Milestone 1: Teleoperating the Robot with your Keyboard

Lab 1: Setting up the Alphabot2

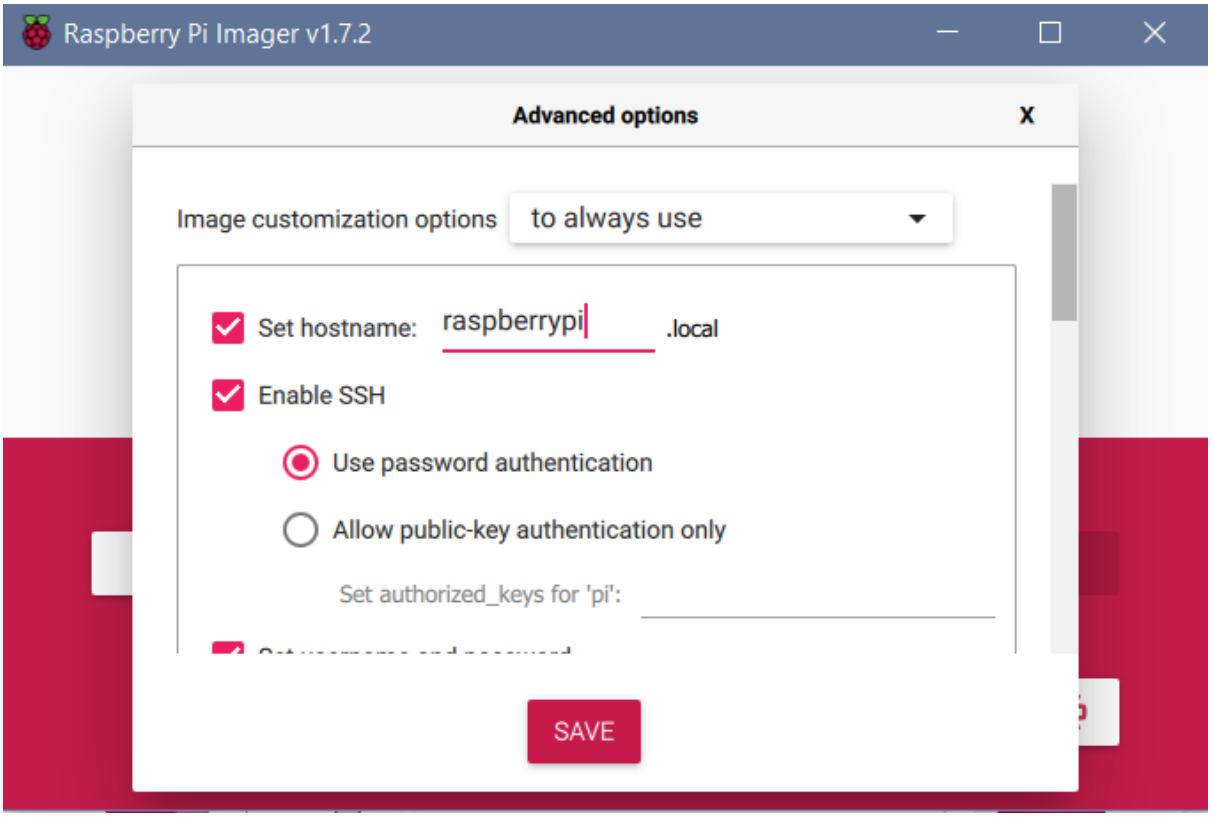
We will be using the Alphabot2 robot for our lab project.

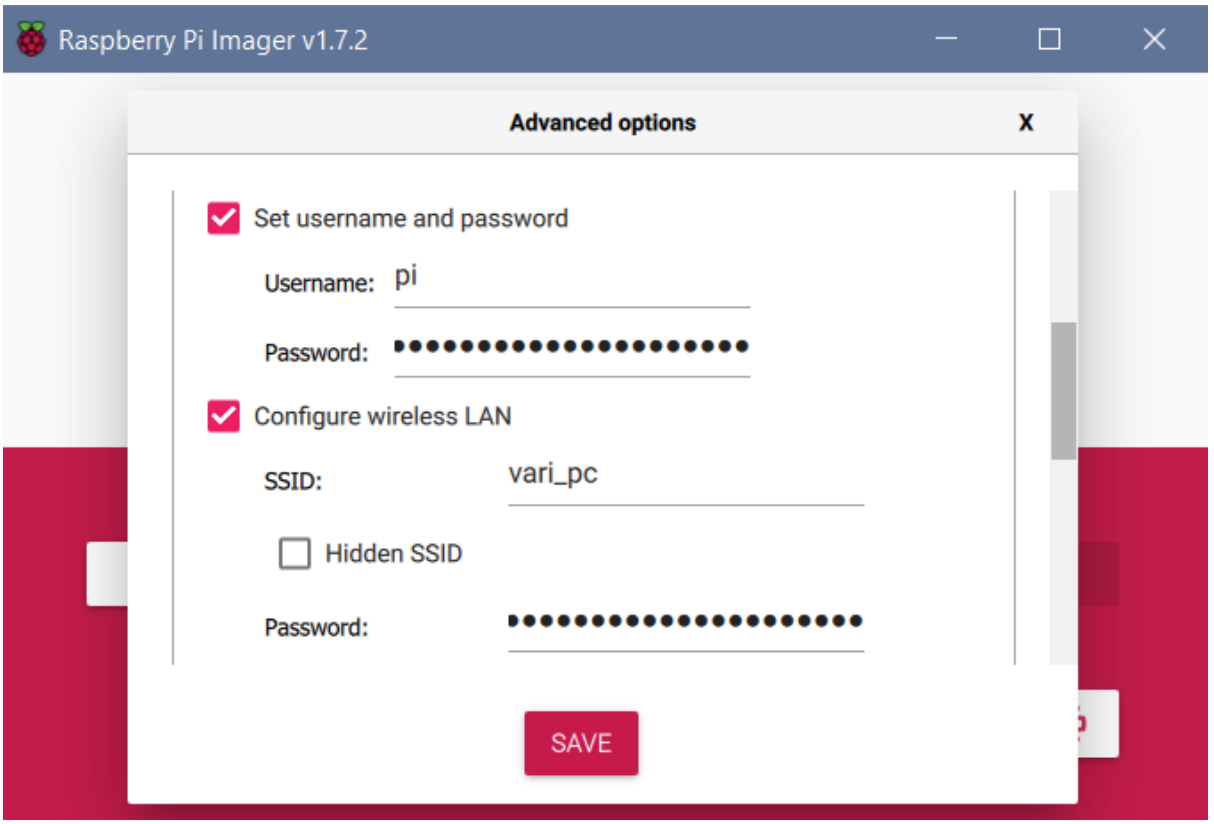
This first milestone will allow you to become more familiar with the robot, and with some useful controls.

