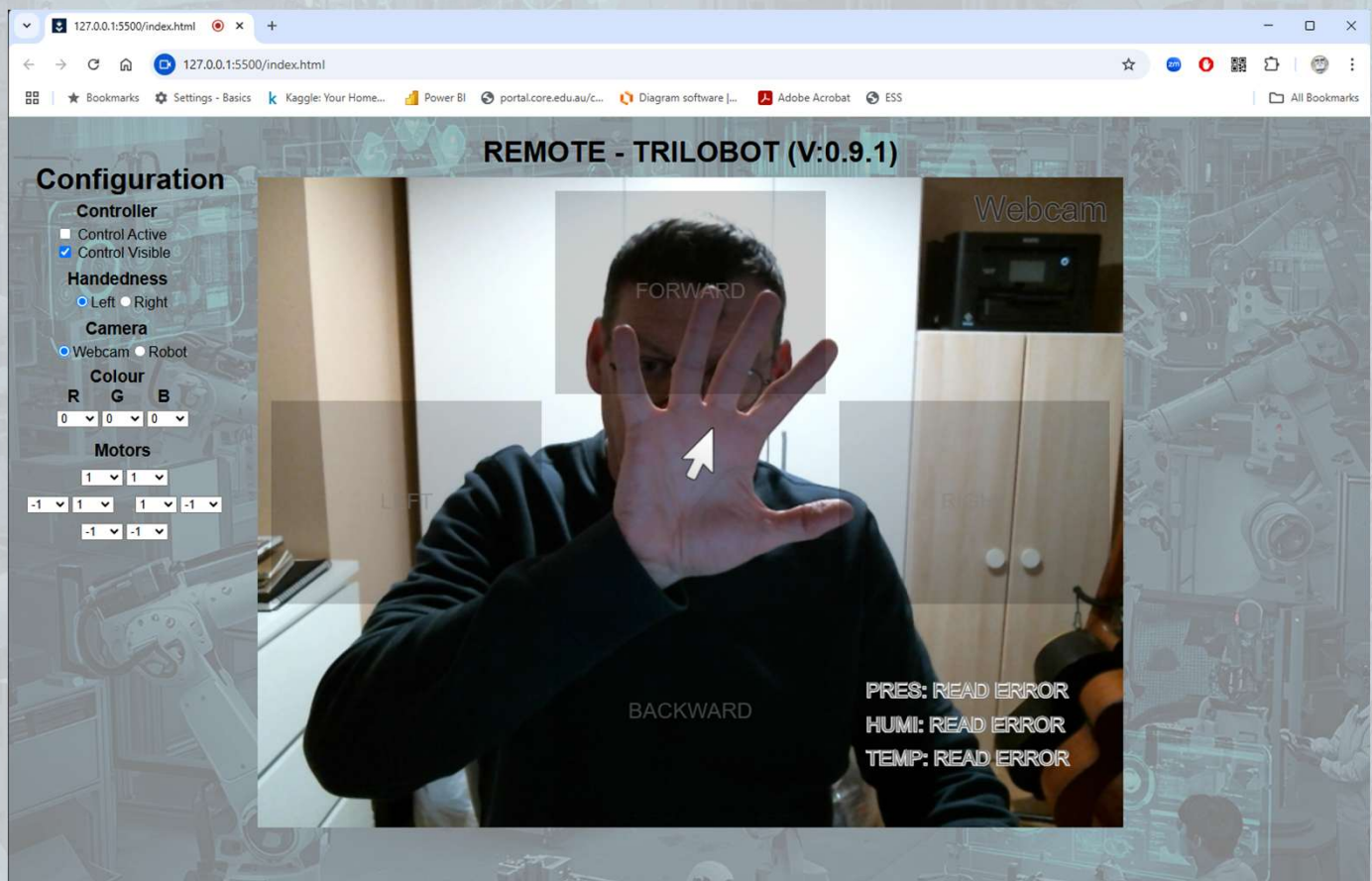# Trilobot Challenge

University of Sunderland

In this activity you will drive a Trilobot using Google's `MediaPipe` AI Models to recognise hand movements from a webcam feed.

The basic idea is you will complete a set of challenges as quickly as possible. But there's a catch, you need to tailor the power to the motors to make the movements as controllable as possible but at the same time fast enough to allow complete the challenges using only hand movements in front of the webcam.

Let's get going!

What do we need!

For this activity we need the following:

- A **web browser** (we recommend you use Chrome).
- The **VS Code** Editor
- A **webcam** connected to the computer.
- A **Trilobot** (Obviously!)
- **Your hand.**

The lab computers should already be setup, but if you get stuck at any point, ask for help. We are here to help you.

Oh, you also need your cunning plan!

