



愛動智教育系統

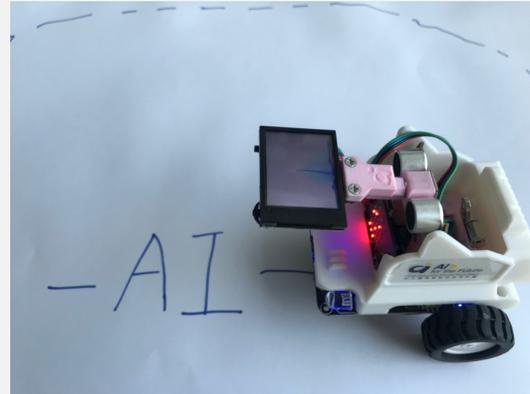
CUHK iCar Experiment Manual
Experiment 3: Moral Dilemma Experiment

Write Your Own Code
(Random)

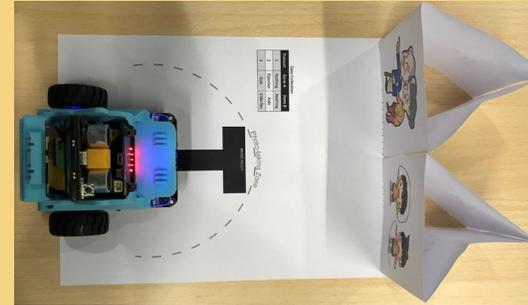
CUHK iCar



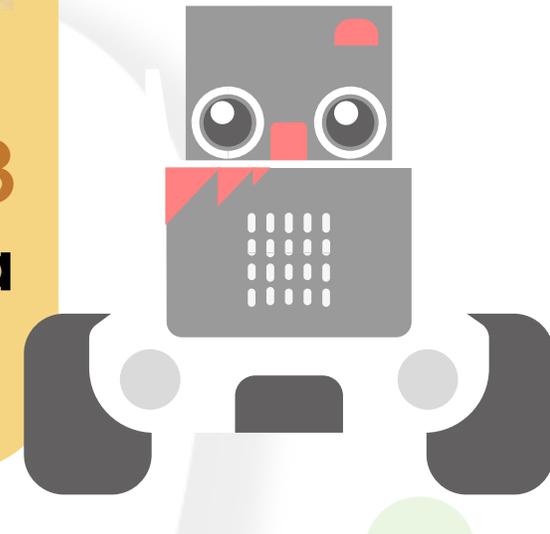
Experiment 1
Face Following



Experiment 2
Line Tracking



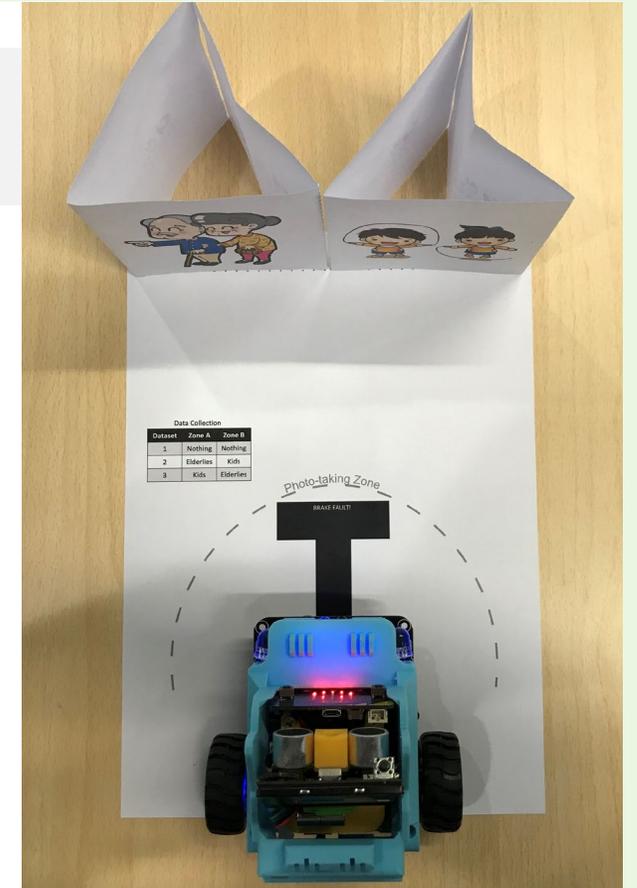
Experiment 3
Moral Dilemma



Moral Dilemma Experiment

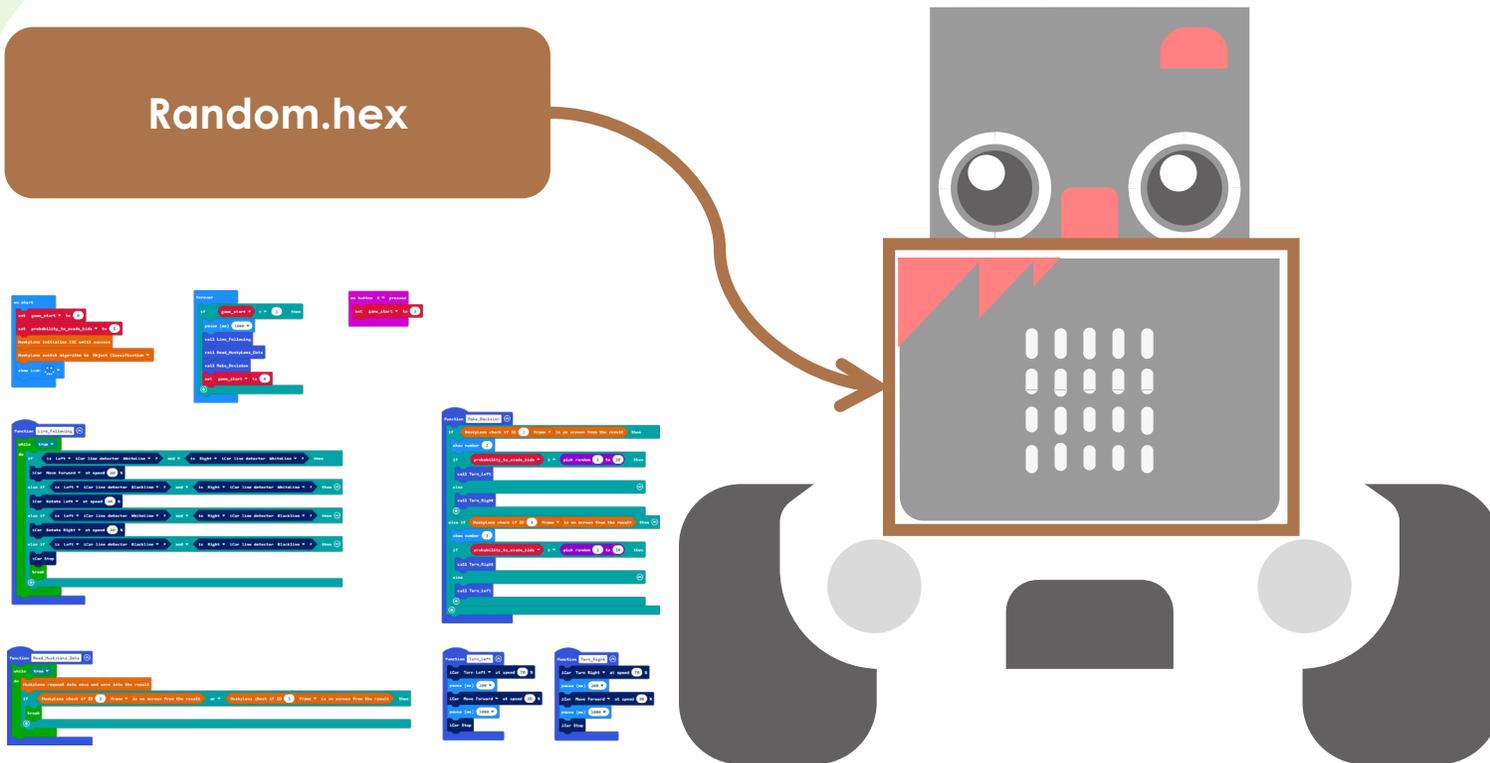
Introduction Of The Experiment

This experiment simulates the predicament of the failure of the self-driving car brake system, leaving it with two options: turn left or right while there are children and elderlies in front of you, which one will you choose to evade?



