



愛動智教育系統

**CUHK iCar Experiment Manual**  
**Experiment 3: Moral Dilemma Experiment**

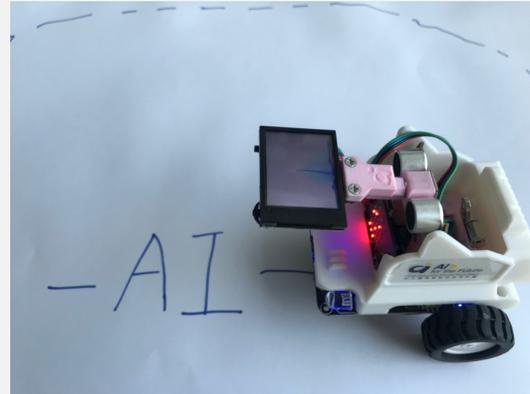
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Write Your Own Code  
(Evade Elderlies)

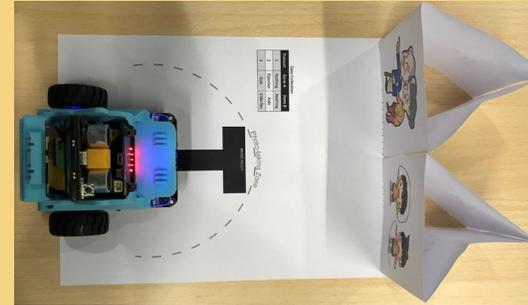
# CUHK iCar



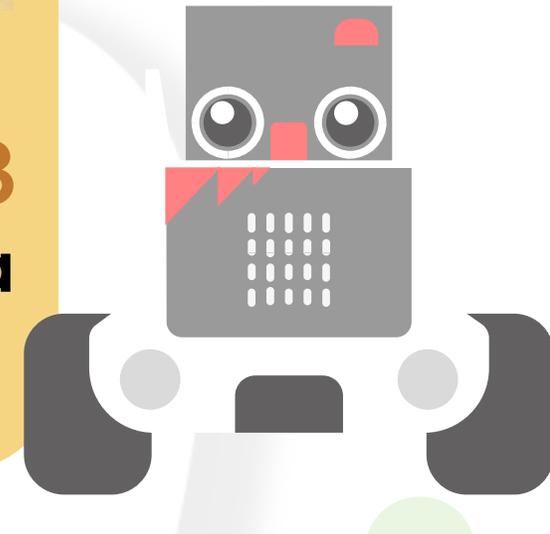
**Experiment 1**  
**Face Following**



**Experiment 2**  
**Line Tracking**



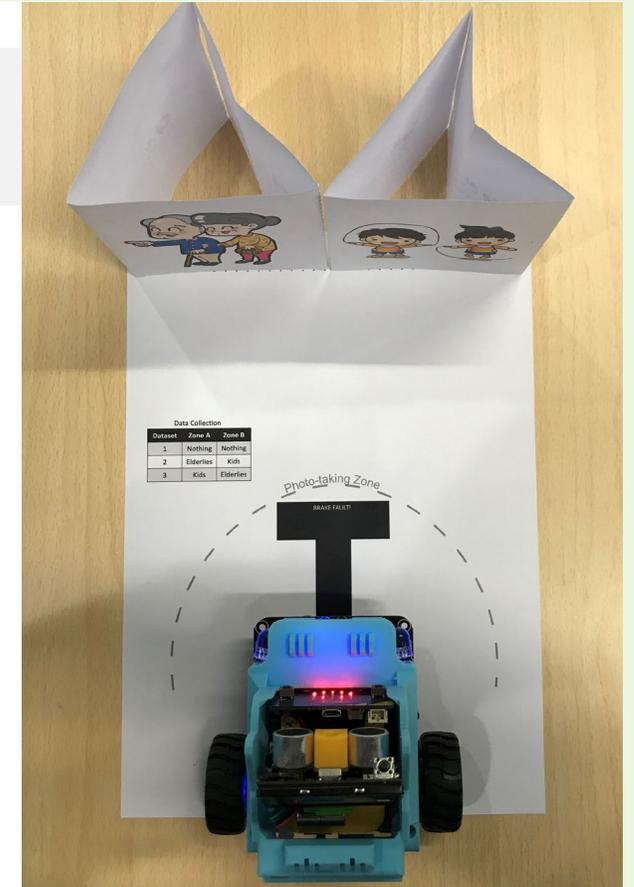
**Experiment 3**  
**Moral Dilemma**



# 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?

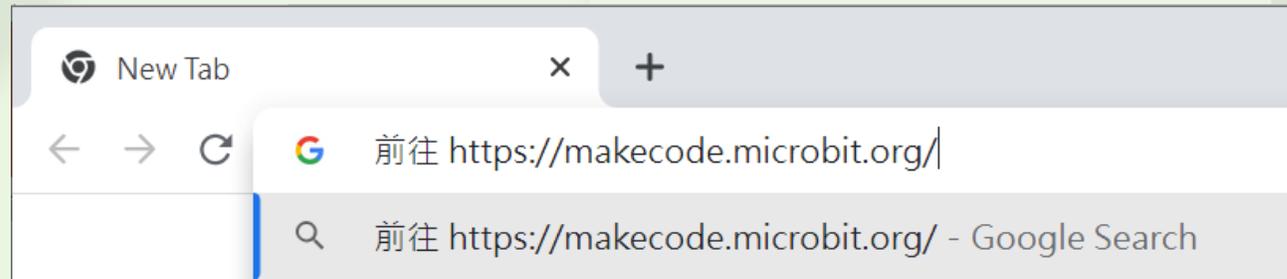




# Code On MakeCode

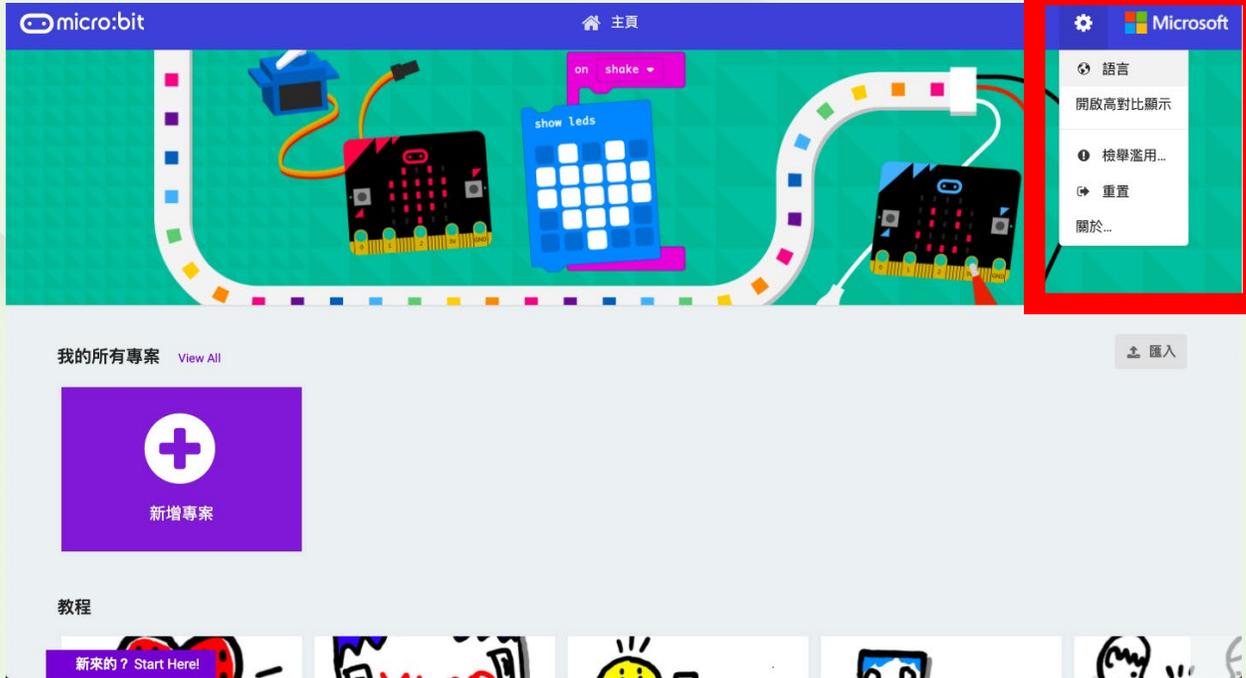


Browse <https://makecode.microbit.org/>





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



1. Click
2. Click

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

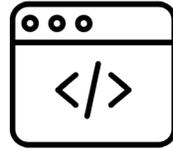
micro:bit 主頁 Microsoft

選擇語言

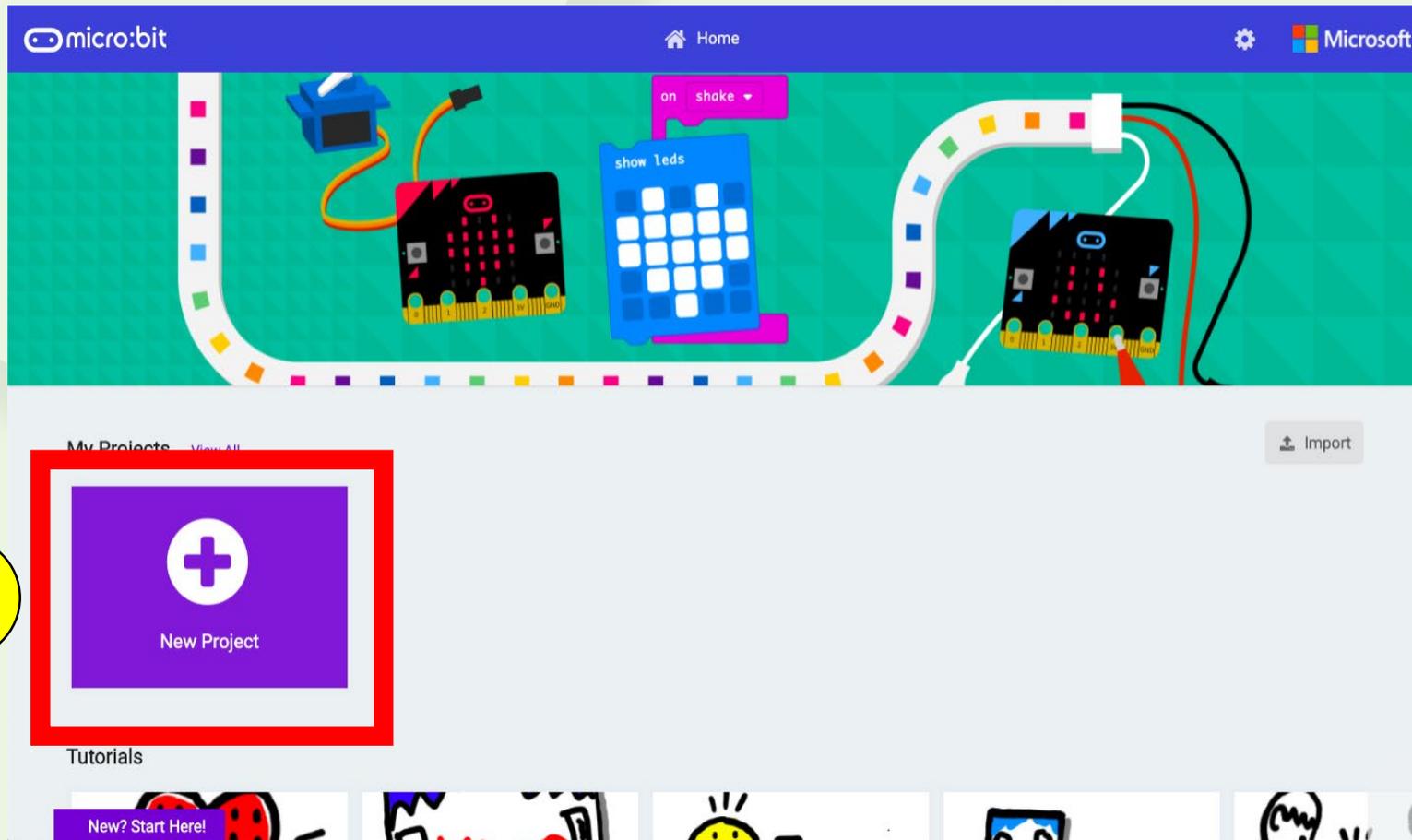
<b>English</b> English	<b>العربية</b> Arabic	<b>български</b> Bulgarian
<b>Čeština</b> Czech	<b>Dansk</b> Danish	<b>Deutsch</b> German
<b>Ελληνικά</b> Greek	<b>Español (España)</b> Spanish (Spain)	<b>Suomi</b> Finnish
<b>Français</b> French	<b>עברית</b> Hebrew	<b>Magyar</b> Hungarian

