



愛動智教育系統

CUHK iCar Experiment Manual

Experiment 3: Moral Dilemma Experiment

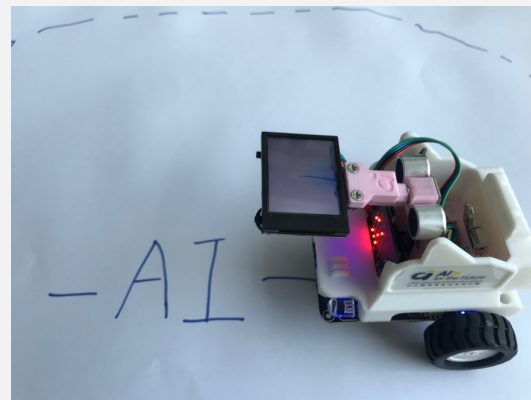
Write Your Own Code

(Evade Elderlies)

CUHK iCar



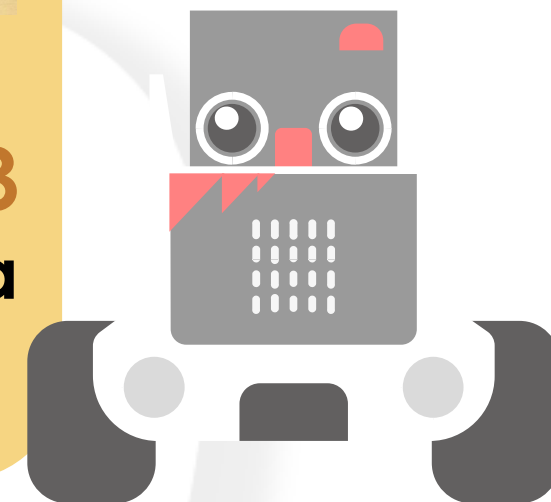
Experiment 1
Face Following



Experiment 2
Line Tracking



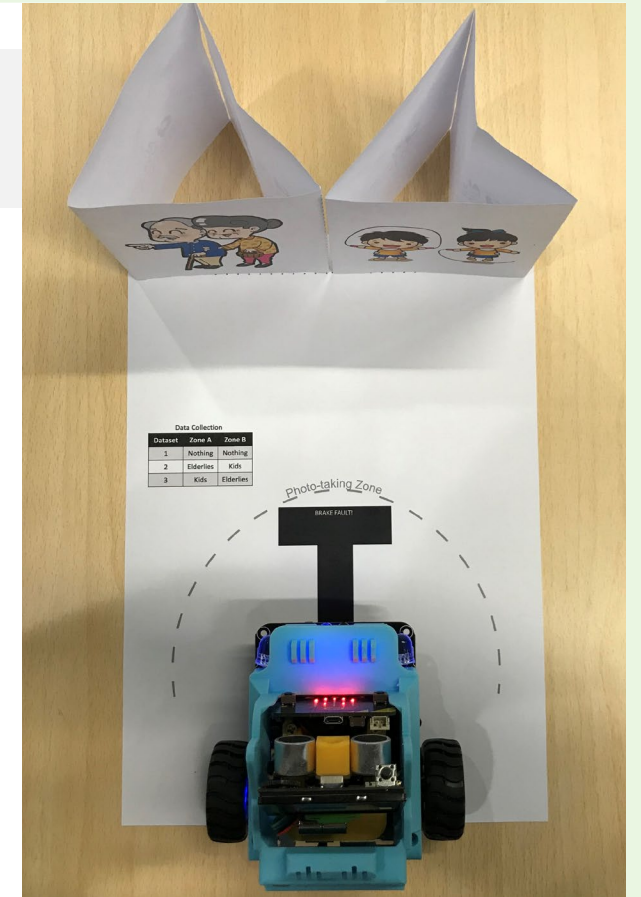
Experiment 3
Moral Dilemma



Moral Dilemma Experiment

Introduction Of The Experiment

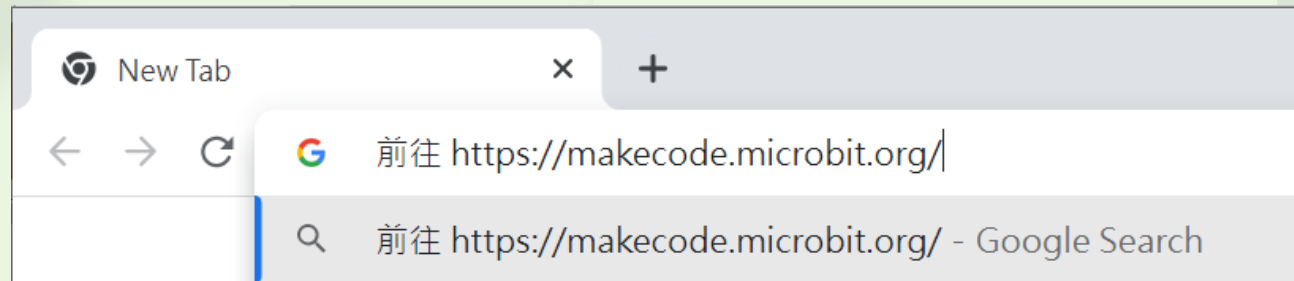
This experiment simulates the predicament of the failure of the self-driving car brake system, leaving it with two options: turn left or right while there are children and elderlies in front of you, which one will you choose to evade?



