:40

MQTT Broker Protocol Installation for Windows OS

- After installing the Miniconda software, our next step is to install the '**MQTT Broker protocol'** package.
- The MQTT Broker Protocol is essential for facilitating effective communication among various devices and clients.
- To install, it please visit the link provided in the subsequent slides for downloading. Ensure to select the appropriate package compatible with your operating system.

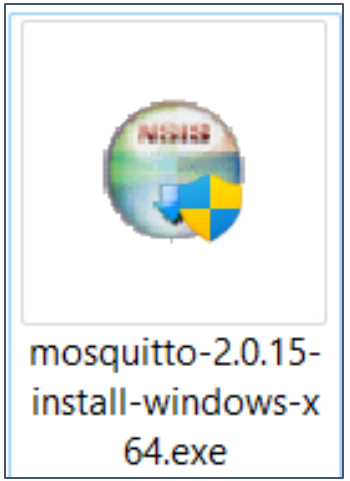
MQTT Broker Protocol Installation for Windows OS

1. If you're using a Windows 64-bit OS, obtain the MQTT (Message Queuing Telemetry Transport) Broker installer suitable for Windows 64-bit from the provided link: Windows 64-bit OS.

2. If your operating system is Windows 32-bit, download the MQTT Broker installer from this link: Windows 32-bit OS.

3. After completing the download, find the installer file, '**mosquitto-2.0.15-install-windows-x64.exe**' from your downloaded location.

4. The package should be installed only in '**C:\Program Files**' and in no other location.



MQTT Broker Protocol Installation for Windows OS

Mosquitto MQTT Broker installation for Ubuntu OS

- Open the Terminal Application
  - Begin by launching the terminal application.

- Update the Repository and Package List. Enter the following commands, in sequence:
  - '**sudo apt-add-repository ppa:mosquitto-dev/mosquitto-ppa**'
  - '**sudo apt-get update**'

- Installation - After adding the Mosquitto repository and updating your package lists. Navigate to your **user profile path** and install Mosquitto broker with the following command: (Do not install in any other directory, apart from your User Profile path‘.)

- '**sudo apt-get install mosquitto**'

MQTT Broker Protocol Installation for Ubuntu OS

Mosquitto MQTT Broker installation for macOS

- Open the Terminal Application
  - Begin by launching the Terminal application on your Mac.
- Installation Using 'Homebrew'
  - To install the MQTT Broker, utilize the 'homebrew' project. Navigate to your **user profile path** and install Mosquitto broker with the following command: (Do not install in any other directory, apart from ‘user profile’ path.)
  - Execute the following command in the Terminal: '**brew install mosquitto**'.

MQTT Broker Protocol Installation for macOS

- Having installed both Miniconda software and the MQTT broker protocol, we'll now proceed to create and activate the **Conda** environment, tailored to your operating system.

- Please follow the steps outlined in the upcoming slides:

Commencing Operations on Diverse Operating Systems

Windows:

- Open the Meritus-CVPRO-Windows (Extracted folder) and open the path in Windows-Command-Prompt, by typing ‘cmd’ in the Address Bar or Breadcrumb Bar.

(or)

- Press ‘Win + R’ which opens the "Run" dialog, then type ‘cmd’ and press ‘Enter’. Now execute the command as follows:

C:\xxxx\xxxx> cd Meritus-CVPRO-Windows

- When you are in the command prompt window, enter the command ‘**cvpro**’. Please note that, throughout the process, this will be our ***working terminal.***

Linux:

- Right Click the Meritus-CVPRO-Linux, (extracted folder) and select ‘Open in Terminal’. This will open a new Terminal with folder path.

(or)

- Open a new Terminal, and type:

xxxx@xxxx: $ cd Meritus-CVPRO-Linux

- When you are in the terminal, enter the command ‘source cvpro.sh’ or ‘. cvpro.sh’. Please note that, throughout the process, this will be our ***working terminal.***

macOS:

- Right-click the Meritus-CVPRO-Mac (extracted folder) and select 'New Terminal at Folder'.

(or)

- Open a Terminal app and type:

xxxx@xxxx: % cd Meritus-CVPRO-Mac

- Execute the command **source cvpro.zsh**. Please note that, throughout the process, this will be our ***working terminal***.