我的所有專案 匯入

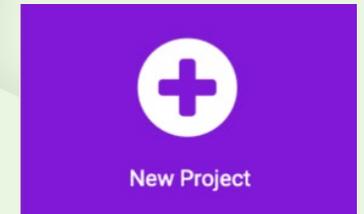
3. Click English



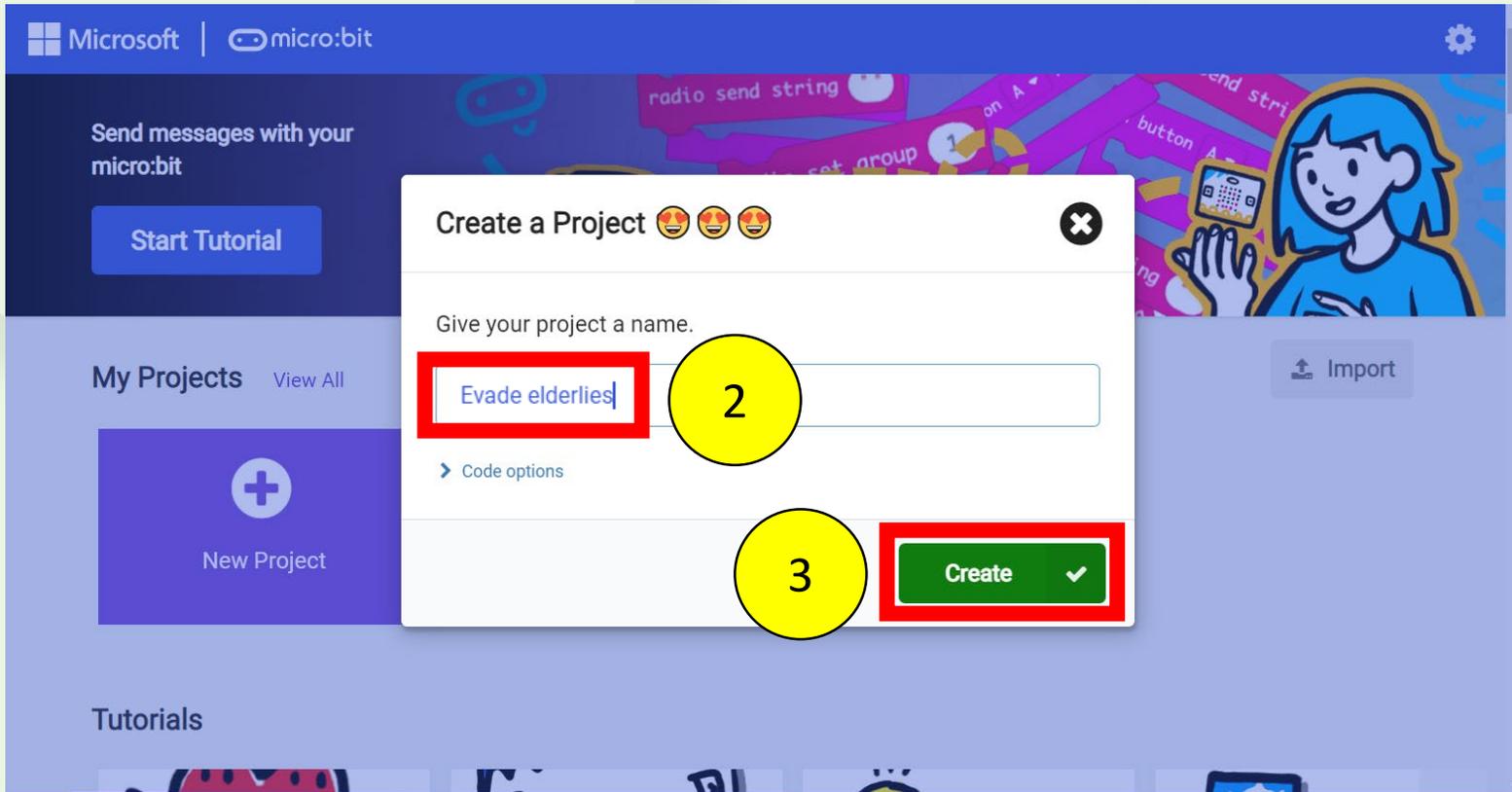
# New Project



1. Click New Project

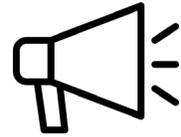


1



2. Enter “Evade elderlies”

3. Click 

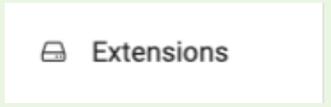


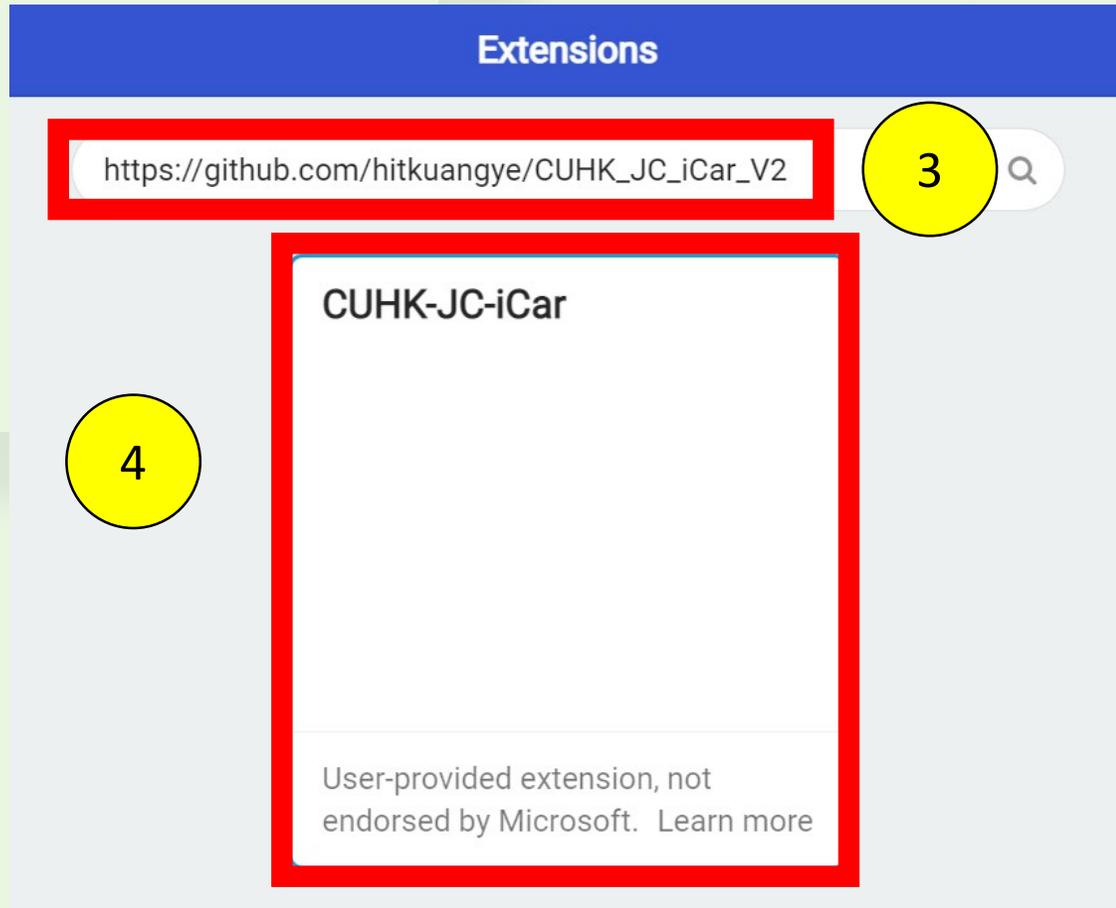
# Prepare CUHK-JC-iCar Extension

1. Click

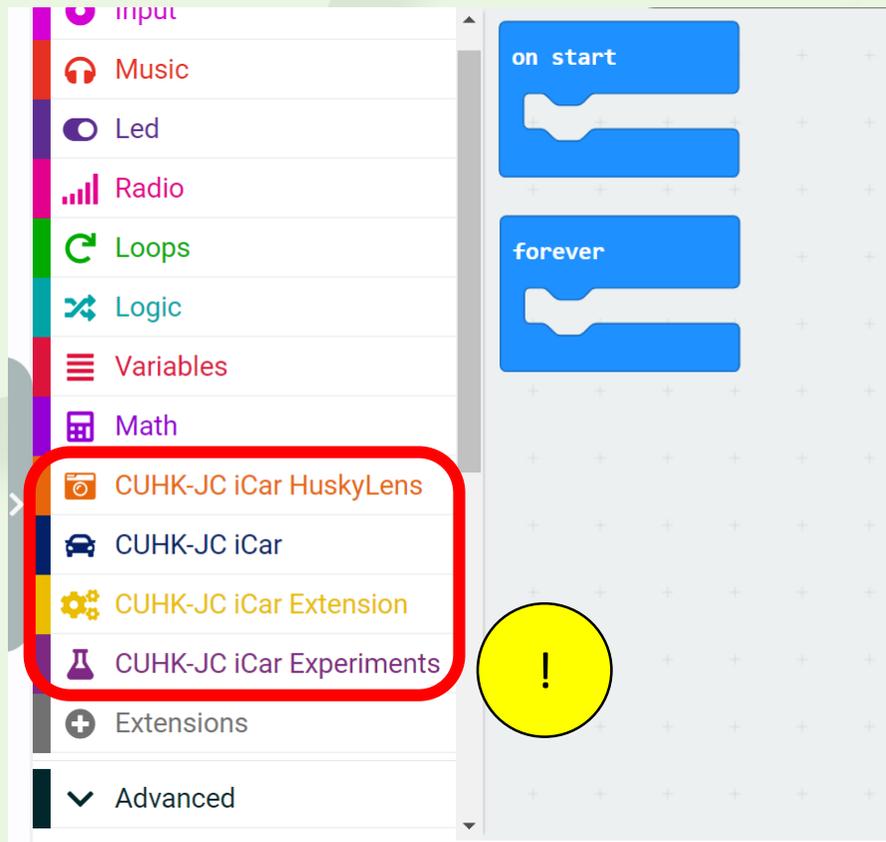


2. Click





3. Paste the following link  
[https://github.com/hitkuangye/CUHK\\_JC\\_iCar\\_V2](https://github.com/hitkuangye/CUHK_JC_iCar_V2)
4. Click CUHK-JC-iCar extension



Extensions are included!