Code On MakeCode

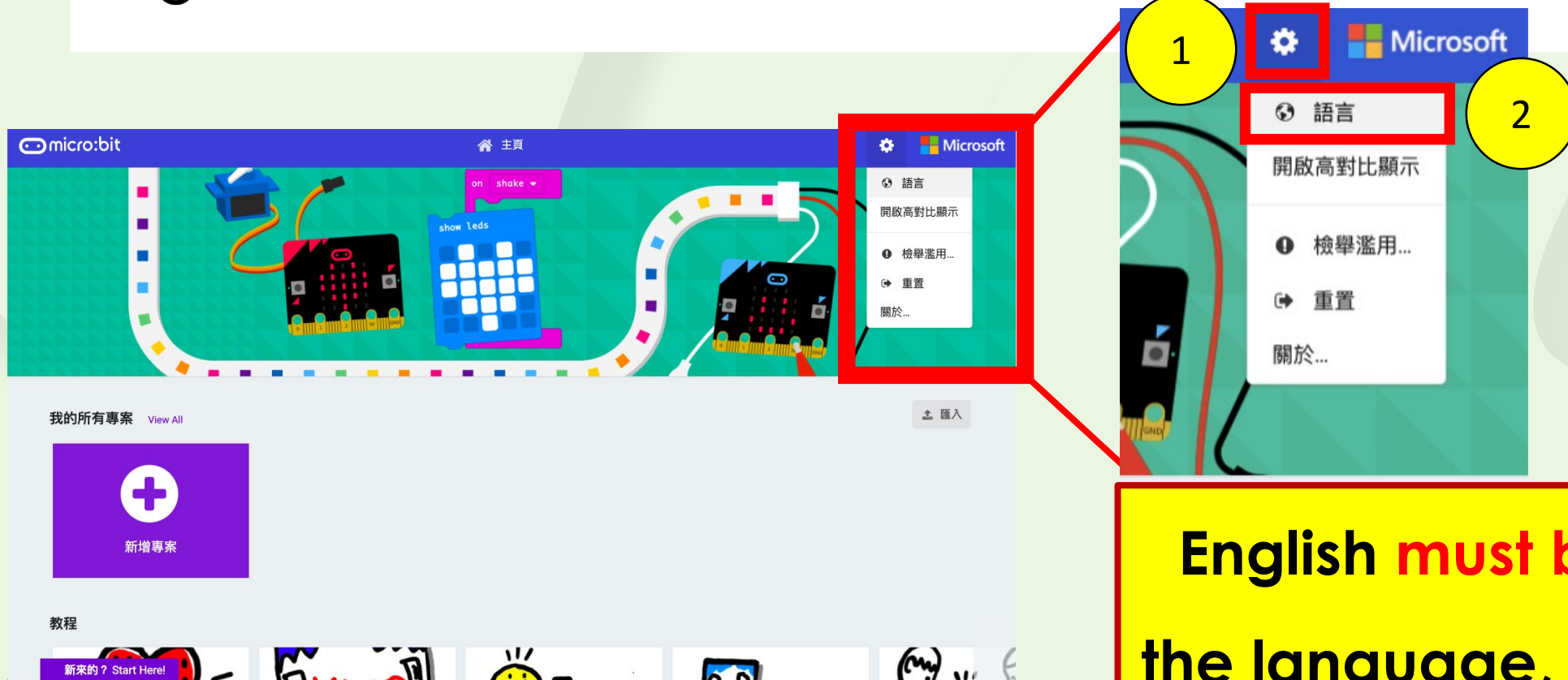


Browse <https://makecode.microbit.org/>





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



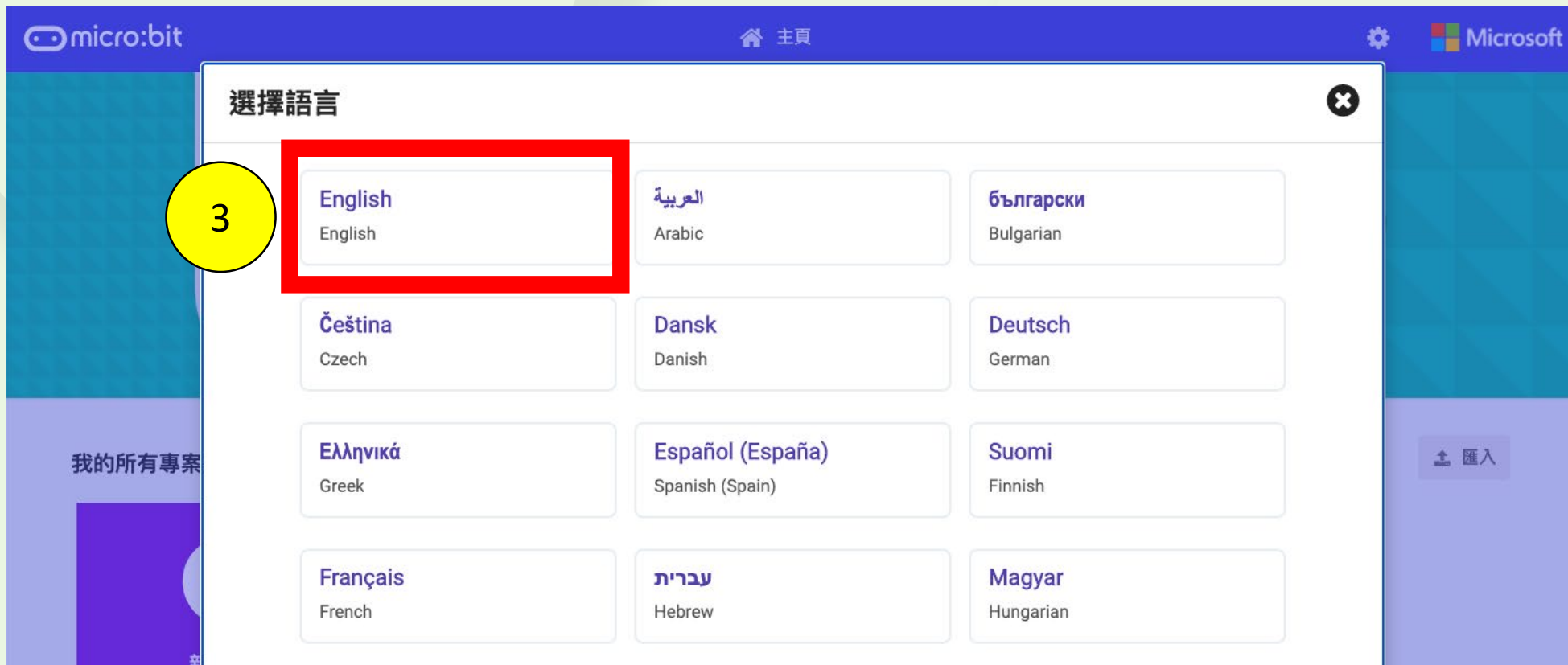
1. Click



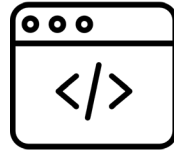
2. Click

語言

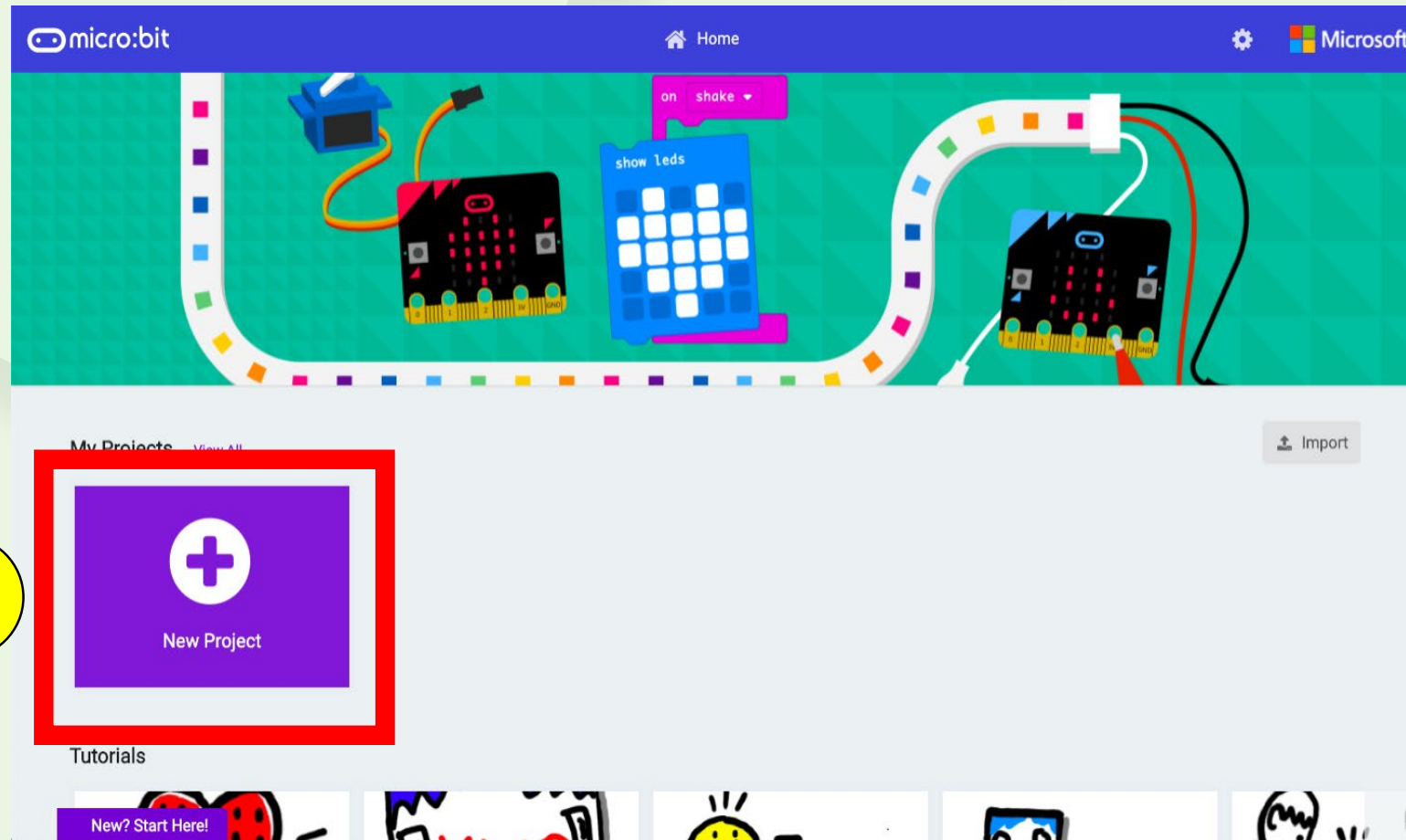
English must be set as the language, otherwise the program may fail.



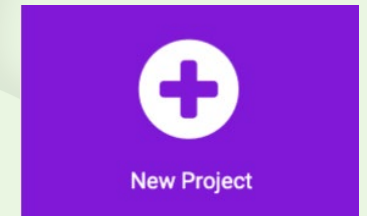
3. Click English

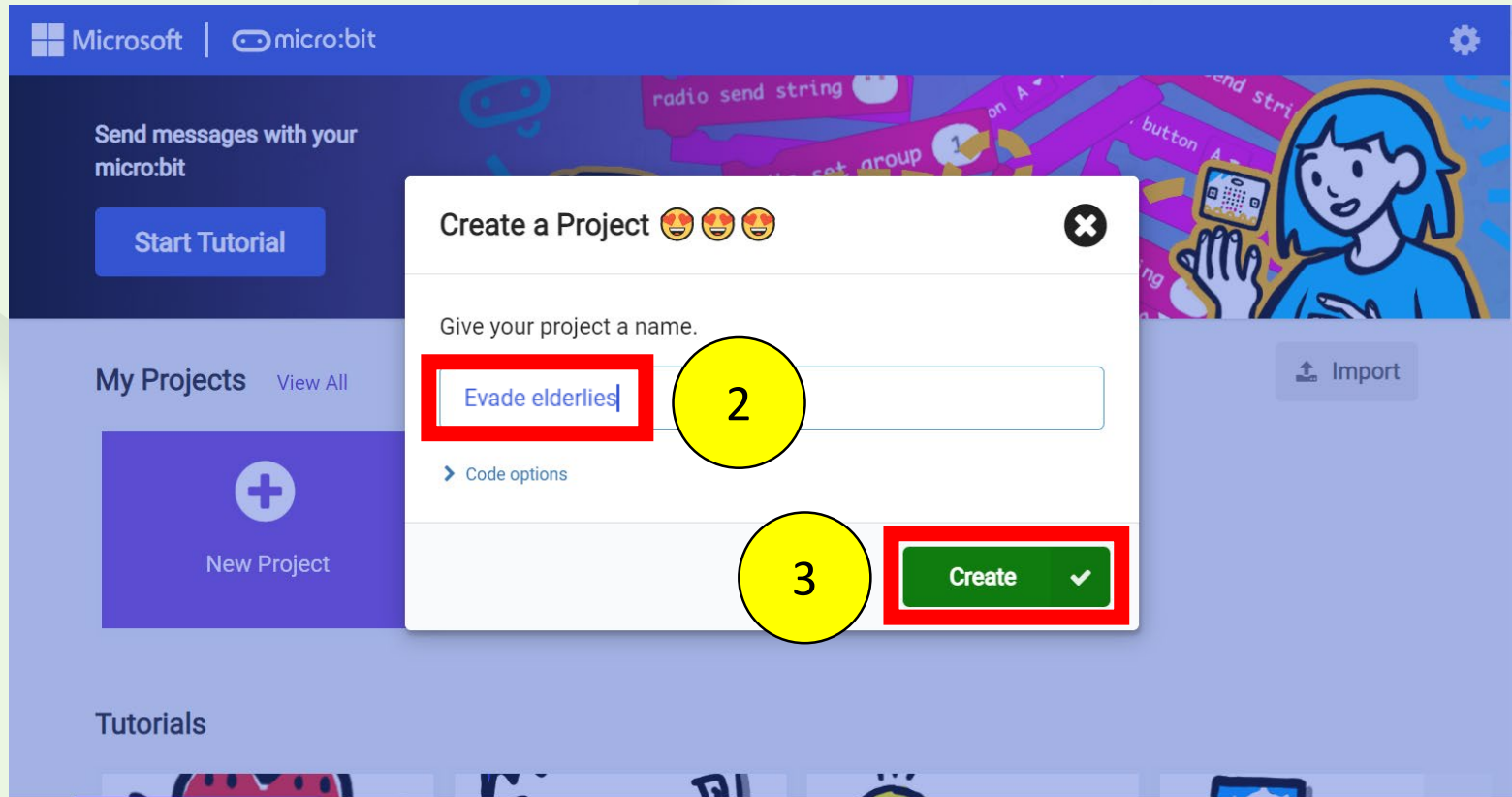


New Project



1. Click New Project

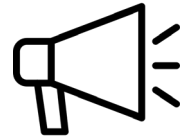




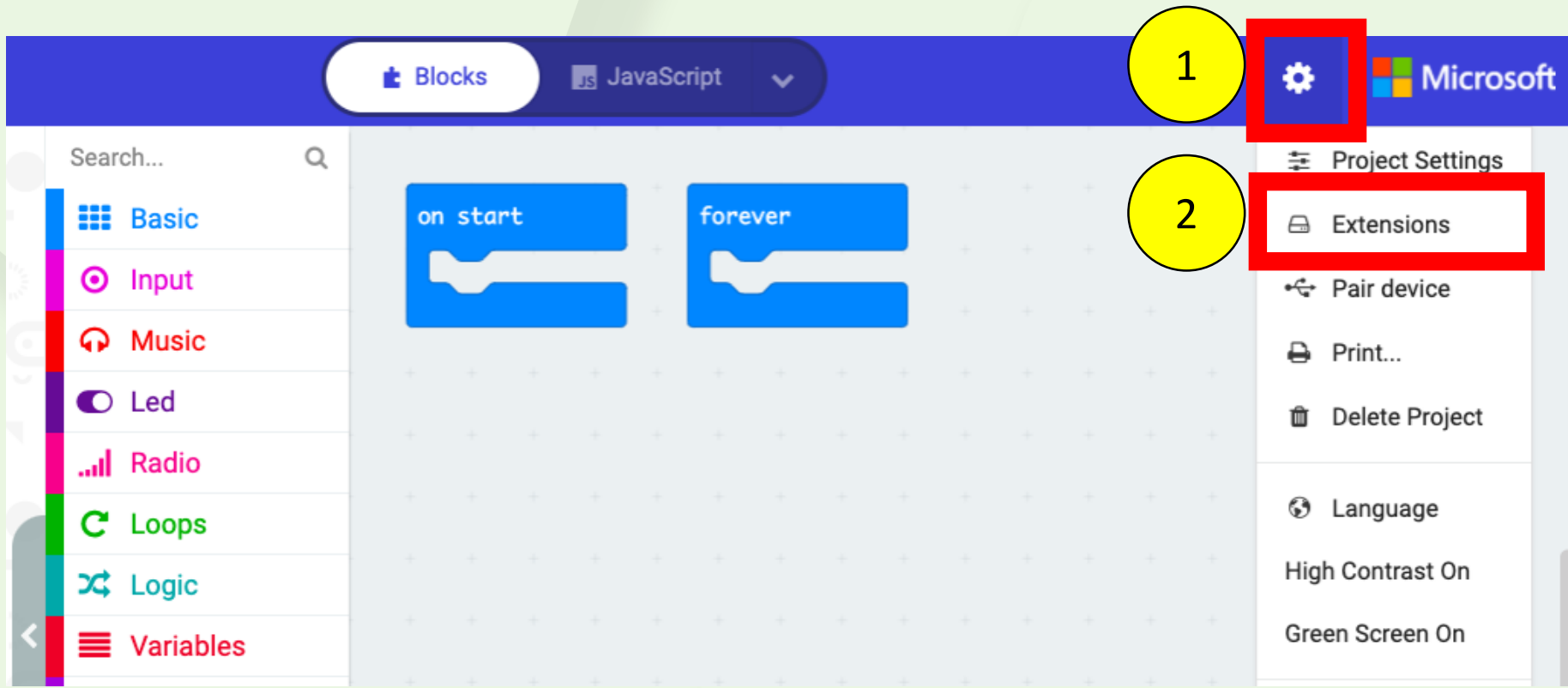
2. Enter “Evade elderlies”