Download Program To micro:bit

Random.hex



Method 1

Clone the .hex to micro:bit directly

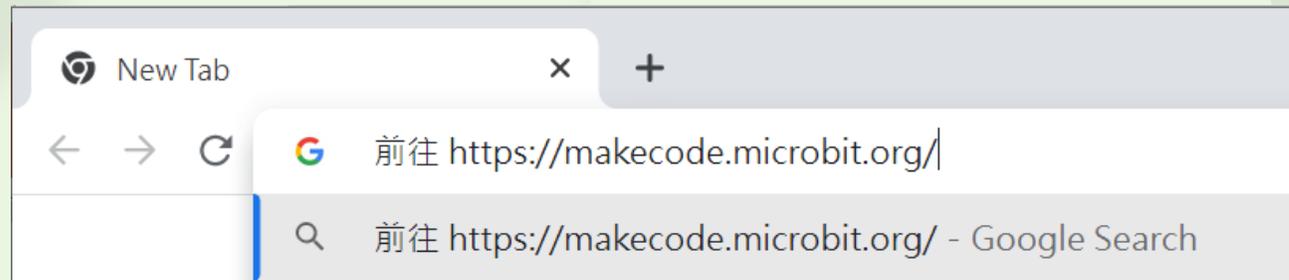
Method 2

Write your own code on MakeCode

Code On MakeCode

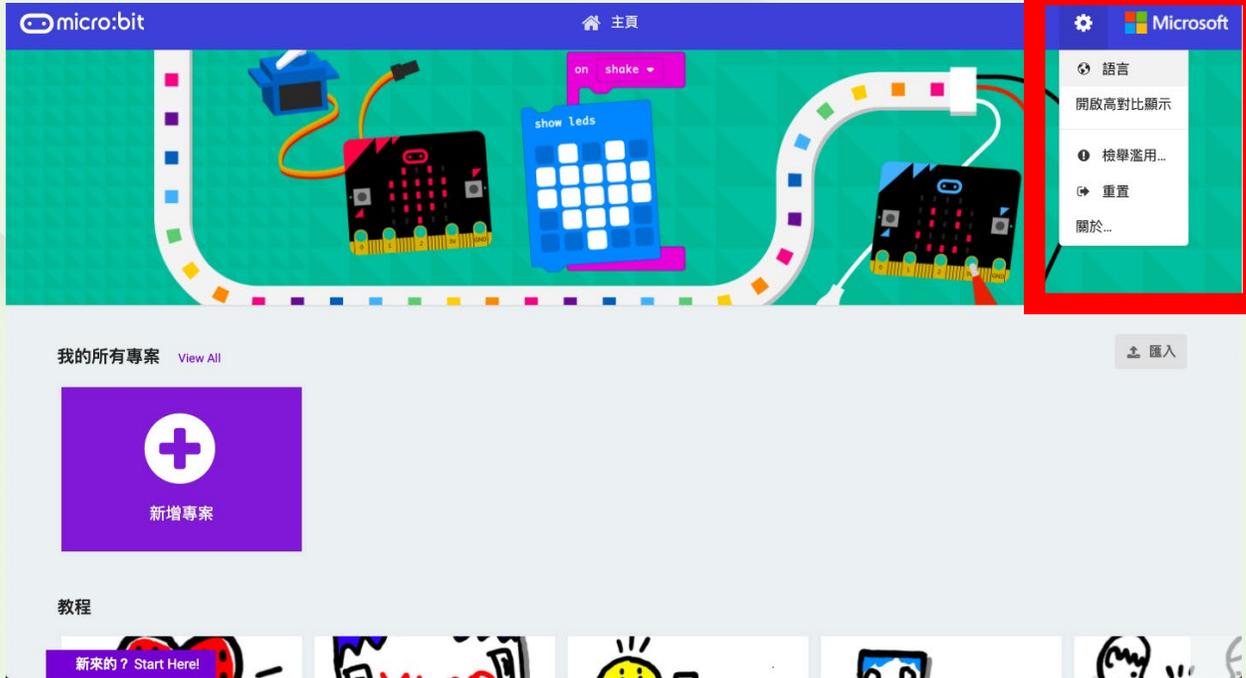


Browse <https://makecode.microbit.org/>





Caution
Please Set **English** As The Language!



1. Click
2. Click

English must be set as the language, otherwise the program may fail.

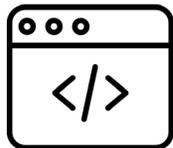
micro:bit 主頁 Microsoft

選擇語言

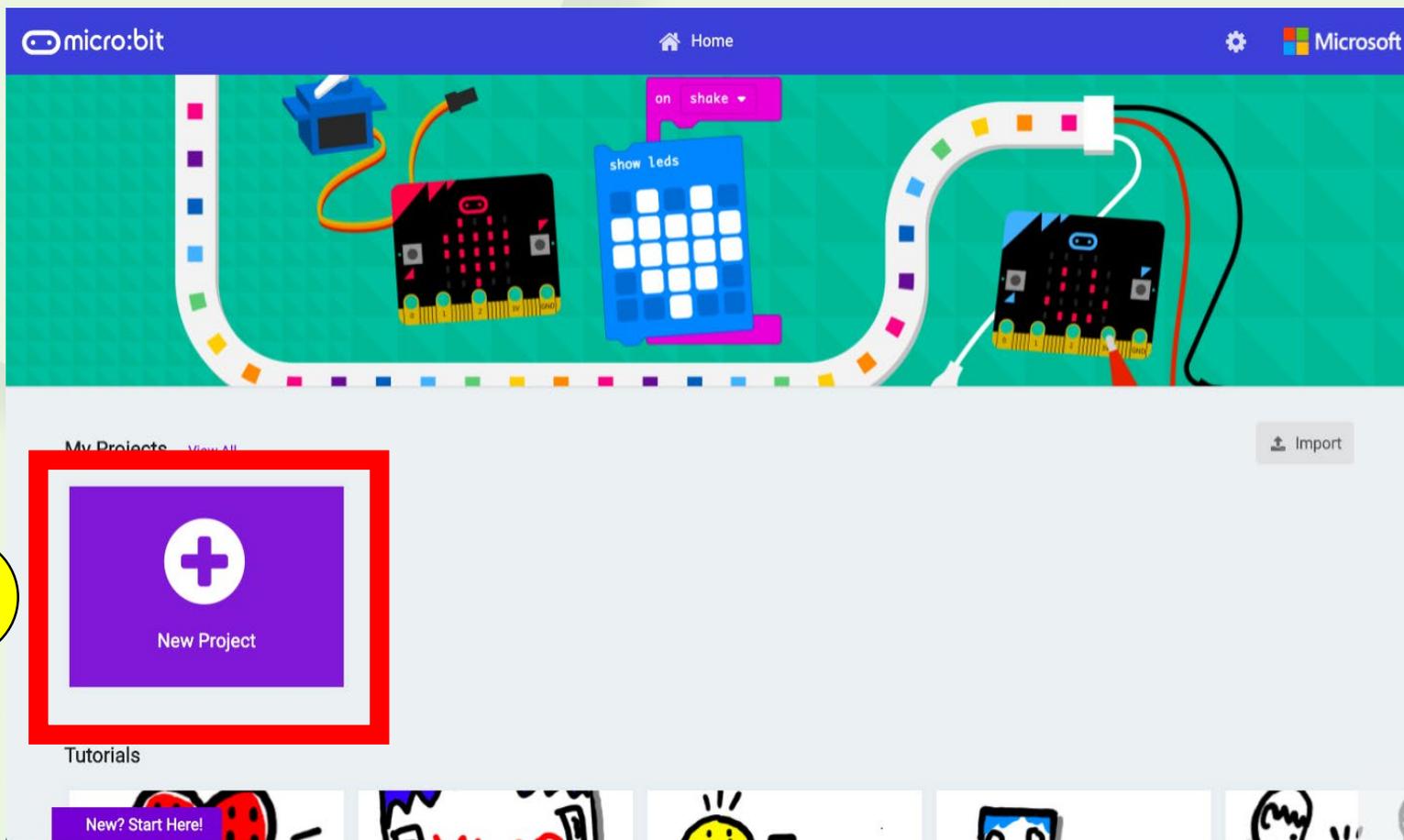
English English	العربية Arabic	български Bulgarian
Čeština Czech	Dansk Danish	Deutsch German
Ελληνικά Greek	Español (España) Spanish (Spain)	Suomi Finnish
Français French	עברית Hebrew	Magyar Hungarian