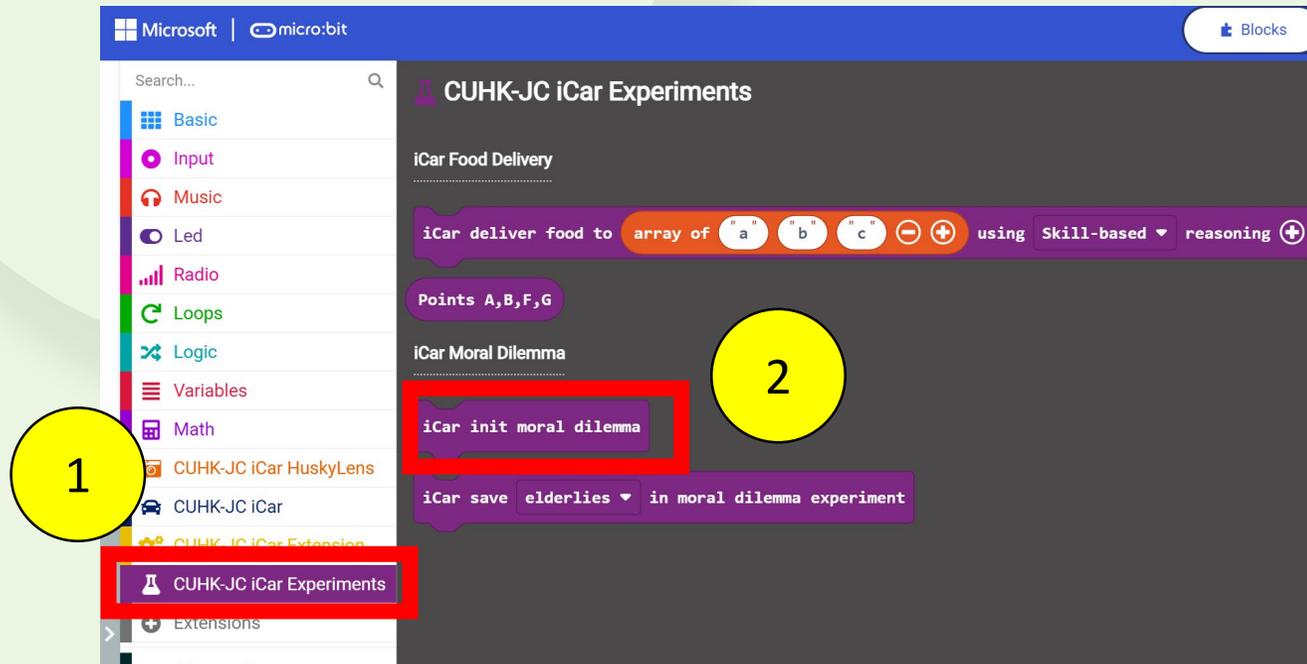
# Complete the program in two ways



We prepared two options for you:

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

# Option 1: Use Prebuilt Blocks



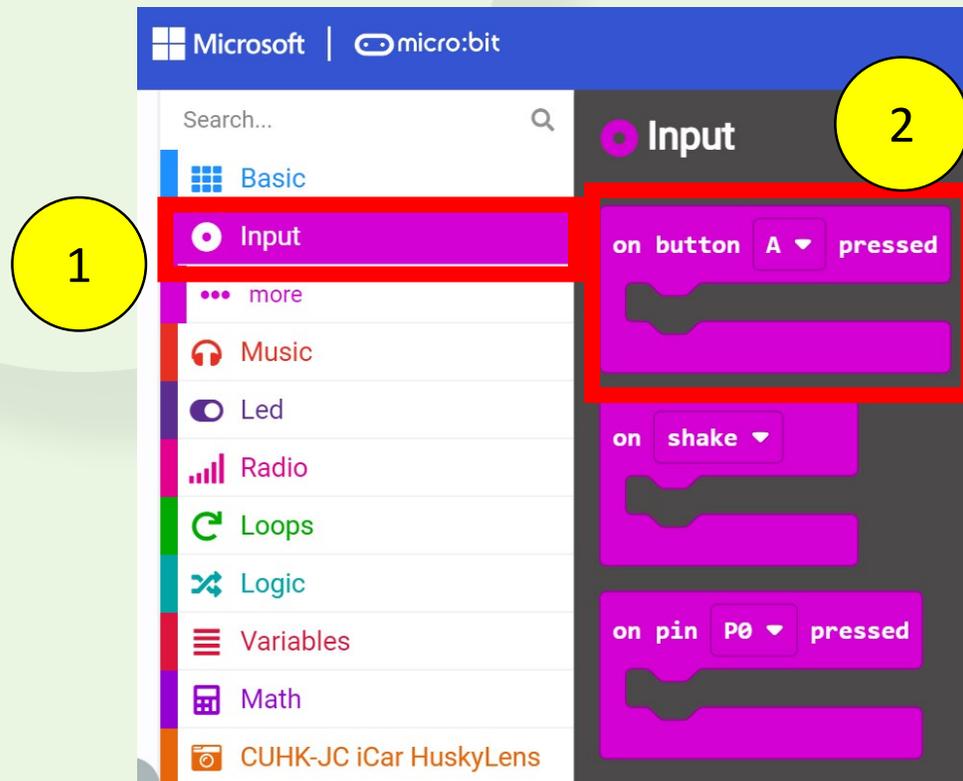
1. Click  from the module list
2. Click 

A blue "on start" block with a purple "iCar init moral dilemma" block nested inside it. The blocks are positioned on the left side of the slide.

```
on start
  iCar init moral dilemma
```

Drag the previous block into the "On Start" Block

# Create on button pressed event



1. Click  from the module list

2. Click 



```
on button A ▼ pressed
  iCar save elderlies ▼ in moral dilemma experiment
```

You can find the blocks from the following:

🎯 Input

🧪 CUHK-JC iCar Experiments



Finished!