Source files: https://github.com/neliot/Trilobot
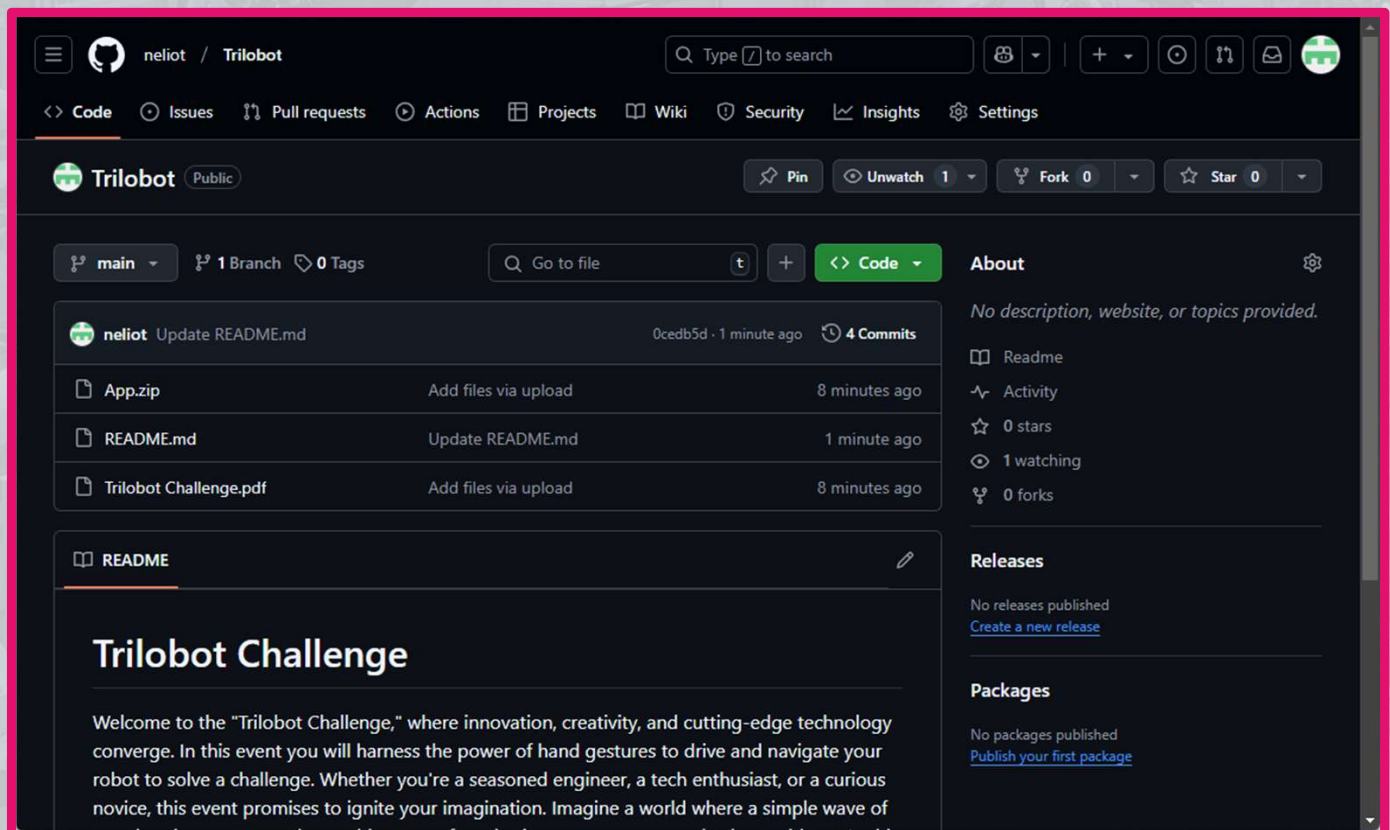
Let's get going!

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Download the application!

In your browser enter the URL below:

https://github.com/neliot/Trilobot

You should see a page similar to the one below:

