makeblock

Lesson plan template

Cross curricular links: Developing skills to script block based programs Learning to train an artificial intelligence in a simple way Coding	**Age group: 10-13**	**Duration: 2 hours**

Objectives:

Understand what an AI is and use machine learning to identify objects and indicate how to recycle them

Resources:

- Desktop or laptop computers every 2 students
- powerpoint presentation
- mBlock 5 (browser based version or downloaded version)
- Extension **Teachable macchine**

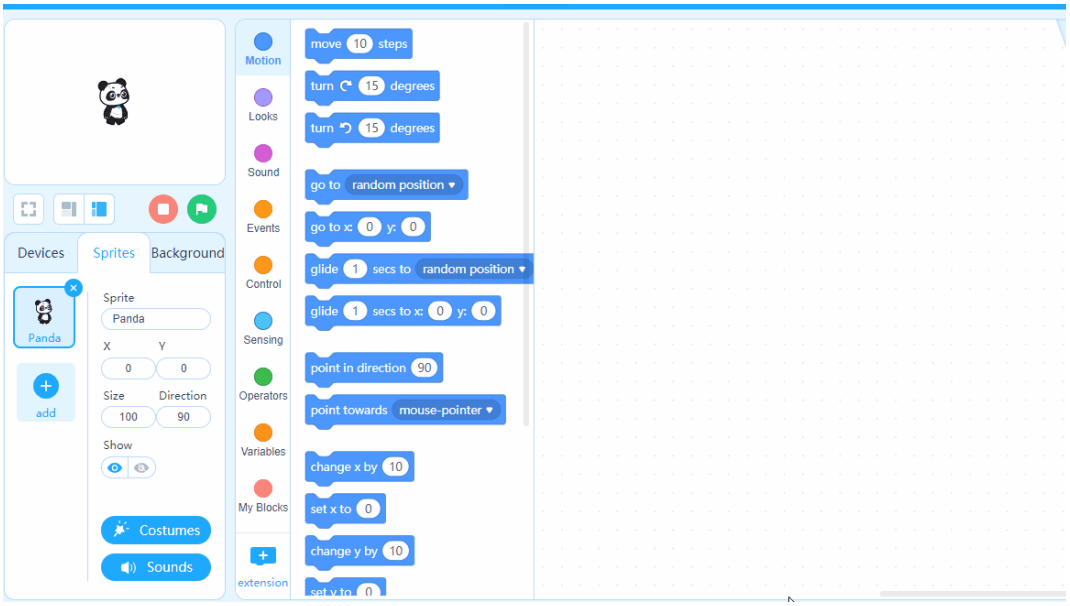
Duration **30 min**	**Mini lesson (introduction):** Waste pollution is an important problem today. Separate waste collection can help to overcome the problems related to pollution of the seas, rivers and our planet in general. Introduce the topic of pollution by showing the video in your class: https://www.youtube.com/watch?v=OqHp03RRTDs **Guide a short discussion on the topic through pilot questions that stimulate reflection** Introduce now the subject of the lesson, using the extension of mBlock 5 **Teachable Machines** to help us in the separate waste collection

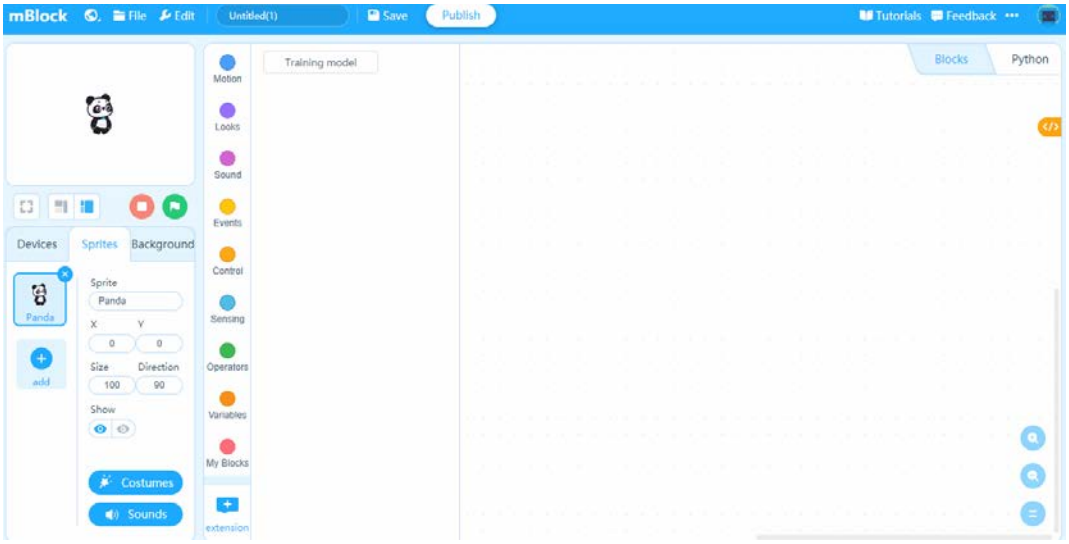
Machine learning is the scientific study of algorithms and statistical models that computer systems use to perform a specific task without using explicit instructions, relying on patterns and inference instead. It is seen as a subset of artificial intelligence. Machine learning algorithms build a mathematical model based on sample data, known as "training data", in order to make predictions or decisions without being explicitly programmed to perform the task. Machine learning algorithms are used in a wide variety of applications, such as email filtering and computer vision, where it is difficult or infeasible to develop a conventional algorithm for effectively performing the task.