EduAIR

on start

iCar init moral dilemma

on button  pressed

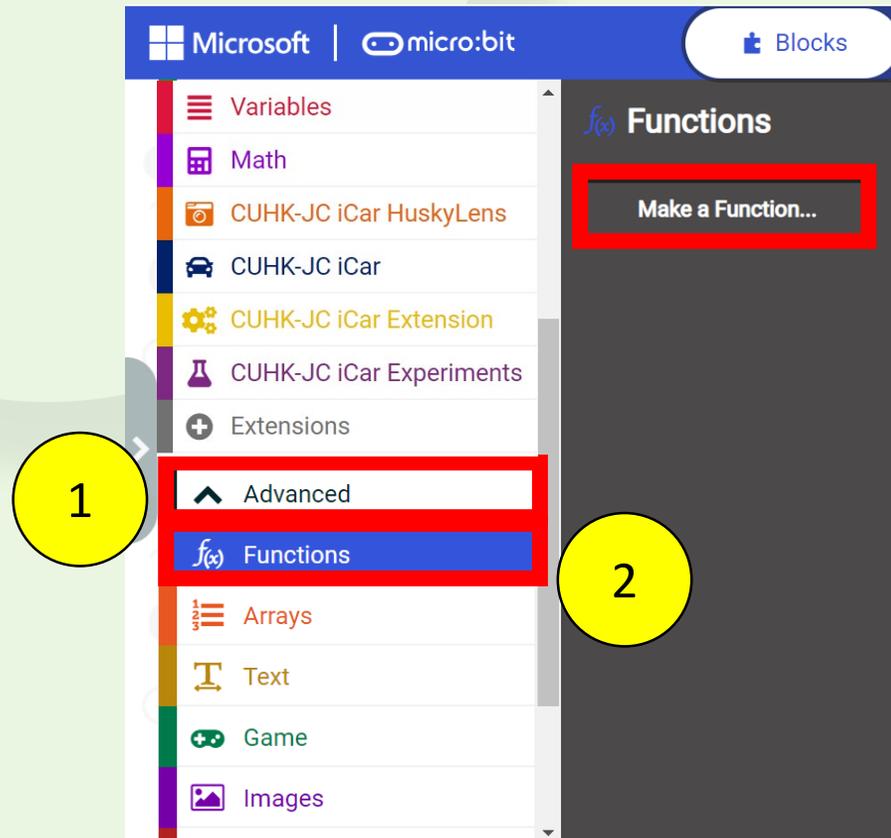
iCar save  in moral dilemma experiment

## Option 2: Program conditions by yourself



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

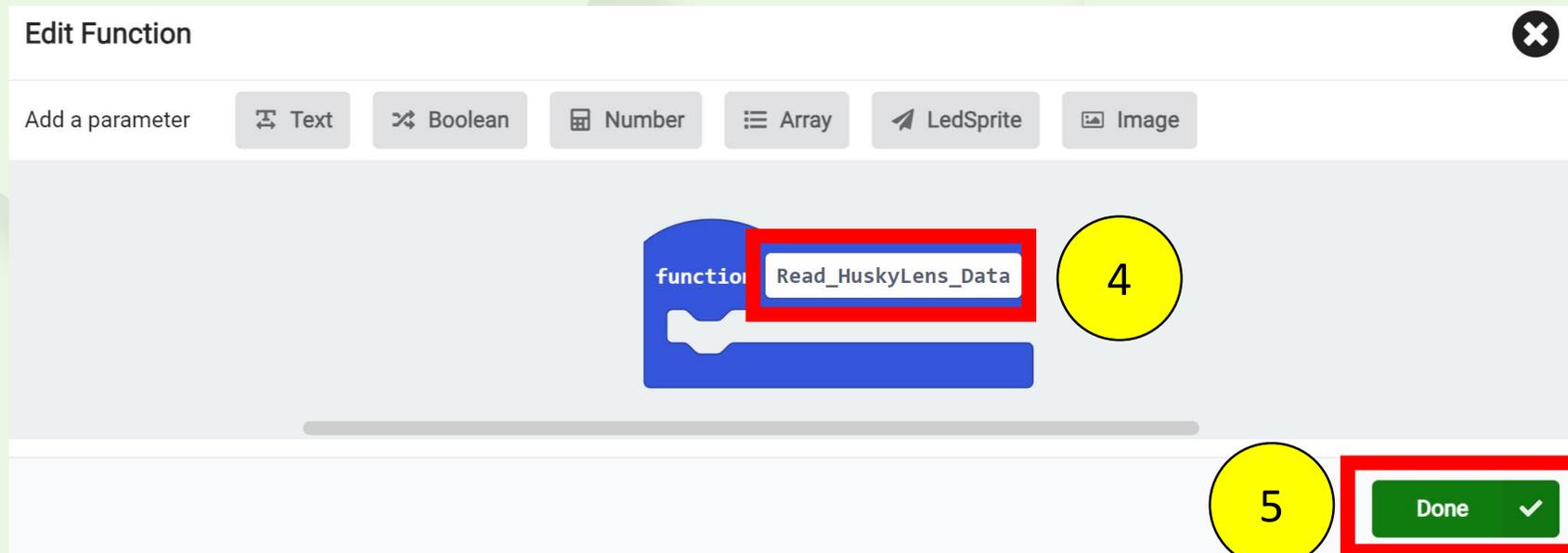
# Functions Modules



1. Scroll to the bottom of module list and click 

2. Click 

3. Click 



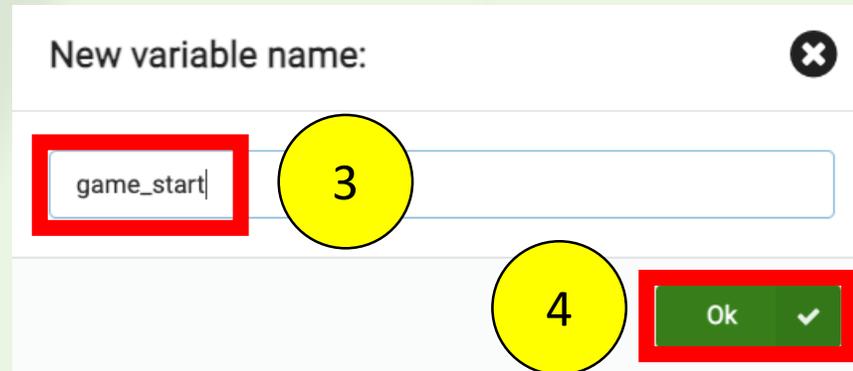
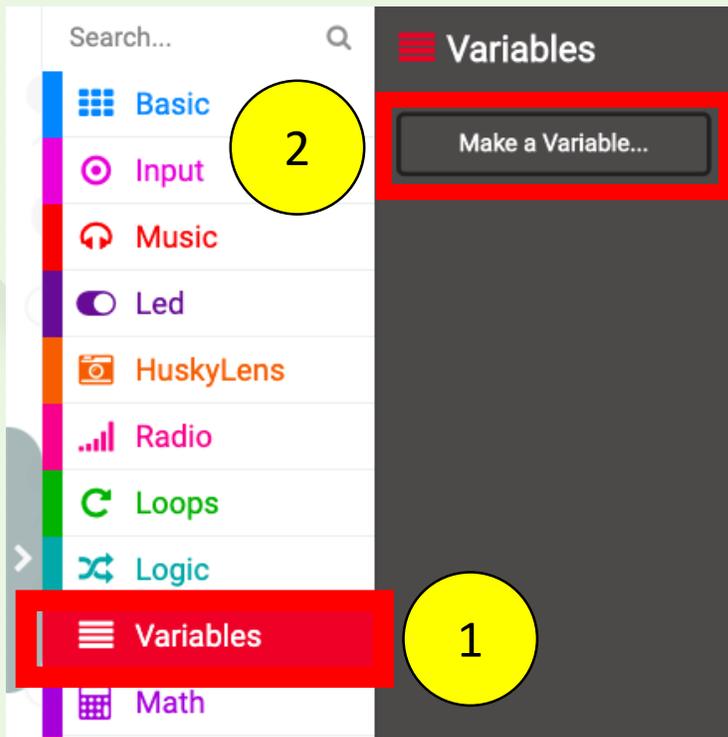
4. Name the function  
"Read\_HuskyLens\_Data"

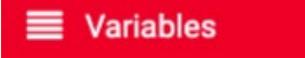
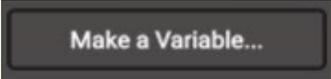
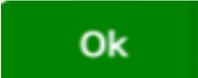
5. Click 

6. "Read\_HuskyLens\_Data"  
function will appear on  
the screen



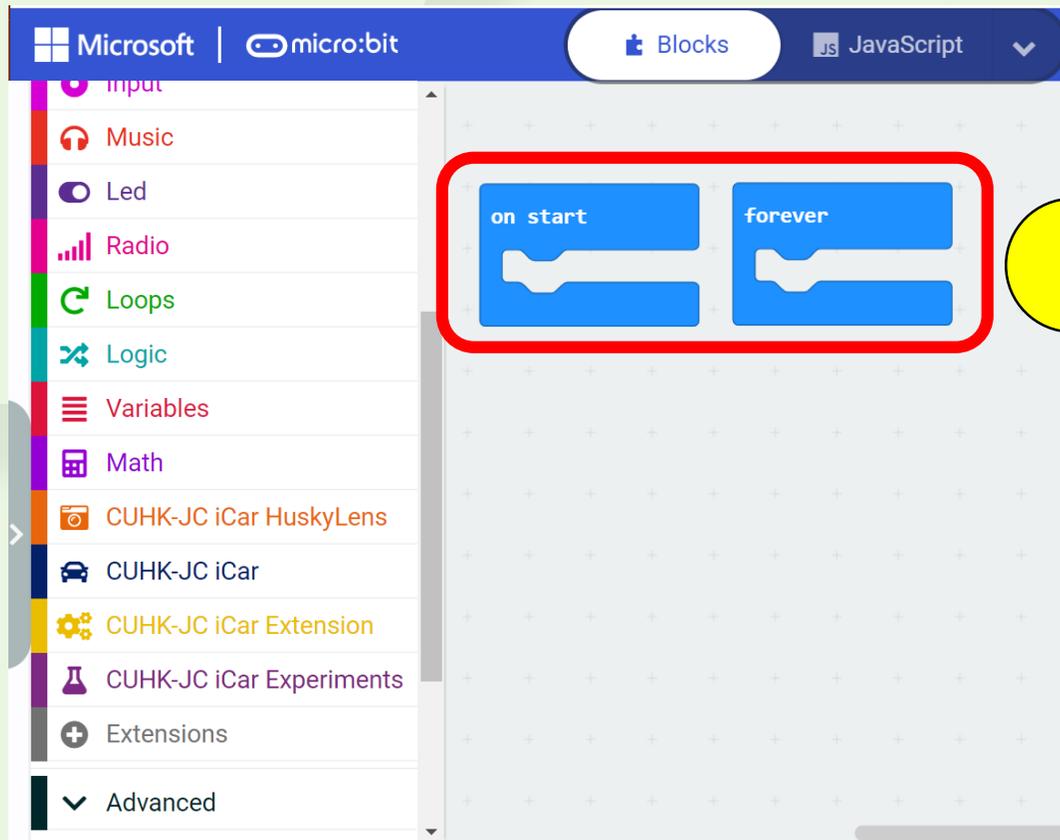
# Variables Modules



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

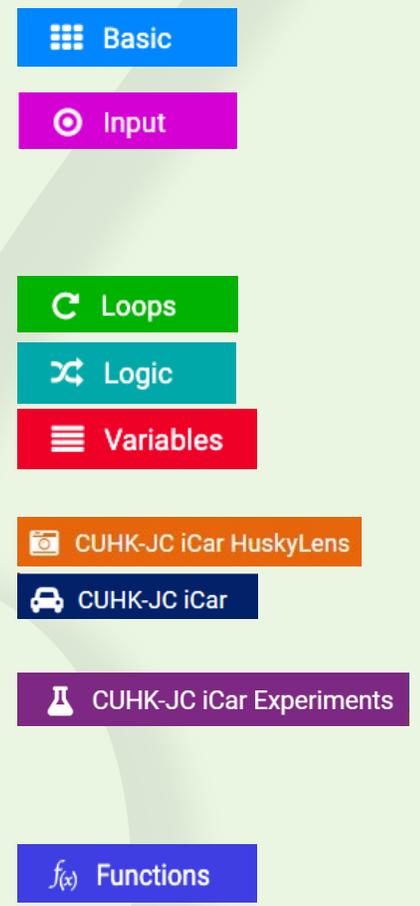
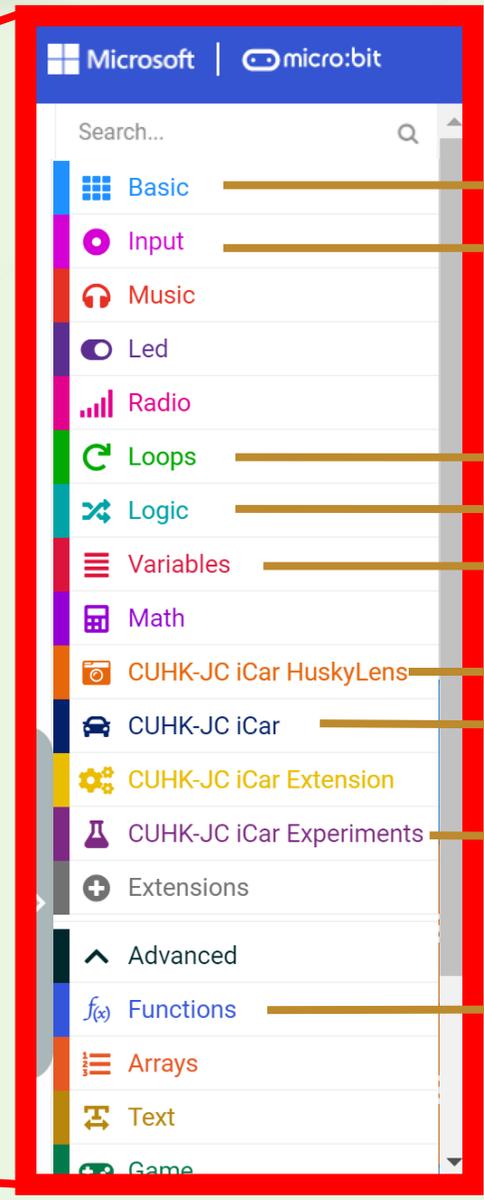
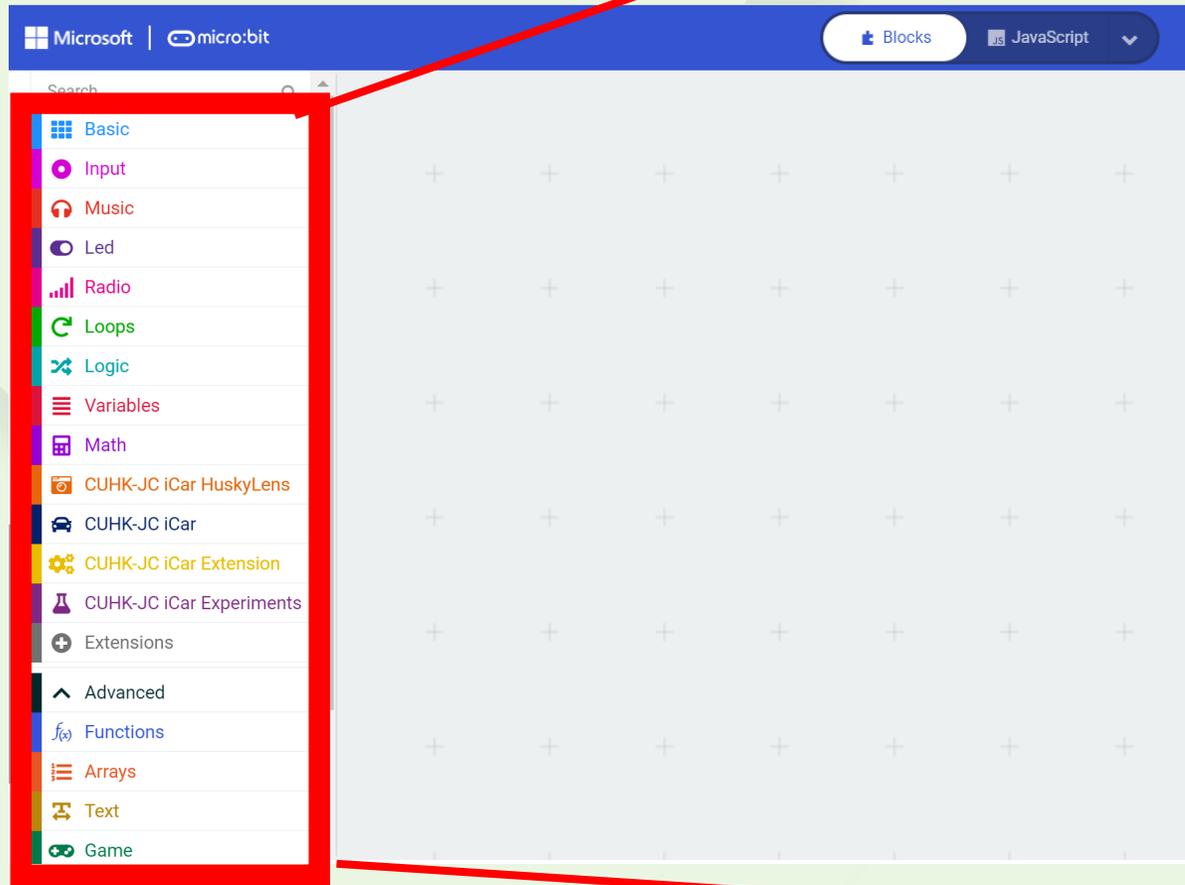