Objective 1: Setting up your Raspberry Pi(RPi) and Alphabot2

Part A - First Time Setting Up the RPi

1. Flash the SD Card with Raspberry Pi OS using the Raspberry Pi Imager: https://www.raspberrypi.com/software/
2. Run the Imager and Select “Choose OS” > Raspberry Pi 32 bit
3. Choose Storage > Select the inserted SD Card
4. Click on the Gear (Settings).





5. Perform several items to ease future processes. Click the gear icon to open Advanced Options.
   - Enable SSH
   - Set username and password (default username:pi , password:raspberrypi)

- Configure LAN (preferable to connect to personal/mobile hotspot from your personal laptop/PC) and change Wireless LAN country to MY

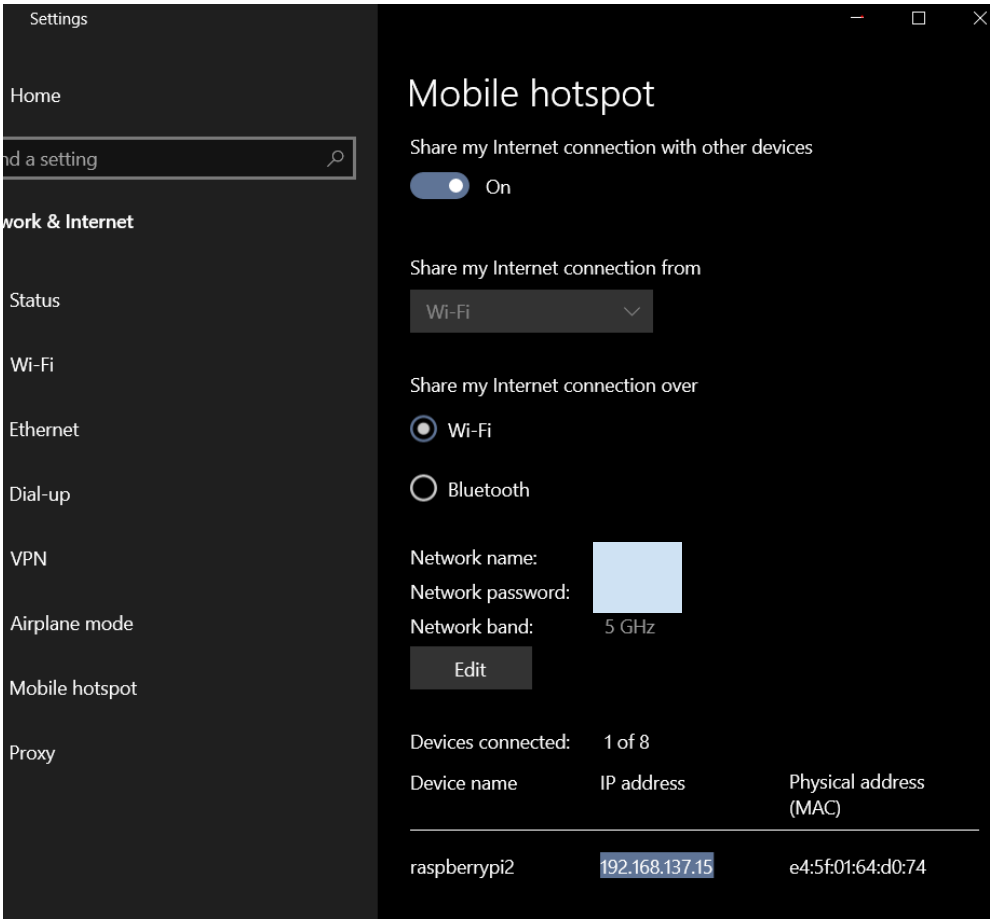
6. Click on Save and then Write

Part B - Setting up Mobile Hotspot in Laptop/PC (Windows)