我的所有專案 匯入

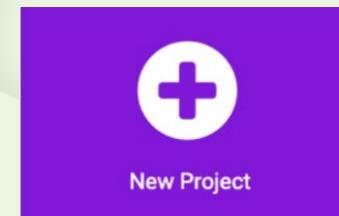
3. Click English



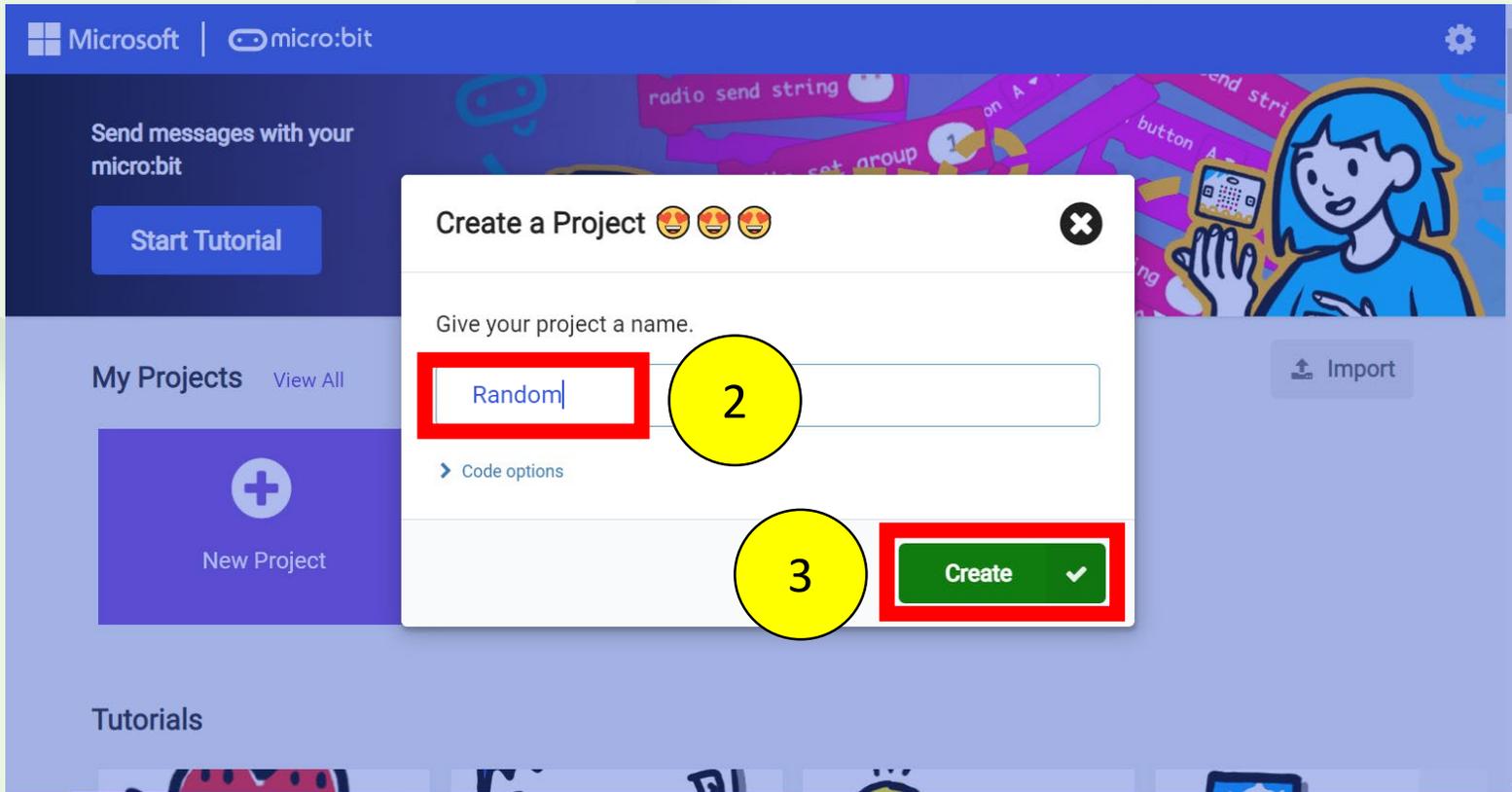
New Project



1. Click New Project

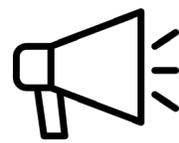


1

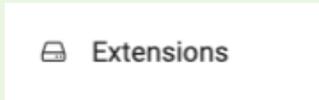


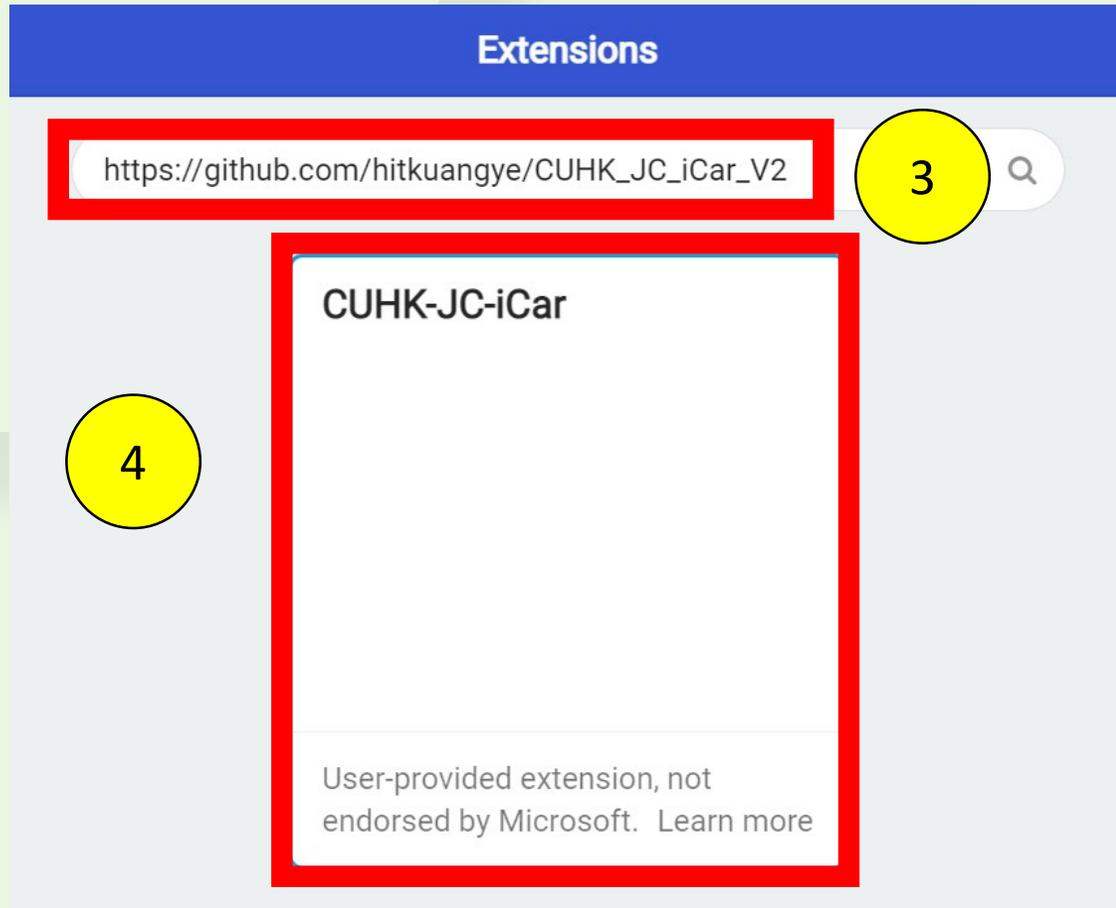
2. Enter “Random”

3. Click 

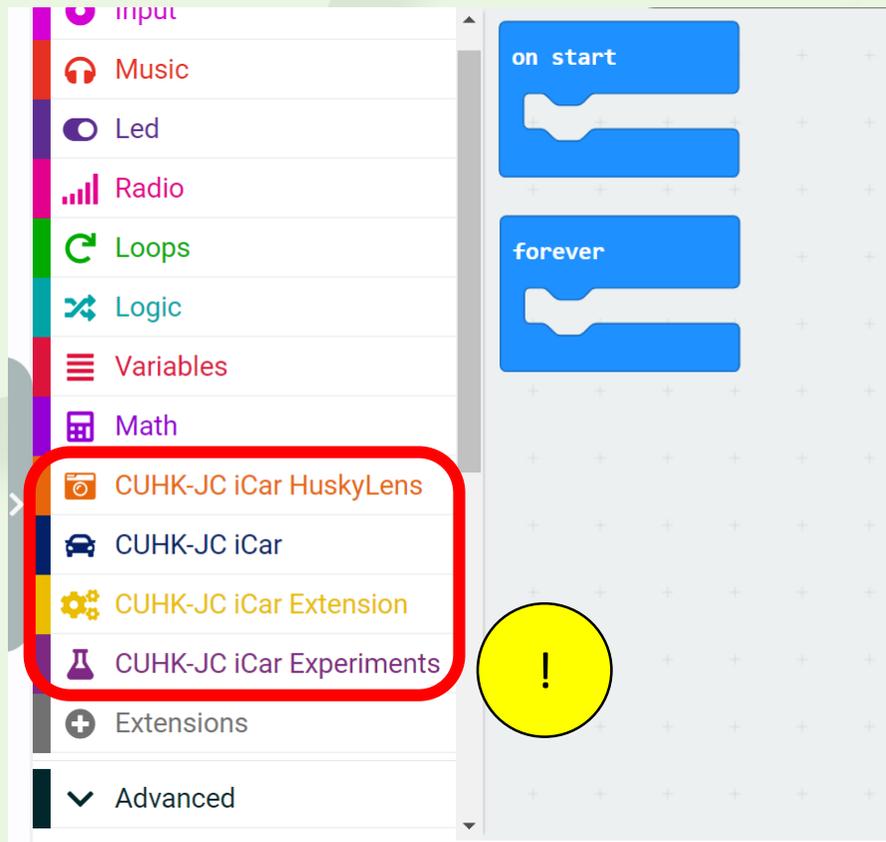


Prepare CUHK-JC-iCar Extension

1. Click 
2. Click 



3. Paste the following link
https://github.com/hitkuangye/CUHK_JC_iCar_V2
4. Click CUHK-JC-iCar extension



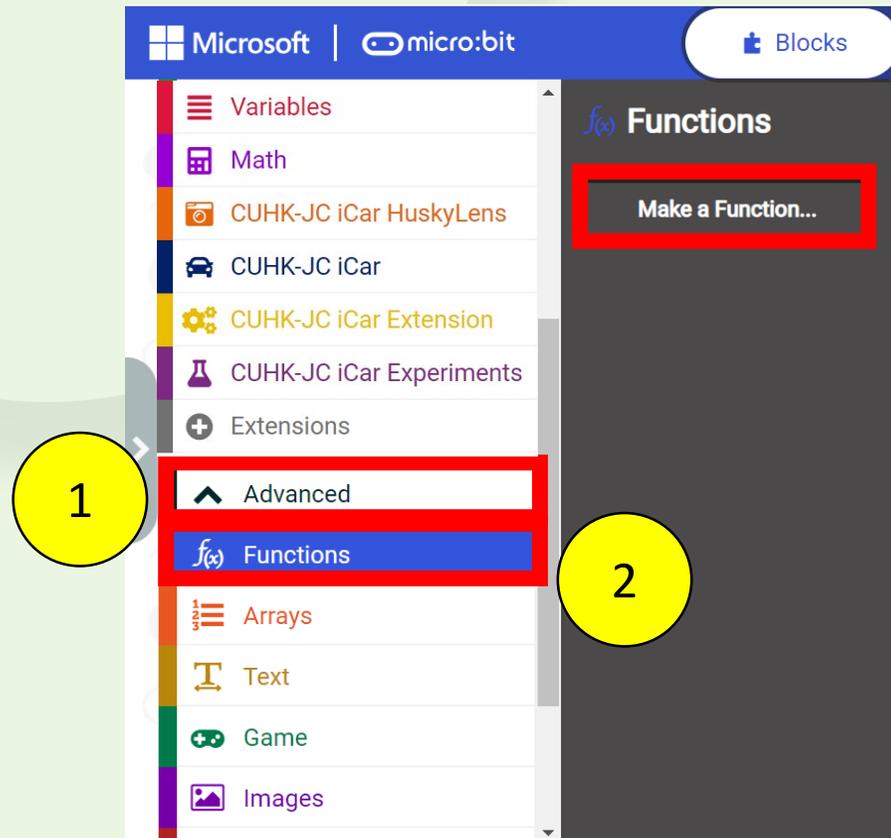
Extensions are included!

Introduction To micro:bit



Before we start programming, let's learn more about micro:bit!

