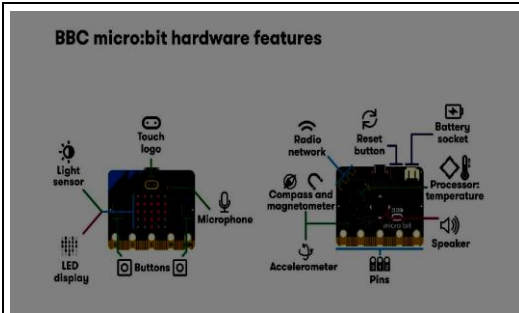




How can AI help us to stay fit ?
Motion recognition

WARNING : for all these activities, you must use **Edge** (not Firefox)

1) The micro:bit electronic prototyping board



Boards details

What is micro:bit board ?

The micro:bit is an electronic **prototyping** board that allows to program **interactive** projects.

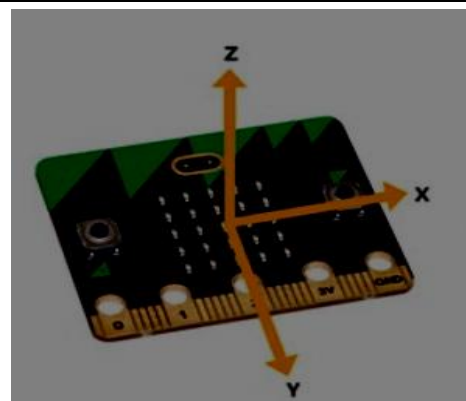
It use **sensors** and control **outputs devices** like LEDs, speaker.

What can we do with the micro:bit's accelerometer ?



The accelerometer **measures** the board's movement **along** three axes

Video : [click here](#)



The x-axis in red,
the y-axis in green,
and the z-axis in blue.

2) Let's create our first program with the accelerometer (without AI)

We want that :

If the board is **shaken**, sparkles appear

If the board is **tilted upward**, upward **arrow** appears

If the board is **tilted** to the **left**, **left-pointing arrow** appears

If the board is tilted to the right, **right-pointing** arrow appears

It it doesn't work : don't forget to put
"CLEAR SCREEN" in the beginning ;
don't nest (imbriquer) the "if instructions".

Plug the board's USB cable into the computer.

Click on this link [Microsoft MakeCode for micro:bit](#)

(set the language on english if necessary)

Then click on "new project" (no need to put a name),
recreate and **complete** the program shown below.

Conclusion : We can see that only a **limited number of movements** can be detected : tilting to the sides or shaking the board.

The screenshot shows the Microsoft MakeCode for micro:bit interface. On the left, a sidebar contains a list of blocks: Basic, Input, Music, Led, Radio, Loops, Logic, Variables, and Math. The 'Logic' block is selected, and an 'if ... then' block is being added to the workspace. Below the sidebar, there is a text box that reads: "You can also right-click on an instruction to duplicate it." Below that, another text box reads: "Once finished, click on 'download' in the board. Test your program. Add the other movements. Download again !". At the bottom of the sidebar is a blue button with a download icon and the text "Download". On the right, the workspace shows a program with a 'forever' loop. Inside the loop, there is a 'clear screen' block, followed by an 'if is shake gesture then' block containing a 'show leds' block. Below that is another 'if is logo up gesture then' block, also containing a 'show leds' block. The 'show leds' blocks display a 5x5 grid of LEDs with some LEDs lit up.

Students may have this program :

show leds --->

is ... gesture --->

if ... then ---->

**You can also right-click
on an instruction
to duplicate it.**

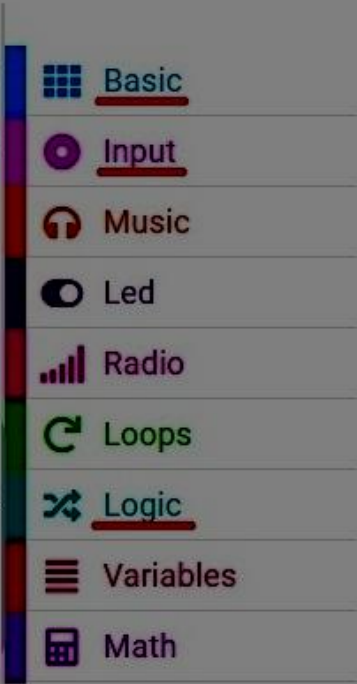
**Once finished, click on
"download" in the board.**

Test your program.

