



# Ink blots

In this project, you will train robots to tell you what they can see in ink blots.

By training more than one robot, you'll see that different machine learning models can give different answers to the same questions, depending on how they've been trained.

This project is a recreation of an AI research project from MIT. In making it for yourself, you'll learn about an example of academic research in AI and the way that some people describe artificial intelligence systems.

The image shows a Scratch project titled "Ink blots". The stage features a green robot and a purple robot. The green robot has speech bubbles saying "that is a pear" and "that is a bird". The purple robot also has a speech bubble. The stage background is light blue with a dotted pattern. In the bottom right corner of the stage, there is a small black ink blot. The script area contains the following code:

```
when green flag clicked
  reset
  set clone v to left
  create clone of myself
  wait 0.1 seconds
  set clone v to right
  create clone of myself
  hide
  when I start as a clone
    if clone = -1
      glide 1 secs to left robot
      use model 1
    end
  end
```

The script palette on the left shows various blocks for Motion, Looks, Sound, Events, Control, Sensing, Operators, Variables, My Blocks, Images, Animals, and Fruit. The "use model 1" and "use model 2" blocks are highlighted in pink. The "define use model 1" and "define use model 2" blocks are orange. The "set [left robot speech v to M1 recognise image costume image (label)]" and "set [right robot speech v to M1 recognise image costume image (label)]" blocks are blue.

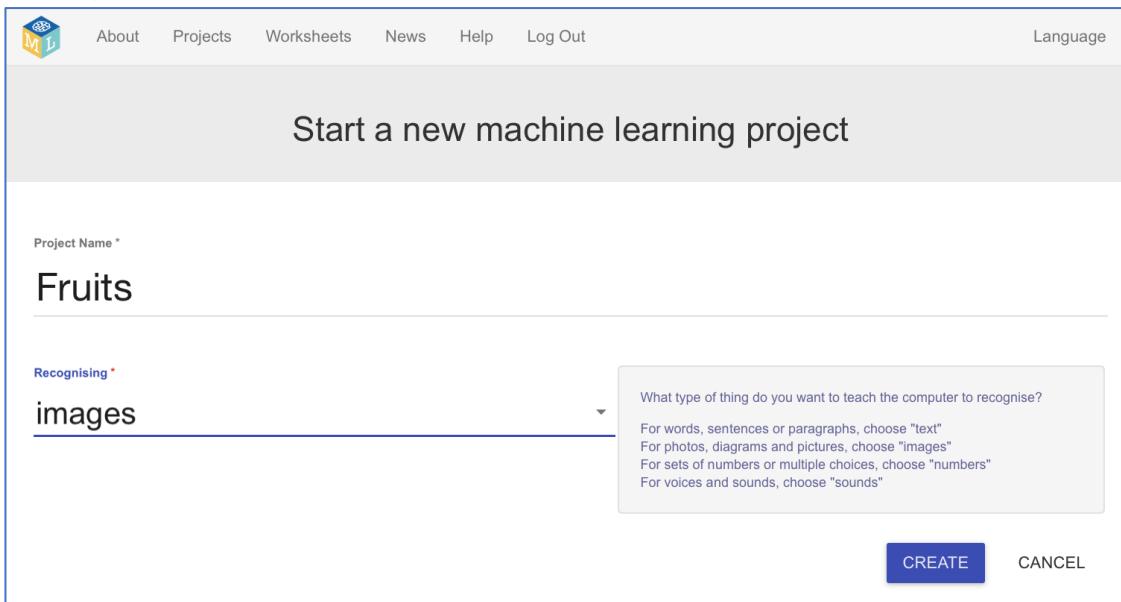


This project worksheet is licensed under a Creative Commons Attribution Non-Commercial Share-Alike License  
<http://creativecommons.org/licenses/by-nc-sa/4.0/>

This project is for two students, working together, each on their own computer  
If you don't have a partner or two computers, you can do all the steps yourself.