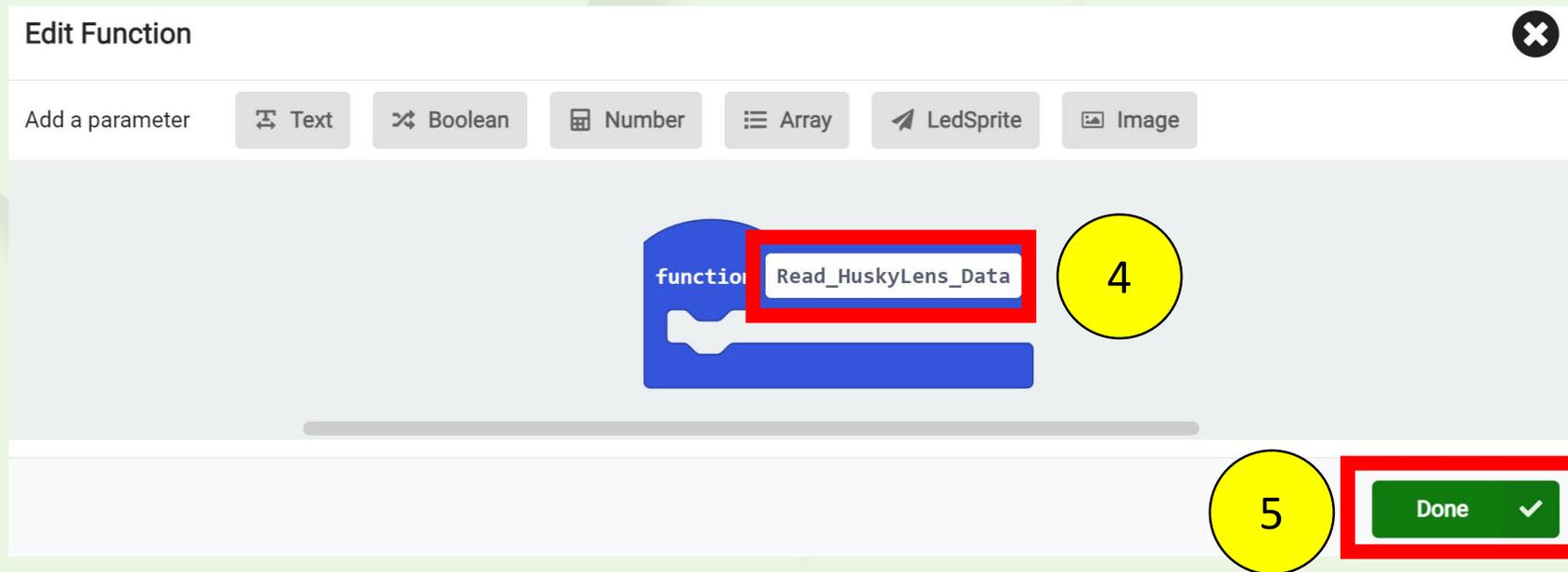
Functions Modules



1. Scroll to the bottom of module list and click 

2. Click 

3. Click 



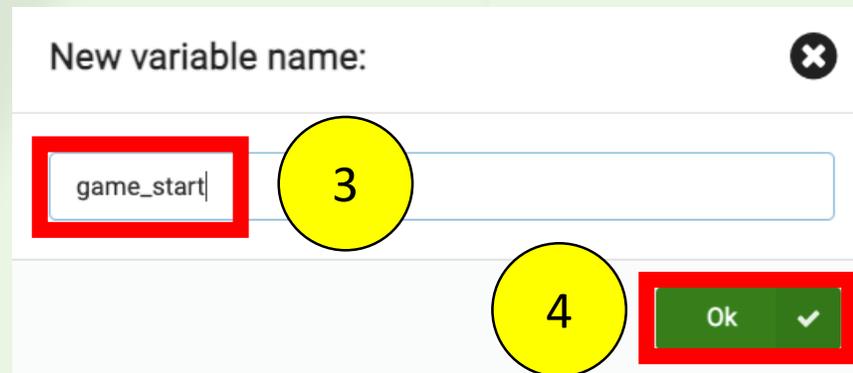
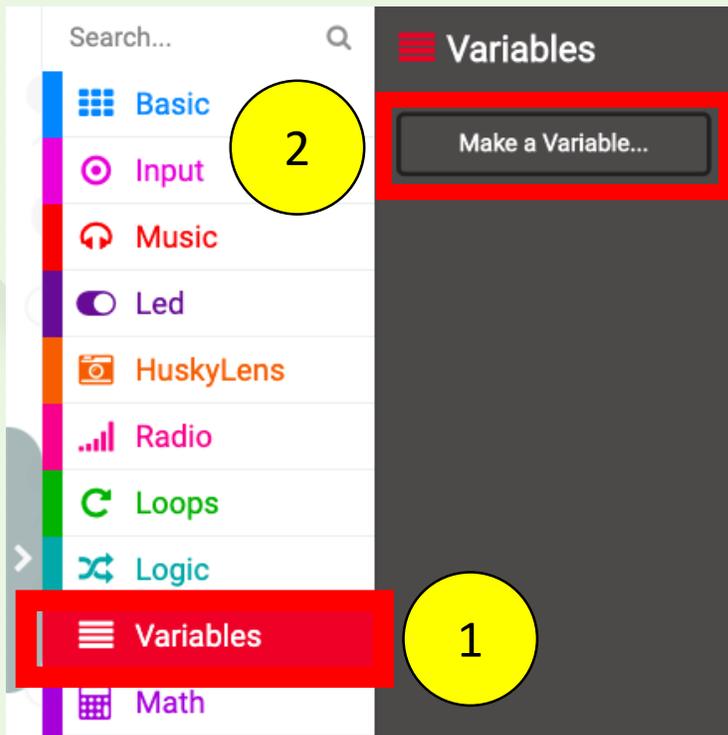
4. Name the function
"Read_HuskyLens_Data"

5. Click 

6. "Read_HuskyLens_Data"
function will appear on
the screen



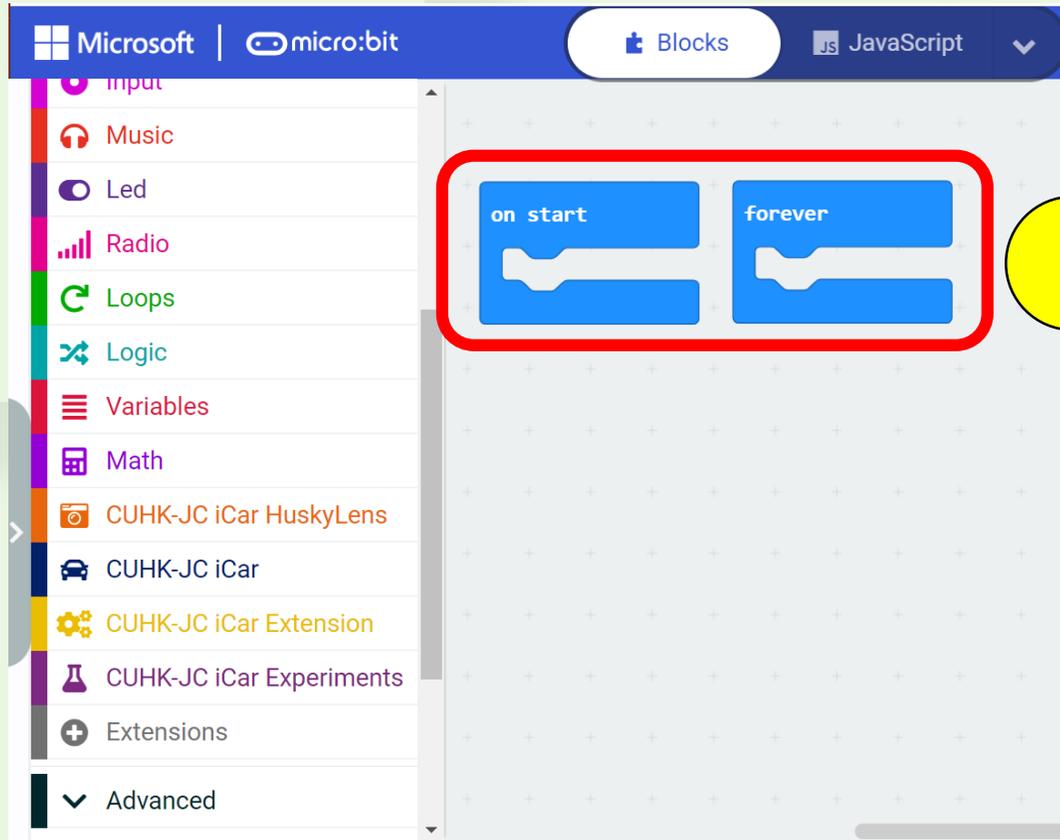
Variables Modules



1. Click 
2. Click 
3. Name the variable "game_start"
4. Click 
5. Programming blocks related to "game_start" will appear on the list