# Let's start coding!



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

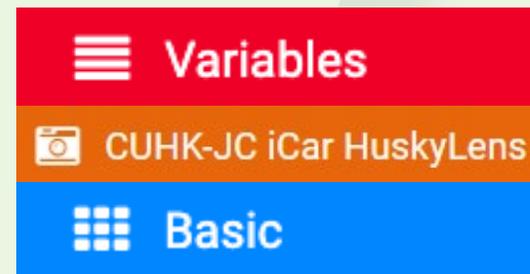
We can ignore them for now.  
**Please don't delete!**



We will use the above modules to do programming.



You can find the blocks from the following:



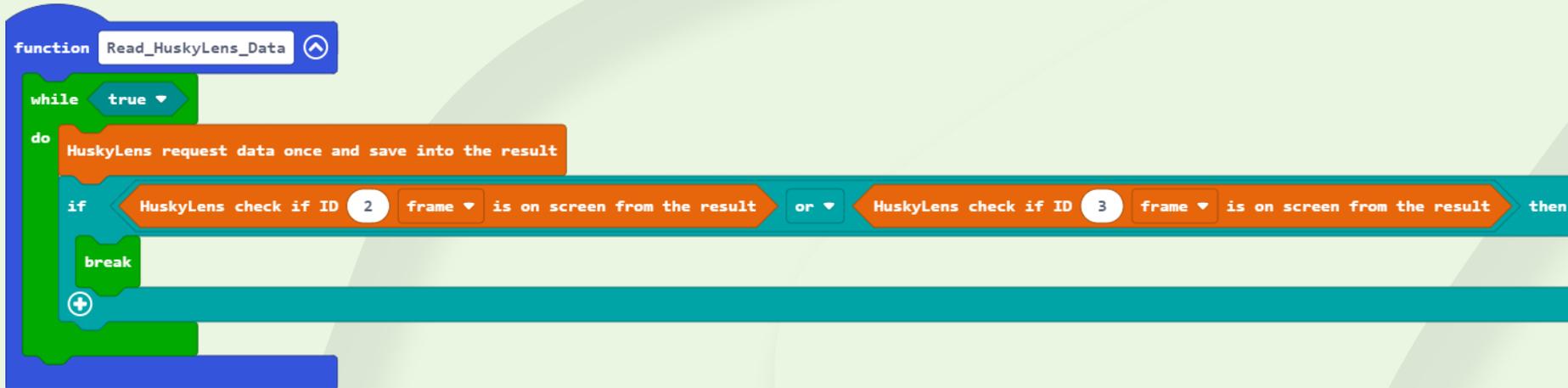
```

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

```

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

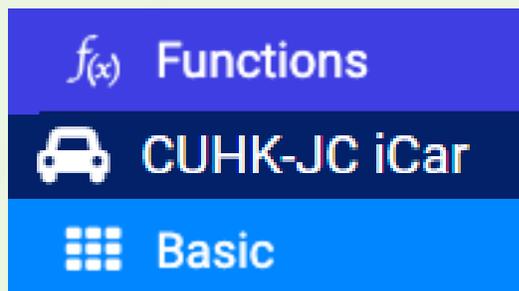
CUHK-JC iCar HuskyLens

Logic

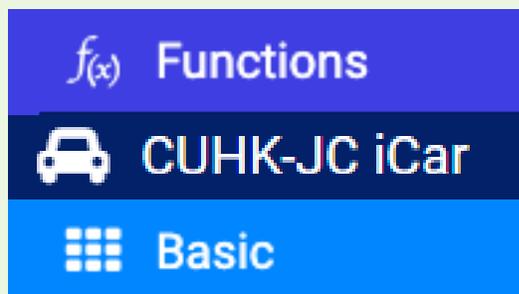
```
function Turn_Left  
iCar Turn Left at speed 70 %  
pause (ms) 200  
iCar Move Forward at speed 60 %  
pause (ms) 1000  
iCar Stop
```

```
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:



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
    call Turn_Right
  else if HuskyLens check if ID 3 frame is on screen from the result then -
    show number 3
    call Turn_Left
  +
```

You can find the blocks from the following:

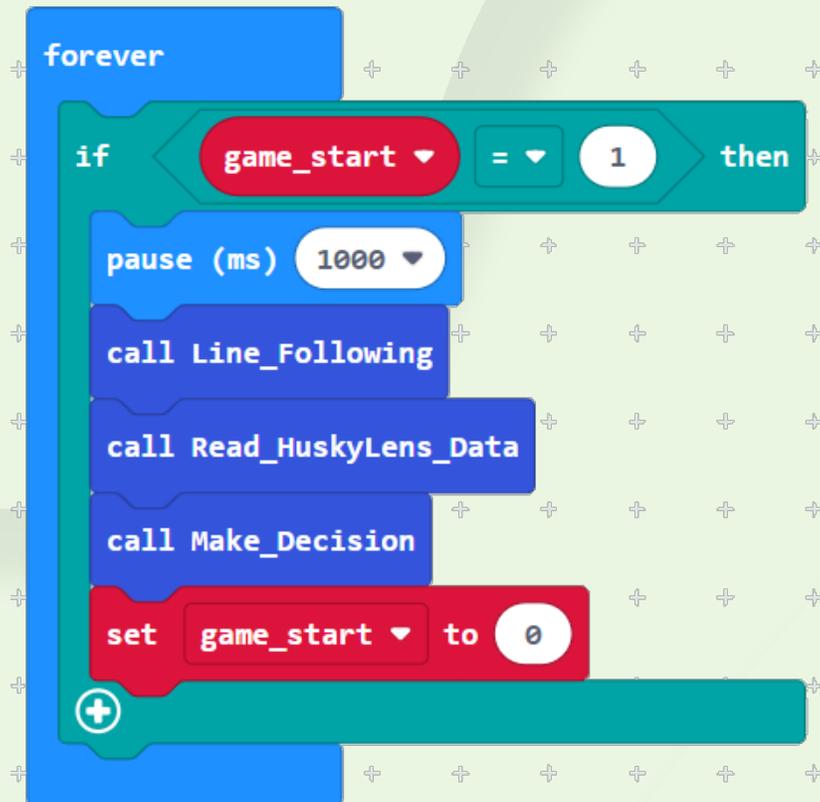
- Functions
- Logic
- CUHK-JC iCar HuskyLens
- Basic



You can find the blocks from the following:

 Input

 Variables



You can find the blocks from the following:

 Logic

 Variables

 Basic

 Functions



Finished!



```
on start
  set game_start to 0
  HuskyLens initialize I2C until success
  HuskyLens switch algorithms 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
```