*These instructions are for “student 1”.  
 (“Student 2” instructions start at step 21)*

- 1.** (student 1) Go to <https://machinelearningforkids.co.uk/> in a web browser.
- 2.** (student 1) Click on “**Get started**”.
- 3.** (student 1) Click on “**Log In**” and type in a username and password.  
**Important:** You need to use the same username/password as “student 2”.
- 4.** (student 1) Click on “**Projects**” on the top menu bar.
- 5.** (student 1) Click the “**+ Add a new project**” button.
- 6.** (student 1) Name your project “**Fruits**”. Set it to learn to recognise “**images**”

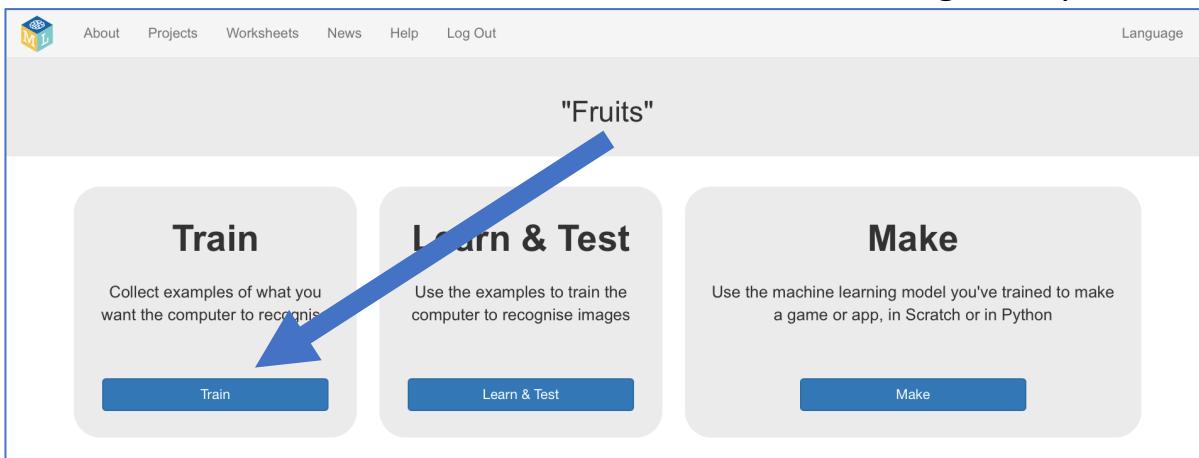


The screenshot shows a web page titled "Start a new machine learning project". At the top, there is a navigation bar with links for "About", "Projects", "Worksheets", "News", "Help", "Log Out", and "Language". Below the navigation bar, the main form has a "Project Name \*" field containing "Fruits". Underneath this, there is a "Recognising \*" dropdown menu with "images" selected. To the right of the dropdown, a tooltip provides information about the types of things that can be recognised: "text", "images", "numbers", and "sounds". At the bottom of the form are two buttons: "CREATE" and "CANCEL".