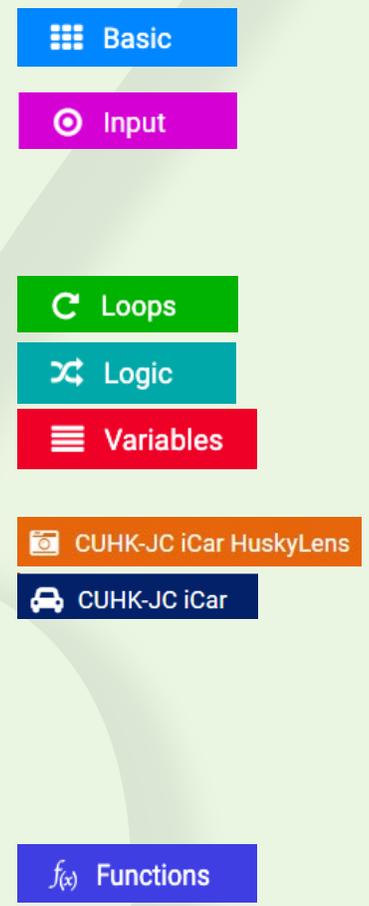
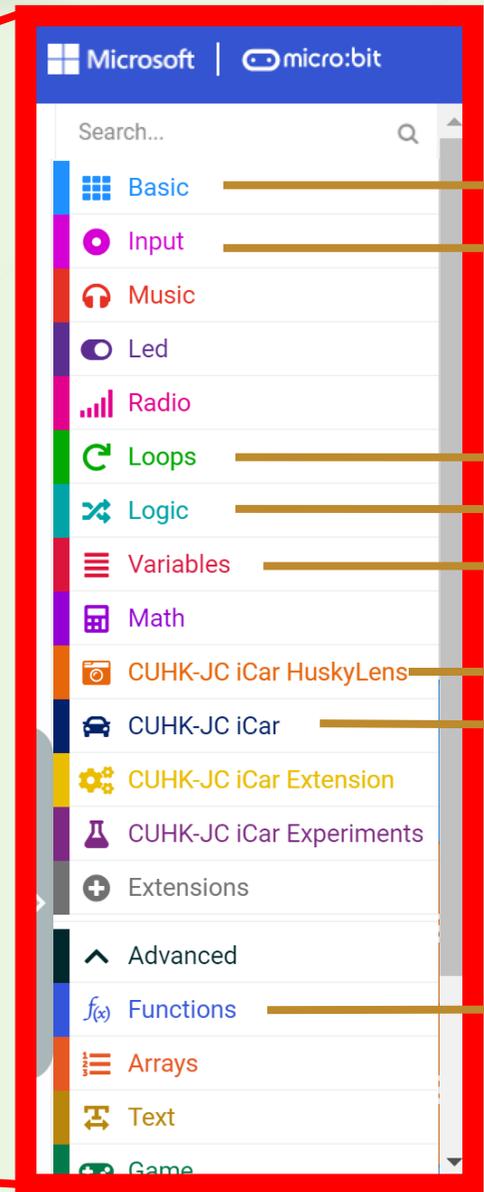
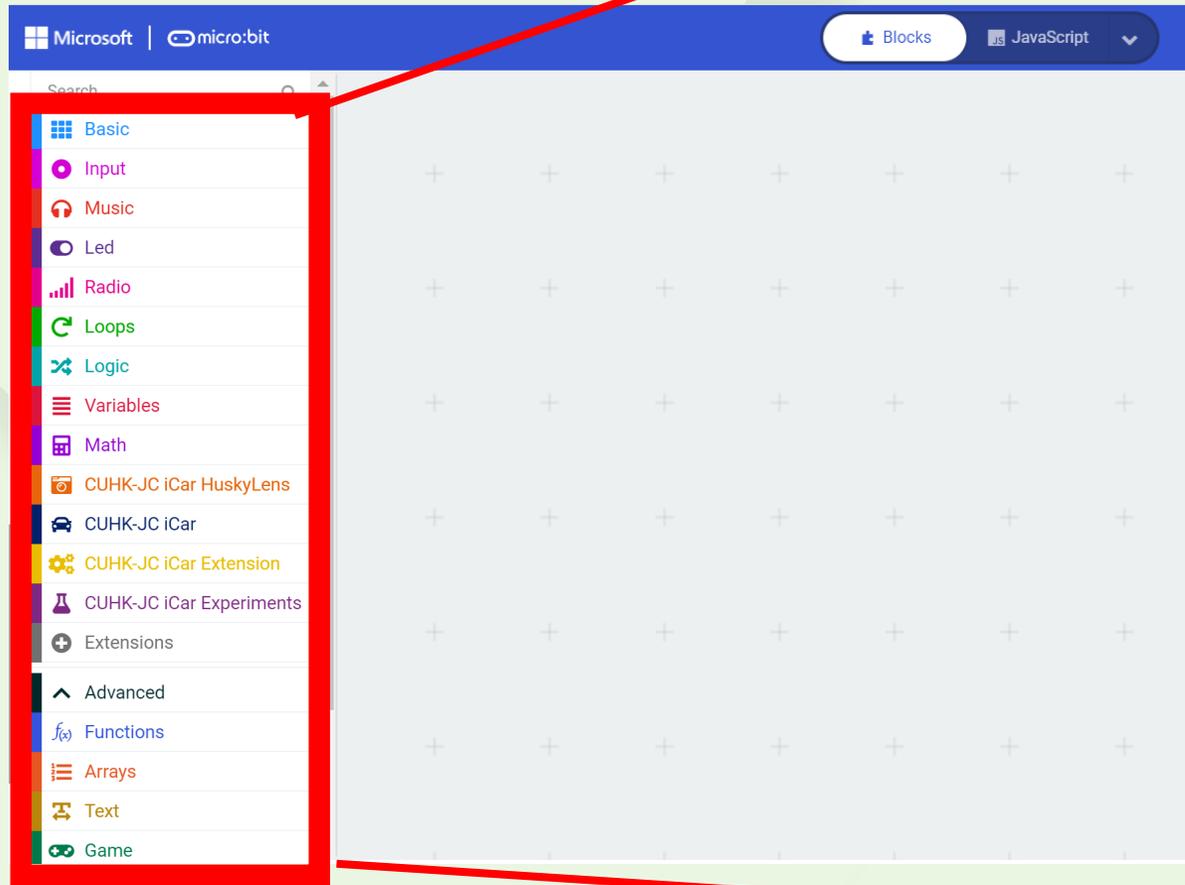


Let's start coding!



The program will pre-set “on start” and “forever” at the beginning.

We can ignore them for now.
Please don't delete!



We will use the above modules to do programming.

```
on start
  set game_start to 0
  set probability_to_evade_kids to 5
  HuskyLens initialize I2C until success
  HuskyLens switch algorithm to Object Classification
  show icon
```

You can find the blocks from the following:

- Variables
- CUHK-JC iCar HuskyLens
- Basic

```
function Line_Following
while true
do
  if is Left iCar line detector WhiteLine ? and is Right iCar line detector WhiteLine ? then
    iCar Move Forward at speed 40 %
  else if is Left iCar line detector WhiteLine ? and is Right iCar line detector Blackline ? then
    iCar Rotate Right at speed 40 %
  else if is Left iCar line detector Blackline ? and is Right iCar line detector WhiteLine ? then
    iCar Rotate Left at speed 40 %
  else if is Left iCar line detector Blackline ? and is Right iCar line detector Blackline ? then
    iCar Stop
  break
end while
```

You can find the blocks from the following:

- Functions
- Loops
- Logic
- CUHK-JC iCar

```
function Read_HuskyLens_Data
while true
do
  HuskyLens request data once and save into the result
  if HuskyLens check if ID 2 frame is on screen from the result or HuskyLens check if ID 3 frame is on screen from the result then
    break
  end
end
```

You can find the blocks from the following:

$f(x)$ Functions

Loops

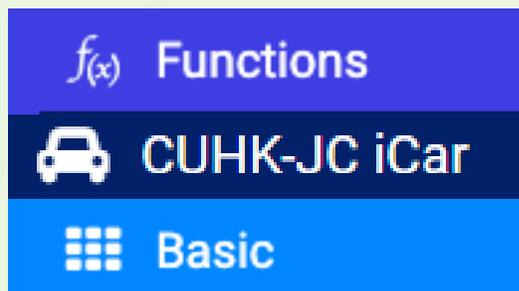
CUHK-JC iCar HuskyLens

Logic

```
function Turn_Left  
  iCar Turn Left at speed 70 %  
  pause (ms) 200  
  iCar Move Forward at speed 60 %  
  pause (ms) 1000  
  iCar Stop
```

```
function Turn_Right  
  iCar Turn Right at speed 70 %  
  pause (ms) 200  
  iCar Move Forward at speed 60 %  
  pause (ms) 1000  
  iCar Stop
```

You can find the blocks from the following:



You can find the blocks from the following:



```
function Make_Decision
  if HuskyLens check if ID 2 frame is on screen from the result then
    show number 2
    if probability_to_evade_kids >= pick random 1 to 10 then
      call Turn_Left
    else
      call Turn_Right
  else if HuskyLens check if ID 3 frame is on screen from the result then
    show number 3
    if probability_to_evade_kids >= pick random 1 to 10 then
      call Turn_Right
    else
      call Turn_Left
```

You can find the blocks from the following:

- Functions
- Logic
- CUHK_JC_iCar_HuskyLens
- Basic
- Variables
- Math

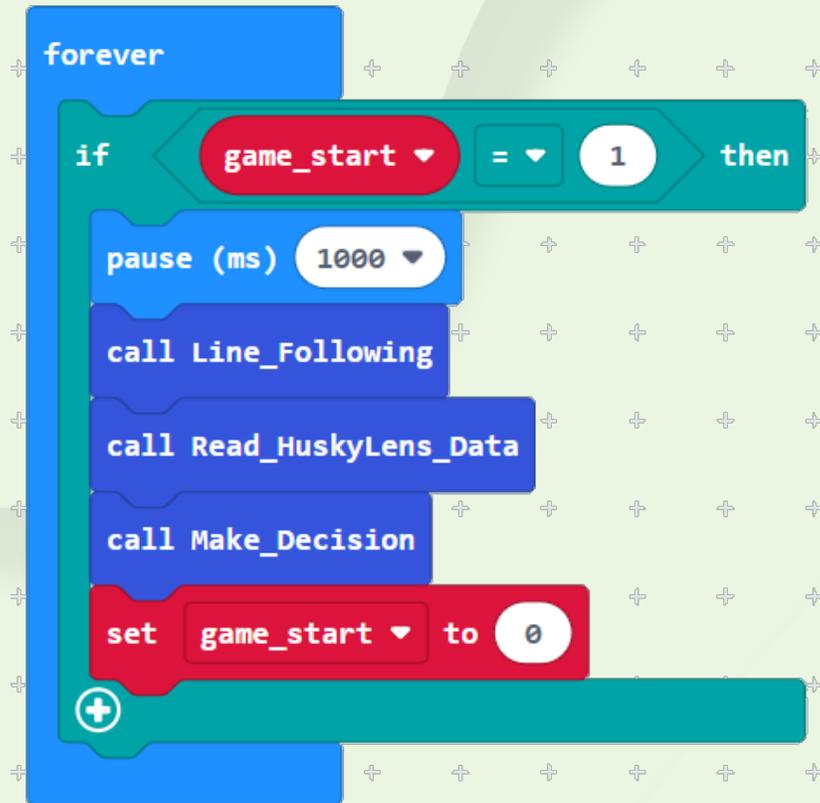


```
on button A pressed
  set game_start to 1
```

You can find the blocks from the following:

Input

Variables



You can find the blocks from the following:

 Logic

 Variables

 Basic

 Functions



Finished!



```
on start
  set game_start to 0
  set probability_to_evade_kids to 5
  HuskyLens initialize I2C until success
  HuskyLens switch algorithm to Object Classification
  show icon
```

```
forever
  if game_start == 1 then
    pause (ms) 1000
    call Line_Following
    call Read_HuskyLens_Data
    call Make_Decision
    set game_start to 0
```

```
on button A pressed
  set game_start to 1
```

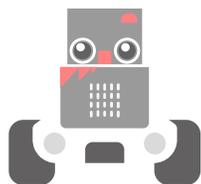
```
function Line_Following
  while true
    do
      if is Left iCar line detector Whiteline ? and is Right iCar line detector Whiteline ? then
        iCar Move Forward at speed 40 %
      else if is Left iCar line detector Blackline ? and is Right iCar line detector Whiteline ? then
        iCar Rotate Left at speed 40 %
      else if is Left iCar line detector Whiteline ? and is Right iCar line detector Blackline ? then
        iCar Rotate Right at speed 40 %
      else if is Left iCar line detector Blackline ? and is Right iCar line detector Blackline ? then
        iCar Stop
      break
```

```
function Read_HuskyLens_Data
  while true
    do
      HuskyLens request data once and save into the result
      if HuskyLens check if ID 2 frame is on screen from the result or HuskyLens check if ID 3 frame is on screen from the result then
        break
```

```
function Make_Decision
  if HuskyLens check if ID 2 frame is on screen from the result then
    show number 2
    if probability_to_evade_kids >= pick random 1 to 10 then
      call Turn_Left
    else
      call Turn_Right
  else if HuskyLens check if ID 3 frame is on screen from the result then
    show number 3
    if probability_to_evade_kids >= pick random 1 to 10 then
      call Turn_Right
    else
      call Turn_Left
```

```
function Turn_Left
  iCar Turn Left at speed 70 %
  pause (ms) 200
  iCar Move Forward at speed 60 %
  pause (ms) 1000
  iCar Stop
```

```
function Turn_Right
  iCar Turn Right at speed 70 %
  pause (ms) 200
  iCar Move Forward at speed 60 %
  pause (ms) 1000
  iCar Stop
```