We build a system capable of recognizing between 3 types of waste and show us where to throw it away for recycling.
If your students are very good, you can try explaining how learning for machines works:

Teaching a machine is very similar to how you teach people, namely learning through experience. You provide a series of examples that enable the machine to compare until it learned what we wanted him to

More elaborate explanation:
https://youtu.be/3bJ7RChxMWQ

Duration **1 hour**	**Main activity:** As preparation you need to collect several objects of the same type: plastic bottles, sheets of paper, cans. In the example I have chosen 3 objects from each category, but remember that the more different examples you give, the more precise the recognition will be! We open mBlock 5 and add the extension Teachable Machines:  The first step is the training of our machine. As mentioned the objective is to show as many examples as possible, in order for the computer to derive from enough examples for comparison to the samples that will be presented in the future. Let's open the **training model**



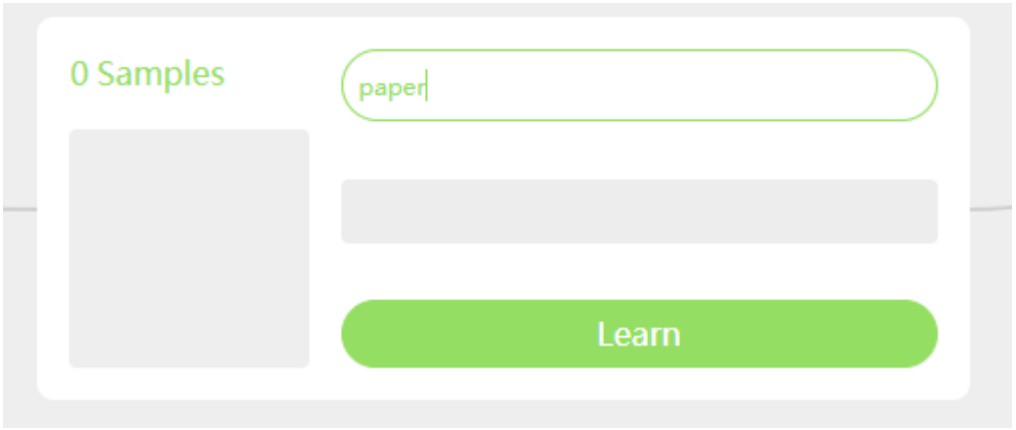
The training consists off placing the object in front of the webcam and saving it by pressing the "**learn**" button

We put the name in the category: "**plasticBottle**".

Now we start the training

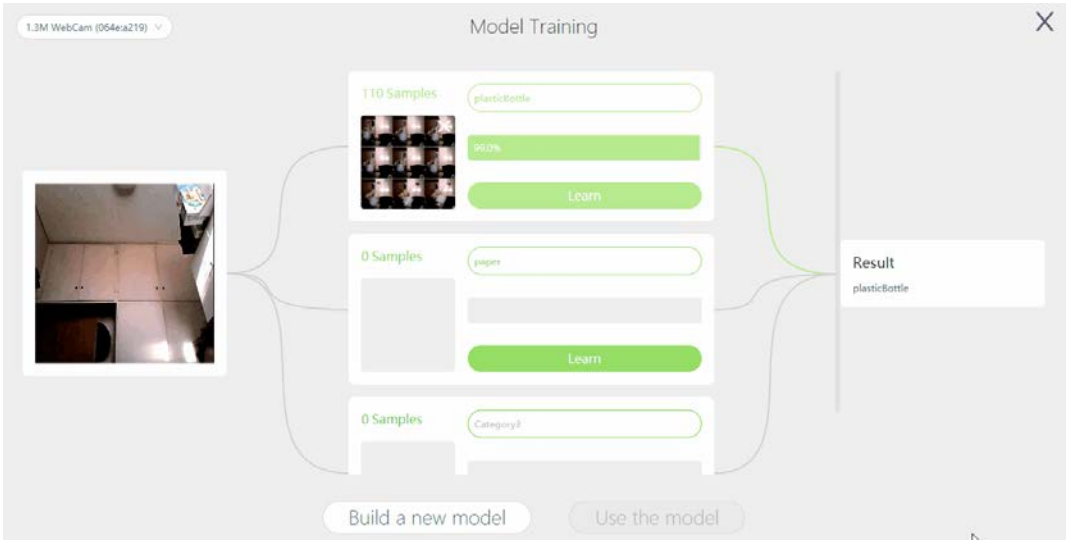
I've used 100 examples.
Remember, the more examples you use, the more accurate your program will be.

Create the category : "**paper**"



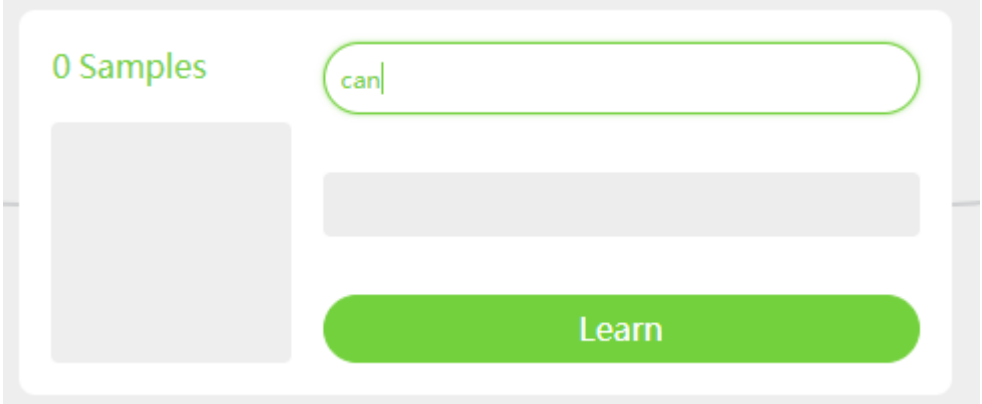
Train the category 'Paper', use different sheets of paper and maybe someone

bundled up in a pile of paper.