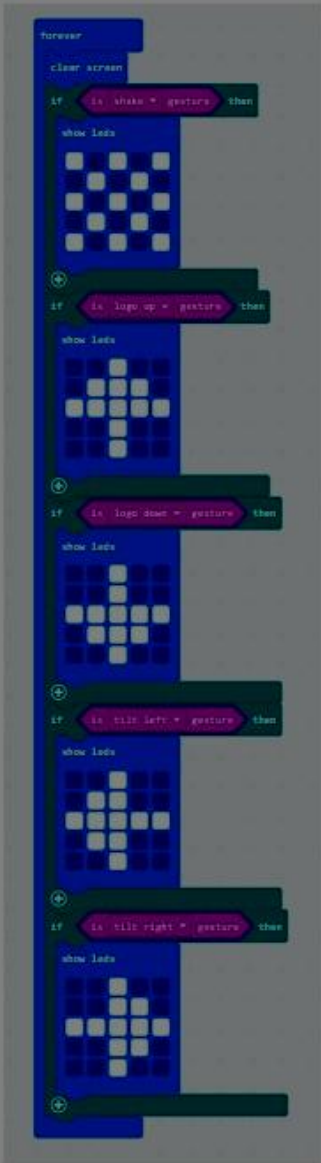
Add the other mouvements.

Download again !

 **Download** 



- Basic
- Input**
- Music
- Led
- Radio
- Loops
- Logic**
- Variables
- Math



```
forever
  clear screen
  if (is shake = gesture) then
    show leds
    [5x5 grid of white squares]
  +
  if (is logo up = gesture) then
    show leds
    [5x5 grid of white squares]
  +
  if (is logo down = gesture) then
    show leds
    [5x5 grid of white squares]
  +
  if (is tilt left = gesture) then
    show leds
    [5x5 grid of white squares]
  +
  if (is tilt right = gesture) then
    show leds
    [5x5 grid of white squares]
  +
```

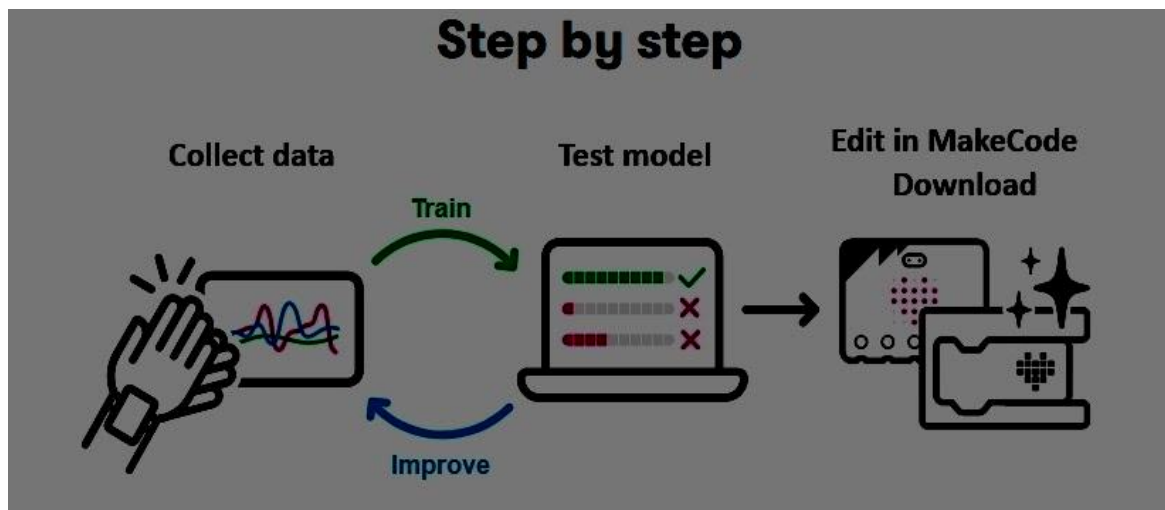
3) So now **close the previous windows** and click here.
We will see how to improve our program with AI.