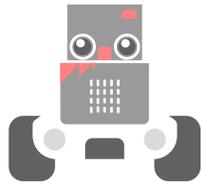
```
function Line_Following
  while true
    do
      if is Left iCar line detector Whiteline ? and is Right iCar line detector Whiteline ? then
        iCar Move Forward at speed 40 %
      else if is Left iCar line detector Whiteline ? and is Right iCar line detector Blackline ? then
        iCar Rotate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

The screenshot shows the Microsoft MakeCode editor interface. The top bar includes the Microsoft logo, the 'micro:bit' logo, and tabs for 'Blocks' and 'JavaScript'. A search bar is located on the left. The left sidebar contains a menu with 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, Extensions, Advanced, Functions, Arrays, and Text. The main workspace displays a JavaScript program with several functions: 'on\_start', 'on\_button\_a\_pressed', 'on\_line\_detector\_detected', 'on\_line\_detector\_detected\_2', 'on\_line\_detector\_detected\_3', 'on\_line\_detector\_detected\_4', 'on\_line\_detector\_detected\_5', 'on\_line\_detector\_detected\_6', 'on\_line\_detector\_detected\_7', 'on\_line\_detector\_detected\_8', 'on\_line\_detector\_detected\_9', 'on\_line\_detector\_detected\_10', 'on\_line\_detector\_detected\_11', 'on\_line\_detector\_detected\_12', 'on\_line\_detector\_detected\_13', 'on\_line\_detector\_detected\_14', 'on\_line\_detector\_detected\_15', 'on\_line\_detector\_detected\_16', 'on\_line\_detector\_detected\_17', 'on\_line\_detector\_detected\_18', 'on\_line\_detector\_detected\_19', 'on\_line\_detector\_detected\_20', 'on\_line\_detector\_detected\_21', 'on\_line\_detector\_detected\_22', 