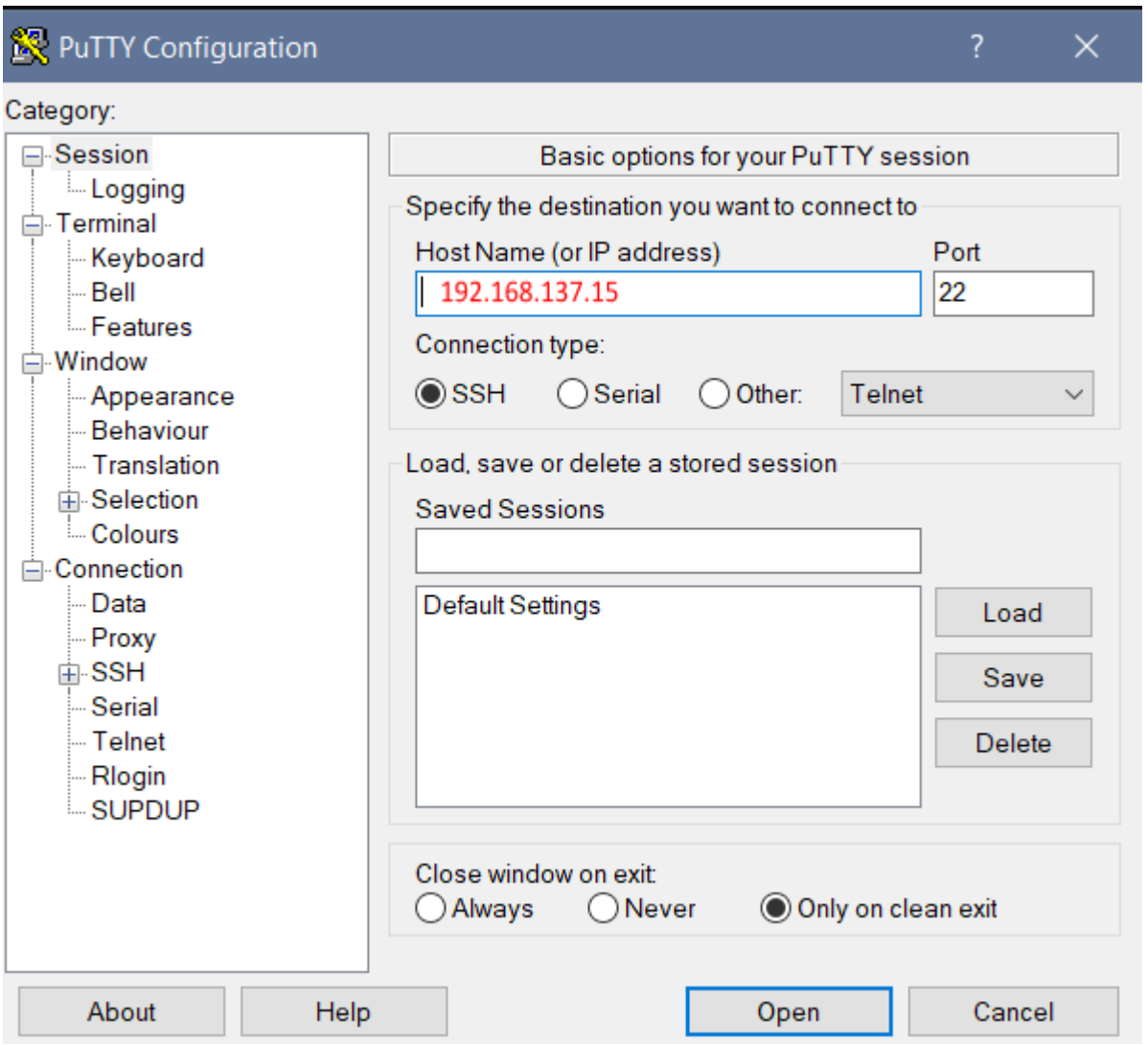
1. Click on the WiFi icon and turn on your mobile hotspot.
2. Right click on the mobile hotspot icon and go to the settings.
3. Enable share internet connection and modify your mobile hotspot name and password (ensure its password protected).

Part C - Putty (SSH) to Access RPi

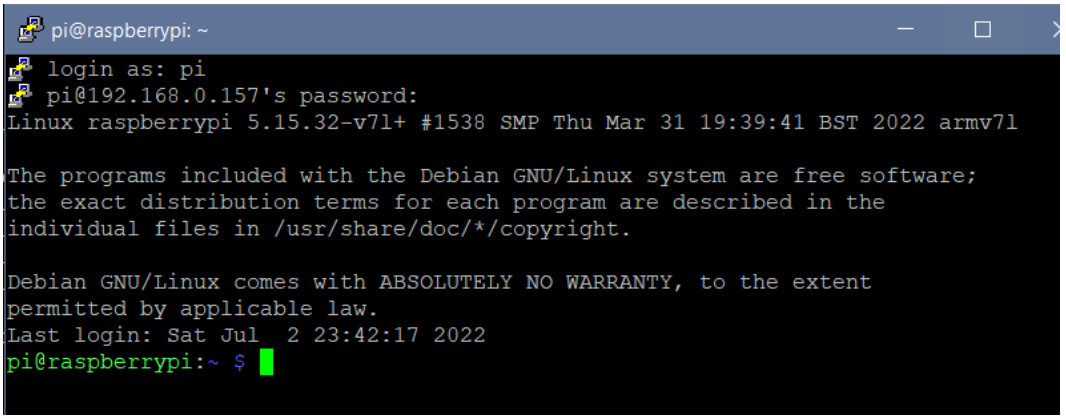
1. Once RPi is connected to your PC's mobile hotspot, open the (Windows) mobile hotspot settings and take note of the IP address.



2. Install PuTTY (https://www.putty.org/) for SSH connection to RPi
3. Now enter your obtained RPi IP address into PuTTY (in Hostname, shown in Red) click "Open".