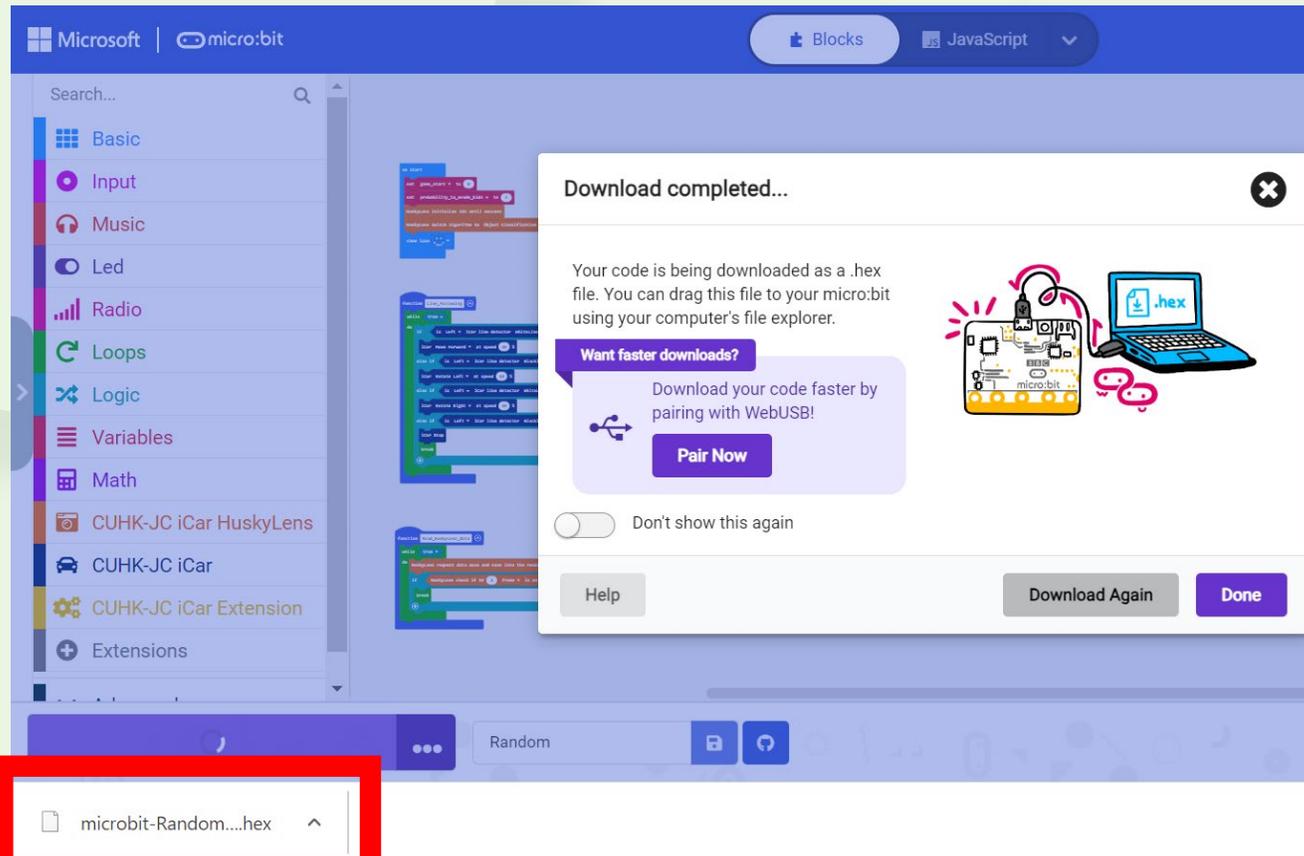
Download The Program To CUHK iCar

The screenshot shows the Microsoft MakeCode editor interface. On the left is a sidebar with a search bar and a list of categories: Basic, Input, Music, Led, Radio, Loops, Logic, Variables, Math, CUHK-JC iCar HuskyLens, CUHK-JC iCar, CUHK-JC iCar Extension, CUHK-JC iCar Experiments, and Extensions. The main workspace contains JavaScript code for controlling an iCar. At the bottom of the editor, a purple 'Download' button is highlighted with a red rectangular box. To the left of this box is a yellow circle containing the number '1'.

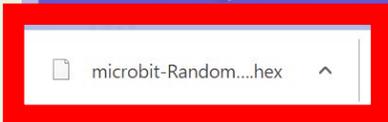
Step 1:

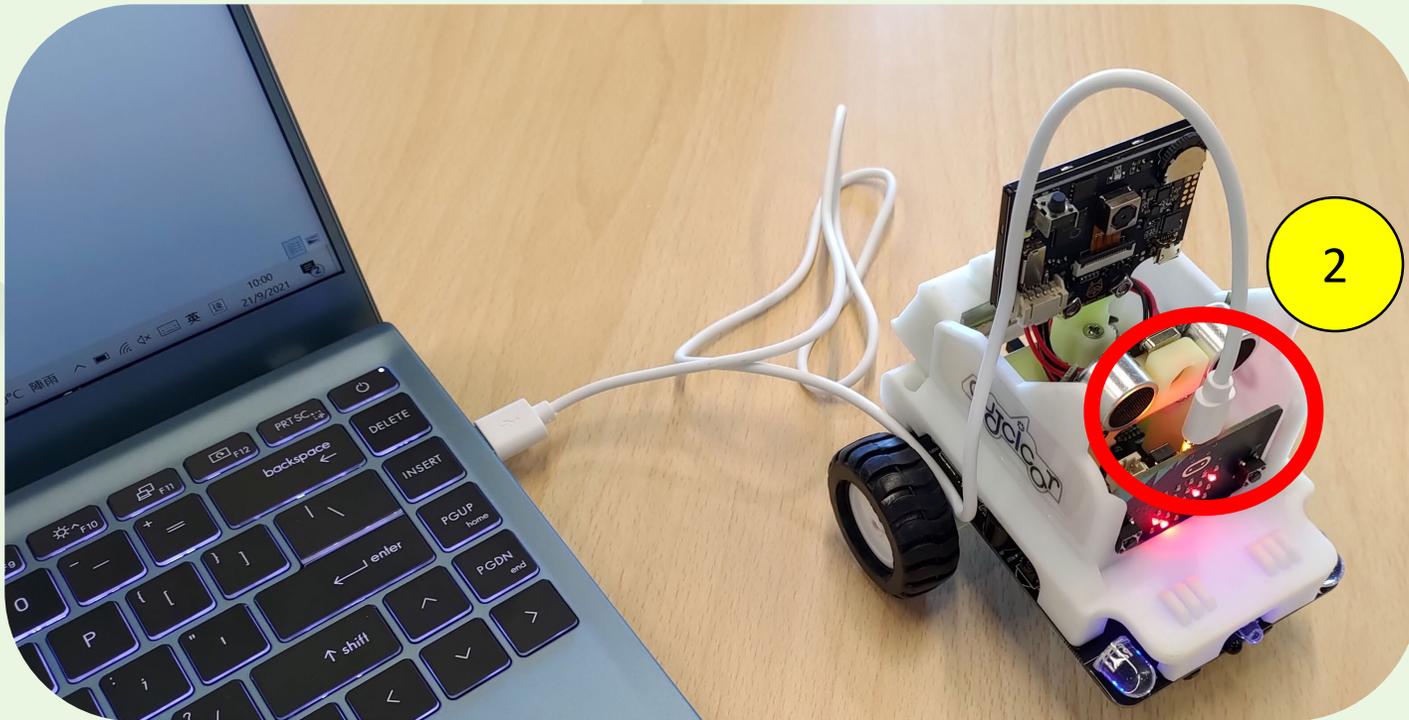
Click

 Download

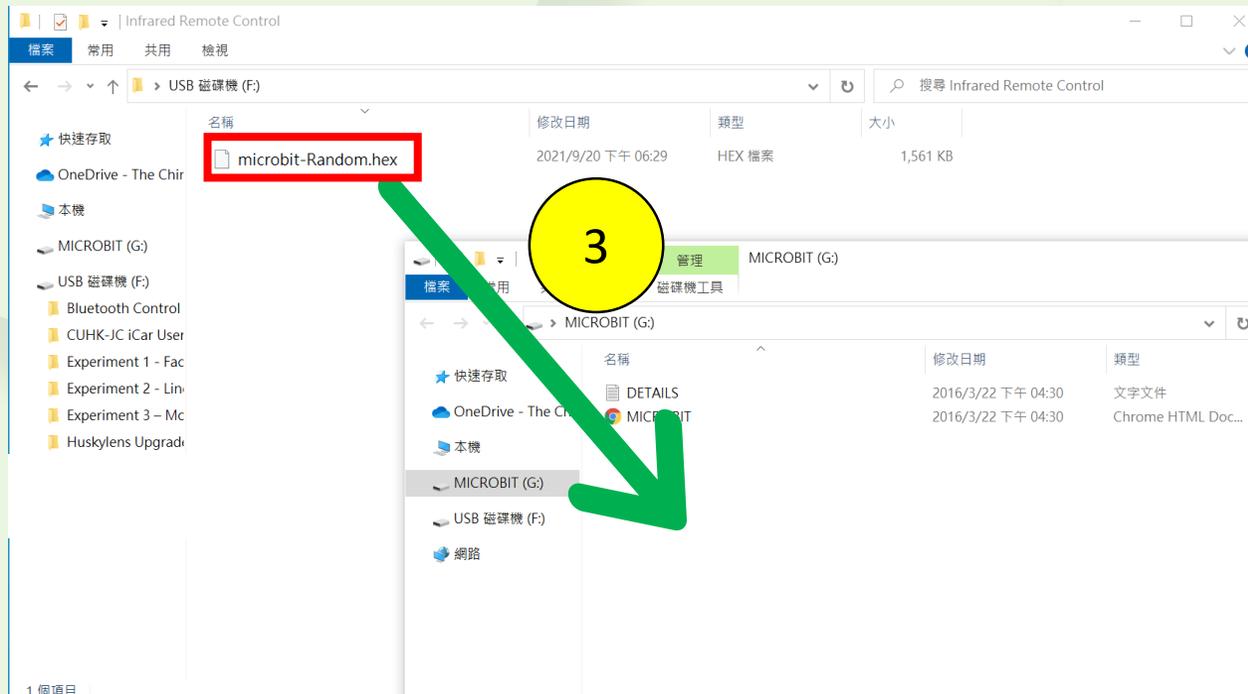


The hex file is downloaded!