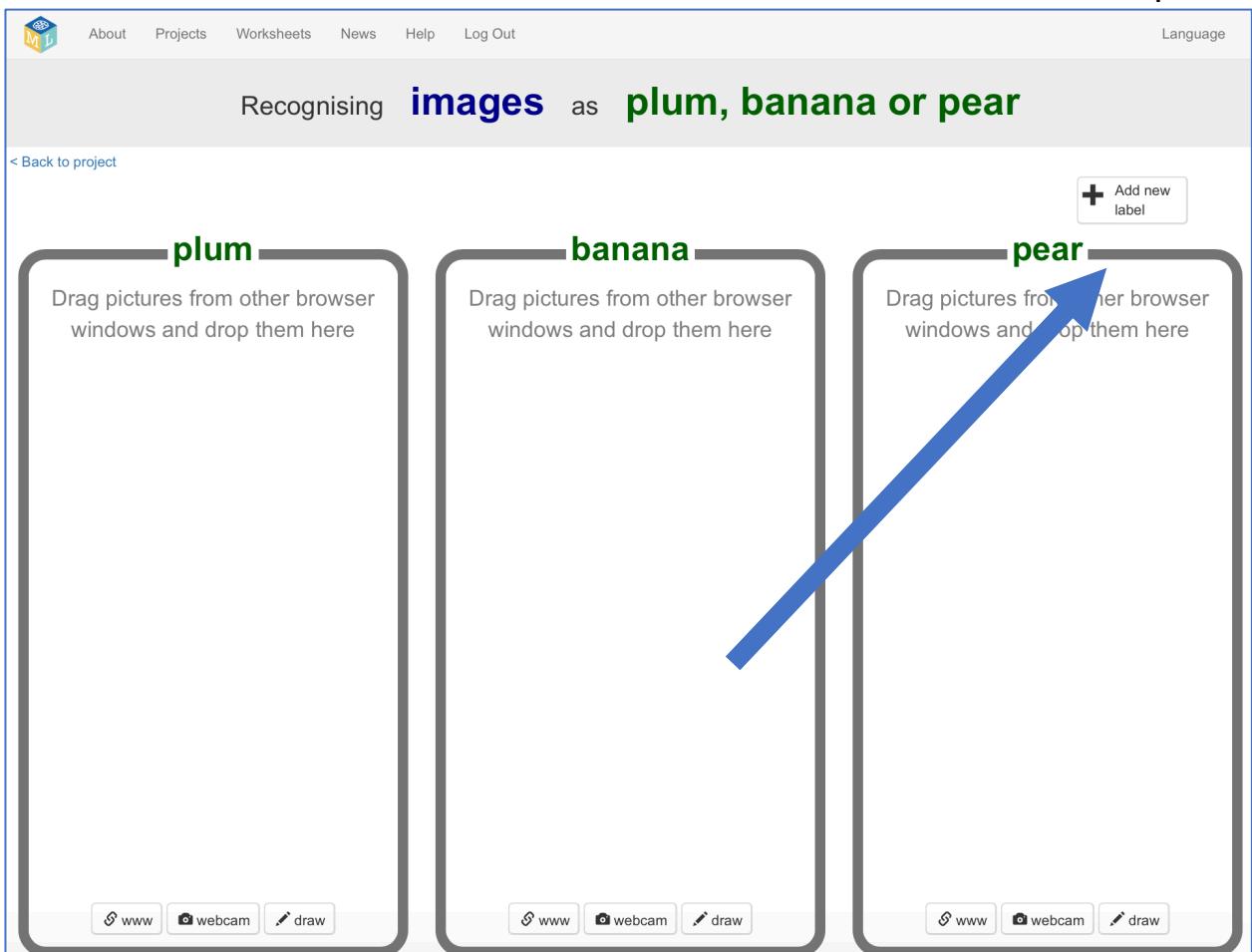
- 7.** (student 1) Click the “**Create**” button.

- 8.** (student 1) You should see “**Fruits**” in the list of your projects.  
Click on it.

- 9.** (student 1) Click the “**Train**” button to start collecting examples.