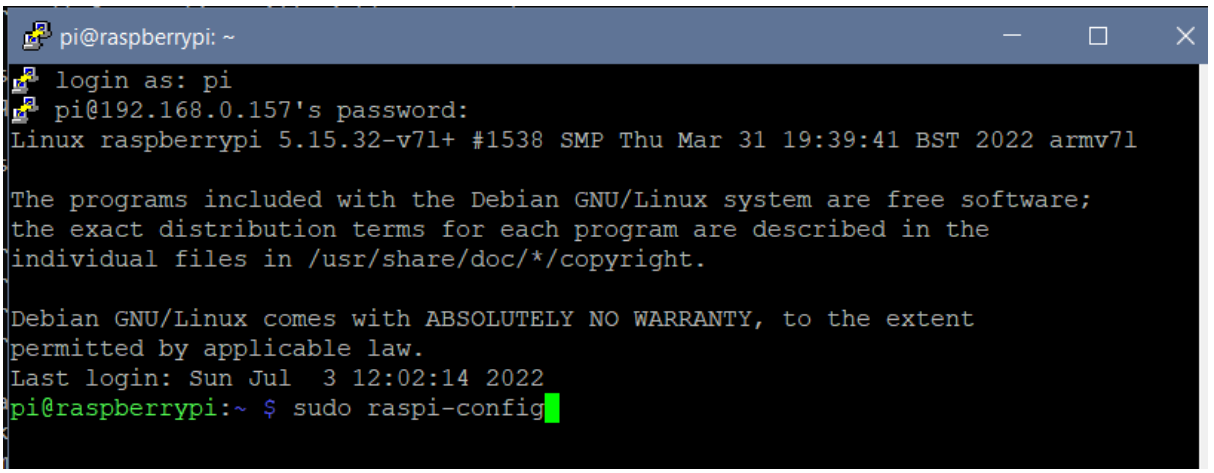


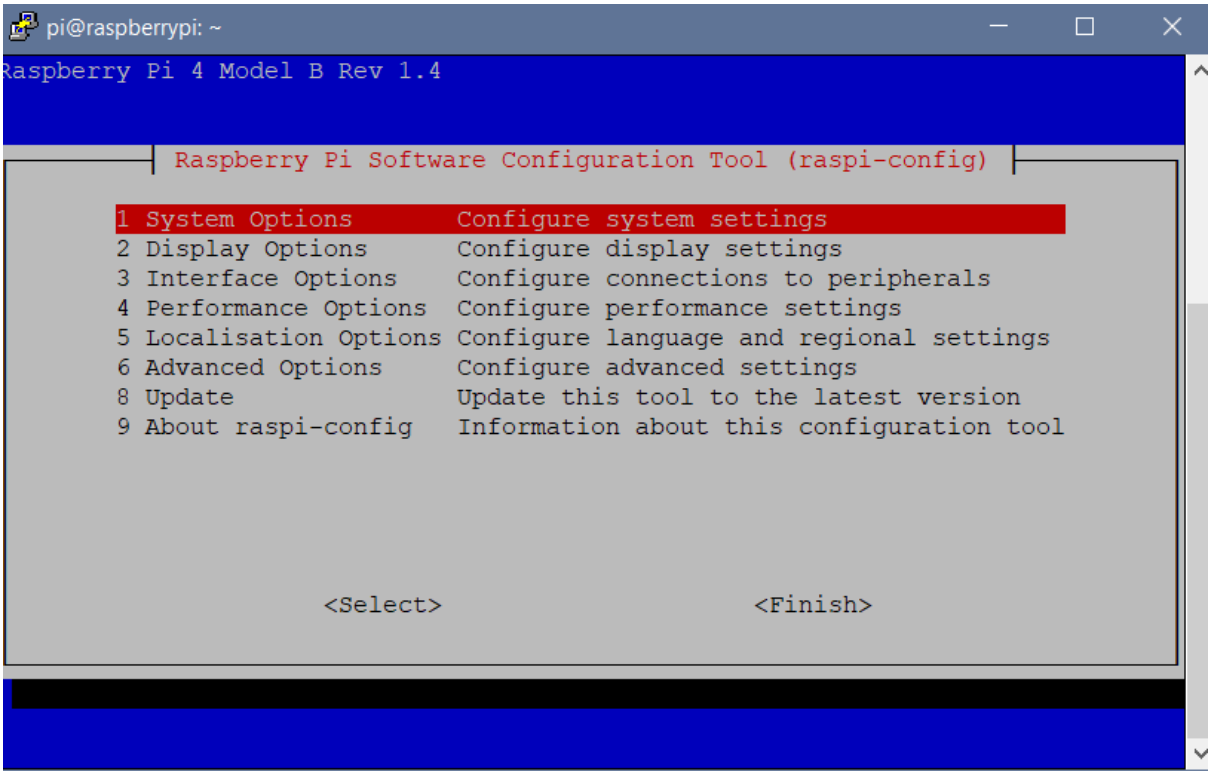
4. Enter username pi and password raspberrypi to login (Unless you specified a different hostname and password during flashing in Step 2 then use the credentials you specified to login).



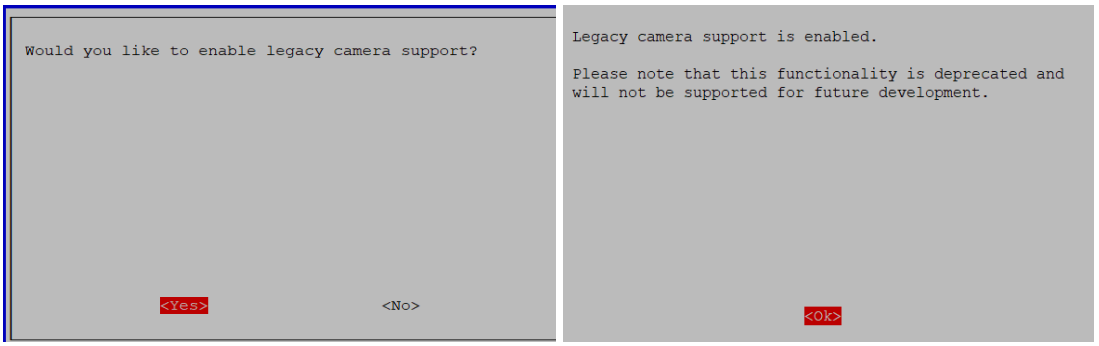
Part C - Enable Interfacing in RPi Config