3. Click

Create



Prepare CUHK-JC-iCar Extension

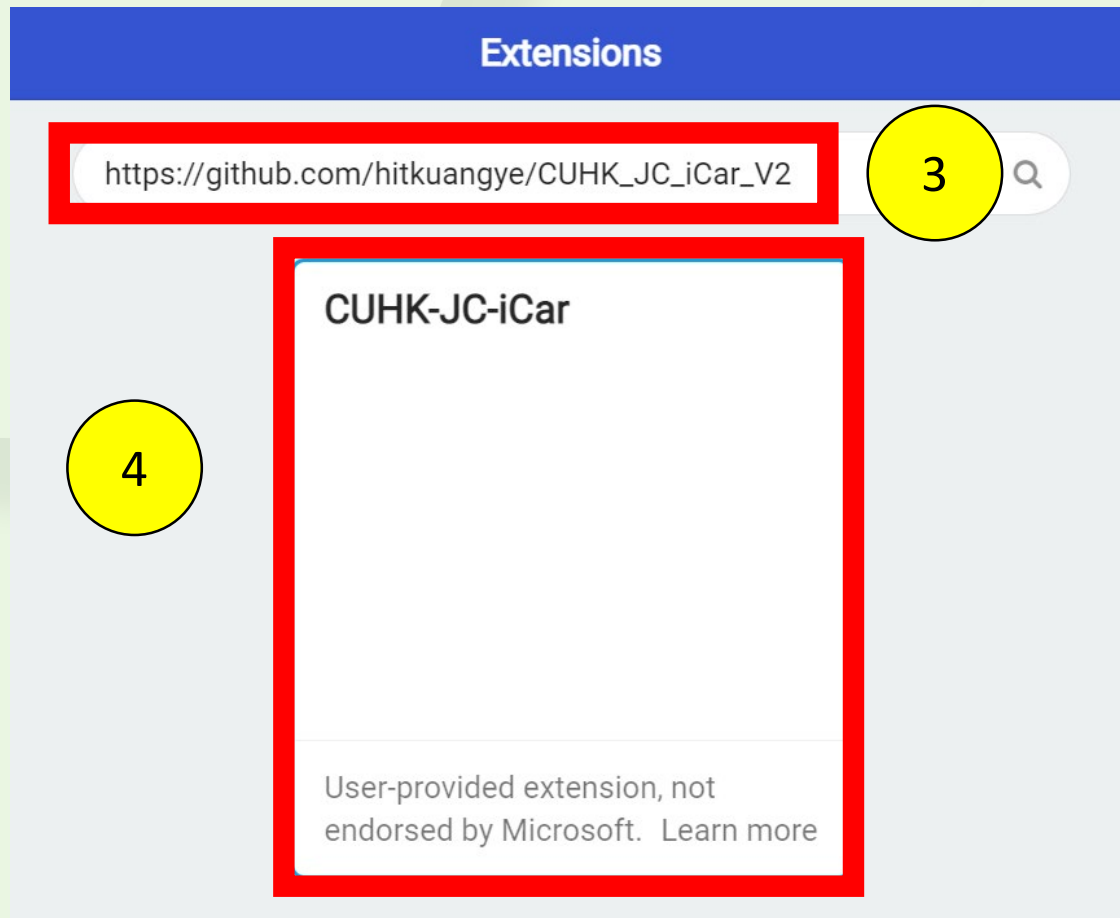


1. Click

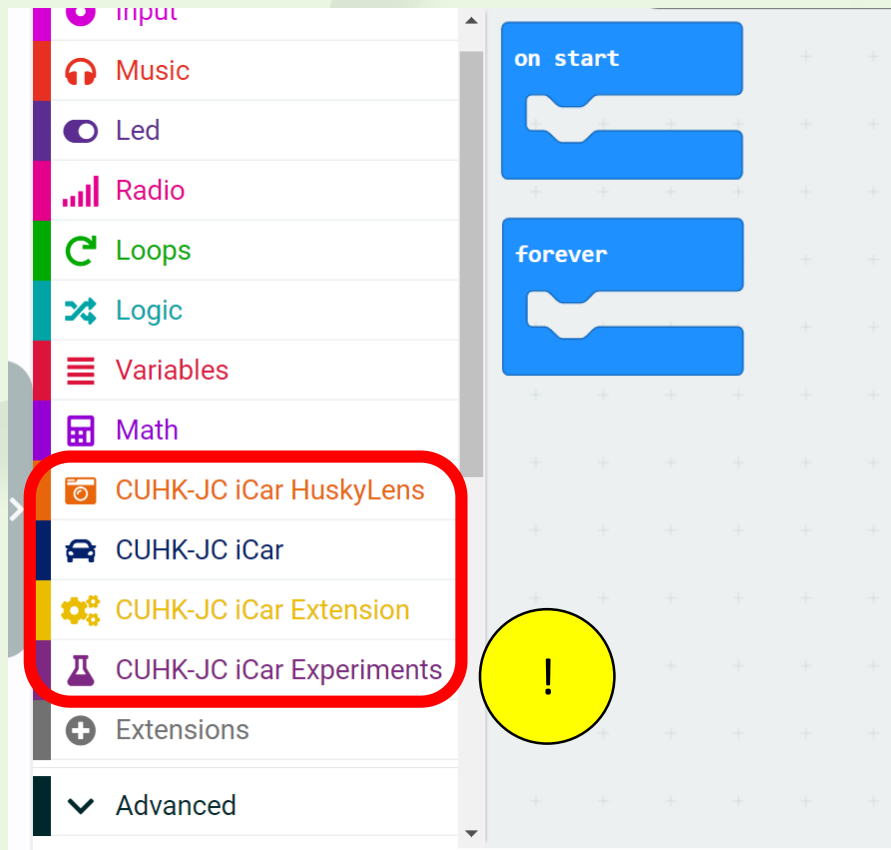


2. Click

Extensions



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



Extensions are included!

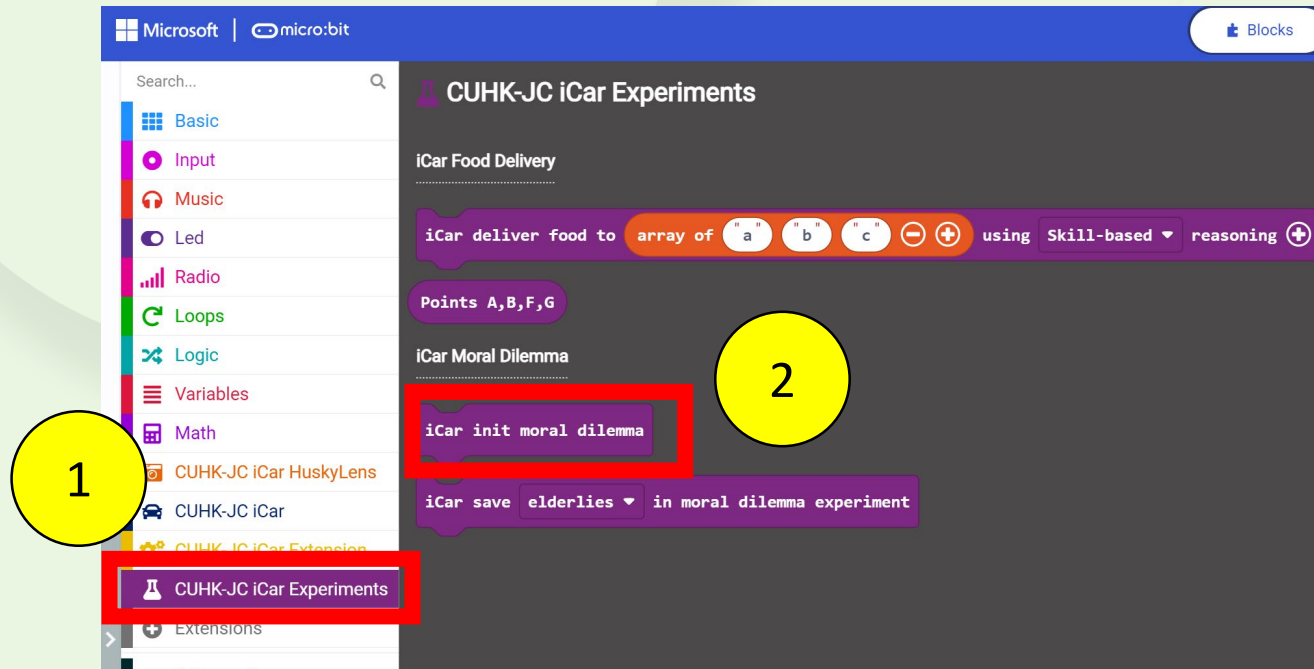
Complete the program in two ways



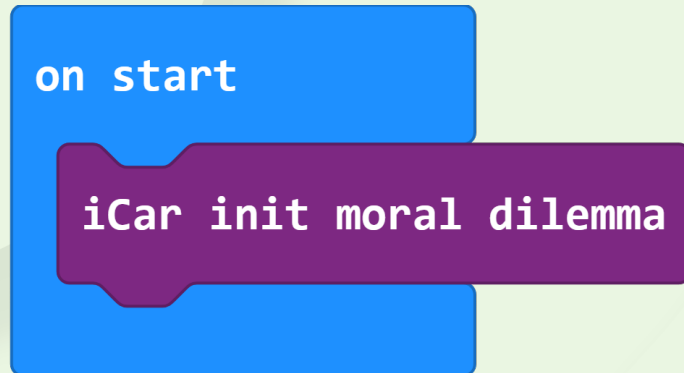
We prepared two options for you:

1. Use our prebuilt blocks
2. Complete the conditions by yourself

Option 1: Use Prebuilt Blocks

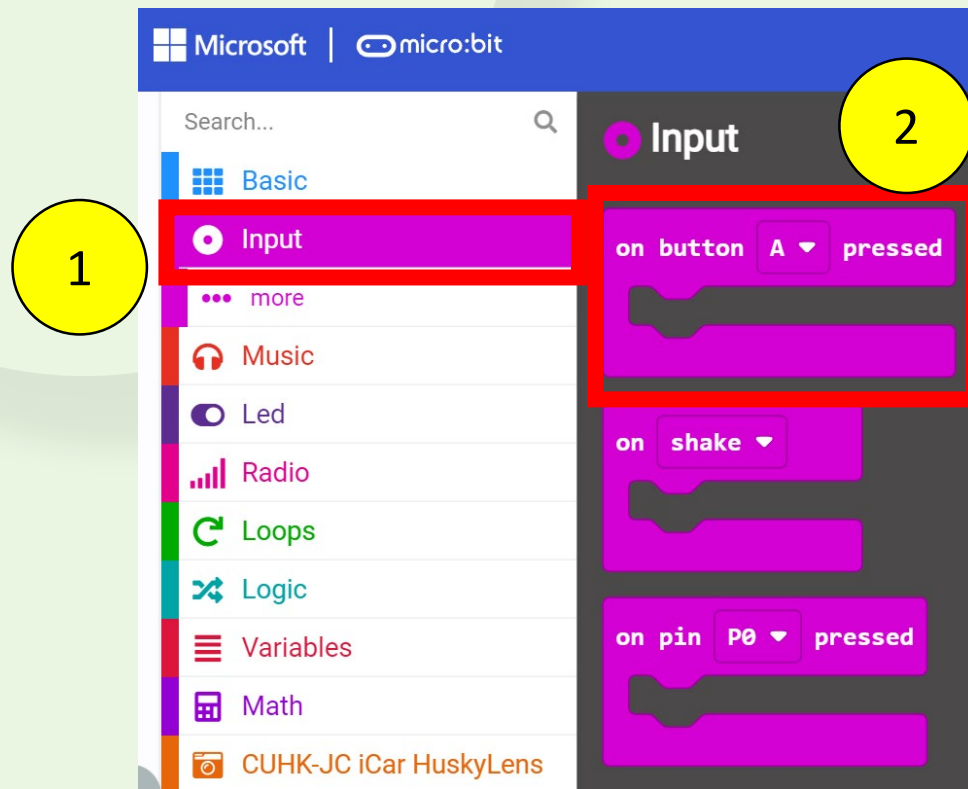


1. Click **CUHK-JC iCar Experiments** from the module list
2. Click **iCar init moral dilemma**



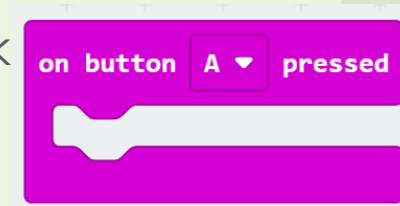
Drag the previous block into the "On Start" Block

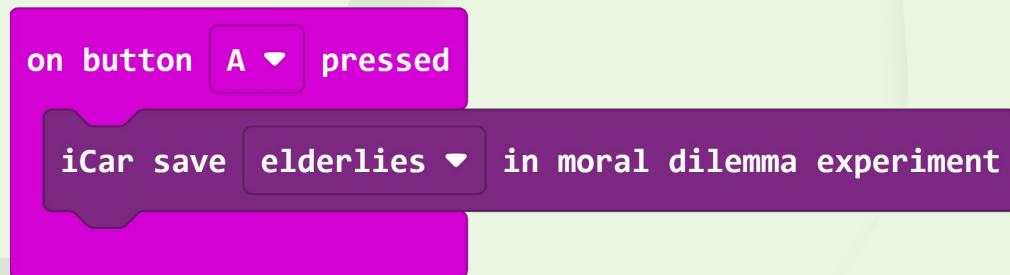
Create on button pressed event



1. Click **Input** from the module list

2. Click **on button A pressed**





You can find the blocks from the following:

Input

CUHK-JC iCar Experiments



Finished!