Click on the App.zip file:
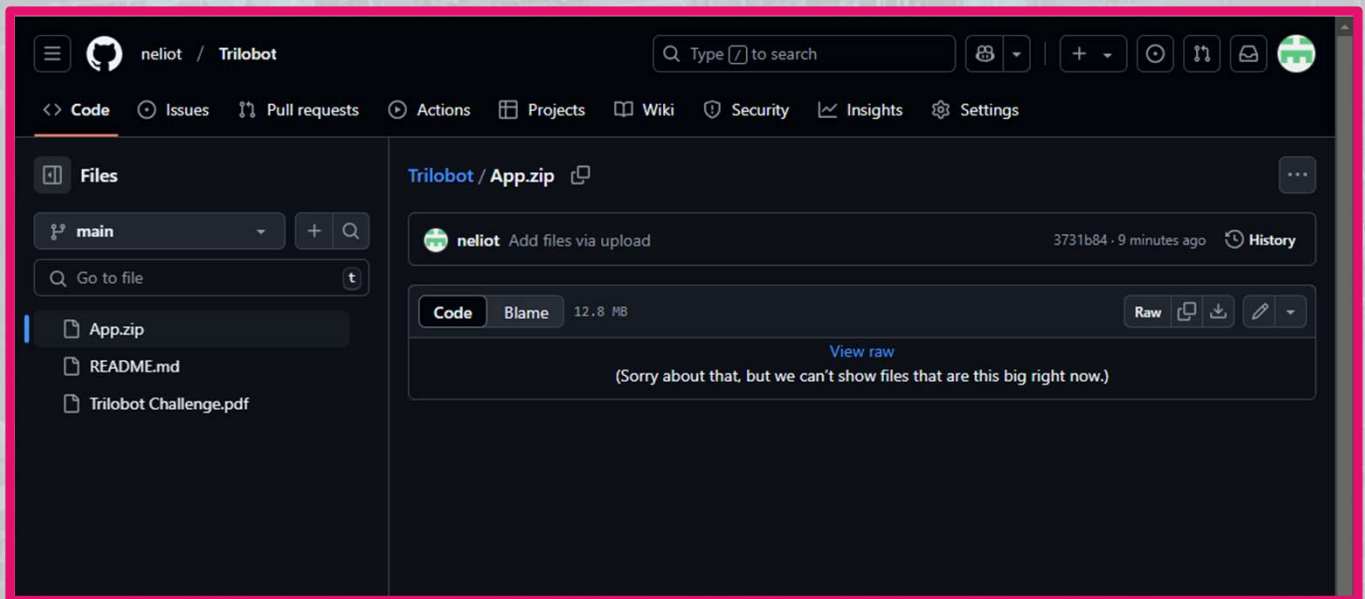
Let's get going!
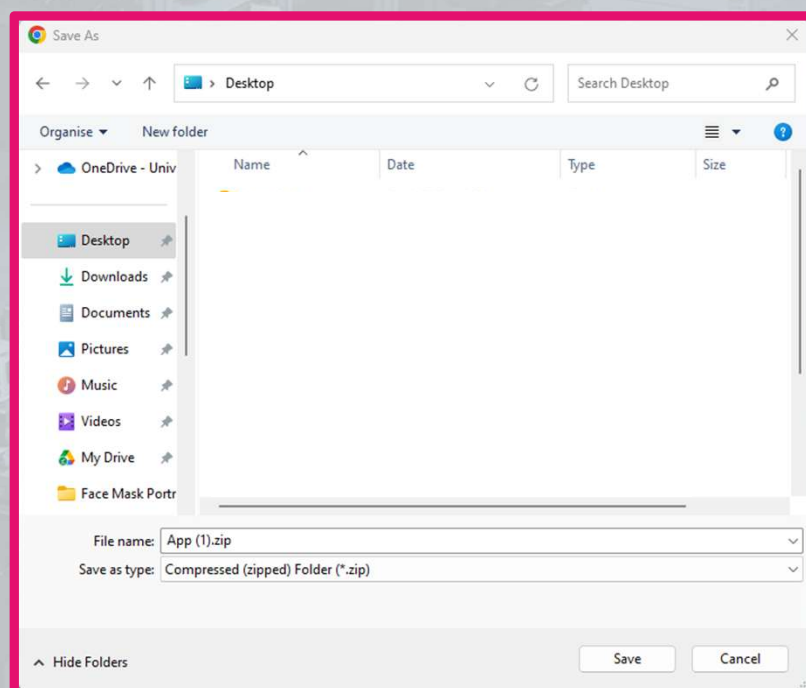

Download the application!

You will now be presented with the following screen:

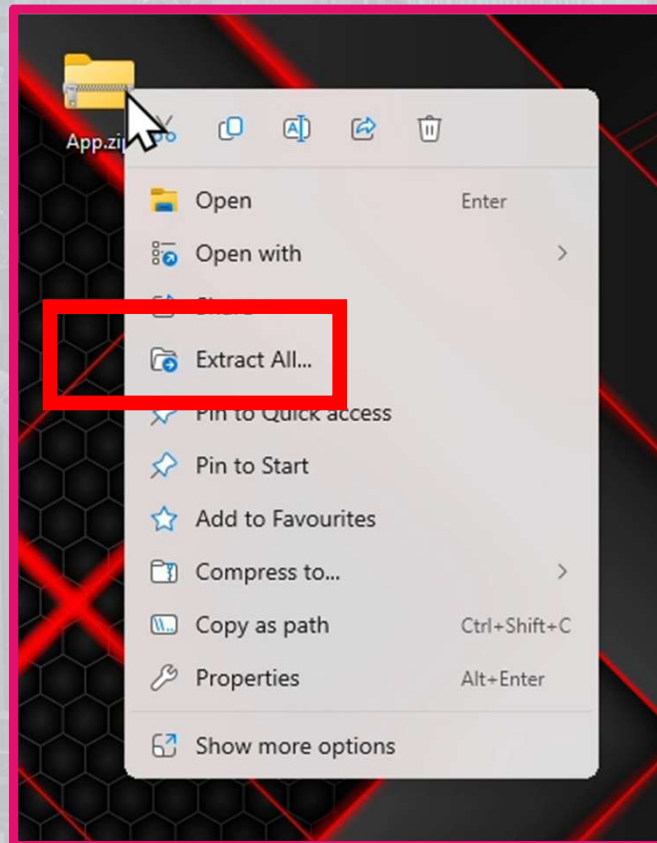Click on the download icon and save the file to the Desktop.
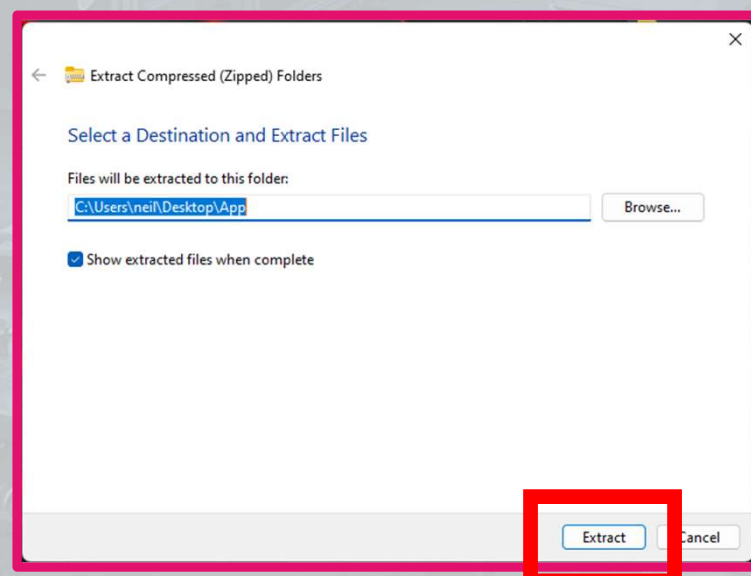
Let's get going!

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Extract the application!

Go to the desktop and find the file you just downloaded and right click on it.

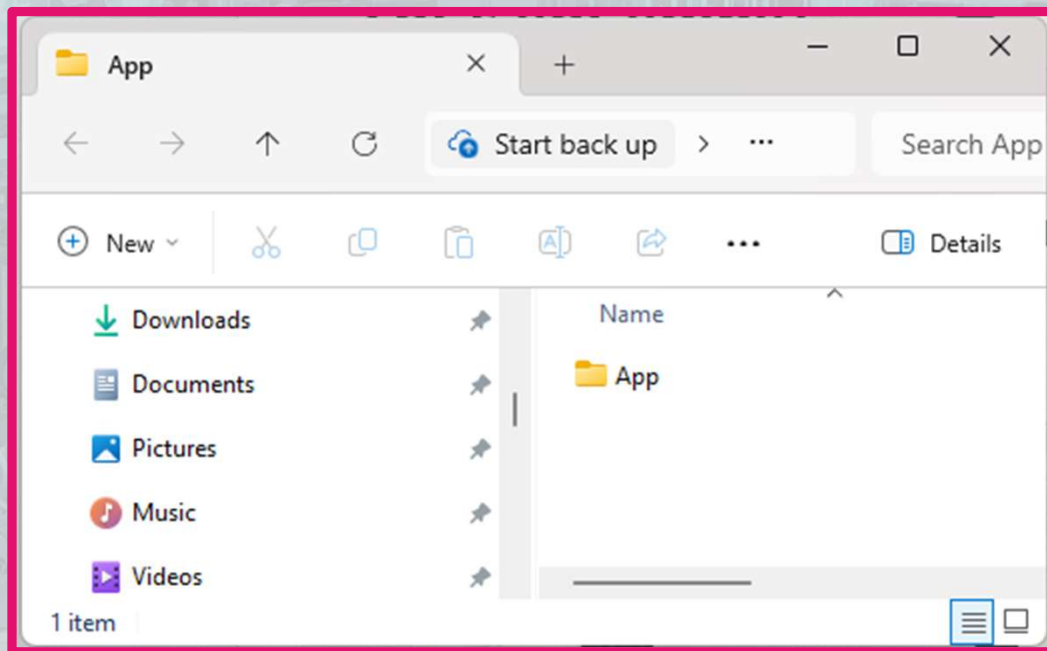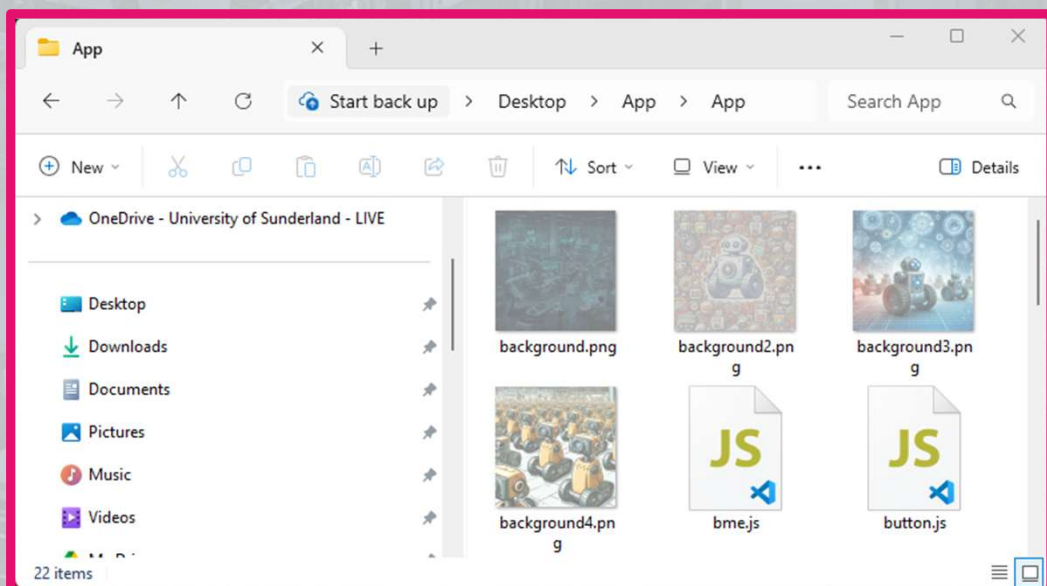Select **Extract All** and then **Extract**.