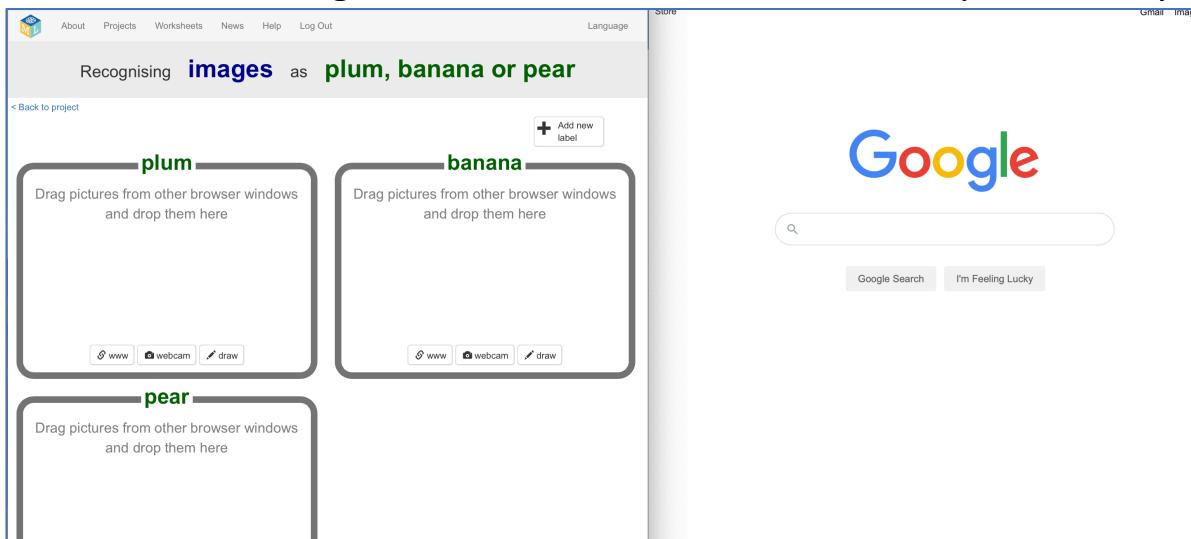


- 10.** (student 1) Click on “**+ Add new label**” and create a label called “plum”.  
Create a second bucket called “banana” and a third bucket called “pear”.



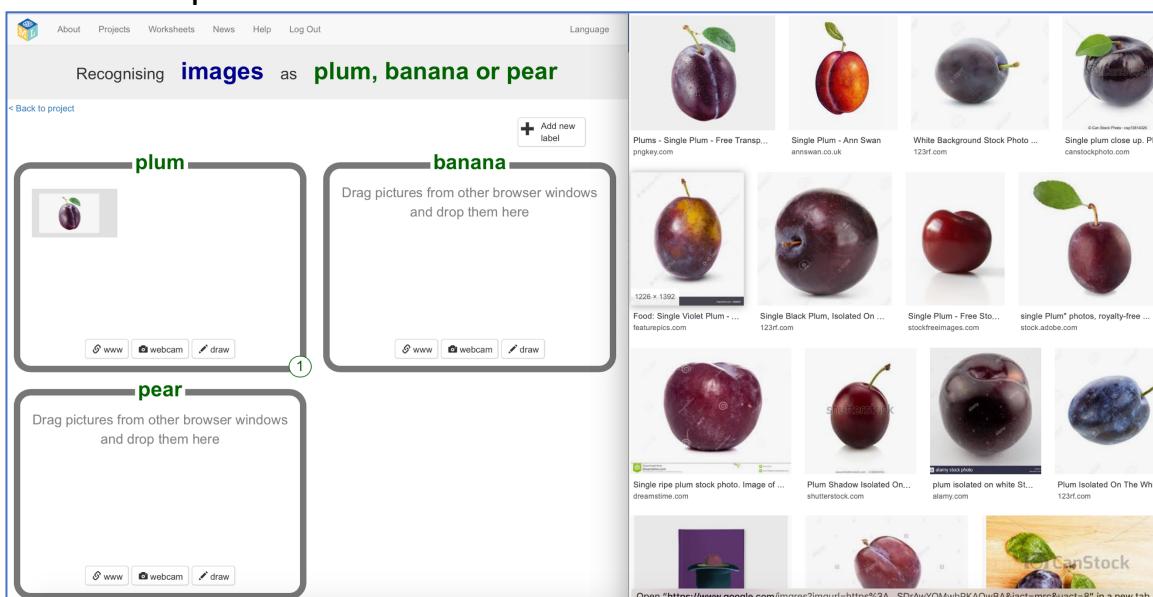
**11.** (student 1) Open another web browser window.

**12.** (student 1) Arrange the web browser windows so they are side by side.



**13.** (student 1) In the new browser window, search for pictures of plums.  
*Images of a single plum with a plain or blank background will work best.  
Try searching for “single plum”.*

**14.** (student 1) Drag a picture from the new window into the training bucket for plums.



**15.** (student 1) Repeat until you've got 10 examples of pictures of plums.

## 16. (student 1) Repeat steps 13-15 for bananas and pears.

The screenshot shows a web-based machine learning tool for image recognition. At the top, it says "Recognising **images** as **plum, banana or pear**". Below this are three sections: "plum", "banana", and "pear". Each section contains a grid of 10 images. In the "plum" section, there are 10 plum images. In the "banana" section, there are 10 banana images. In the "pear" section, there are 10 pear images. In the top right corner of the page, there is a button labeled "Add new label". A blue arrow points from the "pear" section towards this button.