We are going to use **machine learning** so that the board can **distinguish** for example between **waving** a hand or **raising** a hand.

Let's improve our program with AI

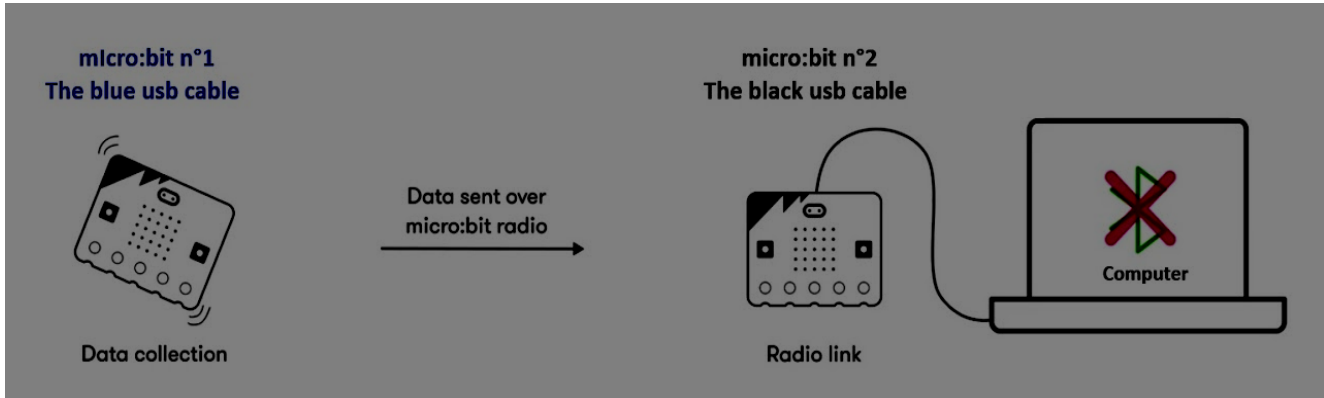
We are going to

- **create a machine learning model**. You may have done this before with images, distinguishing a dog from a cat. Machine learning (ML) is a kind of artificial intelligence (AI) where computers can learn from data and make decisions based on it.
- **then training** it,
- and at least **using** it in the code we will download to the micro:bit.



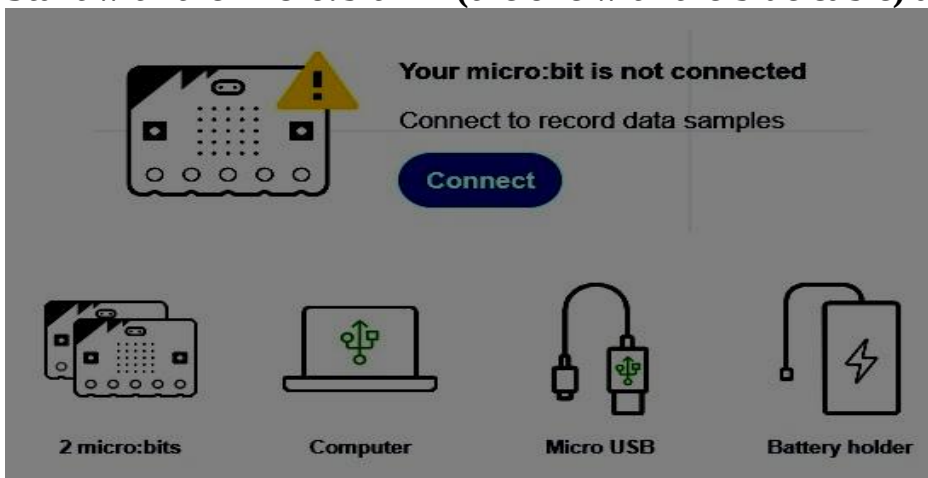
Skip this part if your computer has radio link

The tricky part if your computer has no bluetooth is that we have to use two boards ! first, we have to download a communication program on each boards so that they can communicate via radio link to collect the data



We need two boards because one (the one with the black cable) is used as the bluetooth connector, since the school computers don't have bluetooth.