EduAIR

on start

iCar init moral dilemma

on button pressed

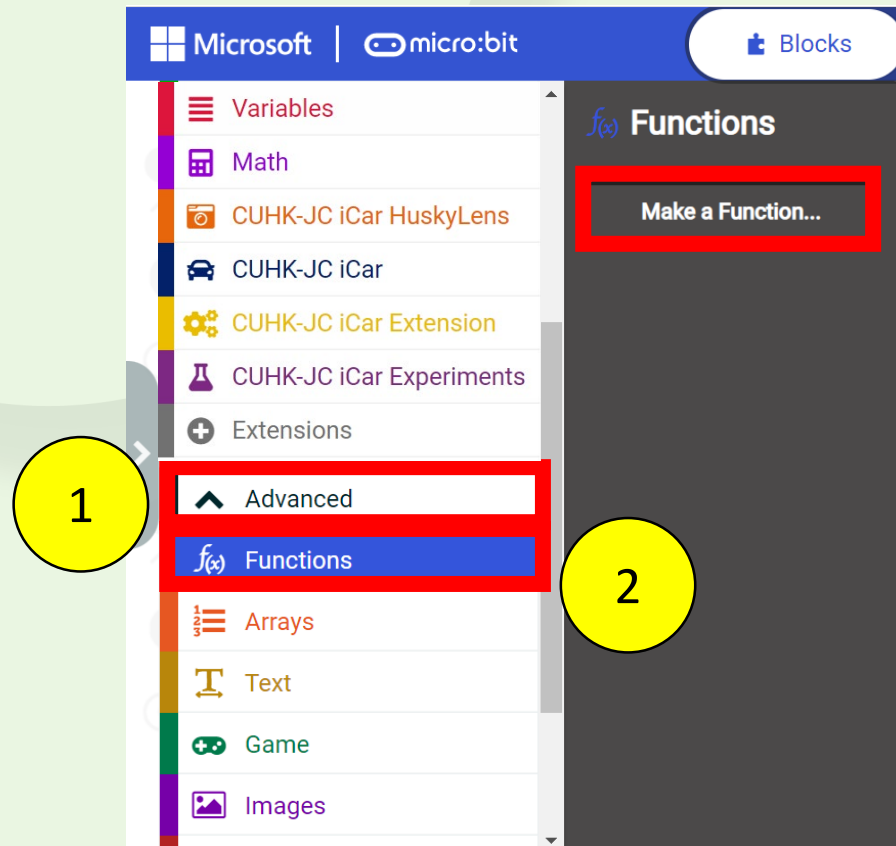
iCar save in moral dilemma experiment

Option 2: Program conditions by yourself



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 



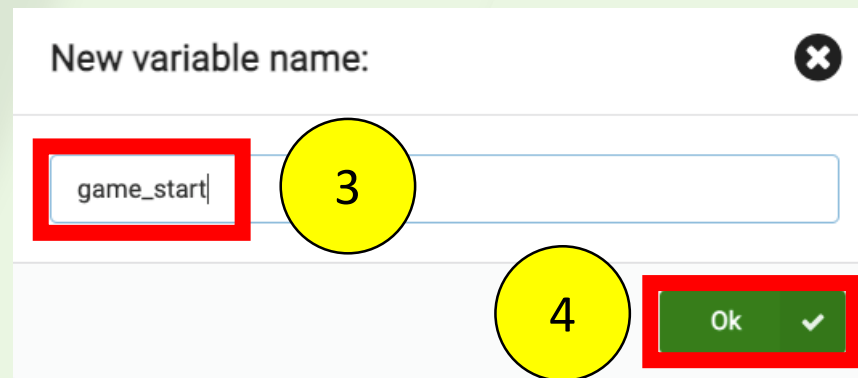
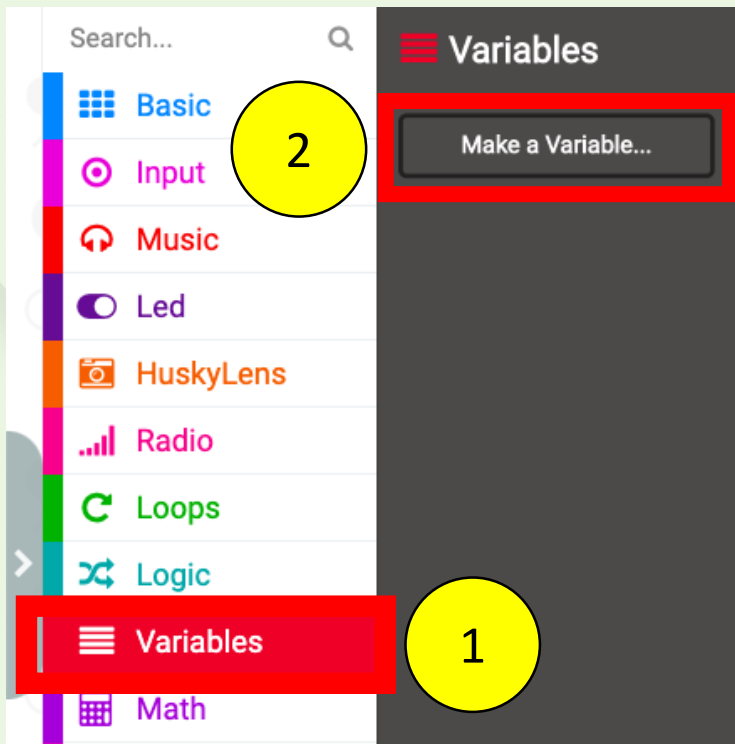
4. Name the function
"Read_HuskyLens_Data"