## 17. (student 1) Click the “< Back to project” link.

## 18. (student 1) Click the “Learn & Test” button.

## 19. (student 1) Click the “Train new machine learning model” button.

The screenshot shows a "Machine learning models" page. At the top, it says "Machine learning models". Below this is a "What have you done?" section and a "What's next?" section. The "What have you done?" section says: "You have collected examples of images for a computer to use to recognise when images are plum, banana or pear. You've collected: • 10 examples of plum, • 10 examples of banana, • 10 examples of pear". The "What's next?" section says: "Ready to start the computer's training? Click the button below to start training a machine learning model using the examples you have collected so far. (Or go back to the [Train](#) page if you want to collect some more examples first.)". At the bottom, there is a box labeled "Info from training computer:" containing a "Train new machine learning model" button. A large blue arrow points from the "Info from training computer:" box down to the "Train new machine learning model" button.

## 20. (student 1) Wait for the training to finish. This can take a few minutes.

The screenshot shows a web-based machine learning project interface. At the top, there's a navigation bar with links for About, Projects, Worksheets, News, Help, Log Out, and Language. The main title is "Machine learning models". Below the title, there's a link "[< Back to project](#)". The interface is divided into two main sections: "What have you done?" on the left and "What's next?" on the right.

**What have you done?**

You've started training a machine learning model using the examples of images that you collected.

It's been training since Wednesday, January 29, 2020 9:31 AM.

This normally takes a few minutes, but can take a little longer if the training computer is very busy.

**What's next?**

You could wait for the machine learning model to finish being trained.

Or, you could try the machine learning quiz below, to check what you've learned.

**Info from training computer:**

Model started training at:	Wednesday, January 29, 2020 9:31 AM
Current model status:	Training
Model last checked:	a few seconds ago

[Cancel training](#)

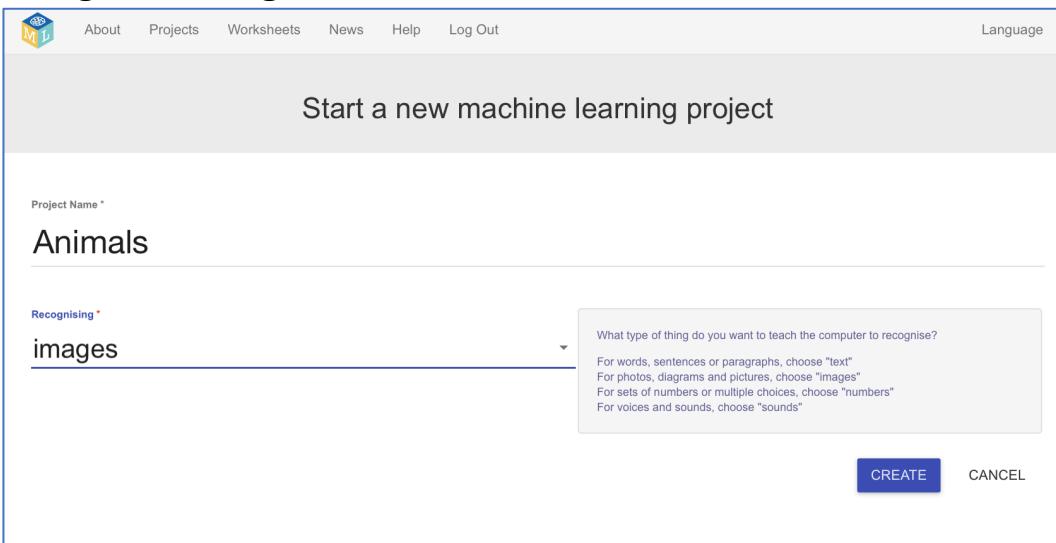
A large blue arrow points from the text "It's been training since Wednesday, January 29, 2020 9:31 AM." towards the "Model last checked" status line.