1. In the RPi Terminal, type sudo raspi-config

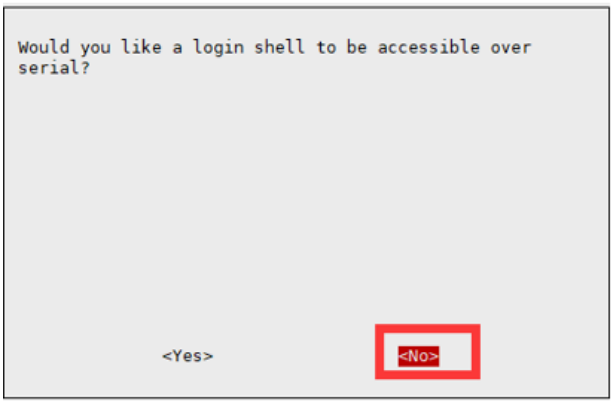


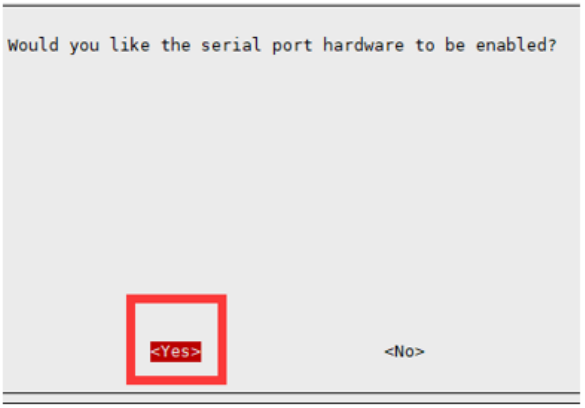


2. Use Arrow Keys and Enter to Navigate to Interface Options and select Yes for Camera, VNC, SPI, I2C.



3. Navigate the Interface Options and select No and then Yes for Serial.





4. Select Finish and Reboot. Restart PuTTY connection by following Steps from **Part B.**
5. Shut down the RPi using sudo shutdown -h now. Unplug the RPi from the Power Supply.

Part D - Alphabot2-Pi Assembly Instructions

1. https://www.waveshare.com/w/upload/1/1a/Alphabot2-pi-assembly-diagram-en.pdf
2. https://www.youtube.com/watch?v=ONg0qpxYWQo (Starts at 0:30)
    a. No need to cut the cross-shaped rocket arm. Use the spare part (smaller) cross shape rocket arm provided in the kit
    b. You can ignore the ultrasonic sensor instructions.
3. Alphabot Wiki Page https://www.waveshare.com/wiki/AlphaBot2-Pi

Additional Notes :-

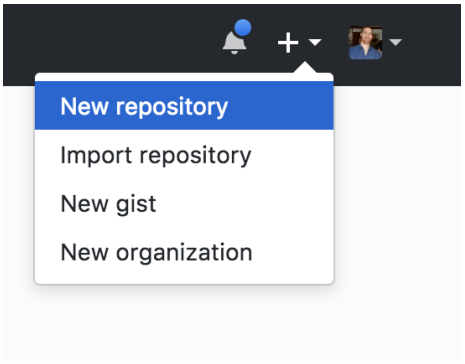
Configuring RPI through monitor

1. Connect the RPi to a steady power supply, Monitor, Keyboard and Mouse and switch it on. Log In with default credentials username pi and password raspberrypi. Boot into the desktop and connect to the network (Top Right).
2. Enable ‘Network on Boot’ and ‘SSH’ in RPi Configuration settings (Top Left Menu). Reboot.
3. Record the IP address of the network by typing ifconfig in the Terminal and write down the inet address of the wlan0.
4. You can now disconnect the RRPi from the Monitor, Keyboard and Mouse.