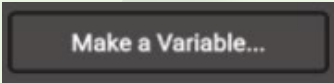

5. Click **Done**

6. "Read_HuskyLens_Data"
function will appear on
the screen



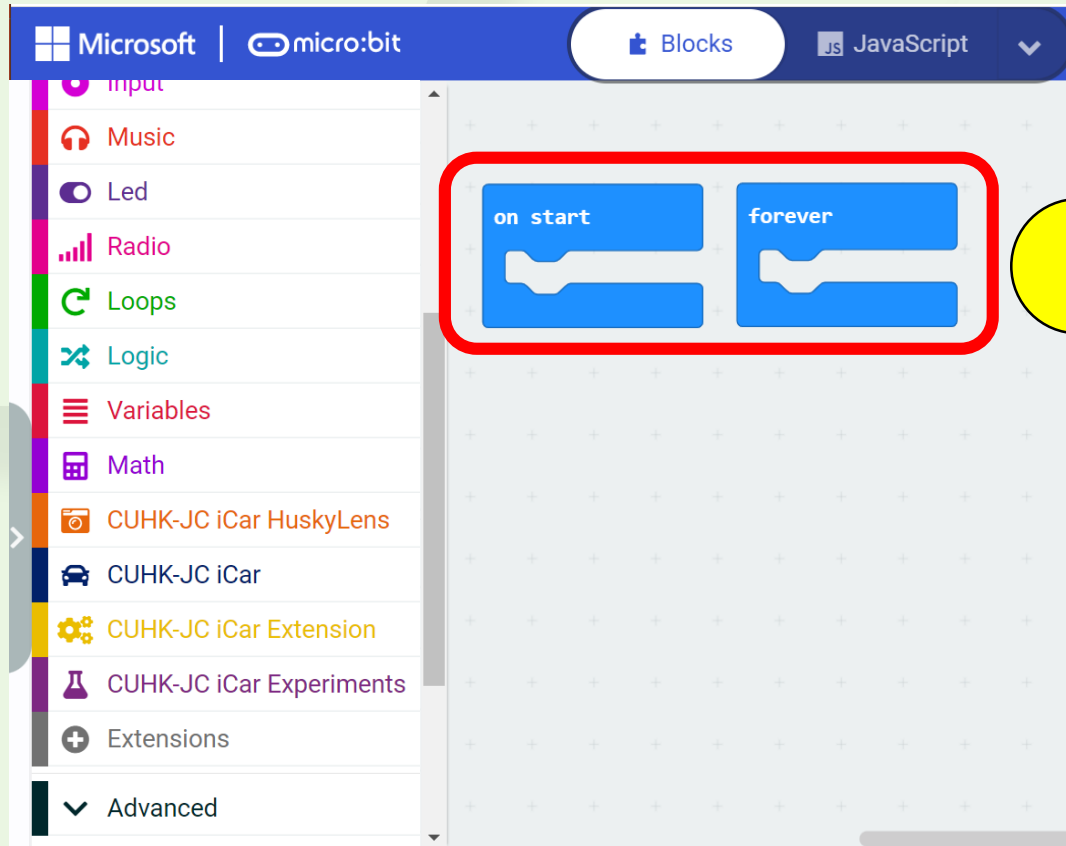
Variables Modules



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

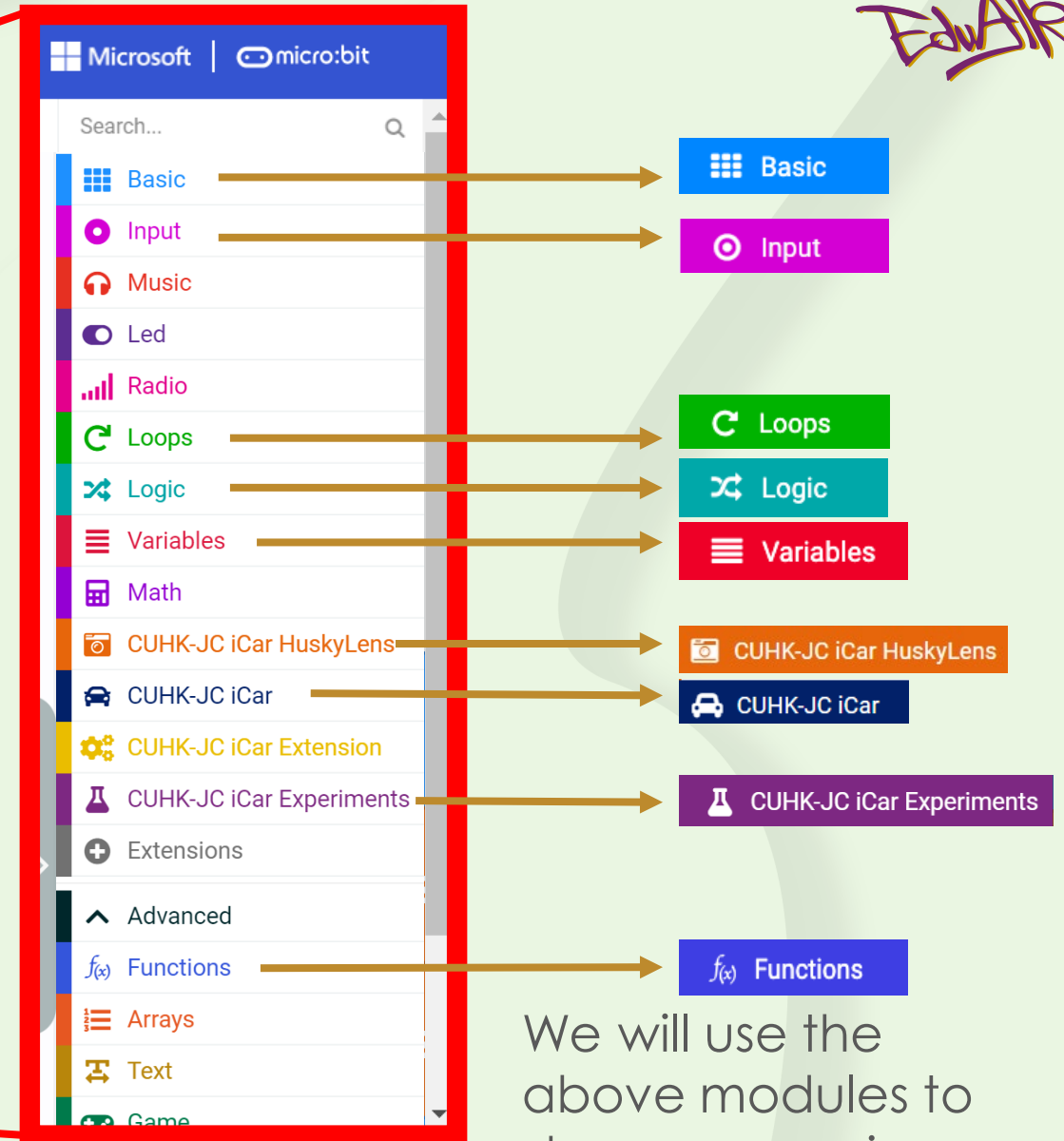
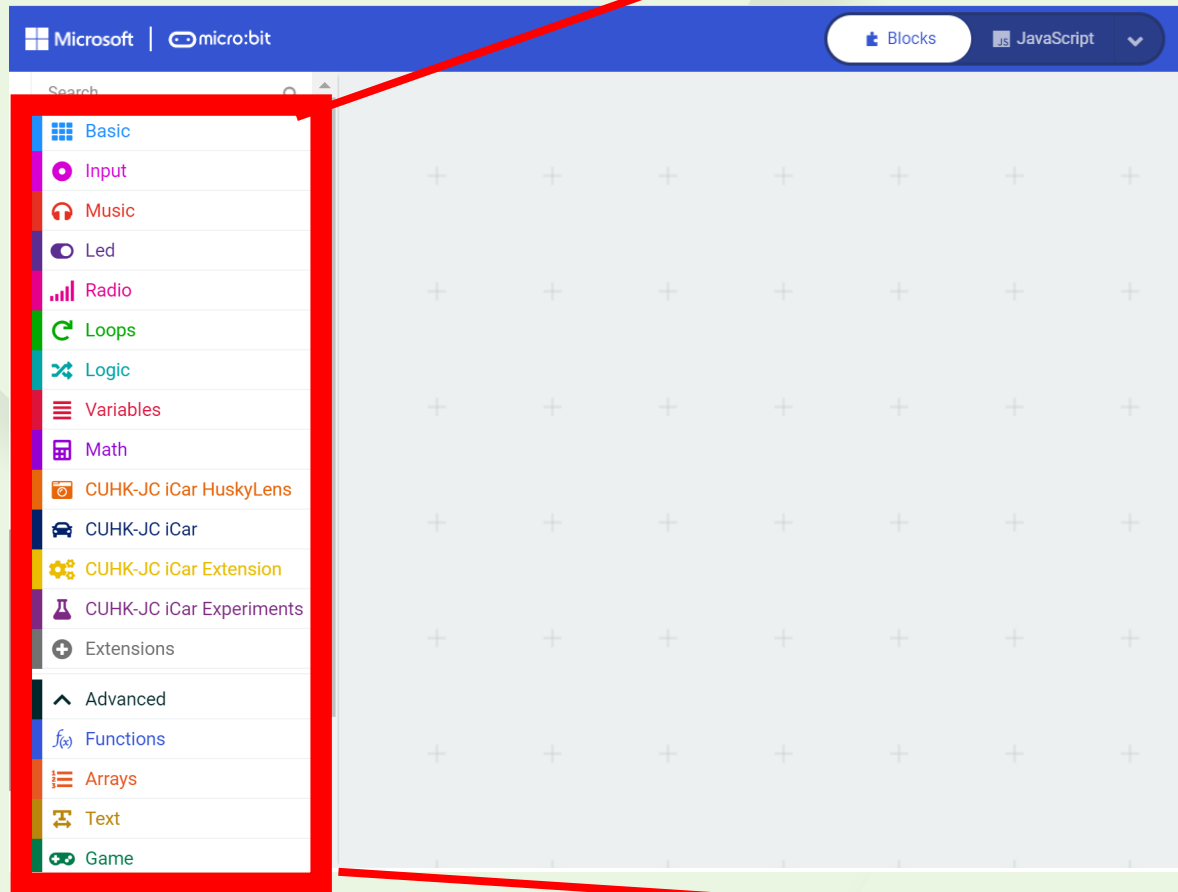


Let's start coding!



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

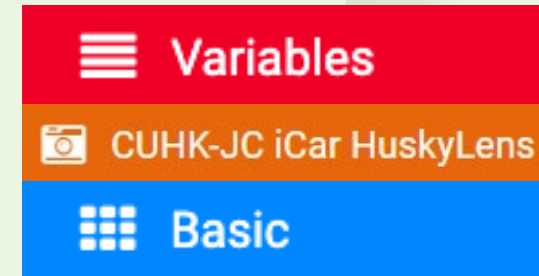
We can ignore them for now.
Please don't delete!



We will use the above modules to do programming.



You can find the blocks from the following:







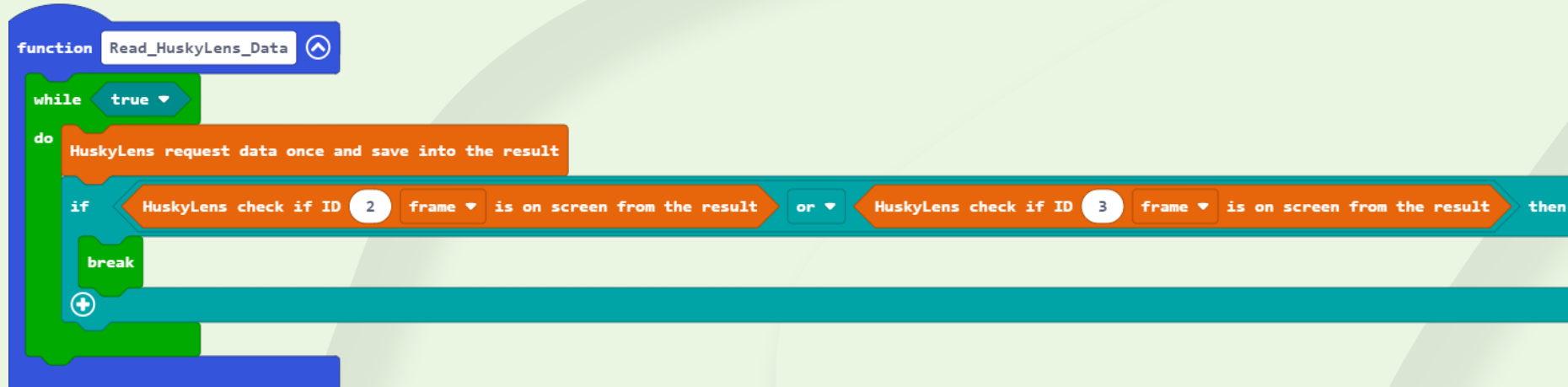
```

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 if
end do

```

You can find the blocks from the following:

-  Functions
-  Loops
-  Logic
-  CUHK-JC iCar



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:


$f(x)$ Functions


 CUHK-JC iCar



 Basic

You can find the blocks from the following:

$f(x)$ Functions

 CUHK-JC iCar

 Basic

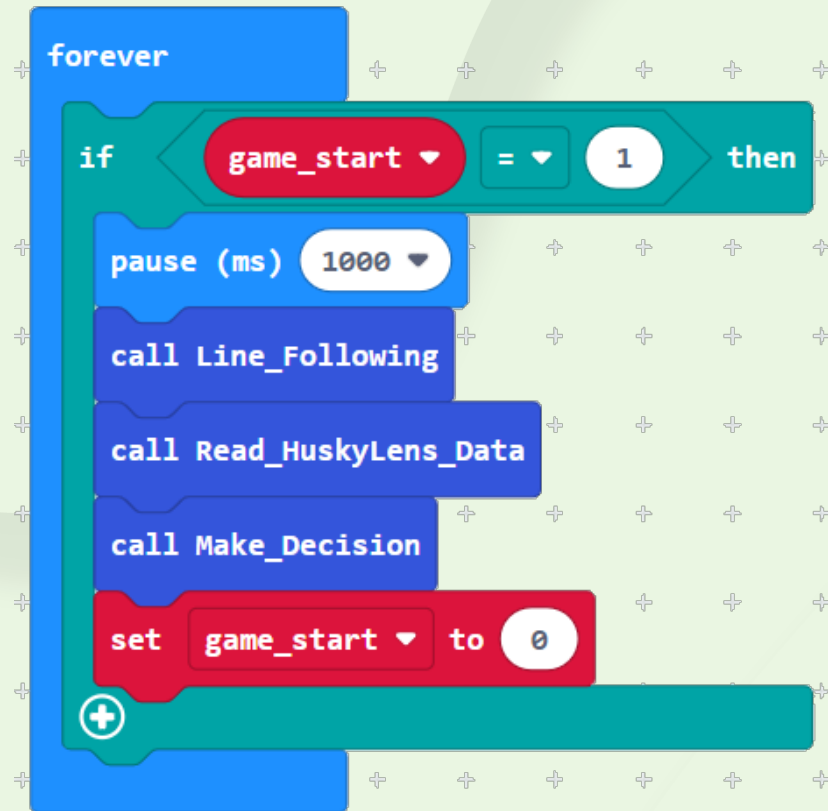
- $f(x)$ Functions
- \Leftrightarrow Logic
-  CUHK-JC iCar HuskyLens
-  Basic



You can find the blocks from the following:

Input

Variables



You can find the blocks from the following:

 Logic

 Variables

 Basic

 Functions



Finished!