Step 2:
Connect the micro:bit to
computer by a micro USB cable



Step 3:
Drag the downloaded hex file
into the micro:bit window



Step 4:
Wait for the completion of cloning process

Caution:

- The micro:bit window will potentially disappear after the completion
- After the completion of cloning process, the hex file will not be displayed in the micro:bit window

Step 5:
Disconnect the micro:bit from your computer

If the connection between CUHK iCar and the computer is failed:

- Restart the computer
- Try another USB port
- Change the micro USB cable



You have finished programming!

Let's start collecting data!



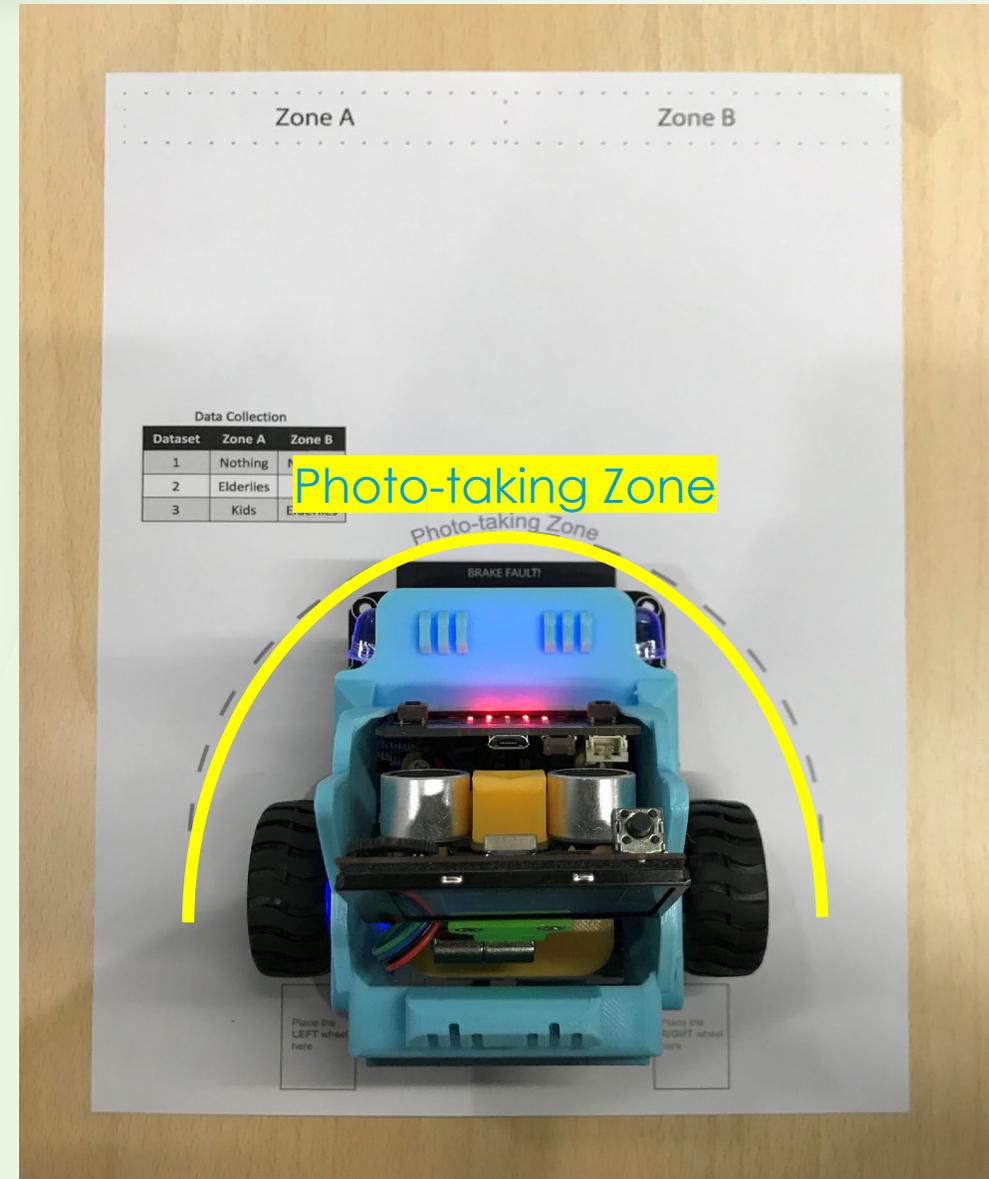


Data Collection



Step 1:

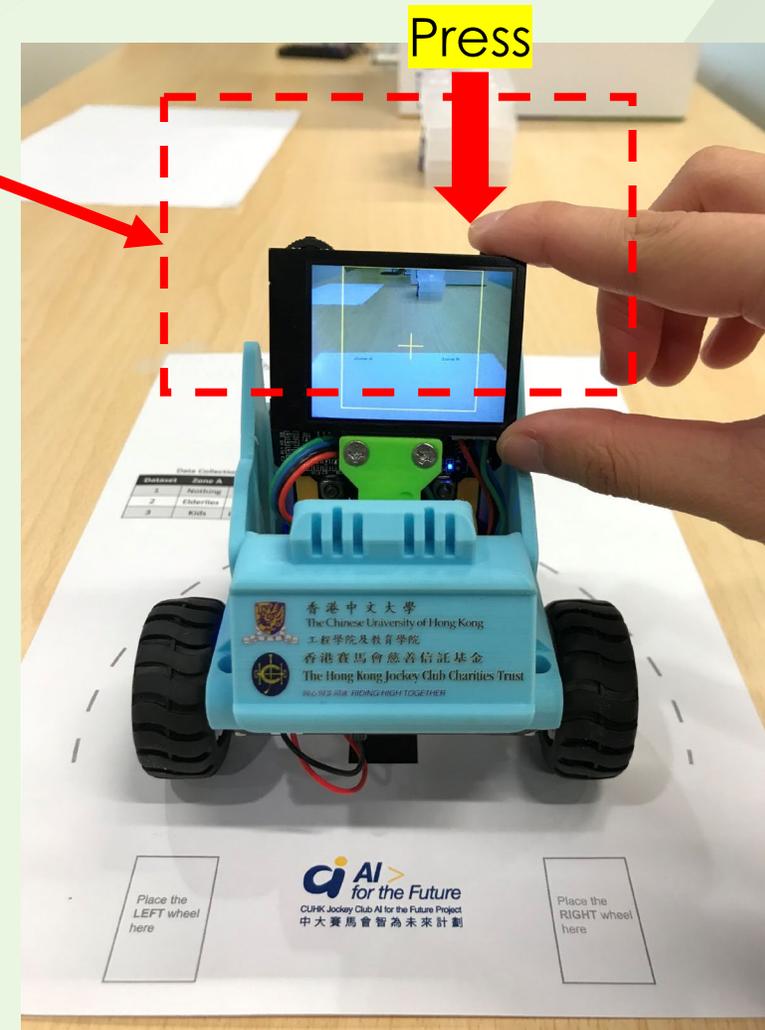
Place the track onto the table, and the CUHK iCar on the Photo-taking Zone



Dataset	Zone A	Zone B
1	Nothing	Nothing
2	Elderlies	Kids
3	Kids	Elderlies

Step 2 - Collect Dataset 1:

- CUHK iCar should face forward
- **Press** the learning button to collect data



Tips:

Rotate the CUHK iCar to obtain a better result

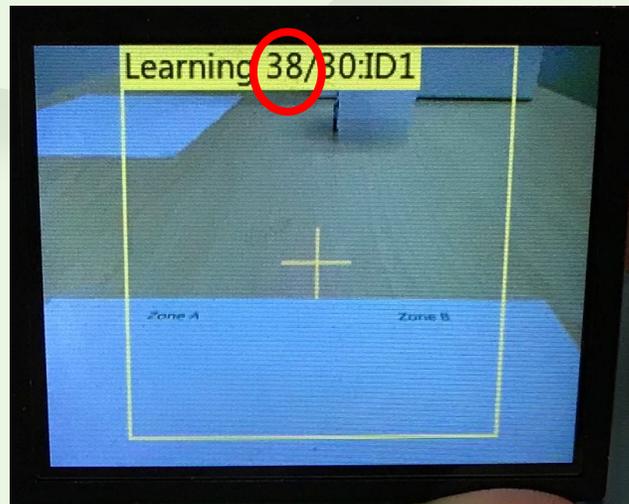
Make sure you keep pressing the button while you're rotating!