## 21. (student 1) Click the “< Back to project” link.

*Student 1 instructions continue at step 43*

*These instructions are for “student 2”.  
 (“Student 1” instructions continue at step 43)*

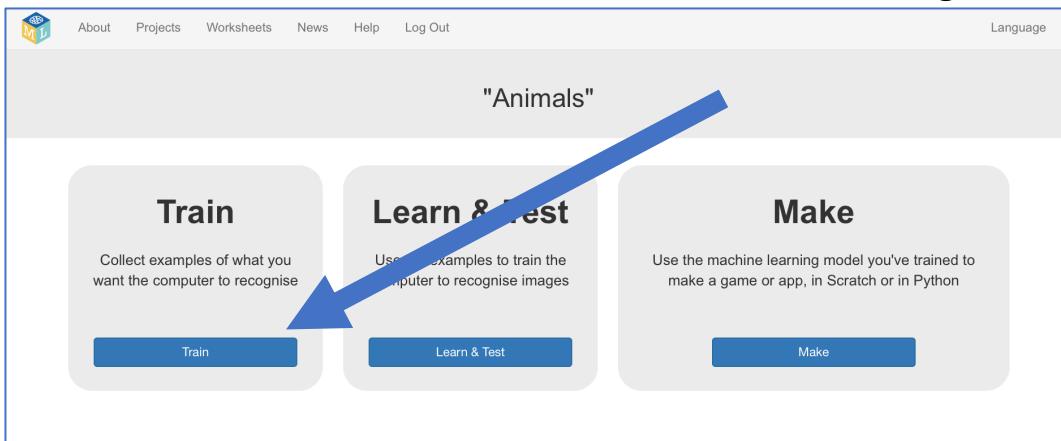
- 22.** (student 2) Go to <https://machinelearningforkids.co.uk/> in a web browser.
- 23.** (student 2) Click on “Get started”.
- 24.** (student 2) Click on “Log In” and type in a username and password.  
**Important:** You need to use the same username/password as “student 1”.
- 25.** (student 2) Click on “Projects” on the top menu bar.
- 26.** (student 2) Click the “+ Add a new project” button.
- 27.** (student 2) Name your project “Animals”. Set it to learn how to recognise “images”



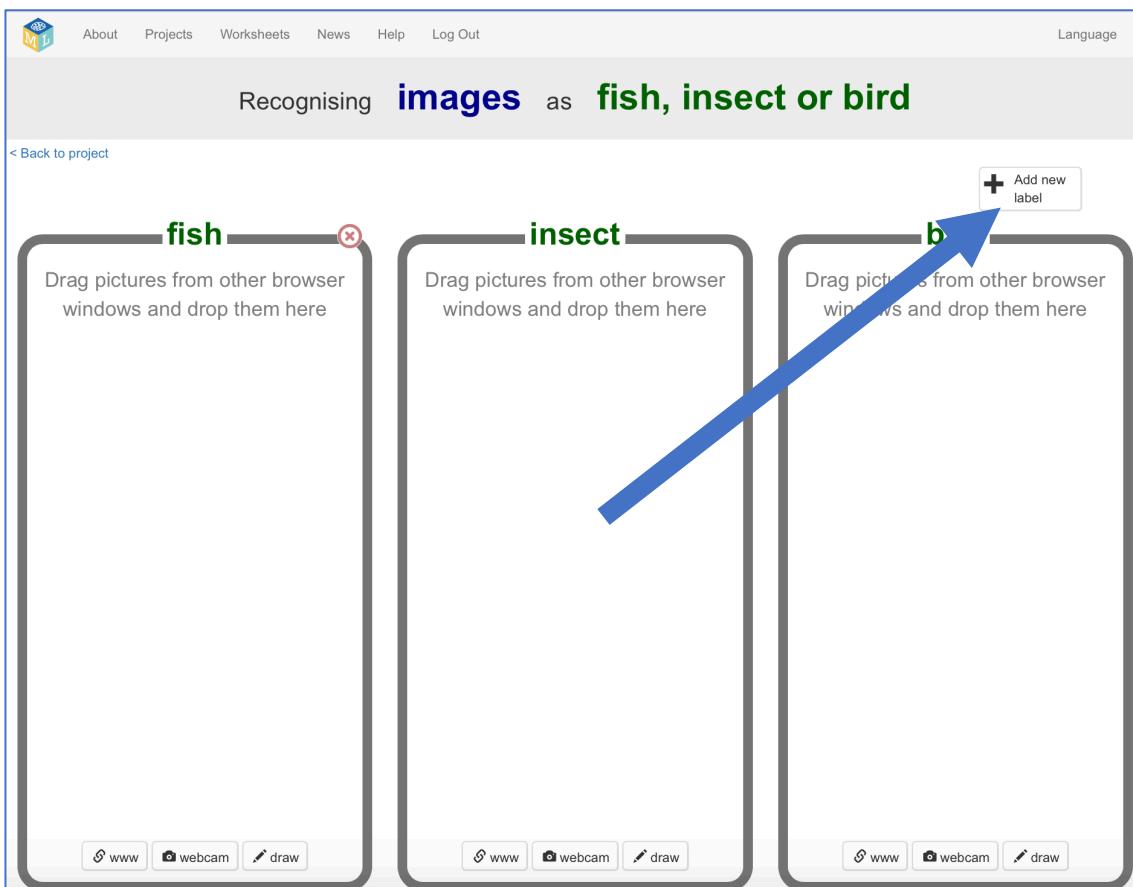
The screenshot shows a web page titled "Start a new machine learning project". At the top, there is a navigation bar with links for "About", "Projects", "Worksheets", "News", "Help", "Log Out", and "Language". Below the title, there is a "Project Name" input field containing "Animals". Underneath it, there is a "Recognising" dropdown menu set to "images". To the right of the dropdown, a tooltip provides information about the types of things that can be recognised: "text", "images", "numbers", and "sounds". At the bottom right of the form, there are "CREATE" and "CANCEL" buttons.