EduAIR

```
on start
  set game_start to 0
  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
```

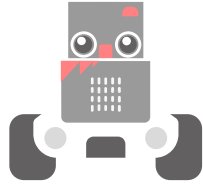
```
function Line_Following
  while true
    do
      if is Left iCar line detector Whiteline ? and is Right iCar line detector Whiteline ? then
        iCar Move Forward at speed 40 %
      else if is Left iCar line detector Whiteline ? and is Right iCar line detector Blackline ? then
        iCar Rotate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

```
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
```

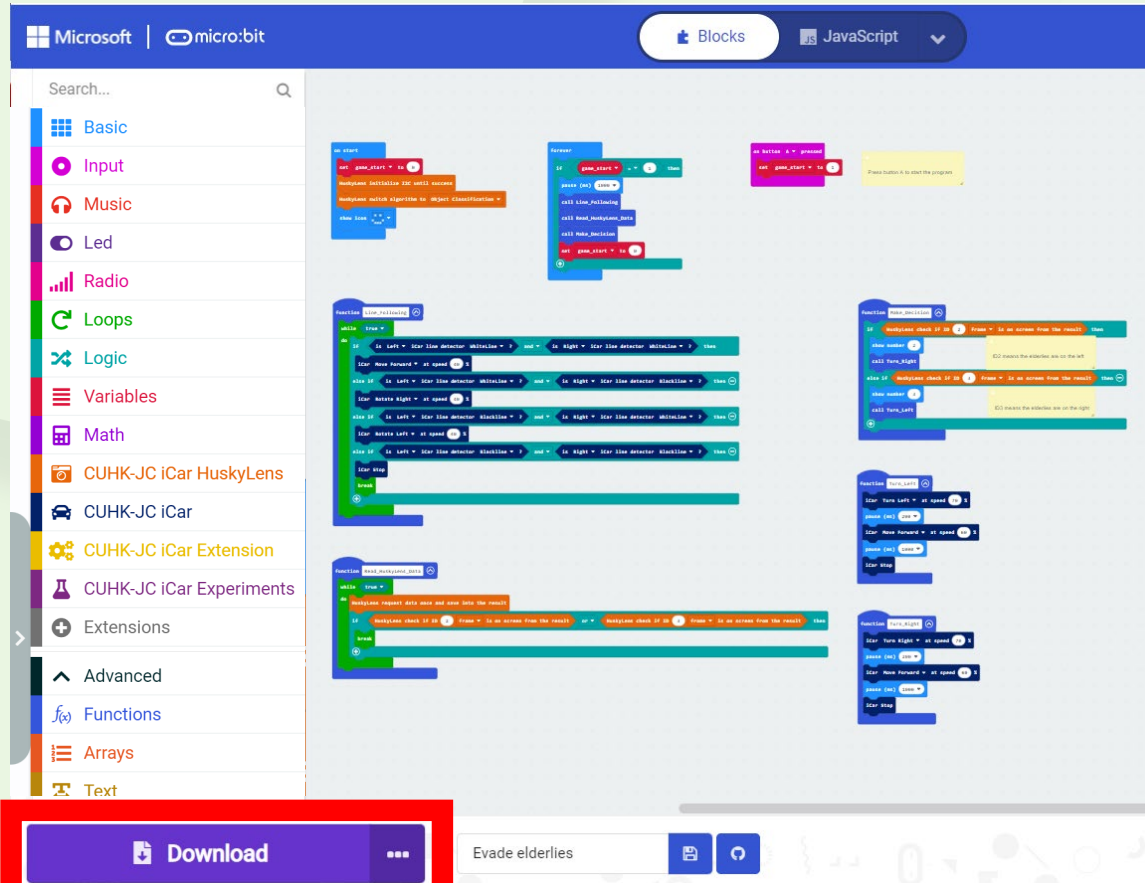
```
function Make_Decision
  if Huskylens check if ID 2 frame is on screen from the result then
    show number 2
    call Turn_Right
  else if Huskylens check if ID 3 frame is on screen from the result then
    show number 3
    call Turn_Left
```