- The **'cvpro'** menu options are as follows:

  - '**my_conda**' – to create or activate the conda environment.
  - '**install_cvpro**' – to install the required libraries.
  - '**launch_server**' – to start MQTT server. (ensure that CV Pro kit is connected with your computer)
  - '**run_cvpro**' – to collect the data by enabling the cv pro kit to navigate around the track..
  - '**train_cvpro**' – to train the kit for generating the machine learning model.

Refer to the figure (4) given in the next slide.

Menu options under ‘cvpro’:

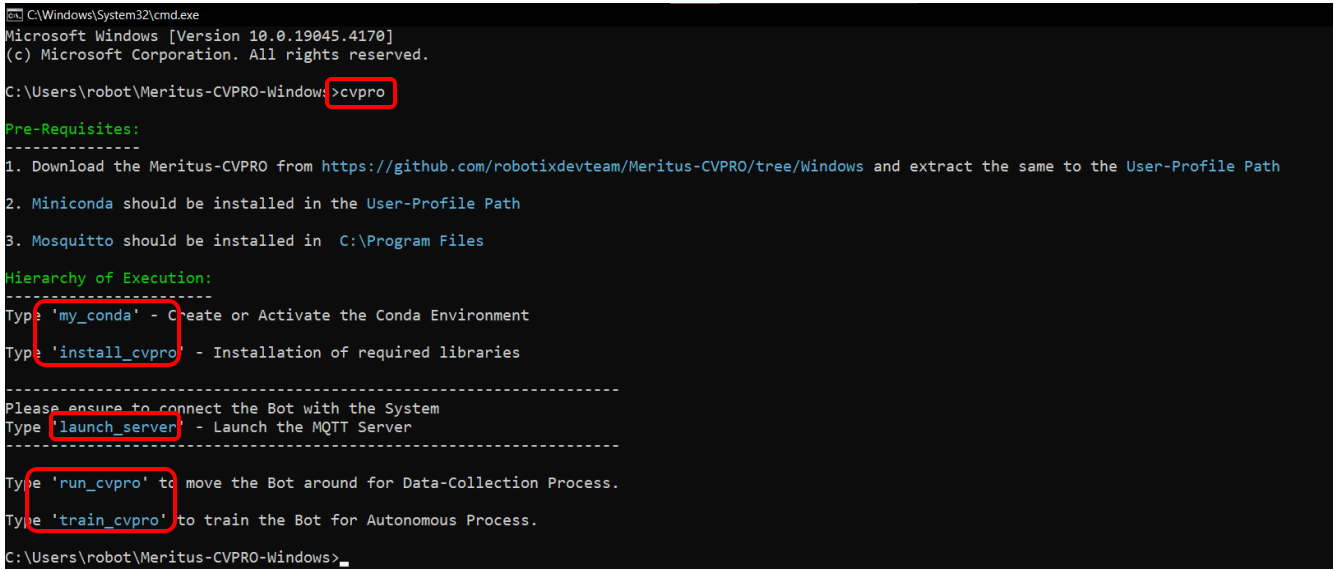


Figure (4)

Creating
&
Activating Environment

Creating work environment - From Miniconda prompt – for Windows OS

- Begin by entering the following command, '**my_conda**' in the working terminal, to create or activate the conda environment.

- When you enter the option, you will be prompted with three more options, **'build', 'activate'** and **'deactivate'.**

Creating work environment - From Miniconda prompt – for Windows OS

- '**build**' – This option will **create and activate** a virtual environment.

- '**activate**' – This will **activate** the environment created. (when required)

- '**deactivate**' – This will **deactivate** the environment created. (when required)

Refer to the figures (5 & 6) given in the next slide.

Creating work environment - From Miniconda prompt – for Windows OS

Step 1: Enter the command '**my_conda**', in the working terminal.

```
C:\Users\robot\Meritus-CVPRO-Windows>my_conda
Hi! Please Ensure Internet Connection!
Give me a command - 'build' or 'activate' or 'deactivate':
```

Figure 5

Step 2: Enter the command '**build**' to create and activate the environment.

```
C:\Users\robot\Meritus-CVPRO-Windows>my_conda
Hi! Please Ensure Internet Connection!
Give me a command - 'build' or 'activate' or 'deactivate': build
Creating a Virtual Environment:- cvpro ...
Retrieving notices: ...working... done
```

Figure 6

If the environment is not activated follow the troubleshooting procedure given here.<<troubleshooting>>

Activating work environment

- Enter the command, **‘my_conda’** and from the options, displayed enter **‘activate’.**

- This will activate the existing environment, allowing us to commence either the '**data collection**' or the '**training process**'. Subsequent instructions will be provided within the command prompt.