Let's get going!

Setup the application!

You can now see the Extracted application folder.

Go into the App folder by double clicking on it.

And now the Editor

Setup the application!

Right Click in the white space for the **action menu** as below:
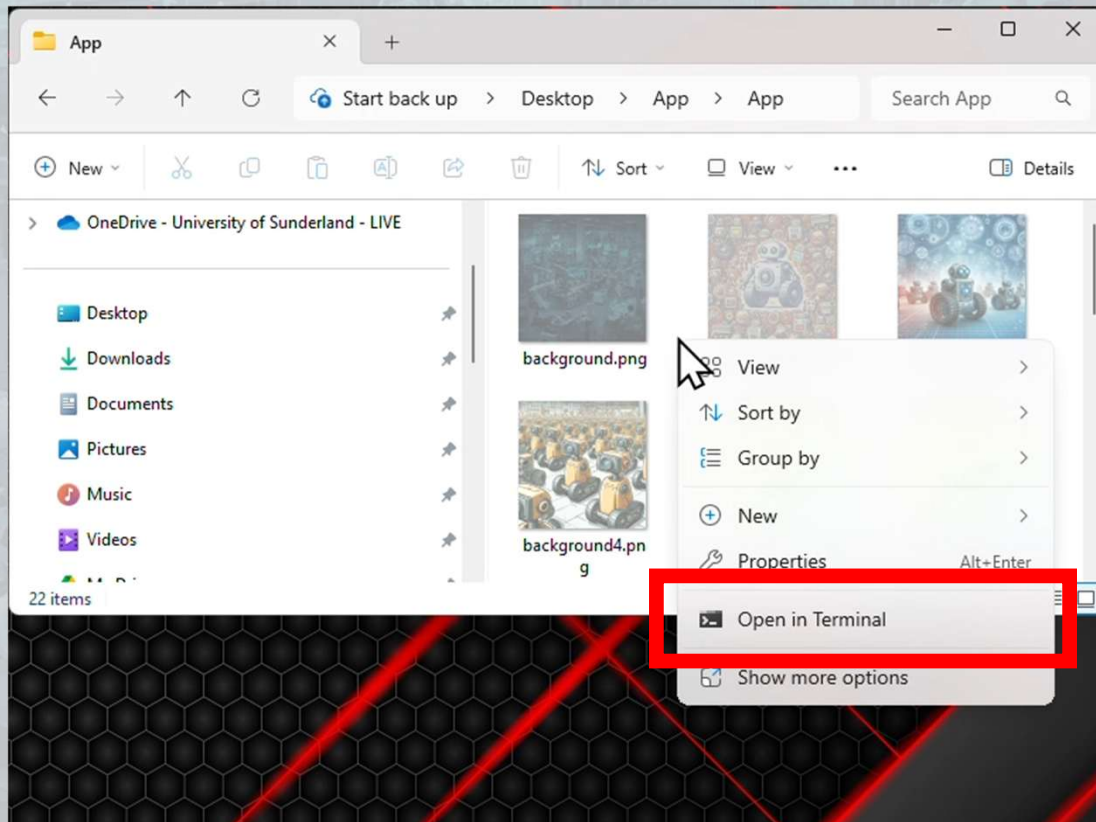
Select the **Open in Terminal** option. When the terminal window opens go to it and type in "**code .**" (without the quotes, yes, a dot is required after **code**!). Press the **RETURN** key. You should now have **VS Code** running with the **App** folder showing the files. If you get a message asking if you Trust this folder select **Yes.**

And now the Editor

Setup the application!