```
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
```



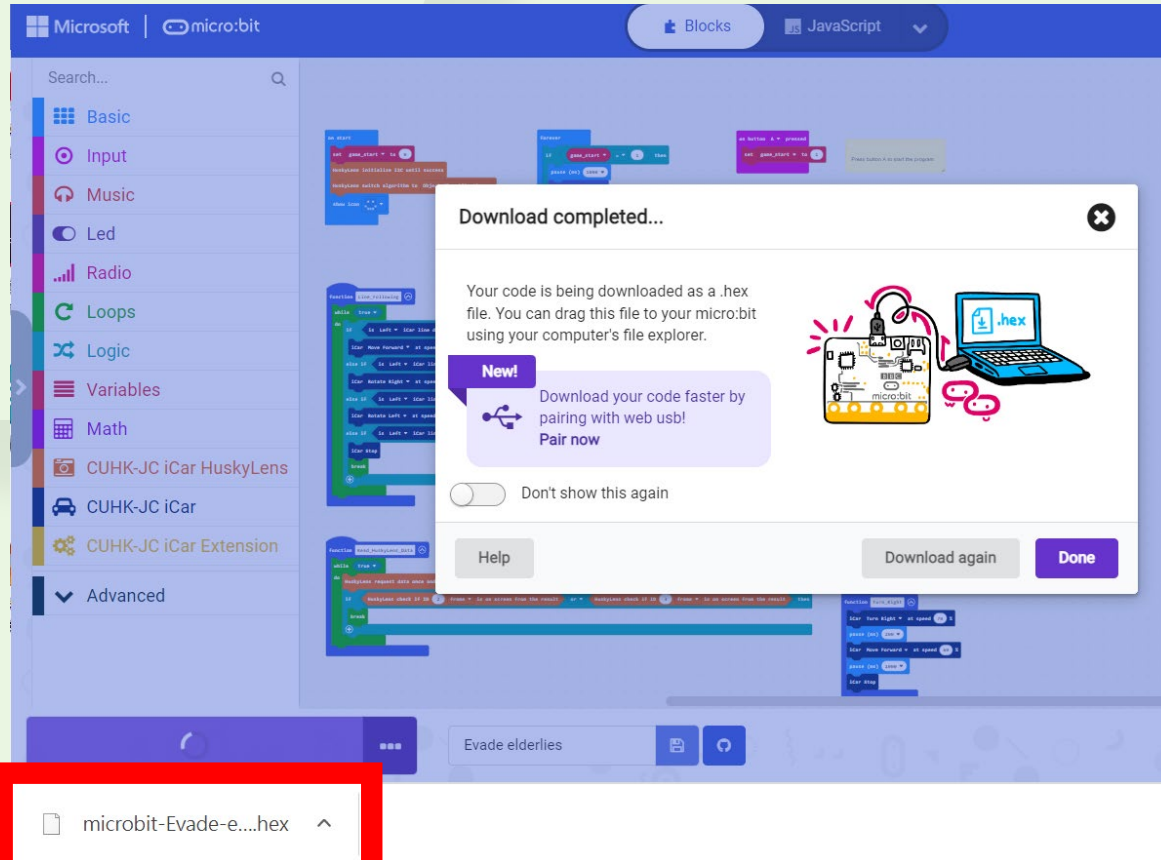
Download The Program To CUHK iCar



Step 1:

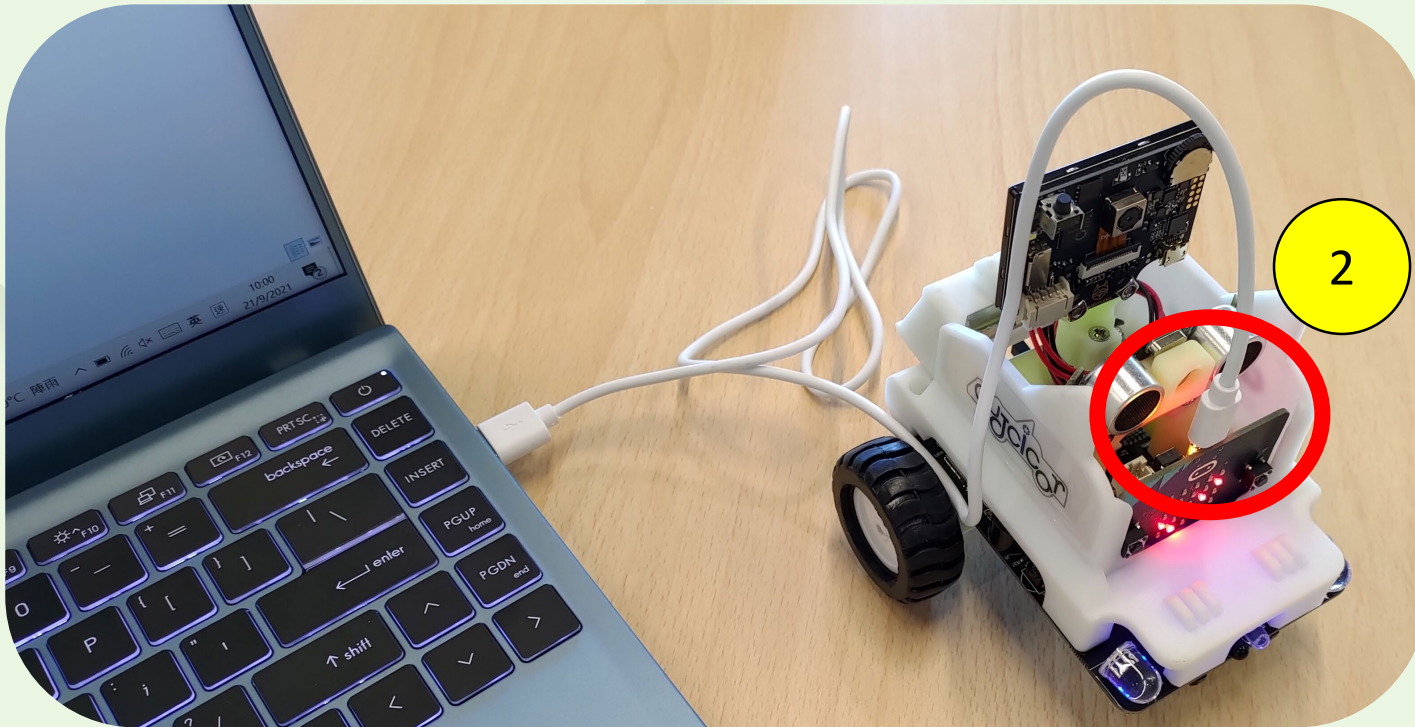
Click

Download

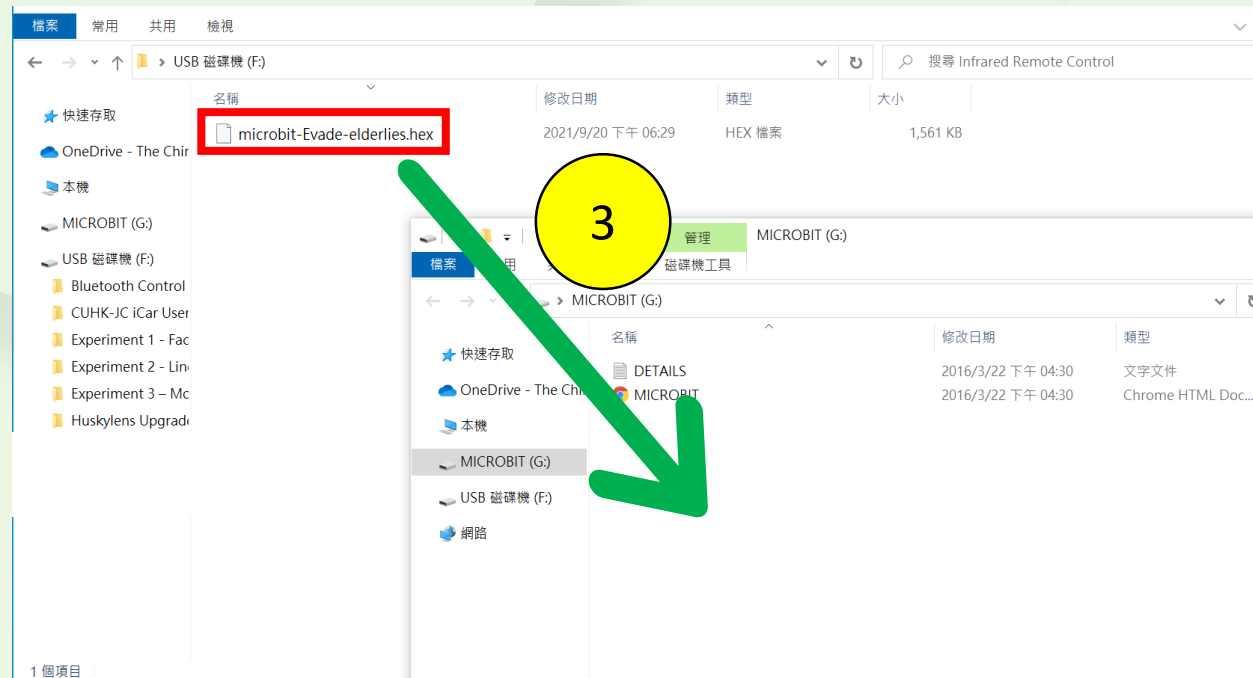


The hex file is downloaded!

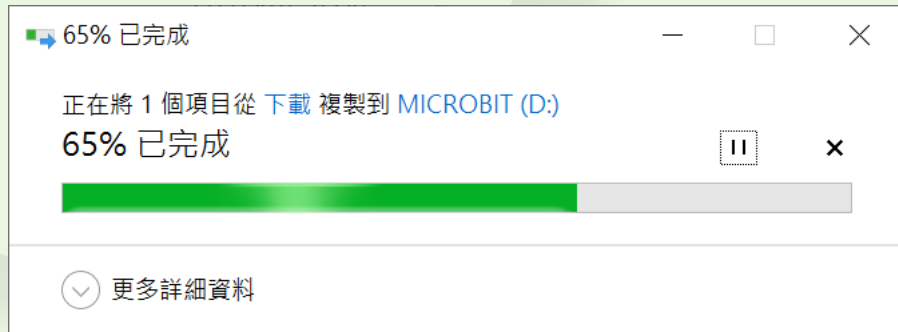




Step 2:
Connect the micro:bit to
computer by a micro USB cable



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!



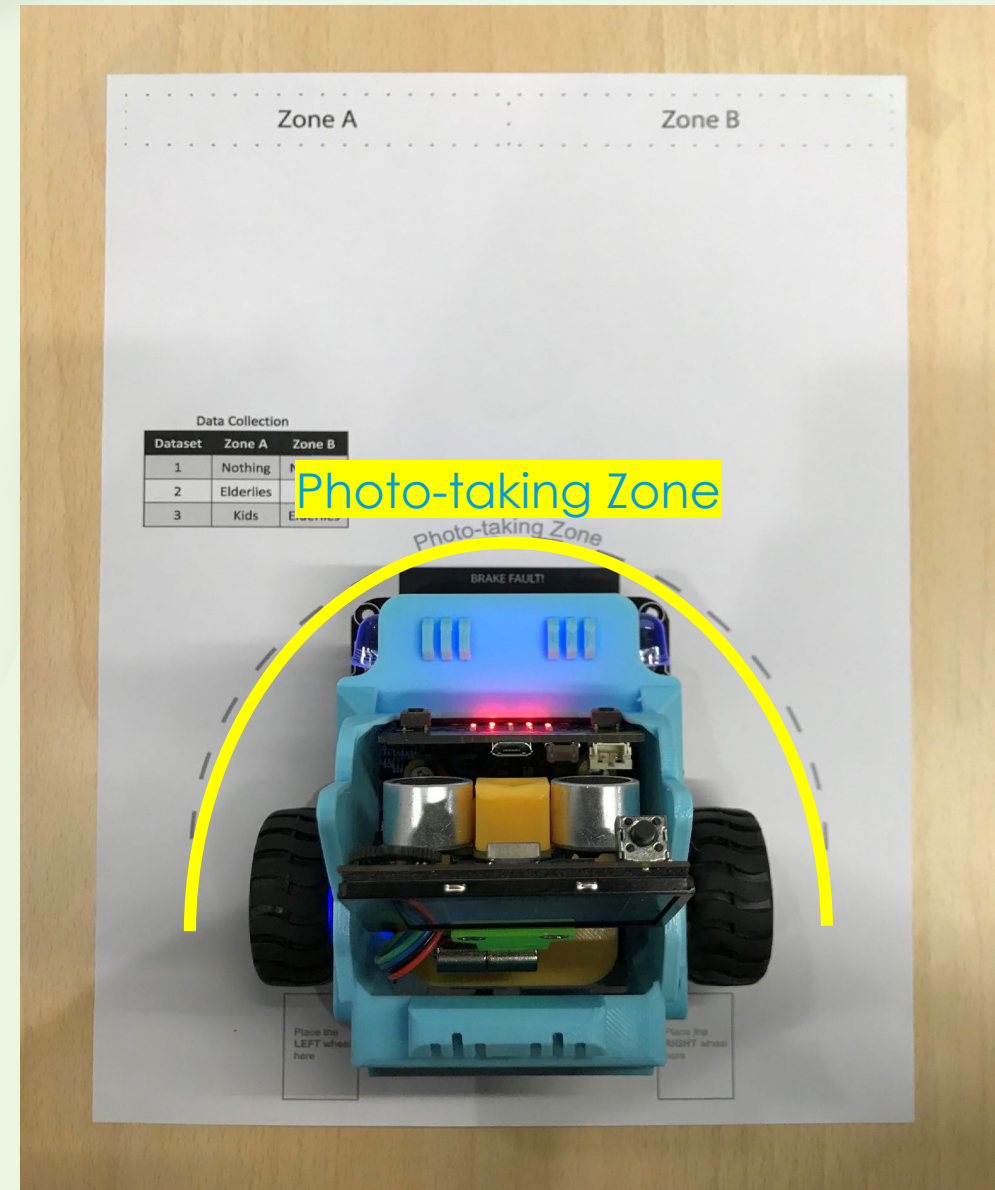


Data Collection



Step 1:

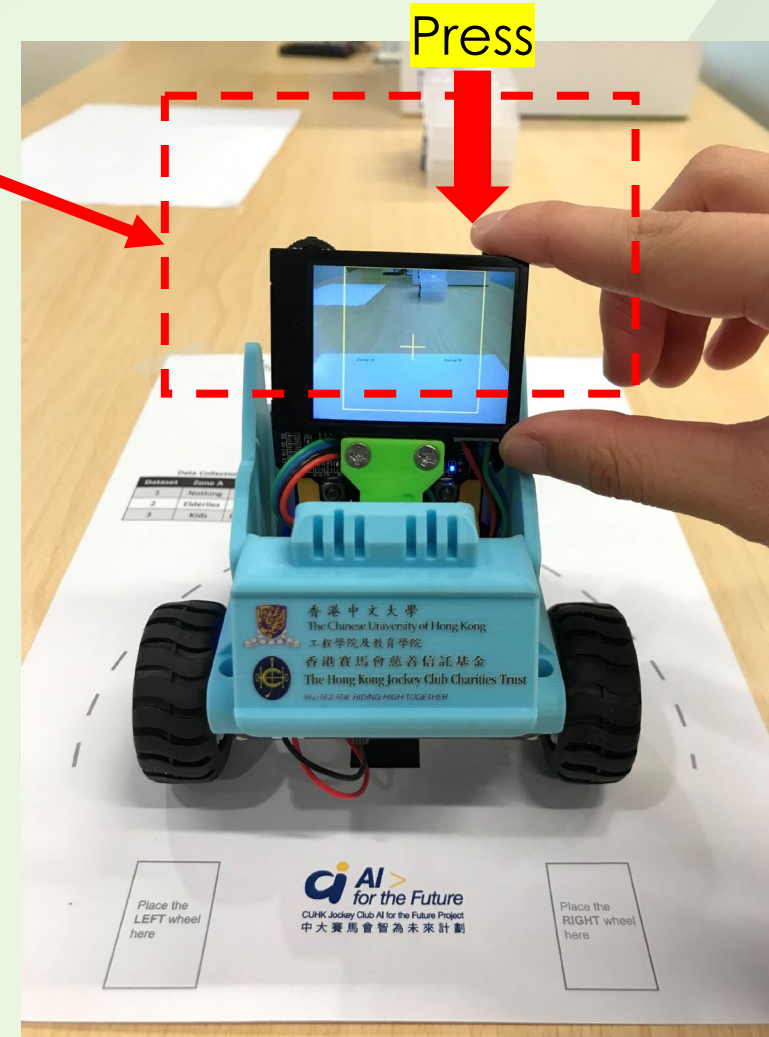
Place the track onto the table, and the CUHK iCar on the Photo-taking Zone



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!

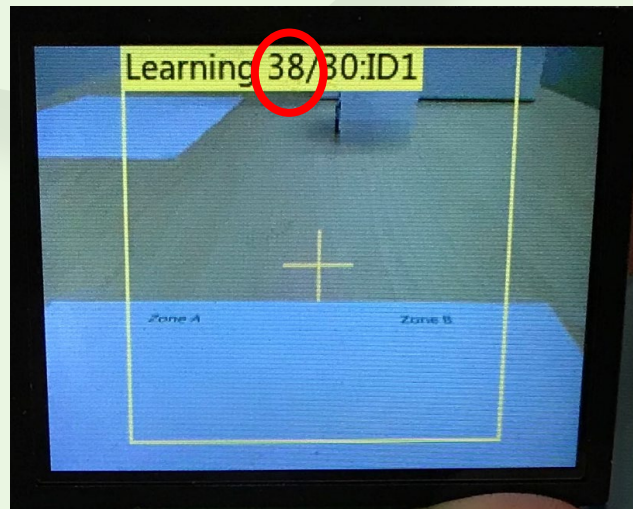


Press



Step 3:

Release the learning button after the number reaches 30



Step 4:

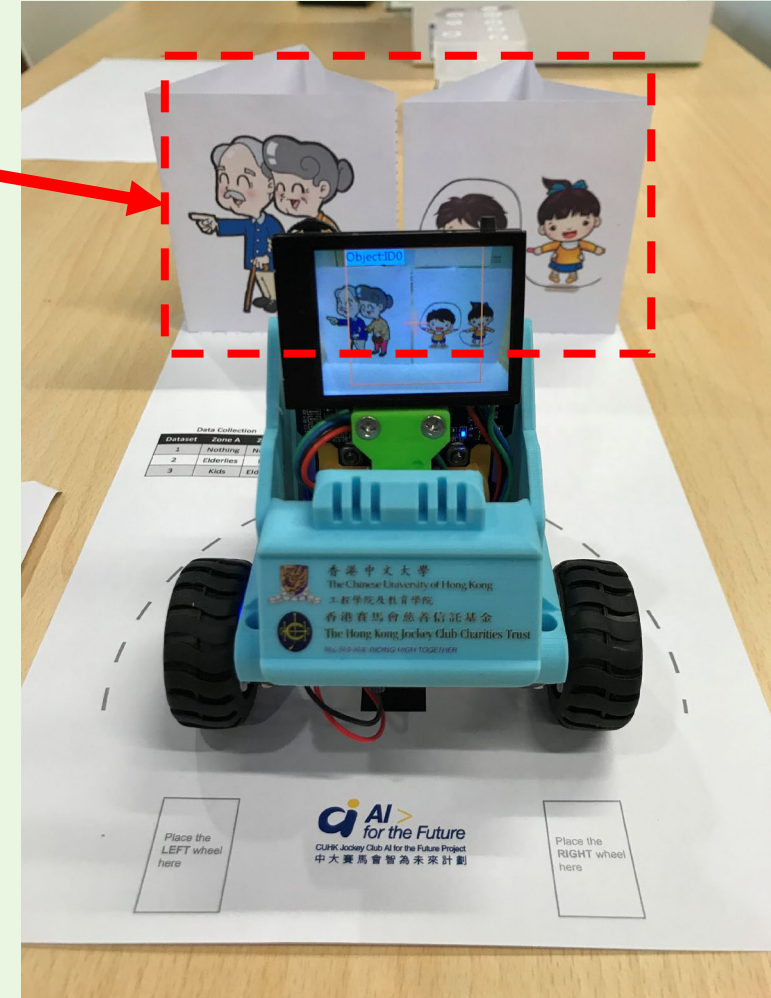
Press the learning button again
before the countdown ends



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!

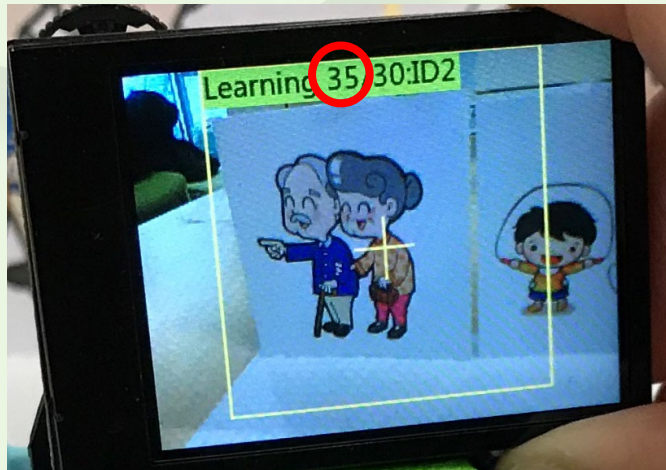


Press



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!