Start with the micro:bit n°1 (the one with the blue cable) and follow the instructions

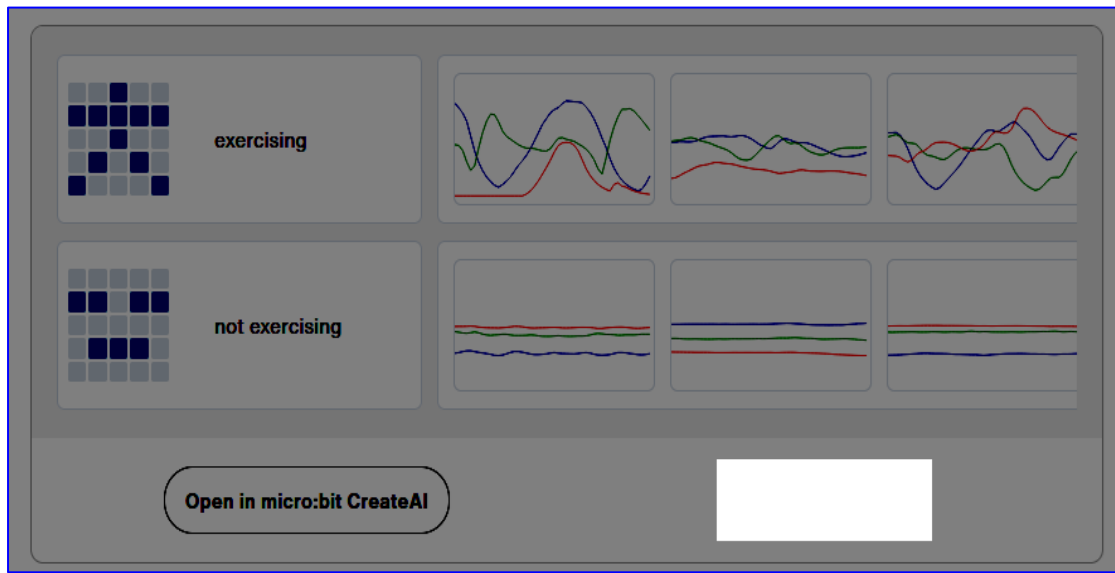


You may have this troubleshooting message :
don't forget to plug the battery on the card n°1 (the blue one)



Exercise 1 Simple AI exercise

In MakeCode, the program associated with this machine learning shows, on the board's LED matrix, how many times someone moves when the A button is pressed, and how many times they don't when the B button is pressed.

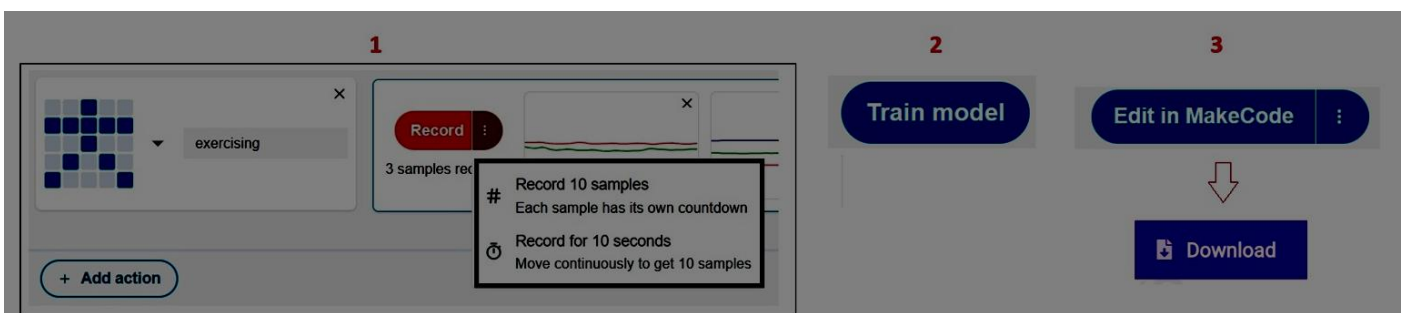


We are going to do this first exercise **together** so you **understand how it works** and can complete the other exercises on your own.