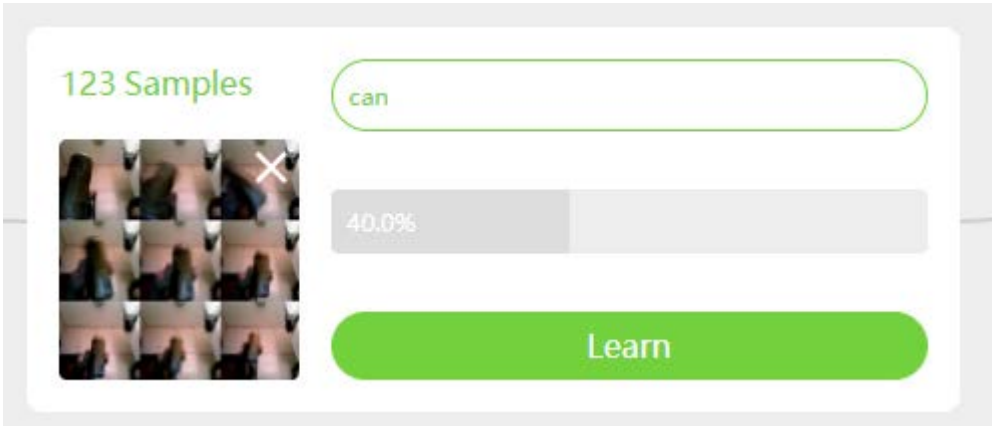
Again, roughly 100 samples were used.

Create the category : "**can**"

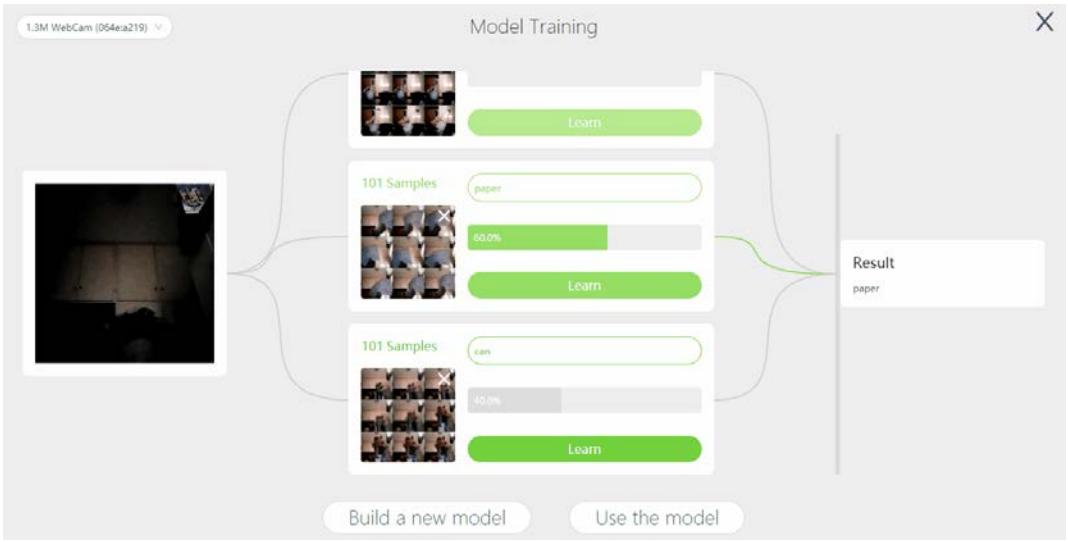


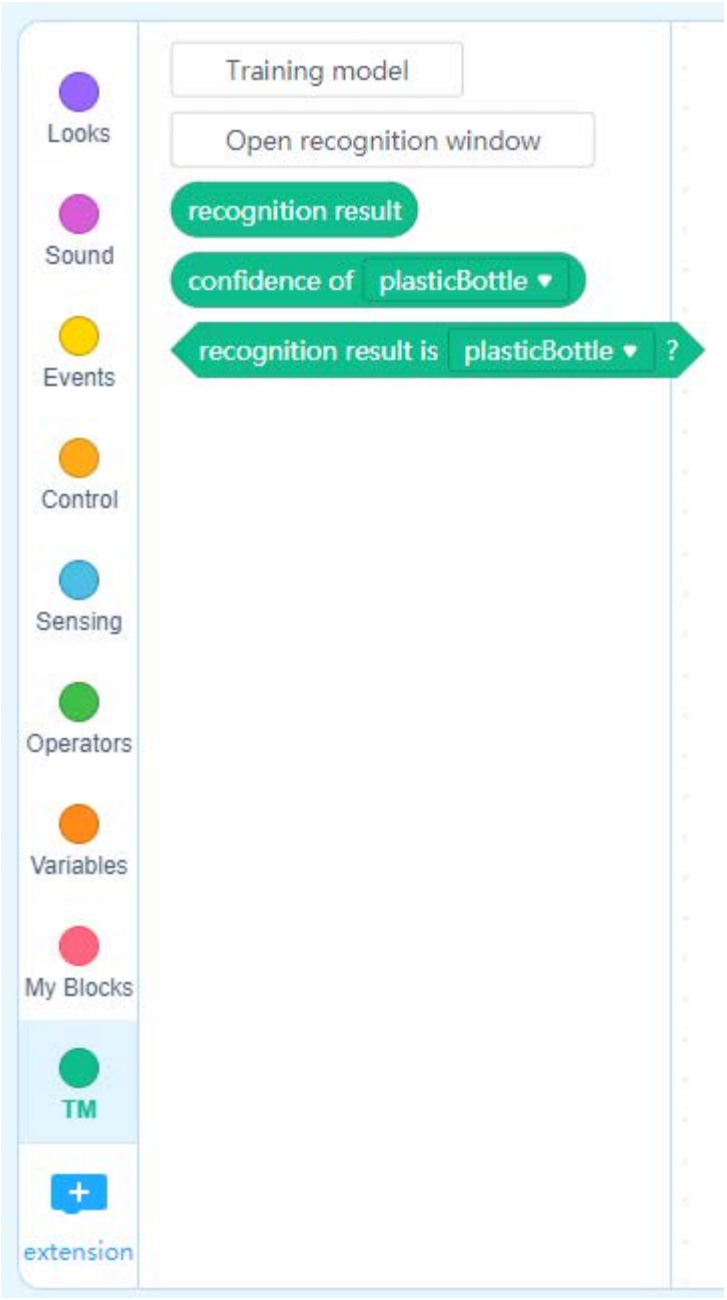
Also here we use different types of aluminium cans to improve the training model