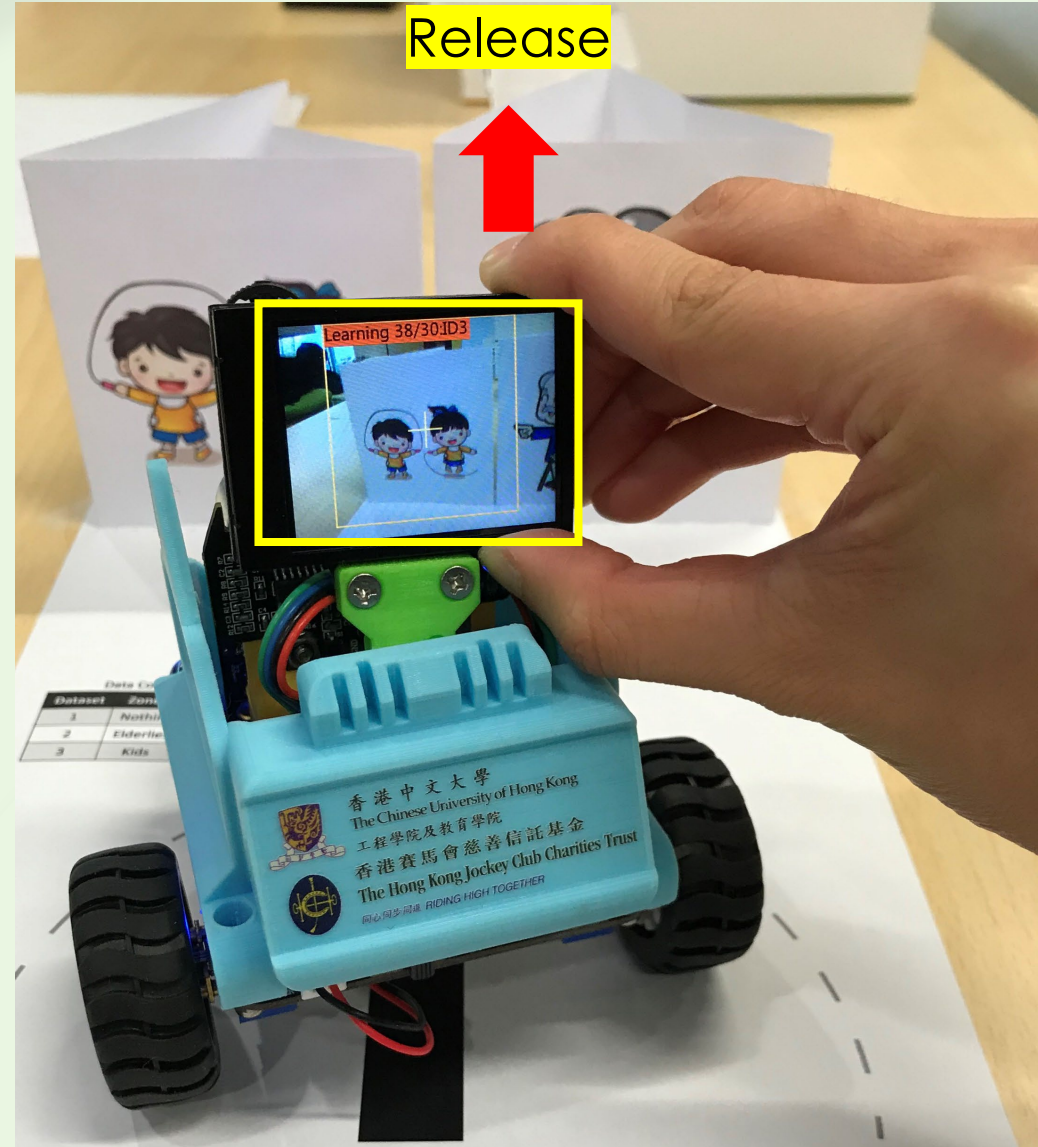


Press



Step 9:

Release the learning
button after the number
reaches 30



Dataset	Zone
1	Nothing
2	Elderly
3	Kids

Step 10:

Wait for the

countdown ends





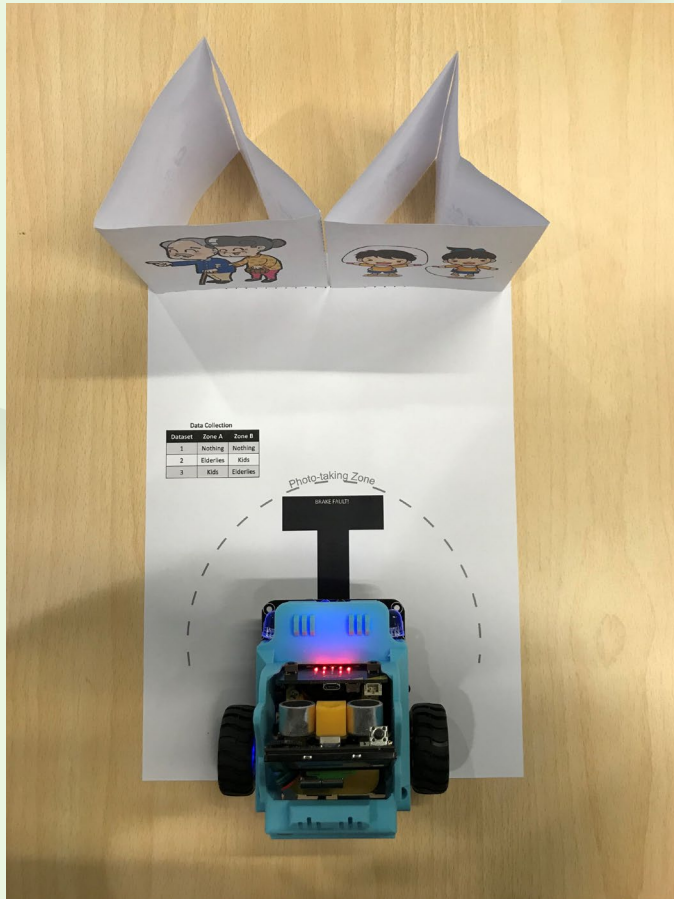
You've collected all the data needed!

Let's conduct the experiment!



Step 1:

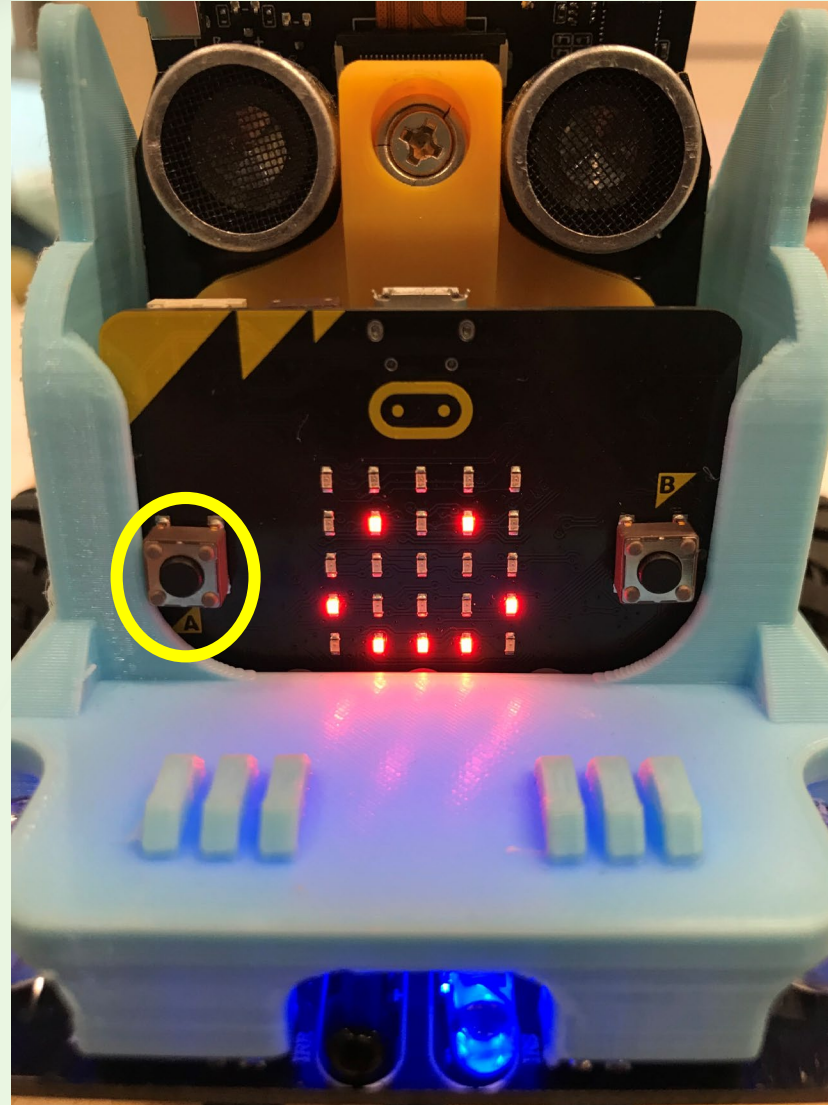
Place the paper models in the designated zones and place CUHK iCar on the starting point



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

Step 2:

Press **button A** on micro:bit



Simulation

Program: Evade Elderlies

Paper Model: Dataset 2



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



CUHK iCar has trouble braking!



It will evade the elderlies.

Simulation

Program: Evade Elderlies

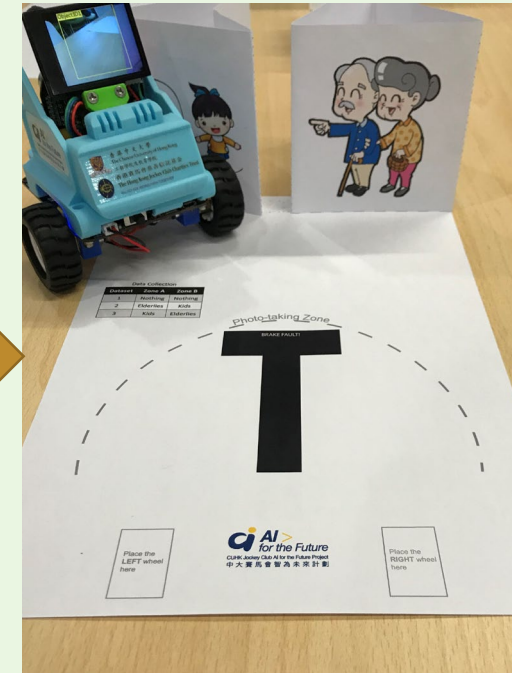
Paper Model: Dataset 3



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

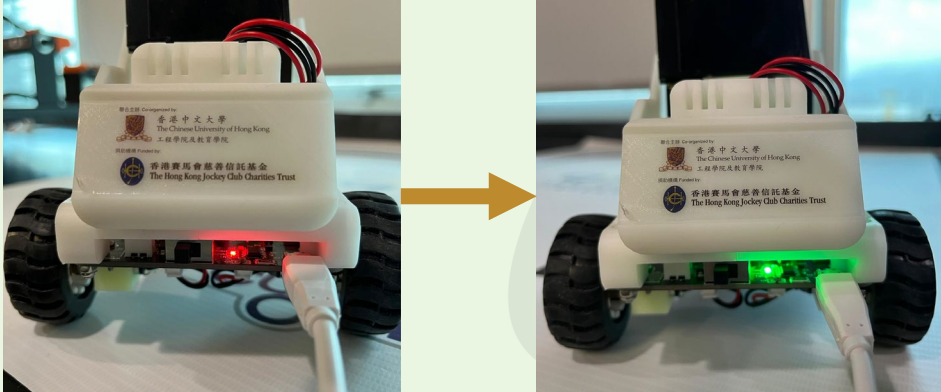


CUHK iCar has trouble braking!



It will evade the elderlies.

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 40