Within the list of files (there are quite a few) there is a file named `init.js` This file contains needs to have the IP address of the root you will control added to it. Select the file and the code will appear in the editor.

You will be given the address of the robot you are going to control by the person running the event. You need to change the address to the one you are given.

```
IP = "192.168.8.144";
```

And now the Editor

Running the application!

Now you can launch the application. At the bottom of the screen is an option "`Go Live`". This is the built in `Live Server` which is a local web server which runs the application.

If the "Go Live" option isn't displayed call the academic over, they may need to install the `p5.vscode` extension for you!
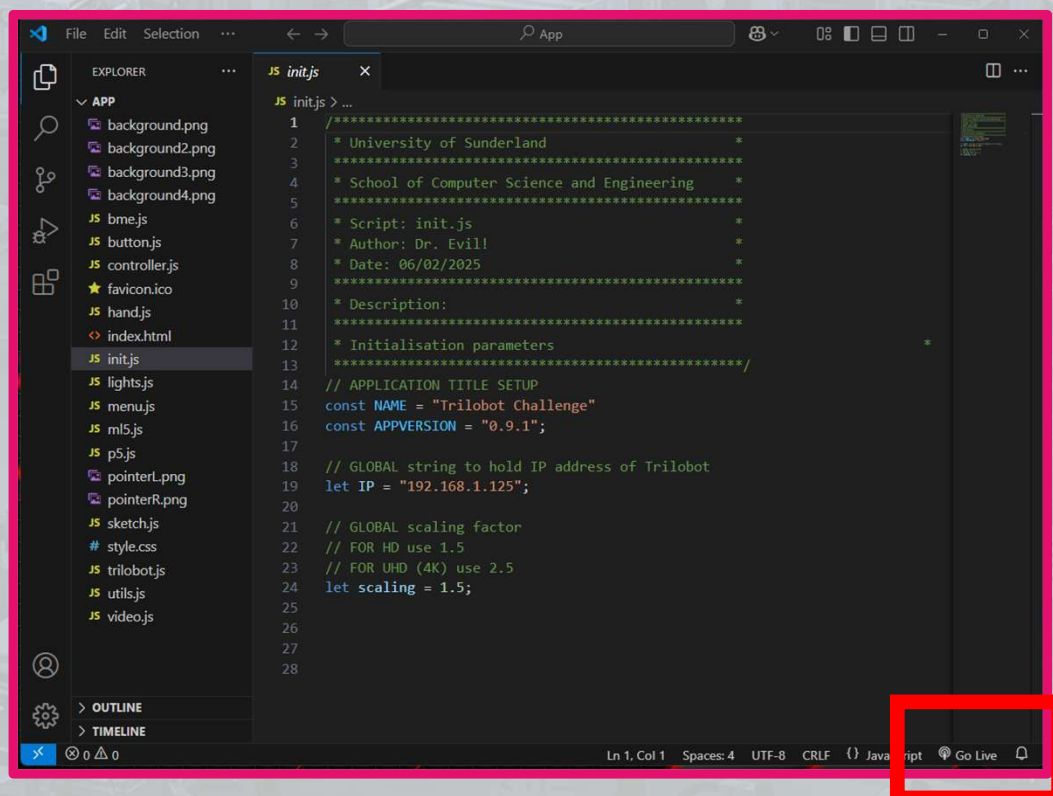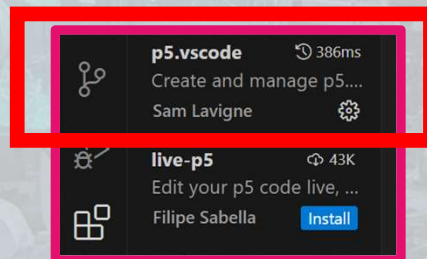
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Running the application!