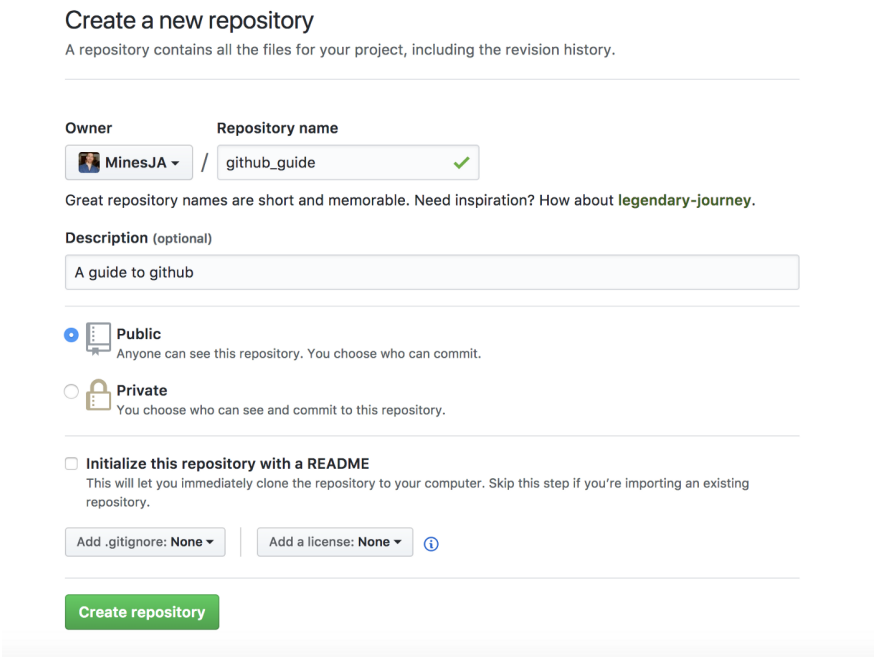
Objective 2: Setting up your GitHub

Part A – Create a repo with GitHub

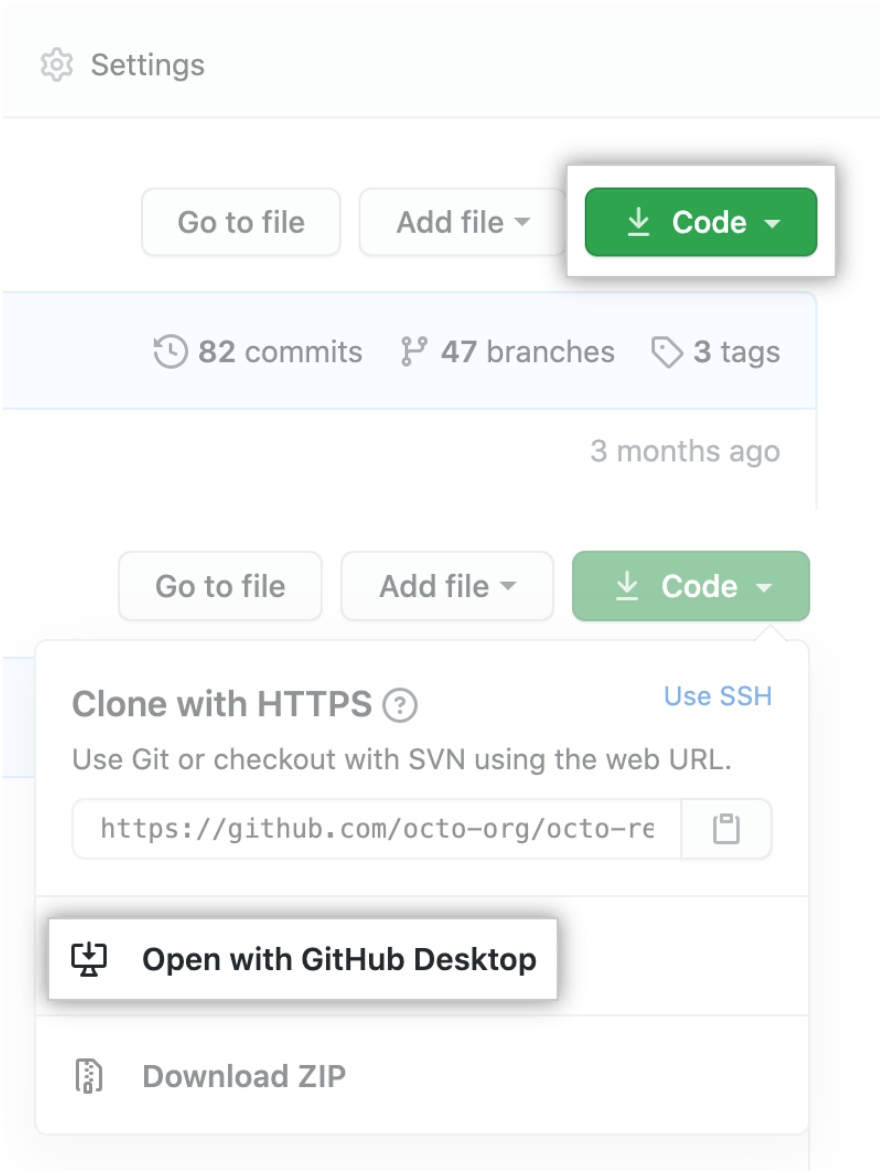
1. One of the team members will initially create a repo in GitHub. Go to you GitHub account and add a new repository.



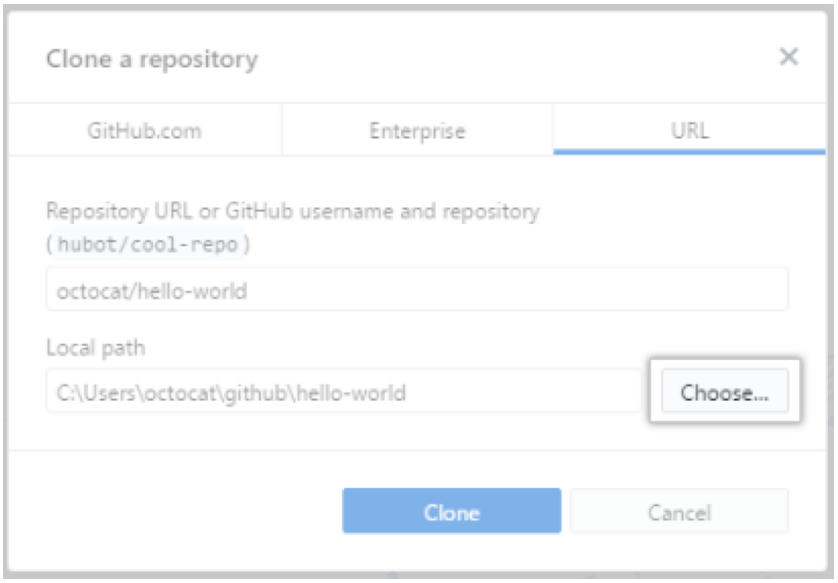
2. Add a suitable name (etc. “ECE4078 G11”). Ensure repo is private and create.