The machine learning part : in this project, **the aim** is to train a machine learning (ML) model to detect whether we **are exercising or not**.

To access the exercise click here on this link / then find the image above and click on "open in micro:bit create AI" / after on "start session"-

After a first try you **can improve** your machine learning, step by step :_

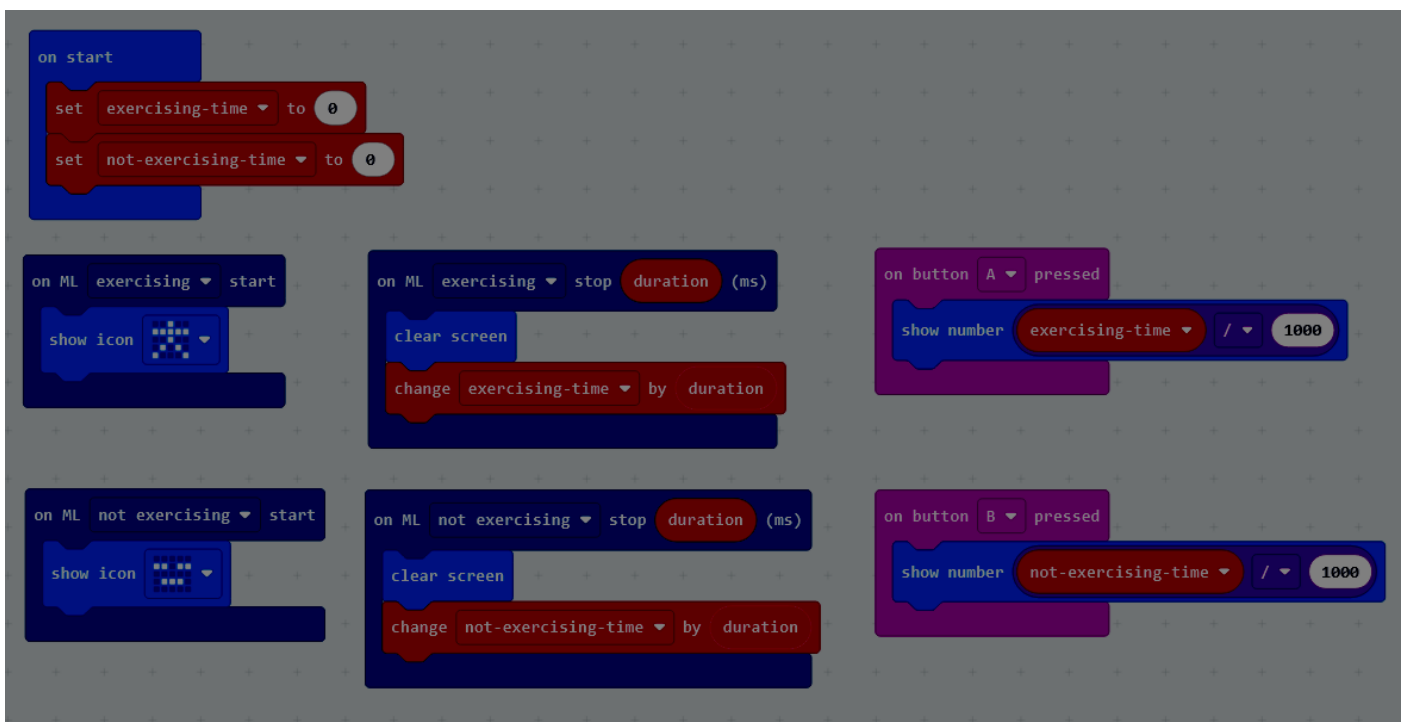


- 1) Click on EXERCISING and change the machine learning model to recognize a specific movement like waving, clapping or raising your hand. Click on RECORD for 10 SECONDS
- 2) Click on TRAIN MODEL
- 3) Click on EDIT IN MAKE CODE / DOWNLOAD the program in the blue card. Your device is now autonomous.

Students can add a third action, but they will have to modify the program in MakeCode if they want to display information on the LED matrix.