I gave 100 examples

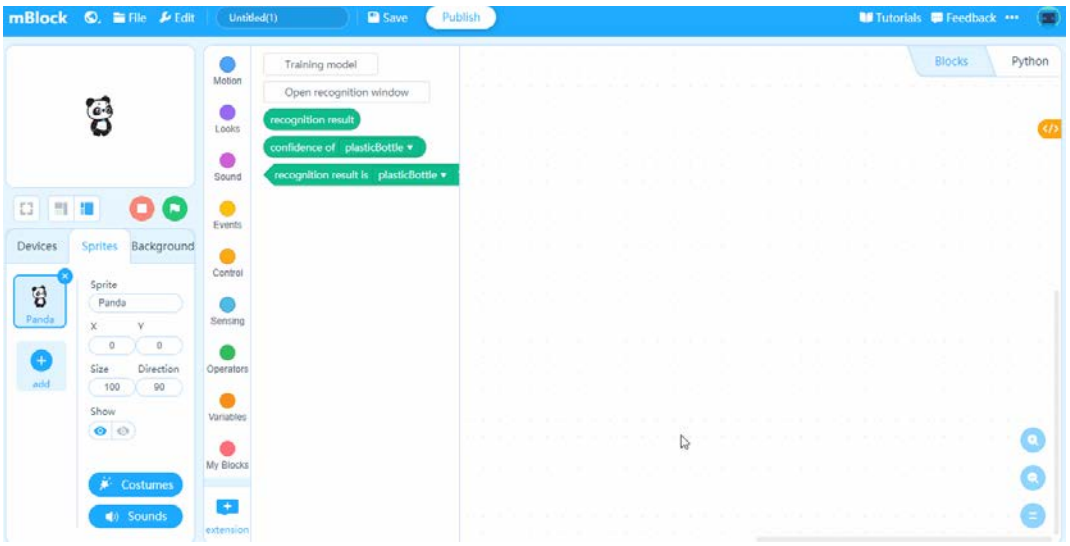


Let's use the model

	 This is the result

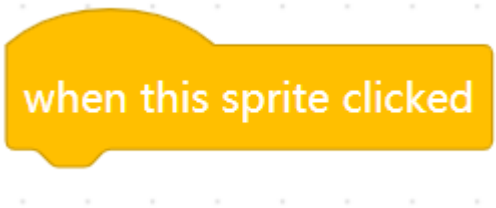


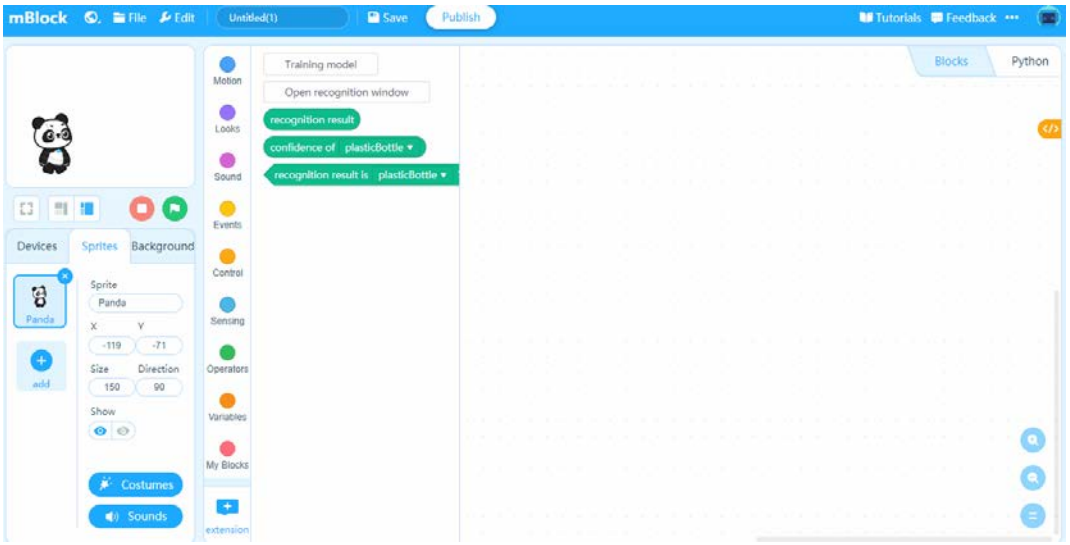
Now it's time to use the new blocks created with our sprites, let's increase the size of the panda to 150%.



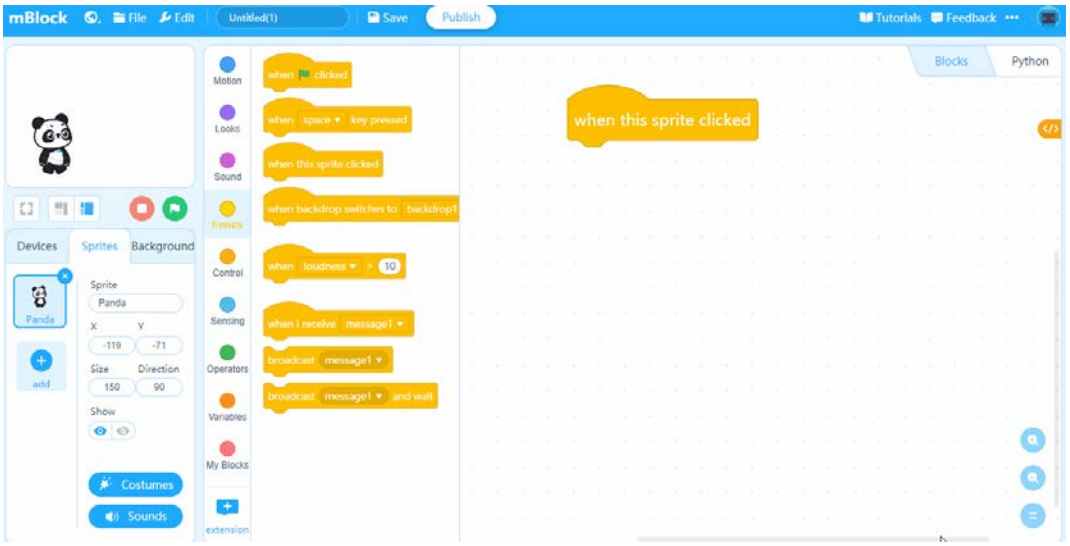
Let's start programming:

we insert the block "When the sprite is clicked"