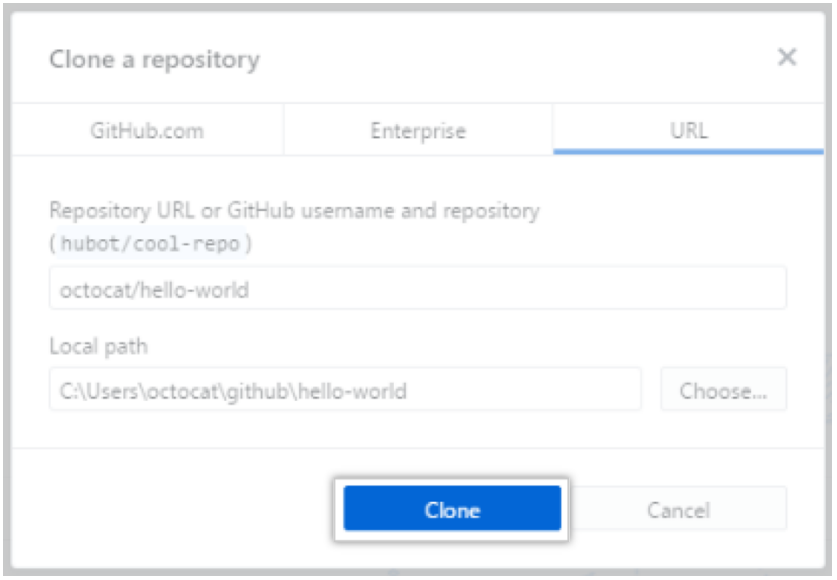


3. Download GitHub Desktop. (https://desktop.github.com)
4. Go to repo through browser and add repo to Github Desktop.



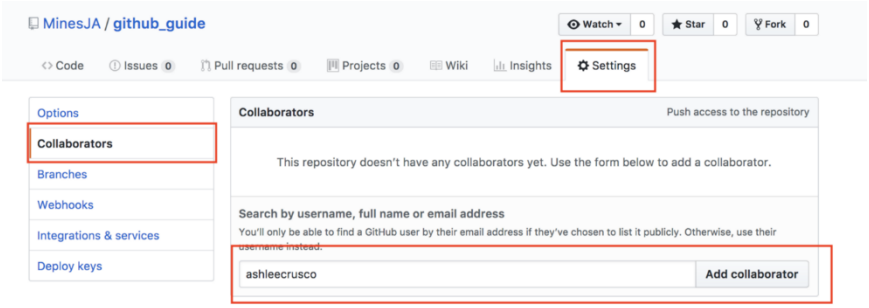
5. Add a local path in your PC and click clone.