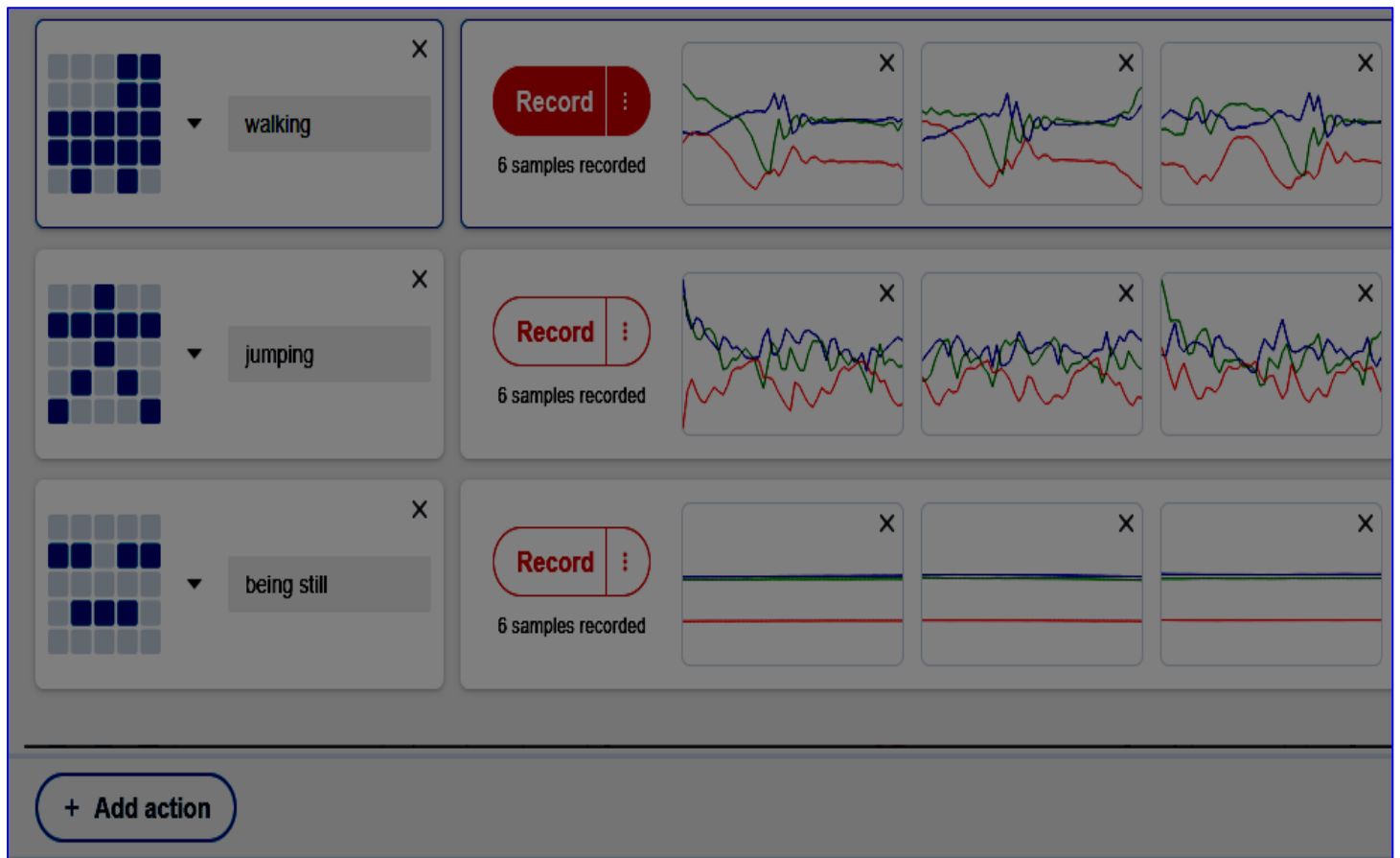
The program part : In MakeCode, some specific instructions appear; ‘ML’ means machine learning.