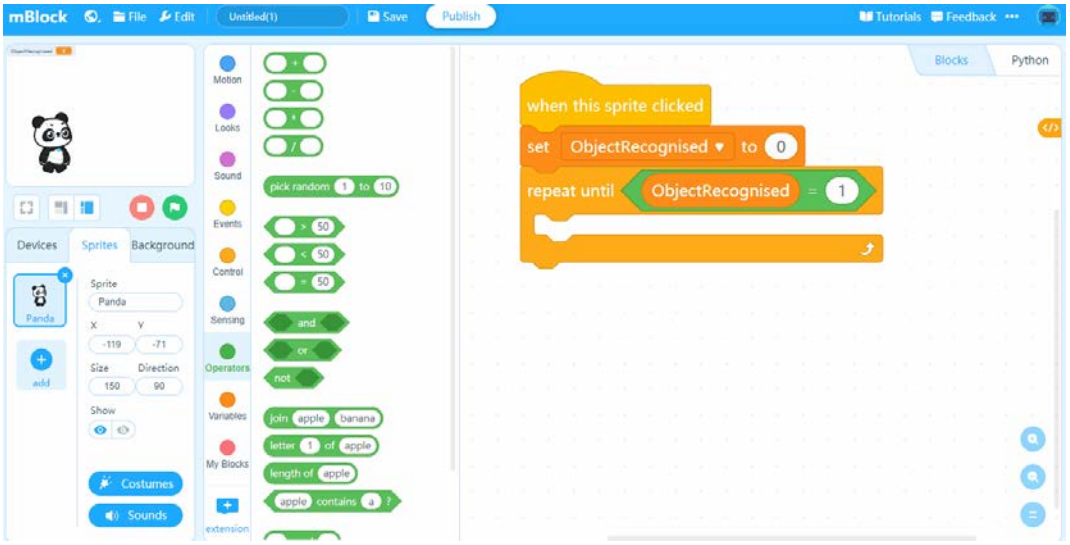




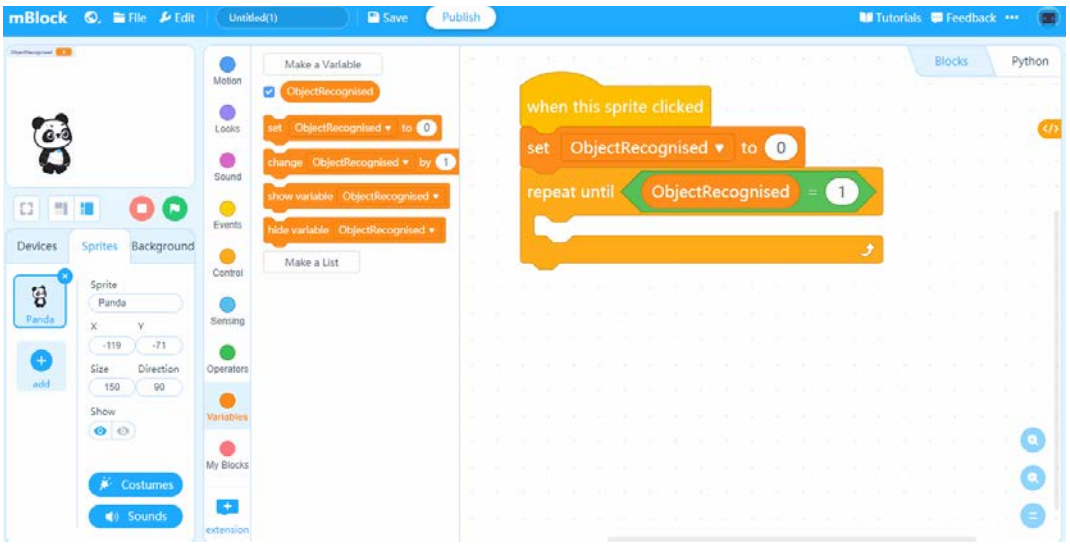
create a "**ObjectRecognised**" control variable that tells us when the object has been recognised and set its value to 0. Its value will become one after recognition has taken place.



Insert the exit condition with ‘control’ and ‘operators’