This application will now be launched in the default browser and should look similar to the image below.
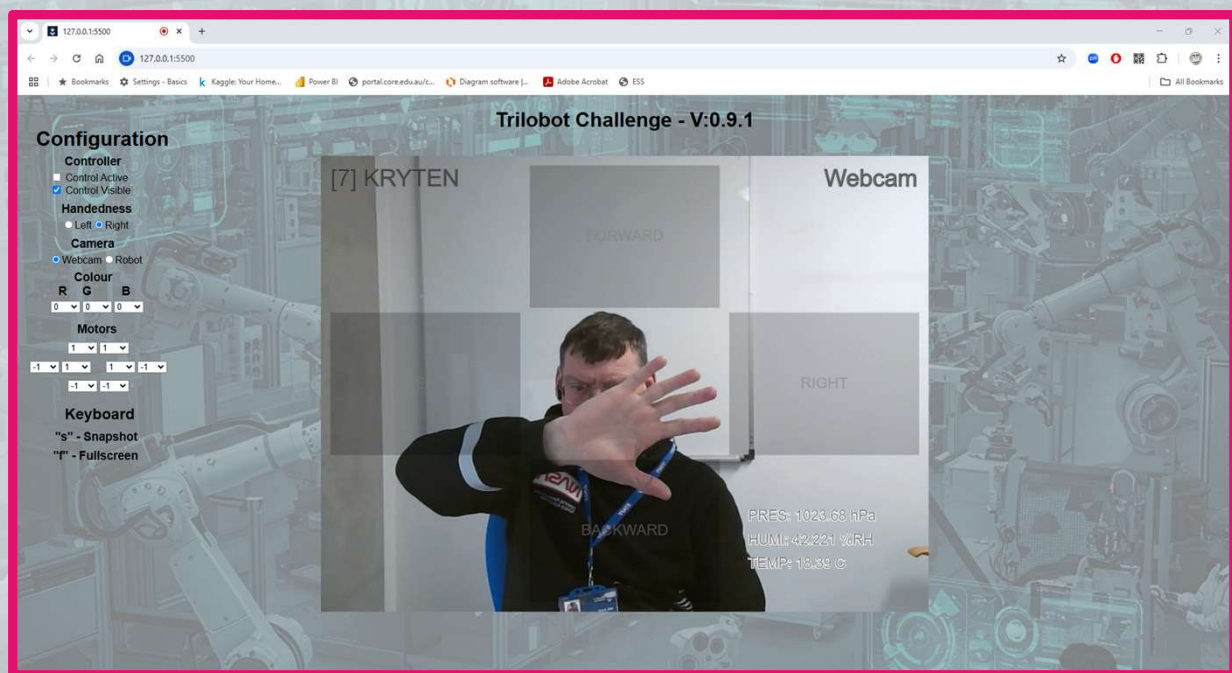
The "Configuration" panel is where you can manipulate the main "video feed" and overlaid on the video feed is the main "application" interface.

The next two pages will go over the interface.

Trilobot Challenge

Using the interface!

The "configuration" panel operations are detailed below:

Configuration

Controller
- ☐ Control Active
- ☑ Control Visible

Handedness
- ○ Left ● Right

Camera
- ● Webcam ○ Robot

Colour

R	G	B
0 ∨	0 ∨	0 ∨

Motors

1 ∨	1 ∨

-1 ∨	1 ∨	1 ∨	-1 ∨

-1 ∨	-1 ∨

Keyboard

"s" - Snapshot

"f" - Fullscreen

The main hand gesture "buttons" can be made inactive so the robot doesn't respond and can also be hidden.

This allows the system to recognise either your left or right hand.

This changes the overall video panel between the webcam and the robot mounted camera.

Selecting the RGB colours (0-255) changes the underlighting of the robot.

These values determine the motor power to each wheel allowing you to "calibrate" the movement.

s – Takes a snapshot of the current video view.
f – Expands the web browser to full screen.

Trilobot Challenge

Using the interface!