Press



Step 3:

Release the learning button after the number reaches 30



Step 4:

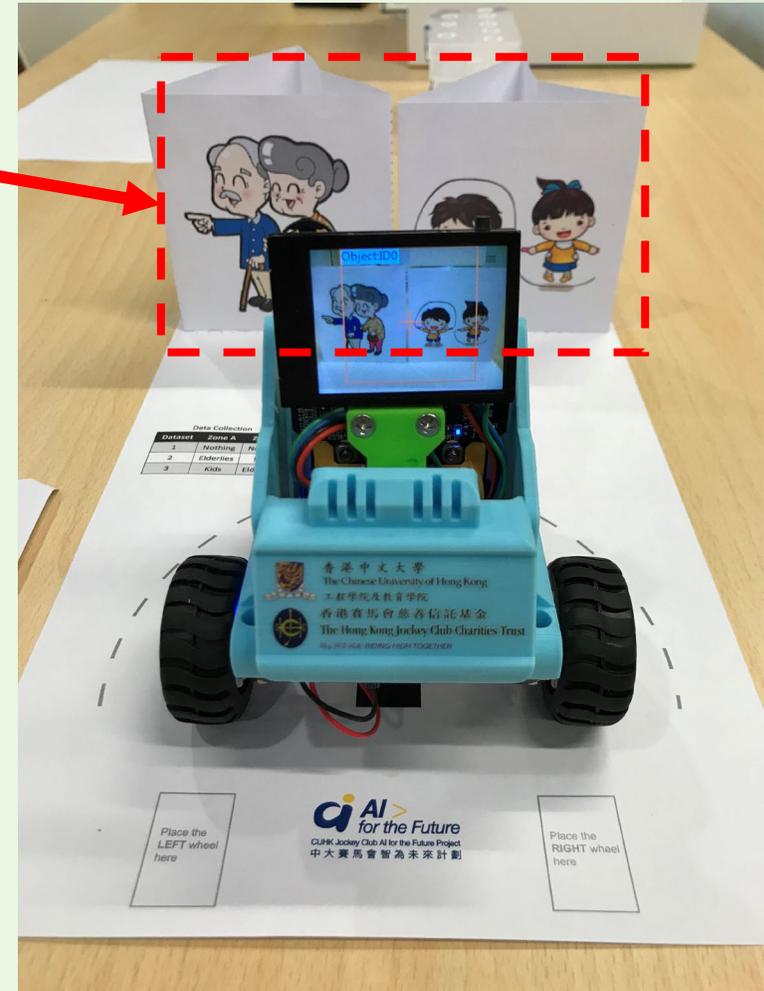
Press the learning button again
before the countdown ends



Dataset	Zone A	Zone B
1	Nothing	Nothing
2	Elderlies	Kids
3	Kids	Elderlies

Step 5 - Collect Dataset 2:

- CUHK iCar should face forward
- Place the paper model accordingly
- **Press** the learning button to collect data



Tips:

Rotate the CUHK iCar to obtain a better result

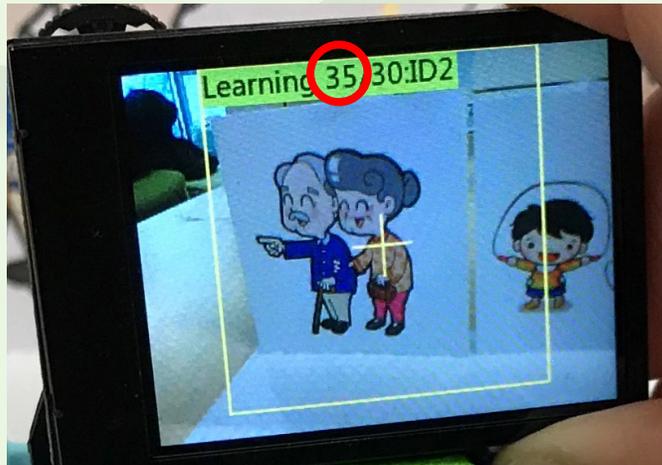
Make sure you keep pressing the button while you're rotating!

Press



Step 6:

Release the learning button after the number reaches 30



Step 7:

Press the learning button again
before the countdown ends



Dataset	Zone A	Zone B
1	Nothing	Nothing
2	Elderlies	Kids
3	Kids	Elderlies



Step 8 - Collect Dataset 3:

- CUHK iCar should face forward
- Place the paper model accordingly
- **Press** the learning button to collect data



Tips:

Rotate the CUHK iCar to obtain a better result

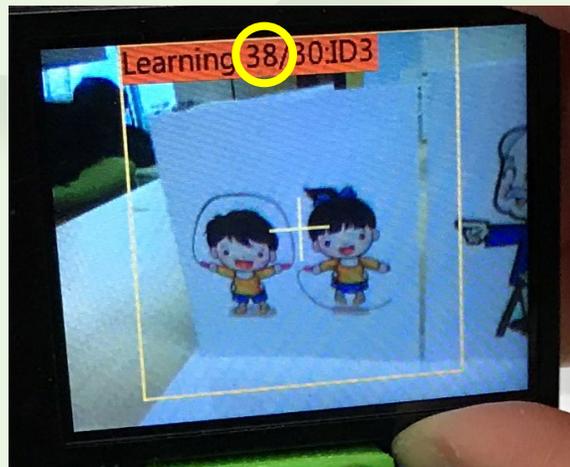
Make sure you keep pressing the button while you're rotating!

Press



Step 9:

Release the learning button after the number reaches 30



Dataset	Zone
1	North
2	Elderly
3	Kids

Step 10:

Wait for the

countdown ends





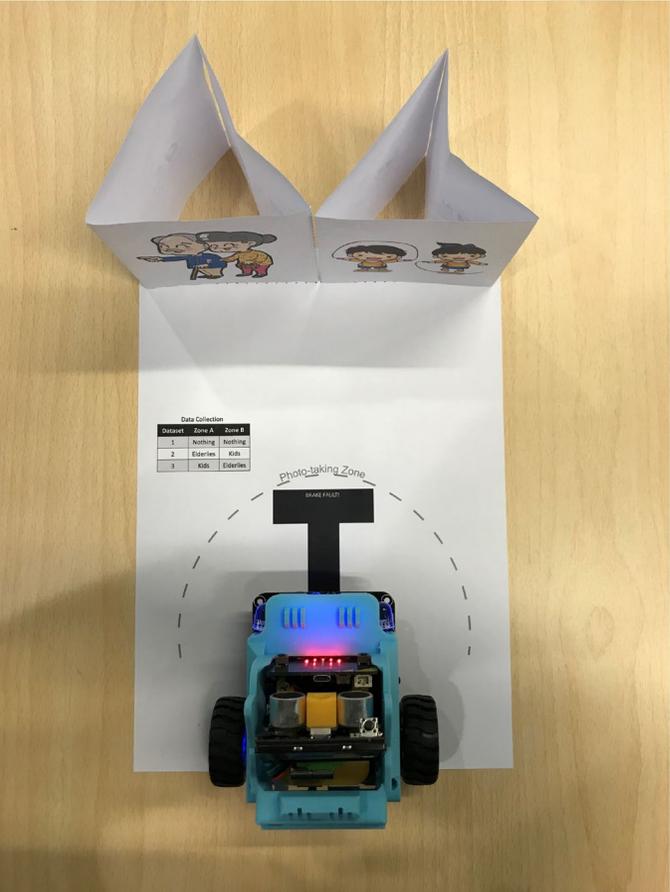
You've collected all the data needed!

Let's conduct the experiment!



Step 1:

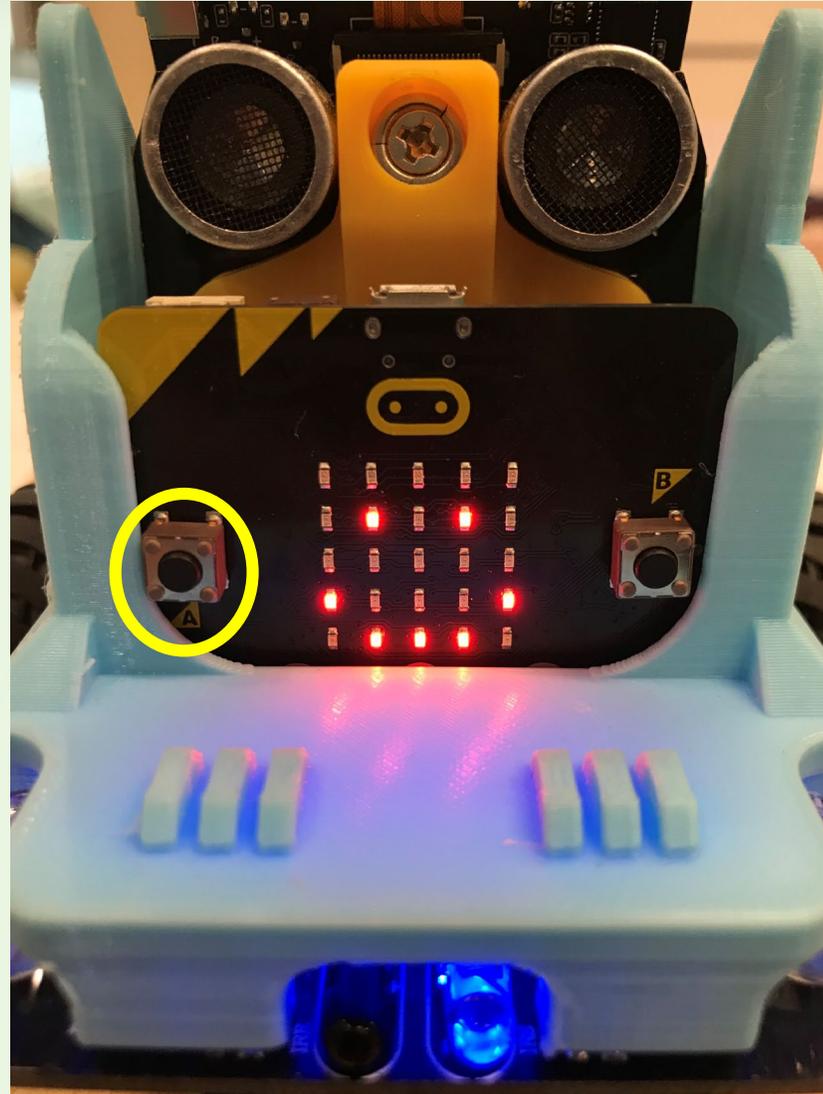
Place the paper models in the designated zones and place CUHK iCar on the starting point



Attention:
Place the two wheels according to the instructions on the paper

Step 2:

Press **button A** on micro:bit



Simulation

Program: Random

Paper Model: Dataset 2



Place the CUHK iCar at the starting position and press button A.



CUHK iCar has trouble braking!



It will decide randomly.

Simulation

Program: Random

Paper Model: Dataset 3



Place the CUHK iCar at the starting position and press button A.



CUHK iCar has trouble braking!



It will decide randomly.

If CUHK iCar does not work as expected:

- Try to fully charge the CUHK iCar
- If the CUHK iCar still does not work as expected, then you can try to recollect data by pressing the learning button twice to forget the recorded data, then to recollect data. For details, please refer to the slide 34

