

Turner Kaminski - Team 3

Welcome to the user manual for piTrainer!

Set-Up

RPI Section

To get started, we will set up the raspberry pi. You are expected to have a conda environment on the raspberry pi already.

MQTT broker

With this environment activated please install the following packages to set up the mqtt broker.

```
pip install paho-mqtt
```

```
sudo apt install mosquitto
```

```
sudo apt install mosquitto-clients
```

Next, please paste the mosquitto.conf file from the Team3/RPI into /etc/mosquitto rewriting the conf file currently there. After a restart, the RPI should have a mosquitto broker running. You can check this using the systemctl status mosquitto command.

Code

When it comes to code to be run on the rpi, it is just the new_RPI_main.py script that should be run. You should not have to make any changes to this script unless you want to use unique mqtt topic names or mqtt client names.

PCB

Now, let's set up one of our custom PCB's for use with the IMU. You must have the old arduino IDE installed (circle icon, not square). From this, open the ESP32-IMU folder from the github into the Arduino IDE. Change the SSID and password constants to your respective hotspot/wifi name and password in the main arduino-BerryIMU script. Please also change the mqtt_server constant to the ip address of your RPI mqtt broker. You can find this by outputting ifconfig on the rpi and its the IP address of wlan0.

After changing these constants, select the "ESP32S3 Dev Module" board under tools, and enable the "Erase all flash before sketch upload" setting under tools as well. Finally select the correct port under tools, and then upload this sketch to the PCB.

Once you have powered the PCB with this sketch uploaded, clicking the top most button will restart the program and get the PCB working. This PCB will not work with eduroam, so please use a hotspot or home wifi.

Laptop

Let us finally set up the final component, the laptop. It is expected that you will also have a conda environment set up in the terminal of your laptop. Please ensure that the following packages are installed

```
opencv-python=4.8.0.74
Pillow
Pip install customtkinter
Pip install paho-mqtt
pip install SpeechRecognition
conda install -c conda-forge portaudio
pip install pyaudio
```

After installing the required packages, please navigate to the Team3/Laptop folder. The script you will be using from this folder is test3.py.

Code

In this test3.py file, you will need to change the ip address of the mqtt broker, the same way you did for the PCB. Also feel free to use `cap = cv2.VideoCapture(1)` instead of `(0)` if you have an external webcam.

Use

Now that you have all the required setup, we can now workout!

Instruction wise, please start the rpi script, then switch over and start the laptop script from the terminal. You will see the terminal has instructions to follow the speech recognition. After choosing your exercise, please get in the position you would like the system to calibrate for, then give the start command.

The GUI will then pop up and show further instructions, including to pause any movement during the calibration process. Once you see the pause button switch to GO, feel free to begin the exercise. Please pay attention to any pause/go instructions during your reps if relevant and watch for reps to be counted, or errors to be counted so you can adjust your workout form for best results.

For exercises bicep curl, squat, plank please have your right side of body facing the camera.
For exercise pushup, please try and have the camera near your eye level or so while fully extended for the pushup, and have it so youre looking directly at the camera.
For exercise leg raise, please face the camera with the left side of your body.

Example videos below of exercise performances.

Squat - [180DW piTrainer Squat Demonstration](#)

Pushup - [180DW piTrainer Pushup demonstration](#)

Plank - [180DW piTrainer plank demo](#)

Leg Raise - [180DW piTrainer Leg Raise demo](#)