Refer to the figure (7) given.

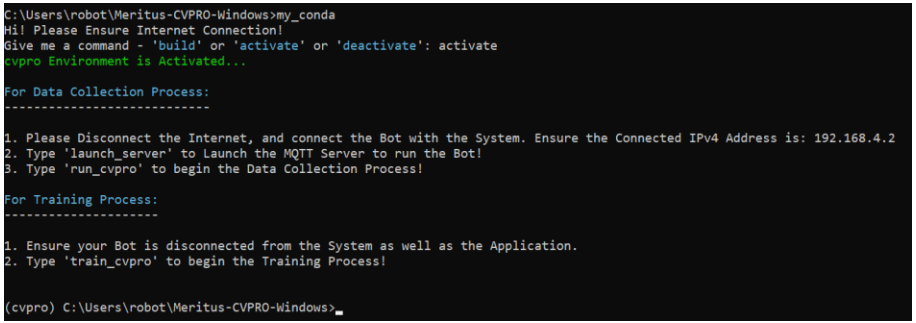


Figure 7

Activating work environment – Required cases

Activate the environment under the following circumstances:

- **Scenario1:** You have given the 'build' command and subsequently '**cvpro**' environment is created successfully.
- **Scenario2:** You already have an environment and **installed** all the required **python libraries** in it.
- **Scenario3:** In the cases when you are **not satisfied** with the **existing model** and wish to **regenerate** the **model**.
- **Scenario4:** In the case where you wish to **redo** the **entire process** with the existing environment, '**cvpro**'.

De-activating work environment – Required cases

- Deactivate the environment only if absolutely necessary. If you need to deactivate, enter the command, **'my_conda'** and in the option, enter **'deactivate'.**

```
C:\Users\robot\Meritus-CVPRO-Windows>my_conda
Hi! Please Ensure Internet Connection!
Give me a command - 'build' or 'activate' or 'deactivate': deactivate

cvpro Environment is De-Activated

(base) C:\Users\robot\Meritus-CVPRO-Windows>
```

Figure 8

Refer to the figure (8) given.

Installing Python Libraries

- We have now created and activated the conda environment, '**cvpro**', as shown in the figure (9).

- The next task is to install the dependencies.

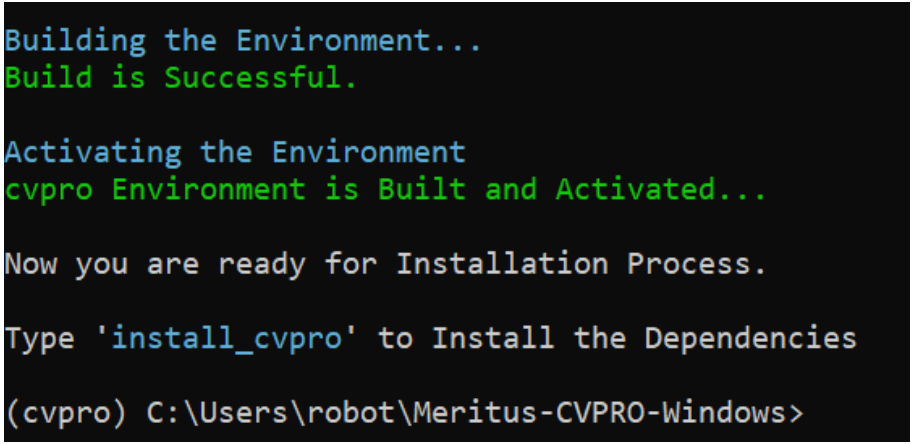


Figure 9

- To install the dependencies, execute the command, '**install_cvpro**', in the working terminal. A prompt will appear with options 'Y' or 'N'. Select 'Y', only in the presence of a stable internet connection. Refer to figure (10) given below.