« on ML exercising start » ; « on ML not exercising start »

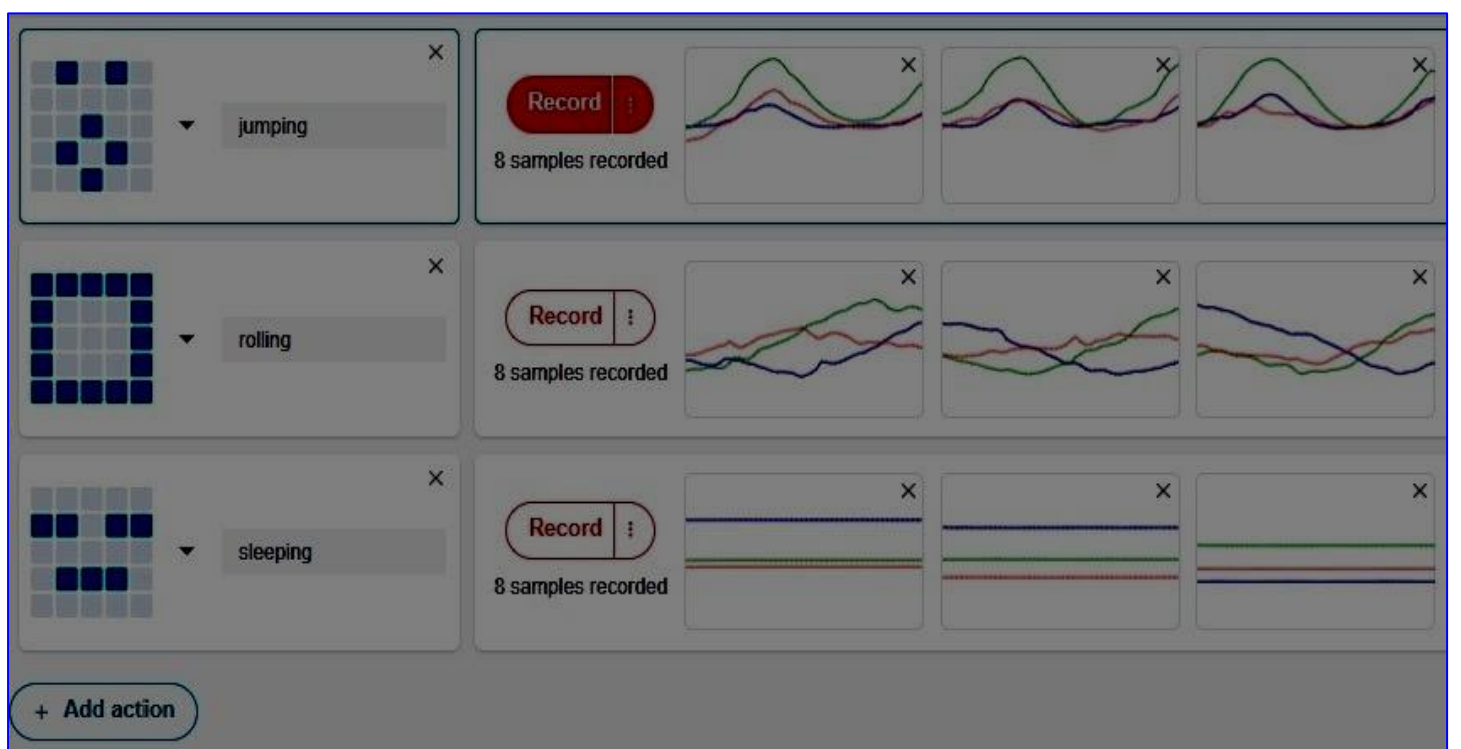


If students have some programming knowledge, they can modify the program as they want.

Exercise 2 AI activity timer : it recognizes two different movements and displays the time spent on each activity.



Exercise 3 AI Storytelling friend : it recognizes three different movements and plays music.



Exercise 4 AI Light switch : this one is the hardest because of the cards manipulations. The aim is that the movement recognized on the blue card turns on the leds on the black card.

First, you train the machine learning model as you did for the other exercises.

When your machine learning model is ready, check on the computer that the program does what you want : the lights on the black card turn on when you clap and turn off when you wave.

Replace the radio communication number 52 with a number from 0 to 255. Each group must have its own number. This number will allow your blue card to send messages to your black card.

then download the program in the blue card AND in the black card (Pay attention, leave the black card plugged into the computer or use a second battery) and test your project.