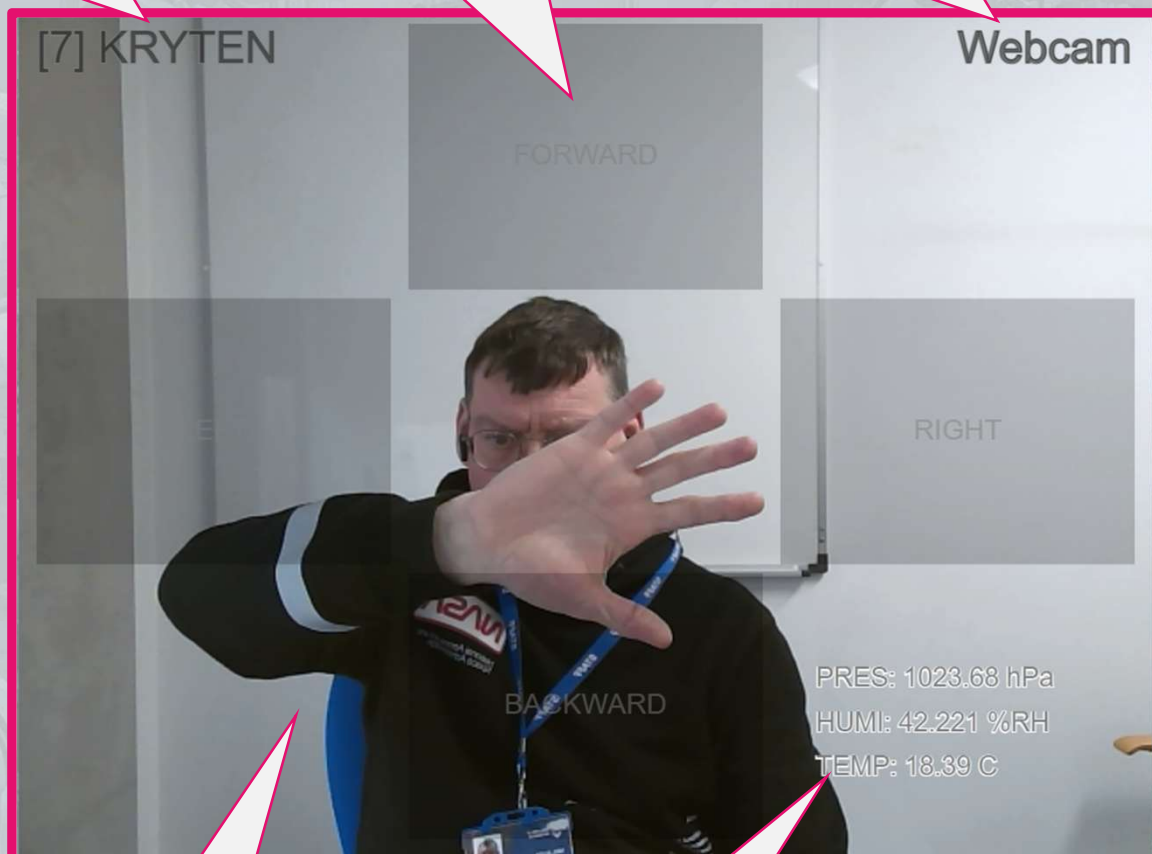The "configuration" panel operations are detailed below:

Trilobot name and number

Hand gesture "buttons" for FORWARDS etc.

Current video feed.

[7] KRYTEN

FORWARD

Webcam

RIGHT

PRES: 1023.68 hPa
HUMI: 42.221 %RH
TEMP: 18.39 C

BACKWARD

Video feed.

Environmental data.

Trilobot Challenge

Anagram Challenge!

Introduction

You will probably know many gameshows that use anagrams as a way pitting contestants against each other. Wel in this challenge it's the same, but with a twist. You are going to experience robotics and artificial intelligent (AI), not to solve the anagram but to find the letters in the anagram!

You will have to search for the letters remotely using a robot that is controlled by you simply waving your hands.

Your Challenge

You are now the operator of the Trilobot inspection robot system, and you are required to search an area to find the letters. They are quite easy to identify, they will be located on the floor, stood upright and easily readable from the robot camera view.

You must collect identify all the letters. You will be told how many there are and solve the anagram. First one to do it wins!

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Anagram Challenge!

Stage 1

Before you carry out the letter search you need to consider how your Trilobot moves.

We know the terrain is flat and easy to manoeuvre in, but every robotic system needs to be calibrated, importantly, it needs to move in a way that the operator will feel most comfortable.

Configuration

Controller
☐ Control Active
☑ Control Visible

Handedness
○ Left ● Right

Camera
● Webcam ○ Robot

Colour
R G B
0 0 0

Motors
1 1
-1 1 1 -1
-1 -1

Keyboard
"s" - Snapshot
"f" - Fullscreen

Calibration

The Configuration panel allows you to change camera views etc. to tailor the interface. Spend some time (about 15 mins) using the **Configuration** section and get the robot setup so you are comfortable driving it around. You will need to adjust the motor speeds and handedness.

The "Webcam" view will allow you to see how the motion is triggered. You can then switch back to the robot view.

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Stage 2

Once you are comfortable with controlling the robot you can move onto the search stage.

Drive the robot around the area and find all the letters. When you find a letter remove the controller buttons from the display and take a snapshot of the letter. (you must have each letter photographed to win).

Continue navigating around the area until you have found all the letters and have taken an unobscured photo of them.

Once you have all the photos navigate back out to the starting point. Once at that the exit you must solve the anagram and show the photos and the "word" to win.

And Finally!

Creating basic applications with AI is just the tip of the iceberg.

AI now empowers us to revolutionize industries, enhance everyday life, and solve complex problems in ways we never thought possible.

What we have seen here is just a simple AI powered robotic control system.

Future possibilities are vast and exciting, and you can be a part of it!

On the **BSc Computer Science** Programme at the **University of Sunderland** you'll study AI and Machine Learning in more detail, which means you'll be able to create some amazing things and have a good grasp on this important emerging technology.

BSc Computer Science

Other Programmes that may be of interested

BSc Cybersecurity and Digital Forensics

BSc Games Development