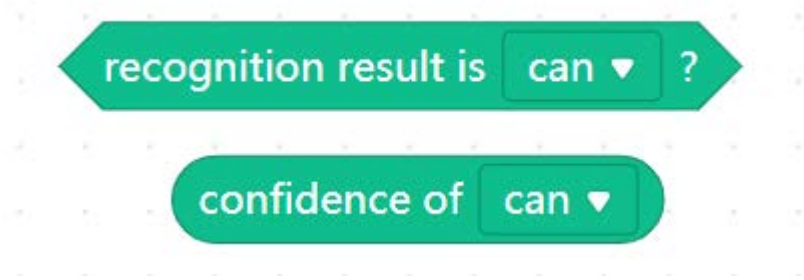


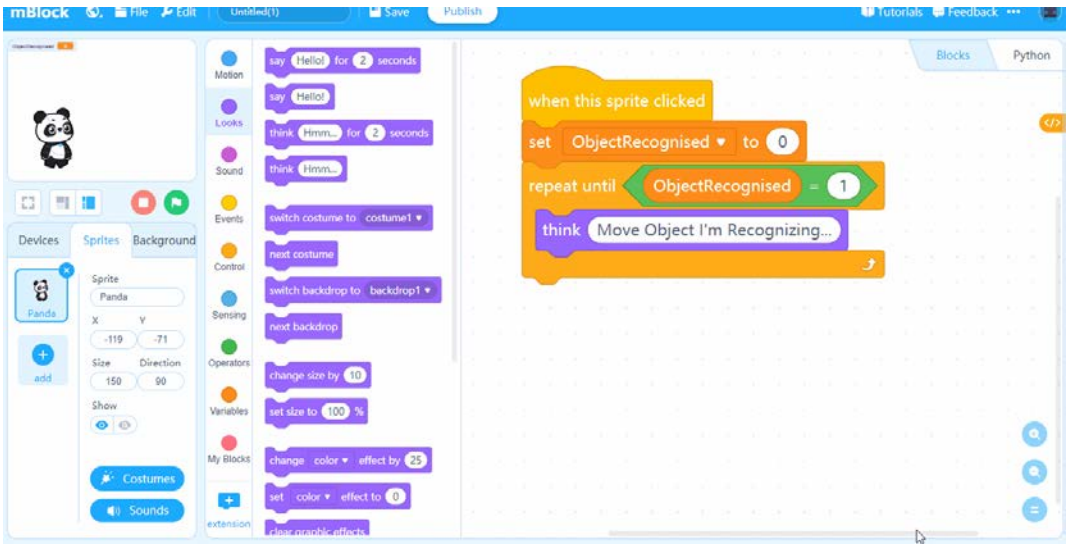
Let's put in a message to see if the recognition has started: something like "**Move Object I'm Recognizing...**"



Now let's insert three "**If... Then...** " blocks to manage the three conditioners. First create the conditioner for the **can**

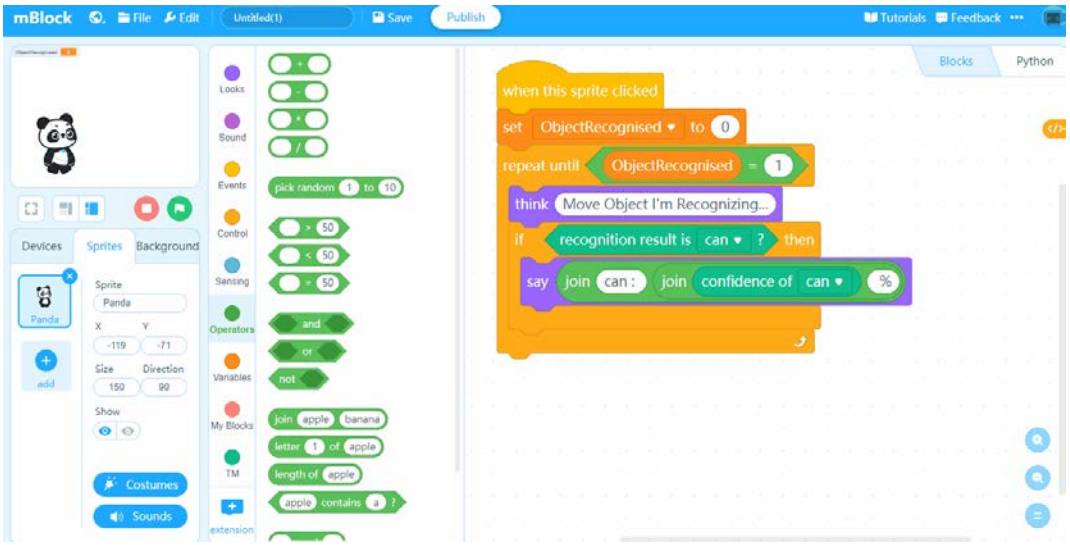
Use the following blocks:



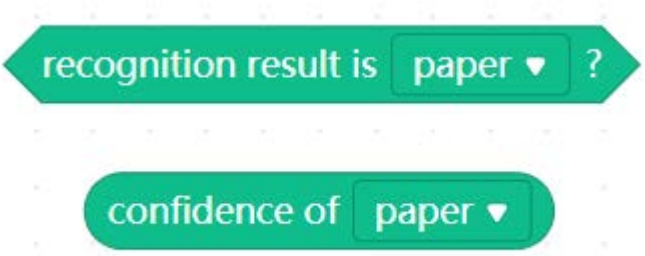


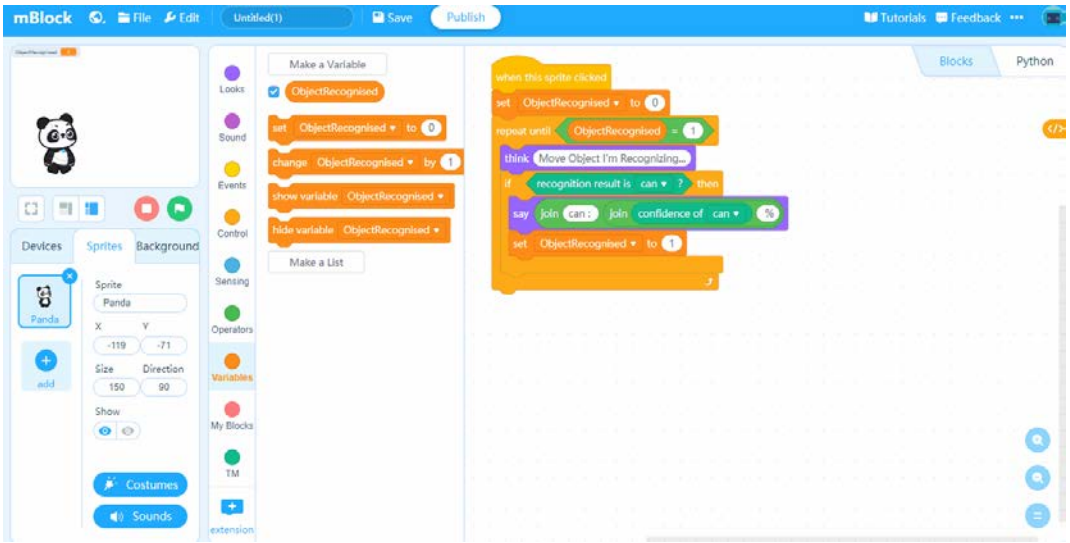
Remember to change the status of the variable "**ObjectRecognised**" to 1 to exit

the cycle and interrupt the execution of the program

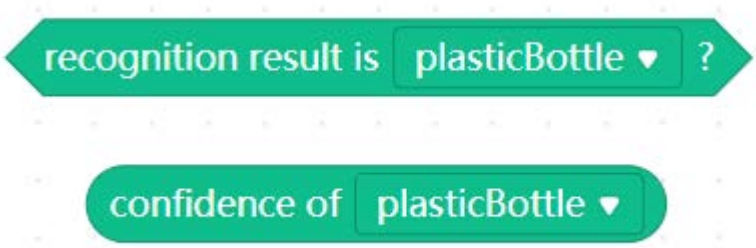


Now let's create the **paper** one, we use the blocks:

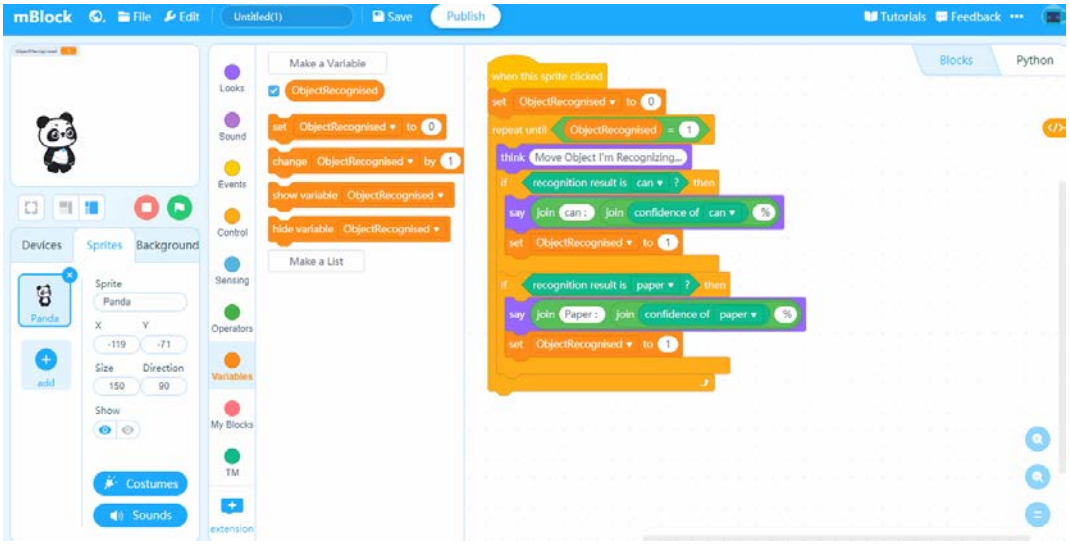




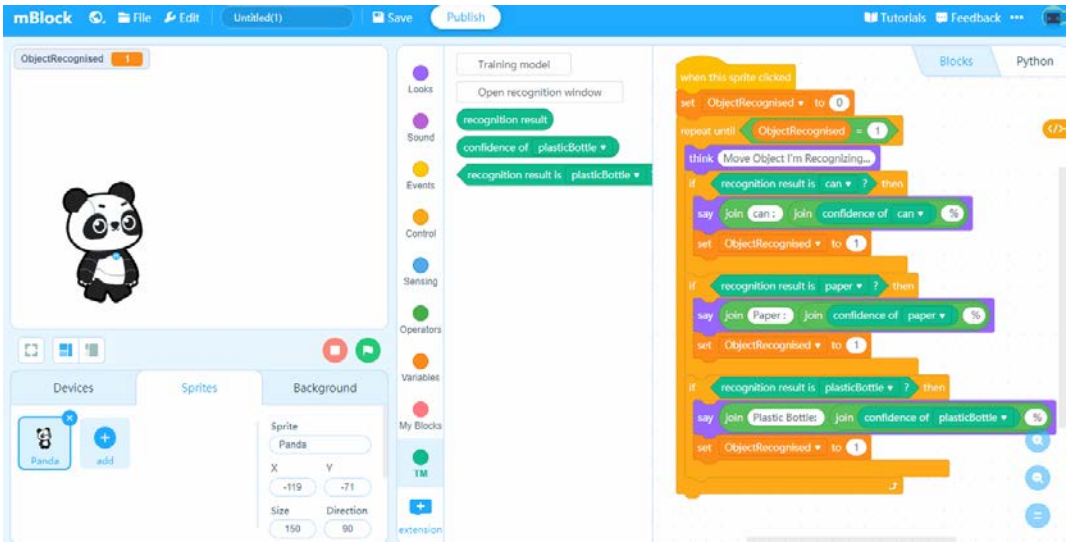
Finally, for the **plastic bottle**, we use the blocks:

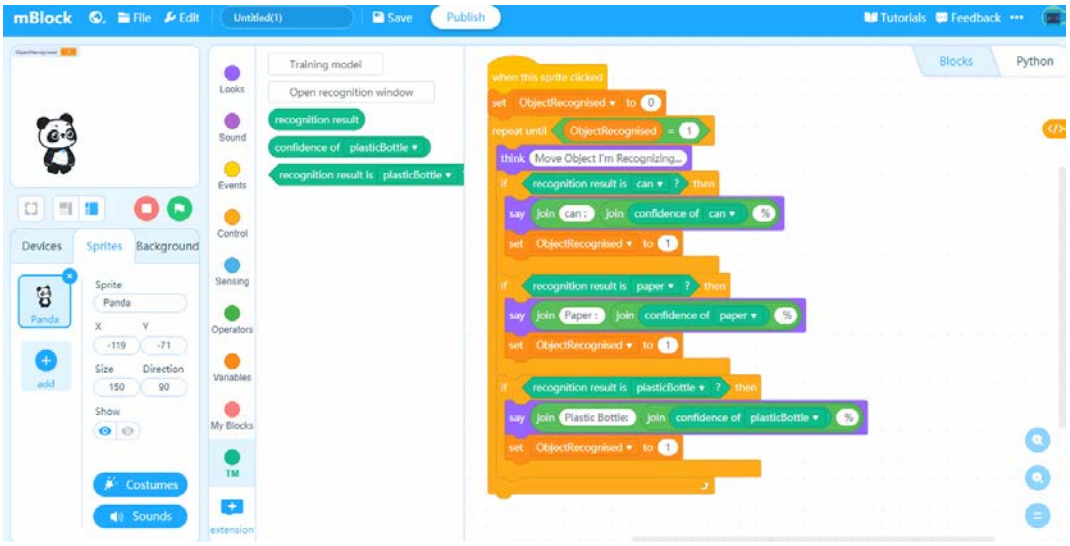
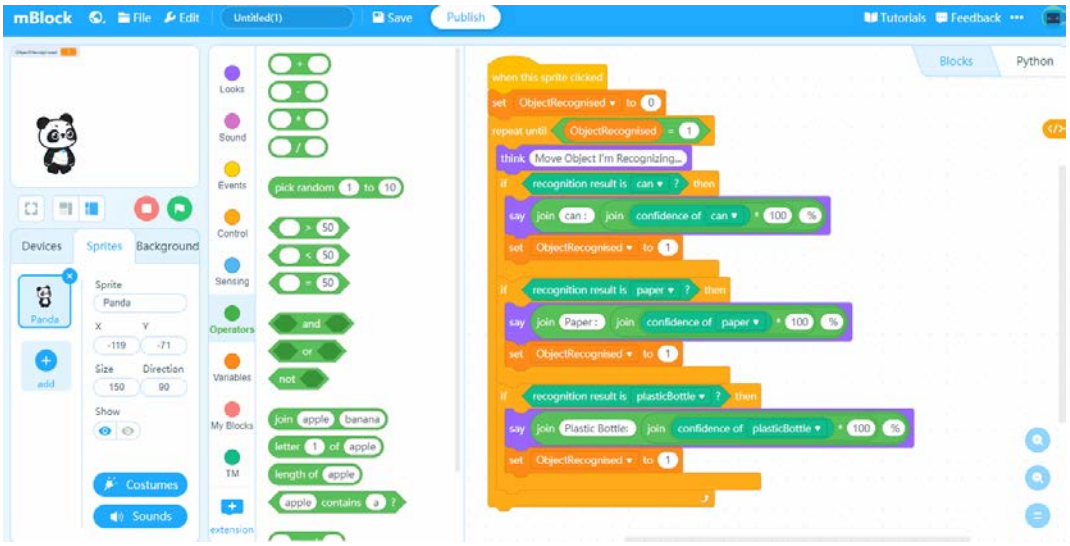


You can duplicate the precedents to do faster



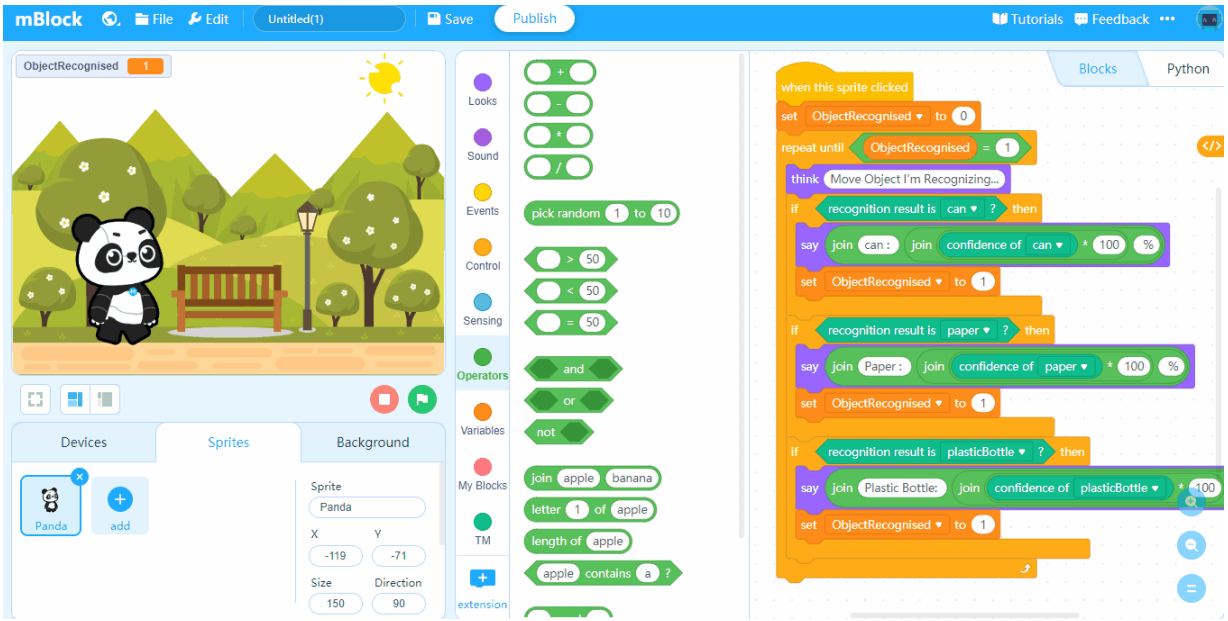
Notice that all the percentages are in decimals.



	Multiply the value of the blocks "**confidence of ()**" by 100 to have the values in percentages.  Insert the background of a park to make everything more green  Test your program: click on the panda to start the recognition
Duration **30 min**	**Conclusion:** Allow students to 'test' other edited scripts by running the script and showing different objects. They should check for: Is the recognition correct? Does the panda correctly recognize the displayed objects? Try with students to decide which will be the next recycling category to add

Notes:

To improve recognition you can at any time add new images or create new categories. Take a look at the example to see how to do it



Opportunity to reflect:

Discuss with the students what they found challenging with regards to editing the program

- What would they do differently?
- Can they enter information about how to recycle this type of object after it is indicated what it is?

Can students think of any other simple AI projects that they could create with this type of machine learning?