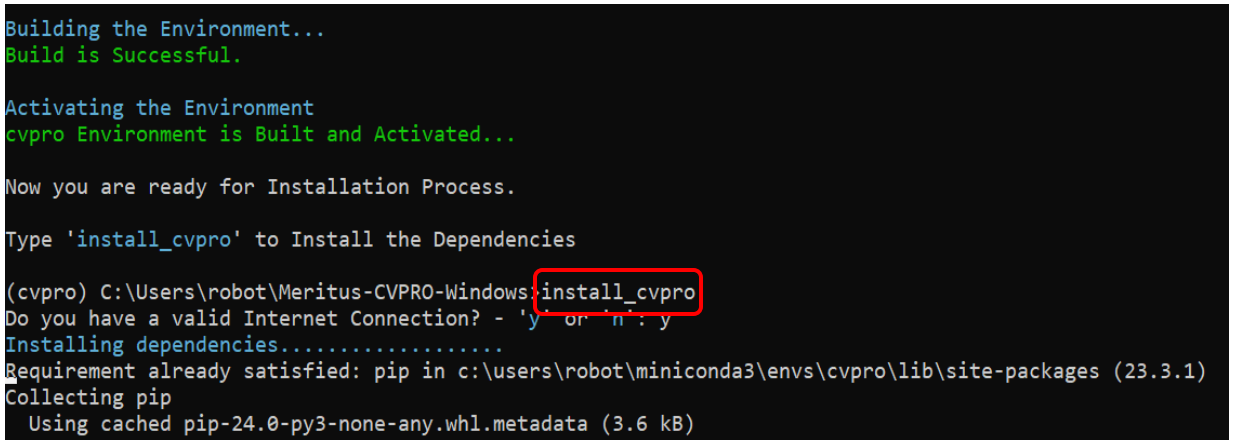


Figure 10

- With this, we have installed the necessary software, created the work environment, activated it and installed the required dependencies. Now, we shall proceed with the data collection process.
- You will be prompted with the following message, as shown in figure (11), when the dependencies have been installed.

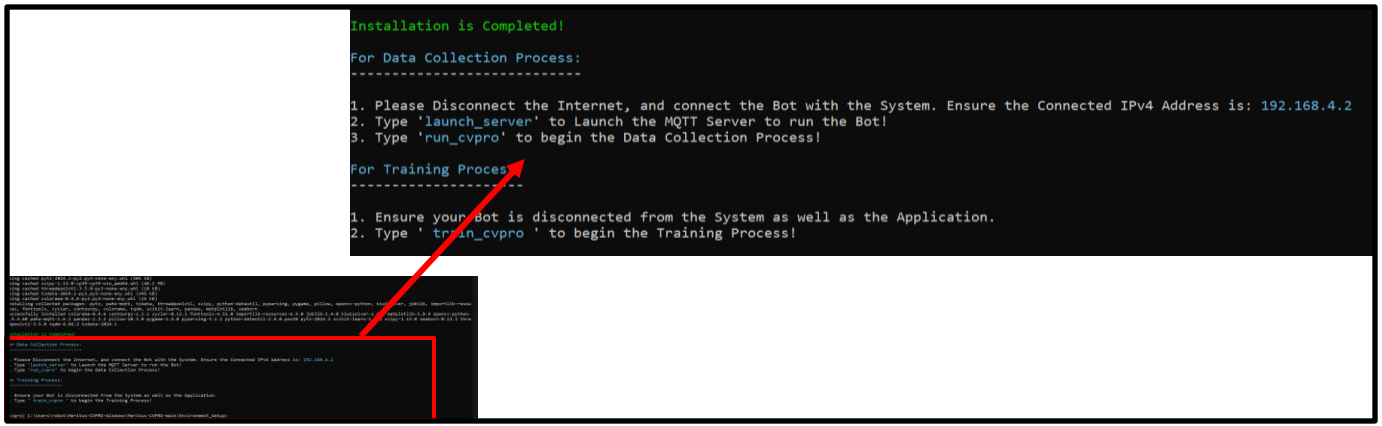


Figure 11

Installing CV Pro Mobile Application

For Android Smartphone Users

- Scan QR-Code or Open the Google Play Store on your Android device.
- Search for the 'CV Pro' application.
- From the search results, select the 'CV Pro' app and tap on 'Install'.
- Review the requested permissions and tap 'Accept'.
- Once installed, locate the app icon either on your home screen or within the app drawer and launch it.
- Find the app icon on your home screen, and then launch the app.

For iOS Phone Users

- Scan QR-Code or Access the App Store on your iOS device.
- Search for the 'CV Pro' application.
- Locate the 'CV Pro' app from the search results and tap 'Get'.
- If prompted, authenticate using your Apple ID or use Touch ID/Face ID to confirm.
- Allow the app to download.
- Find the app icon on your home screen, and then launch the app.


Thank you!