'on\_line\_detector\_detected\_23', 'on\_line\_detector\_detected\_24', 'on\_line\_detector\_detected\_25', 'on\_line\_detector\_detected\_26', 'on\_line\_detector\_detected\_27', 'on\_line\_detector\_detected\_28', 'on\_line\_detector\_detected\_29', 'on\_line\_detector\_detected\_30', 'on\_line\_detector\_detected\_31', 'on\_line\_detector\_detected\_32', 'on\_line\_detector\_detected\_33', 'on\_line\_detector\_detected\_34', 'on\_line\_detector\_detected\_35', 'on\_line\_detector\_detected\_36', 'on\_line\_detector\_detected\_37', 'on\_line\_detector\_detected\_38', 'on\_line\_detector\_detected\_39', 'on\_line\_detector\_detected\_40', 'on\_line\_detector\_detected\_41', 'on\_line\_detector\_detected\_42', 'on\_line\_detector\_detected\_43', 'on\_line\_detector\_detected\_44', 'on\_line\_detector\_detected\_45', 'on\_line\_detector\_detected\_46', 'on\_line\_detector\_detected\_47', 'on\_line\_detector\_detected\_48', 'on\_line\_detector\_detected\_49', 'on\_line\_detector\_detected\_50'. The 'Download' button is highlighted with a red box and a yellow circle containing the number 1.

Step 1:

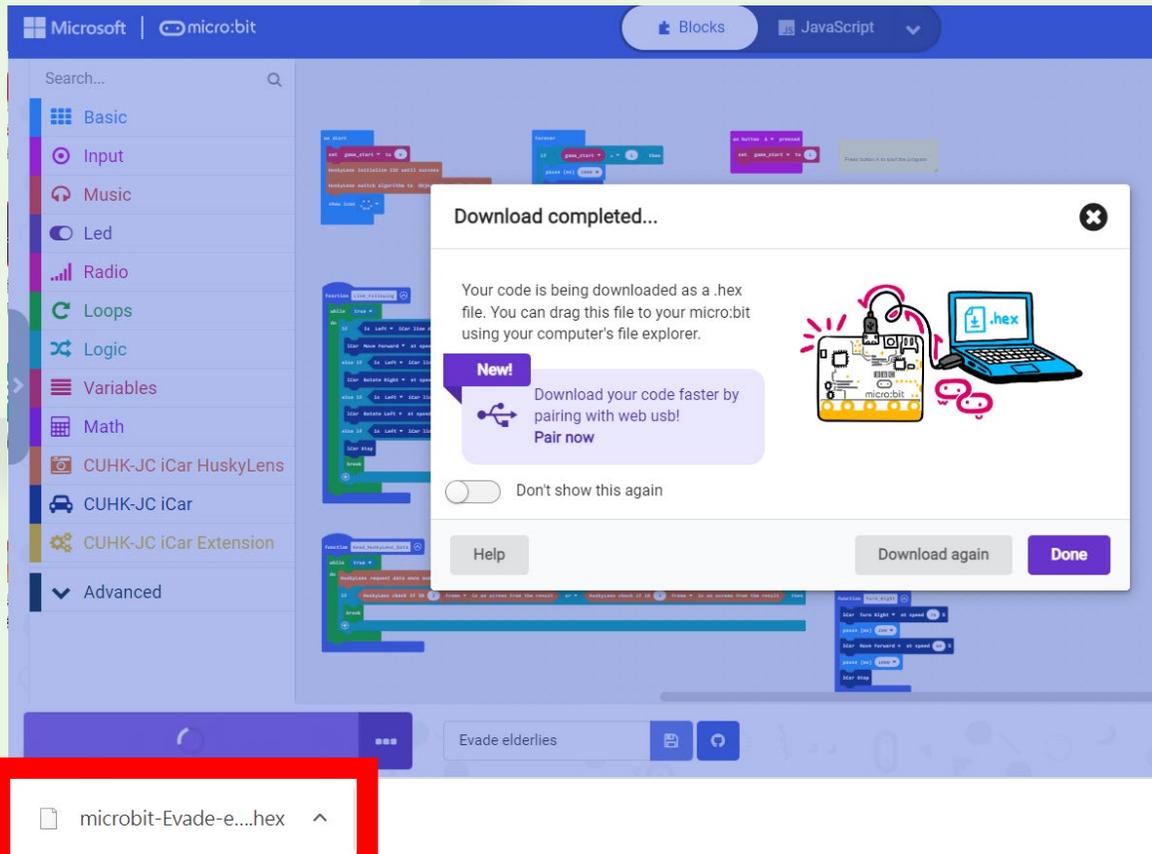
Click

 Download

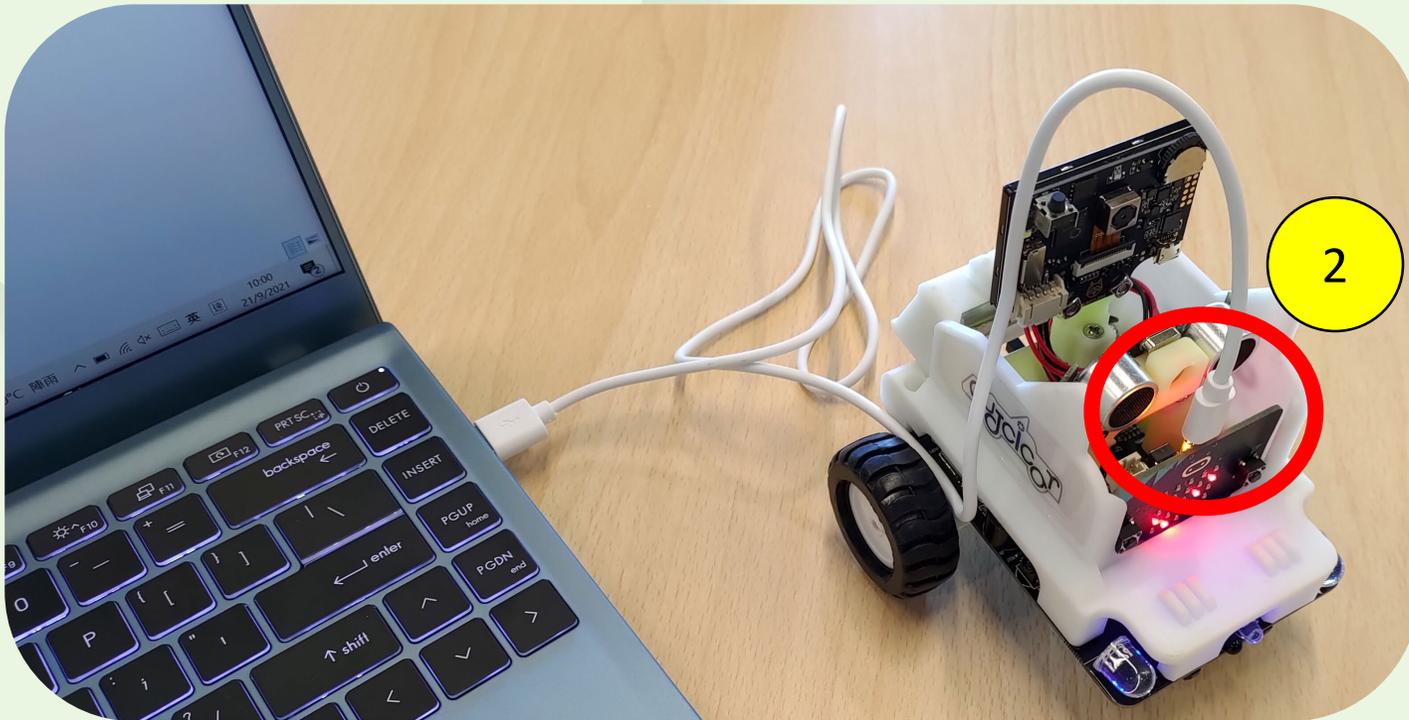
1

 Download

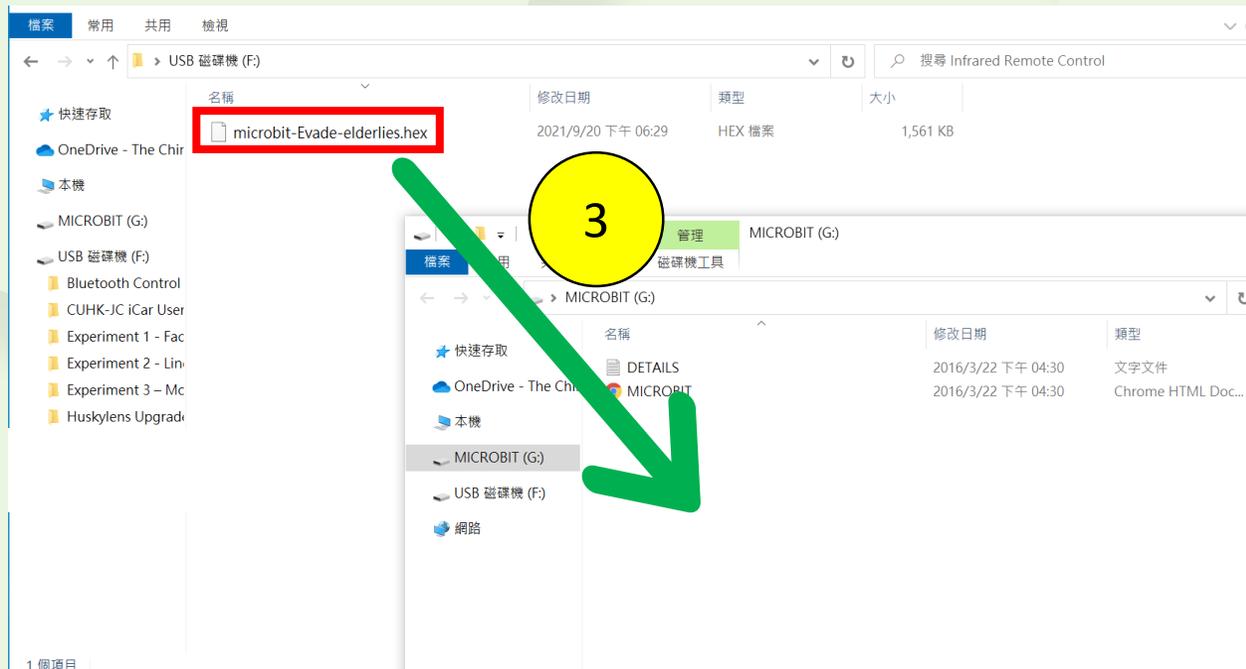
Evade elderlyies



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!



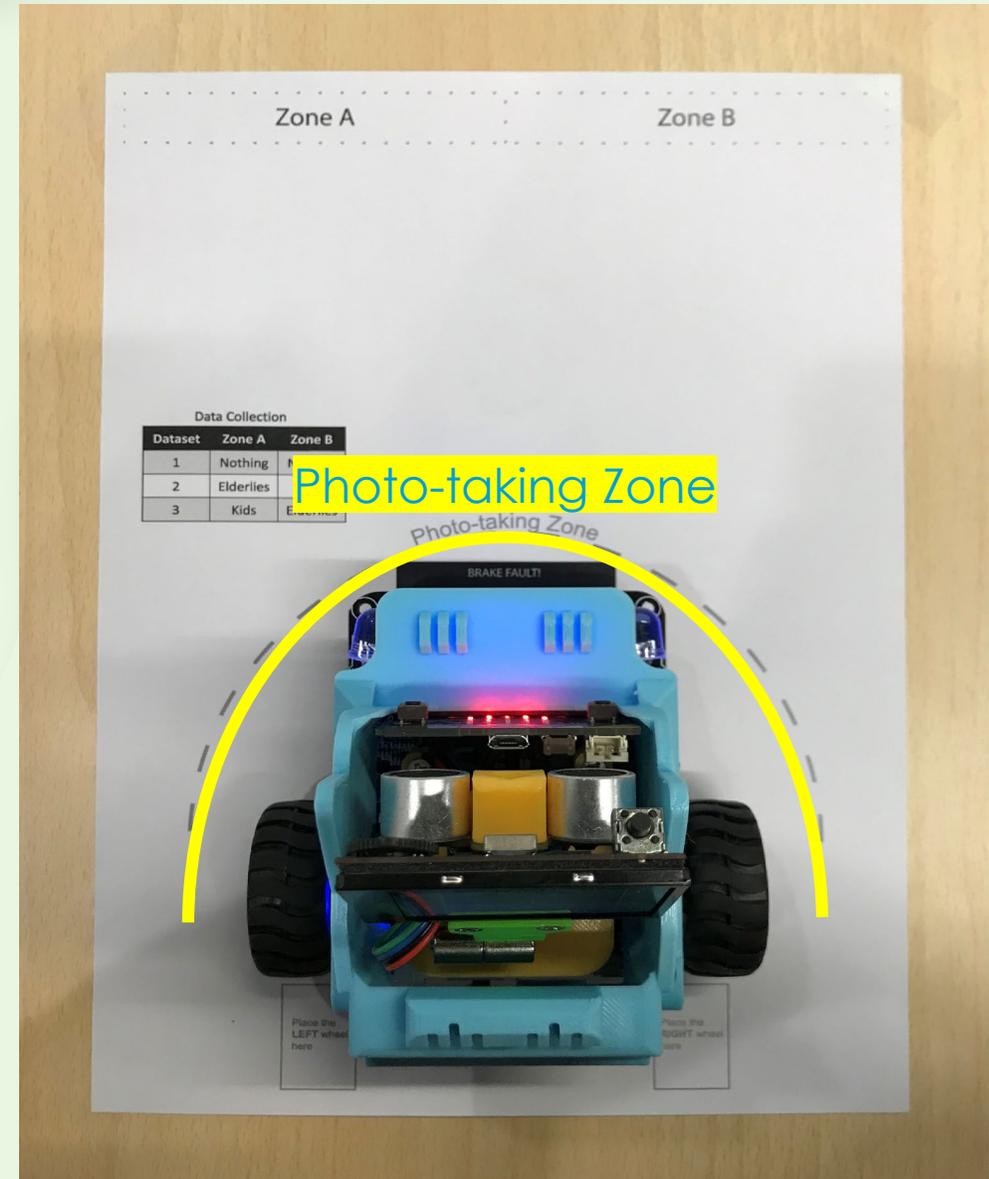


# Data Collection



Step 1:

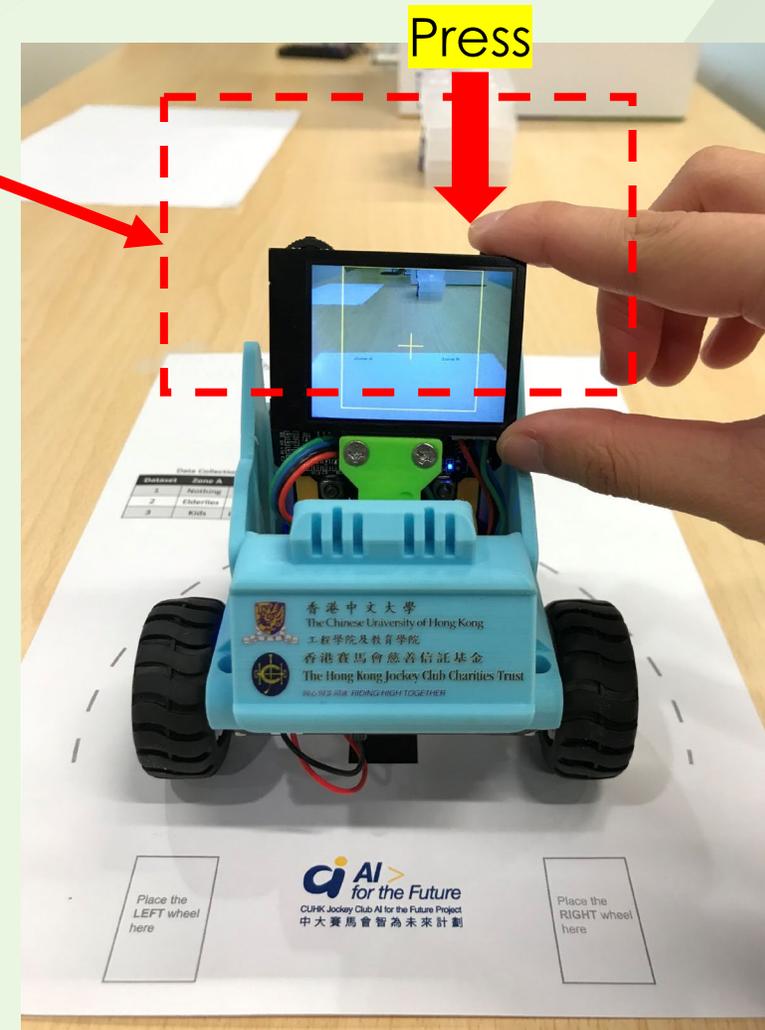
Place the track onto the table, and the CUHK iCar on the Photo-taking Zone



Dataset	Zone A	Zone B
<b>1</b>	<b>Nothing</b>	<b>Nothing</b>
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