Part B – Adding collaborator to your repo

1. Add other team members as collaborators to your repo by going to your settings in your repo GitHub's webpage

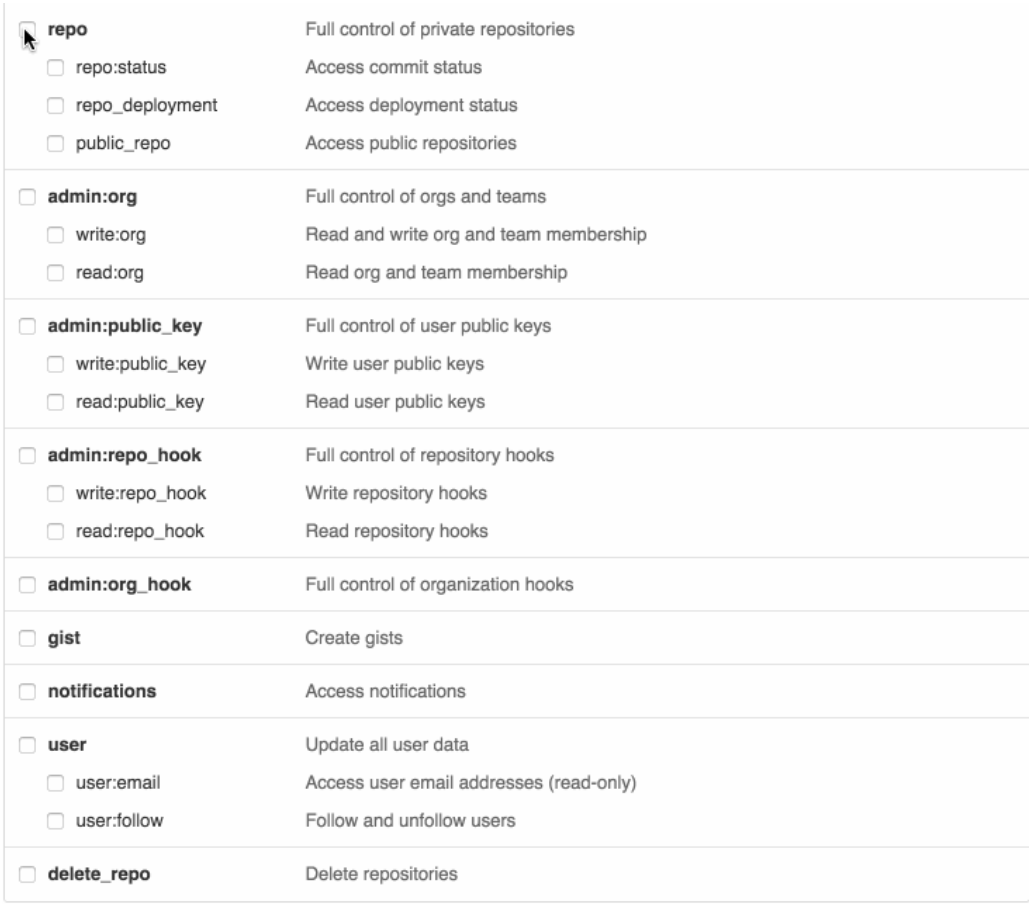


2. Check email to accept invite.
3. You can now clone repo using Personal Access Token.

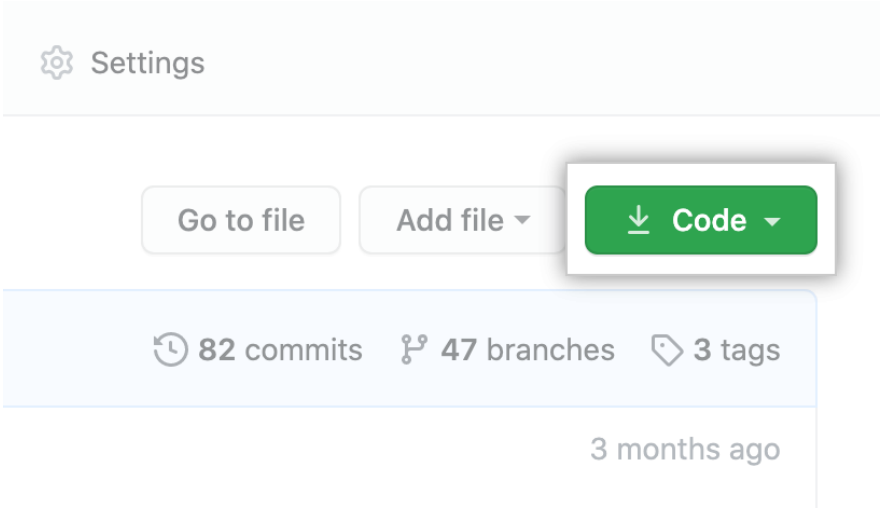
Part C - Create Personal Token Method

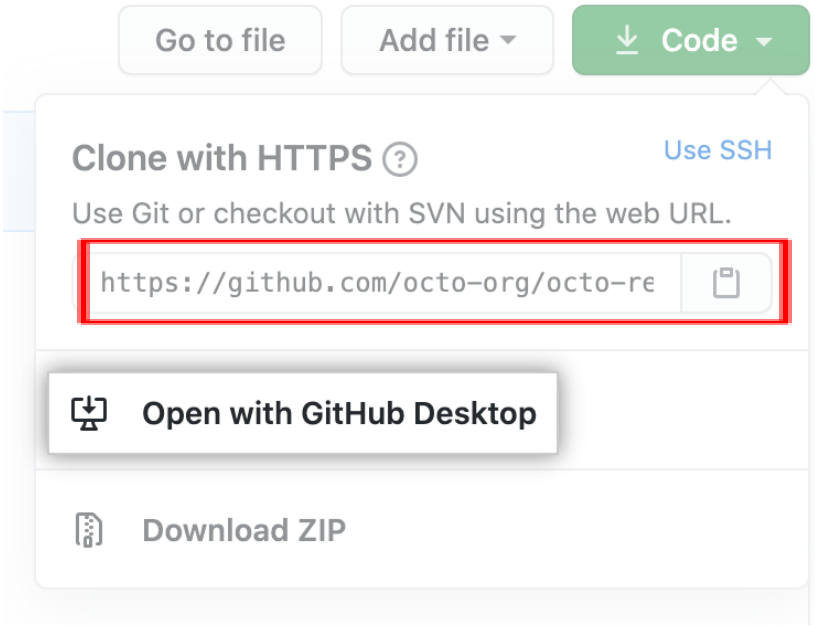
Generate Token:

1. In the upper-right corner of any page, click your profile photo, then click Settings.
2. In the left sidebar, click Developer settings.
3. In the left sidebar, click Personal access tokens.
4. Click Generate new token.
5. Ensure to at least tick the box with repo



Note down your token somewhere safe and DO NOT LOSE IT OR SHARE IT





6. Clone your repo to RPi by typing git clone REPO_URL to the RPi terminal.
   - *Add your personal token into the URL before github.com and add @ after the token:*
   - *git clone https://YOUR_PERSONAL_TOKEN@github.com/user/YOUR_REPO_NAME.git*
7. Access your repo with cd REPO_NAME at the RPi root terminal.

Part D : Pull content to RPi

1. In your PC, create a folder under the local repo (etc. Milestone1) and add the codes folder under it.
2. Commit the changes in Github Desktop.
3. In the RPi terminal, access the repo through cd REPO_NAME and pull the files with git pull (ensure at the repo folder directory when performing git pull).

Additional Notes:

SSH key auth with RPi for GitHub

1. To clone the repo into the RPi, you will need to use an SSH key to authenticate the process. Ensure that the owner of the repo does this.
2. Follow instruction in https://docs.github.com/en/authentication/connecting-to-github-with-ssh/generating-a-new-ssh-key-and-adding-it-to-the-ssh-agent to create and https://docs.github.com/en/authentication/connecting-to-github-with-ssh/adding-a-new-ssh-key-to-your-github-account to insert SSH key to GitHub and the RPi.
3. Clone your repo to RPi by typing git clone REPO_SSH_URL to the RPi terminal.
4. An SSH URL looks like ***git@github.com:user/repo.git***
5. Access your repo with cd REPO_NAME at the RPi root terminal.
6. To clone the repo into the RPi, you will need to use an SSH key to authenticate the process. Ensure that the owner of the repo does this.
7. Follow instruction in https://docs.github.com/en/authentication/connecting-to-github-with-ssh/generating-a-new-ssh-key-and-adding-it-to-the-ssh-agent to create and https://docs.github.com/en/authentication/connecting-to-github-with-ssh/adding-a-new-ssh-key-to-your-github-account to insert SSH key to GitHub and the RPi.
8. Clone your repo to RPi by typing git clone REPO_SSH_URL to the RPi terminal.
   - An SSH URL looks like ***git@github.com:user/repo.git***
9. Access your repo with cd REPO_NAME at the RPi root terminal.

Objective 3: Add some basic modules into RPi

1. You will need to install some modules by running the following codes at the RPi terminal:

```
sudo apt-get update
sudo apt-get install ttf-wqy-zenhei
sudo apt-get install python-pip
sudo pip install RPi.GPIO
sudo pip install spidev
sudo apt-get install python-smbus
sudo apt-get install python-serial
sudo pip install rpi_ws281x
sudo pip install bottle
```

Debugging and troubleshooting

- Try connecting to your own hotspot as Monash WiFi blocks the connection to the time server. This may cause certificates issues.
- Ensure all modules are installed, especially the bottle module for next week's assignment to run smoothly.