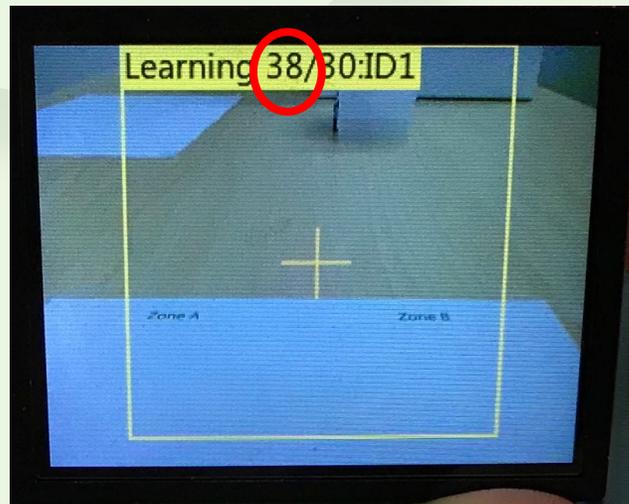
Make sure you keep pressing the button while you're rotating!

Press



Step 3:

Release the learning button after the number reaches 30



Step 4:

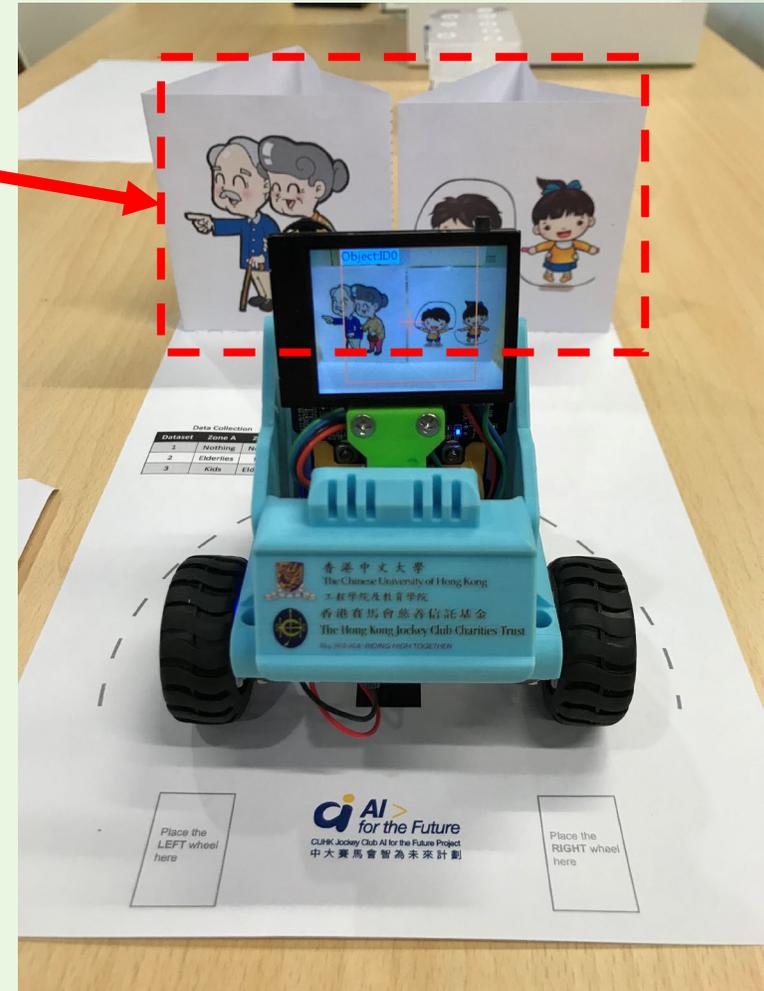
Press the learning button again  
before the countdown ends



Dataset	Zone A	Zone B
1	Nothing	Nothing
<b>2</b>	<b>Elderlies</b>	<b>Kids</b>
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

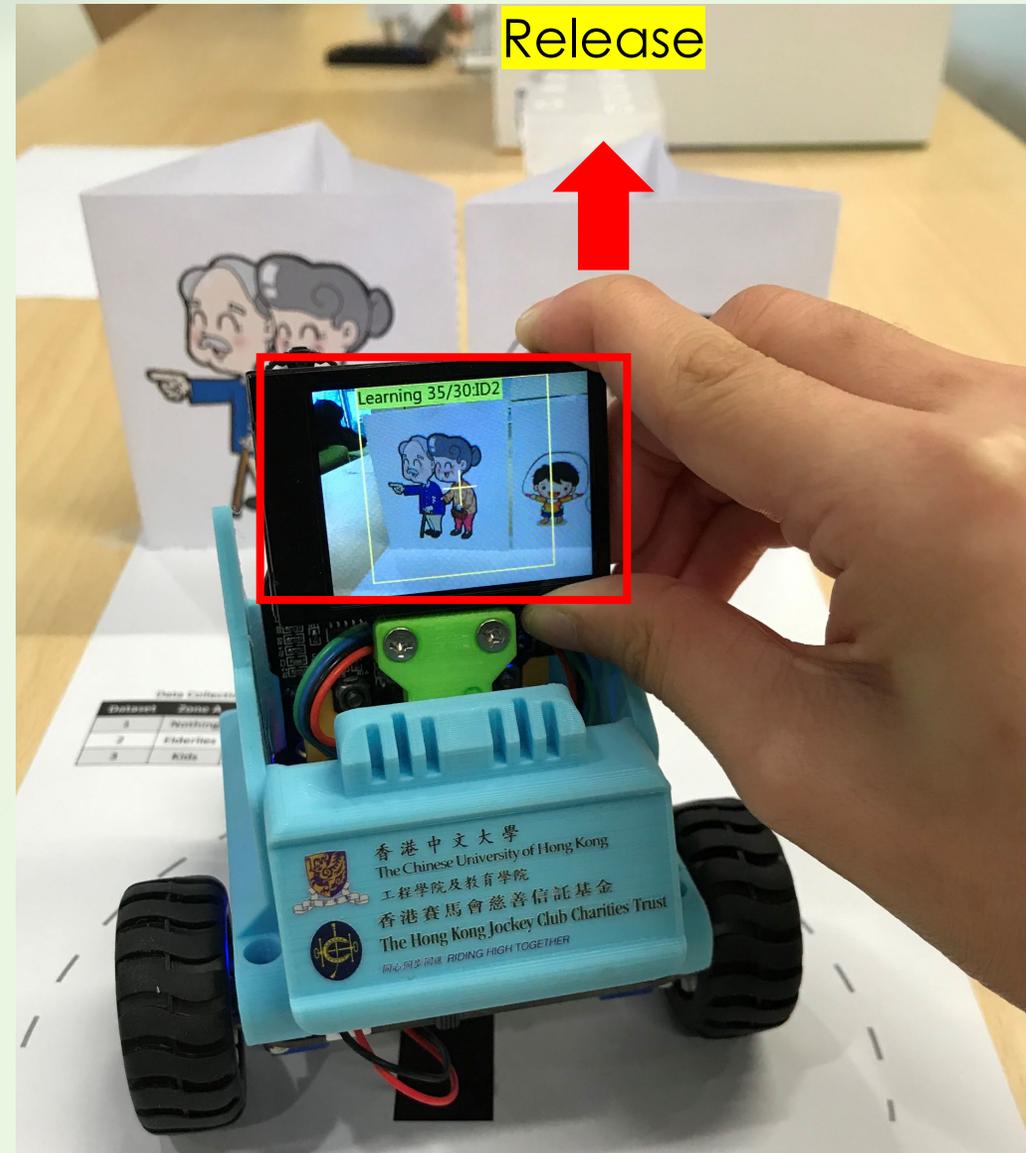
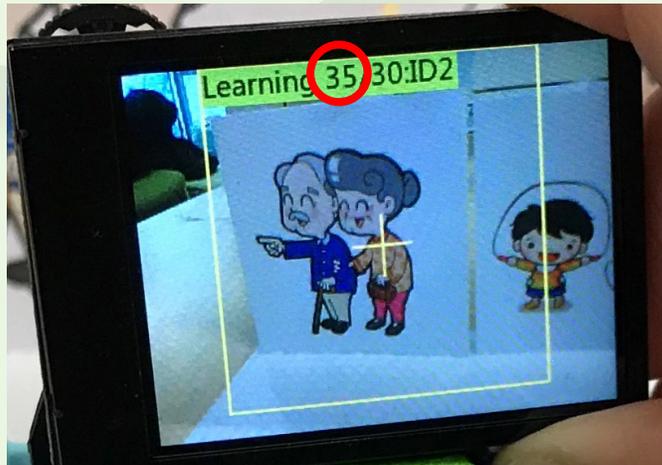
Make sure you keep pressing the button while you're rotating!

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
<b>3</b>	<b>Kids</b>	<b>Elderlies</b>



### 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

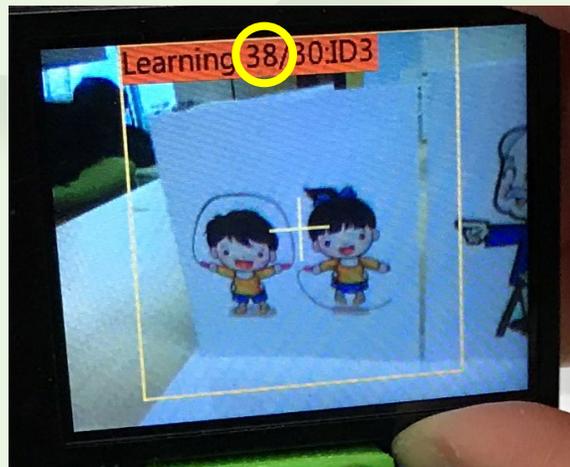
Make sure you keep pressing the button while you're rotating!

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





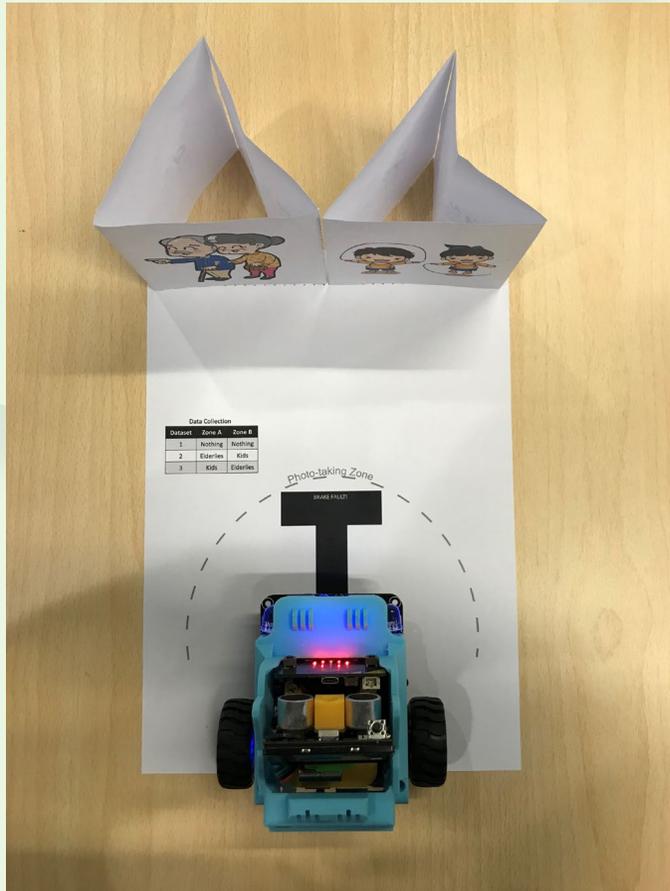
# You've collected all the data needed!

Let's conduct the experiment!



## Step 1:

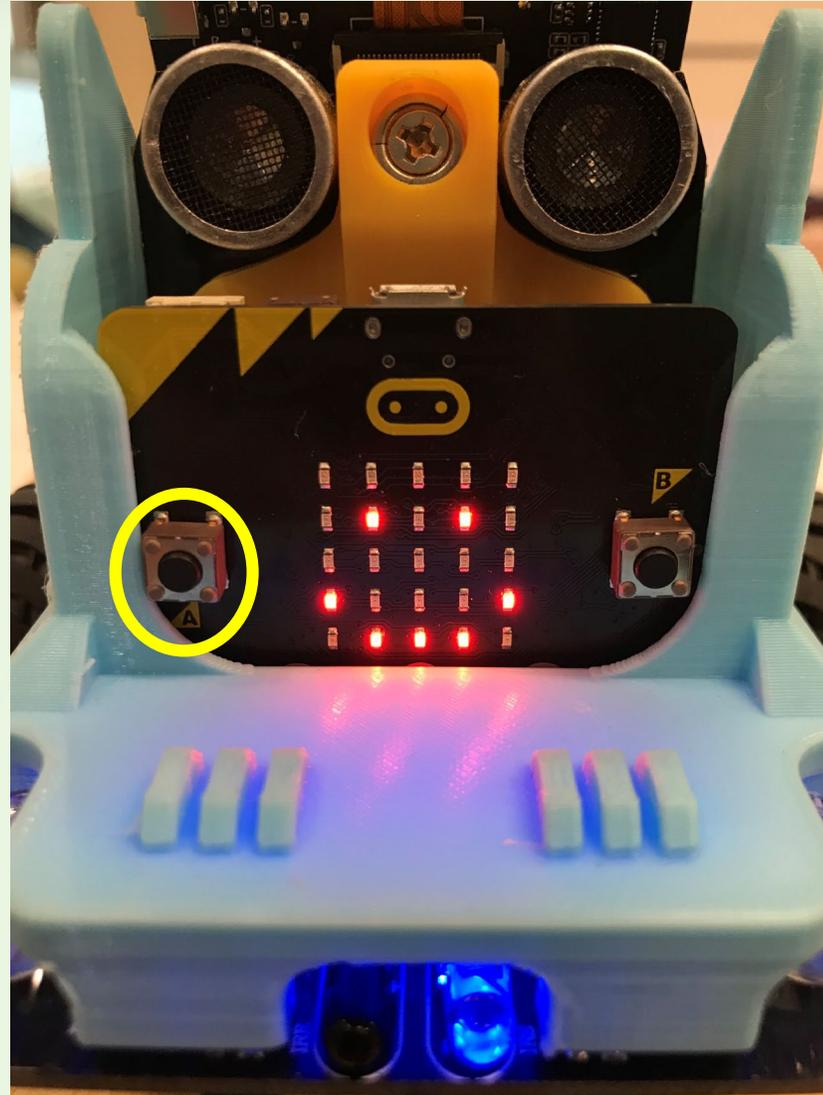
Place the paper models in the designated zones and place CUHK iCar on the starting point



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

Step 2:

Press **button A** on micro:bit



# Simulation

Program: Evade Elderlies

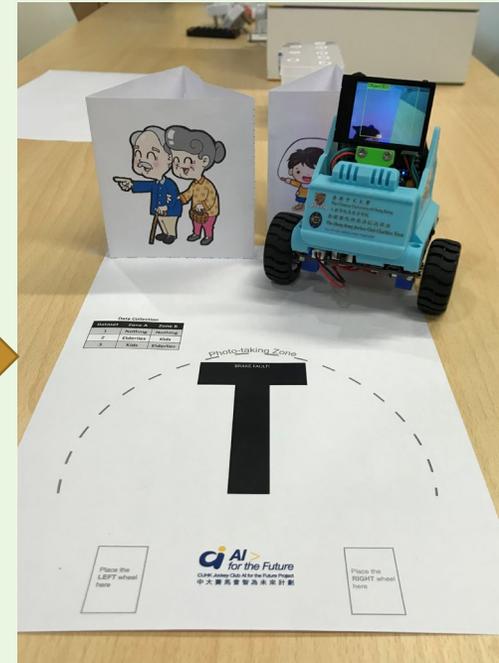
Paper Model: Dataset 2



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

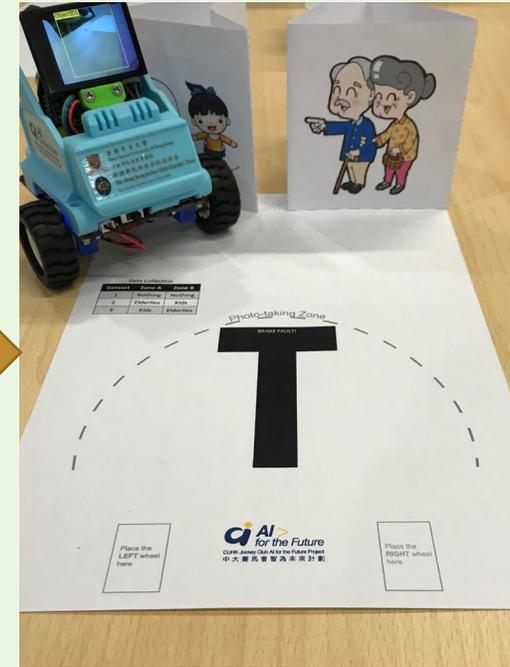
Paper Model: Dataset 3



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



CUHK iCar has trouble braking!



It will evade the elderly.

# 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