- 28.** (student 2) Click the “Create” button.
- 29.** (student 2) You should see “Animals” in the list of your projects.  
Click on it.

## 30. (student 2) Click the “Train” button to start collecting examples.

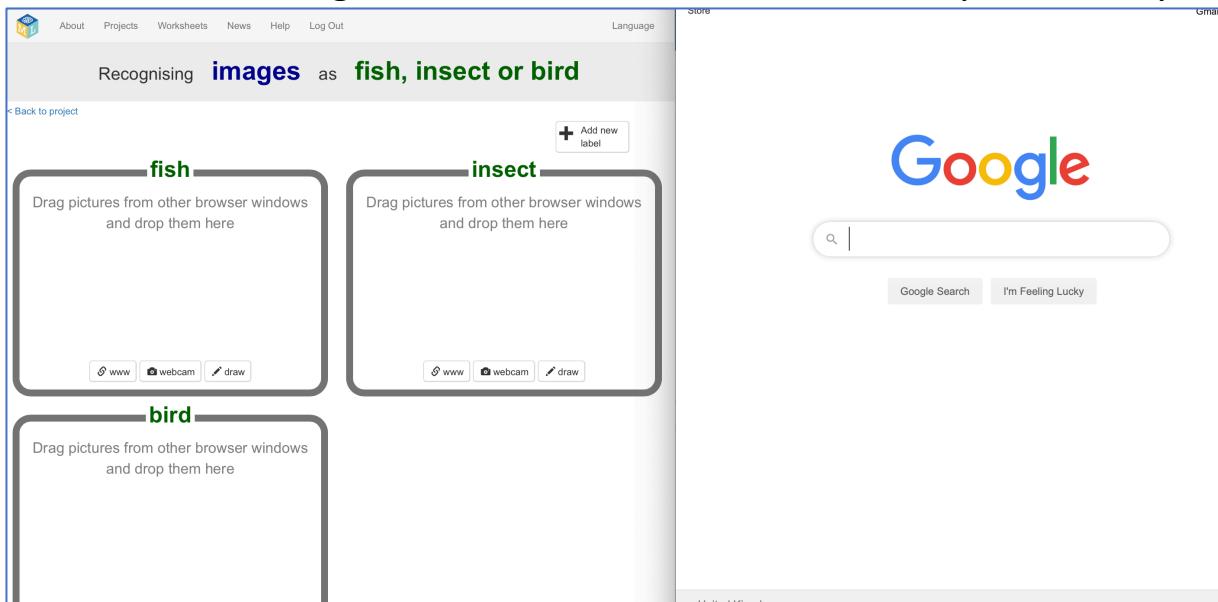


## 31. (student 2) Click on “+ Add new label” and create a bucket called “fish”. Create a second bucket called “insect” and a third bucket called “bird”.



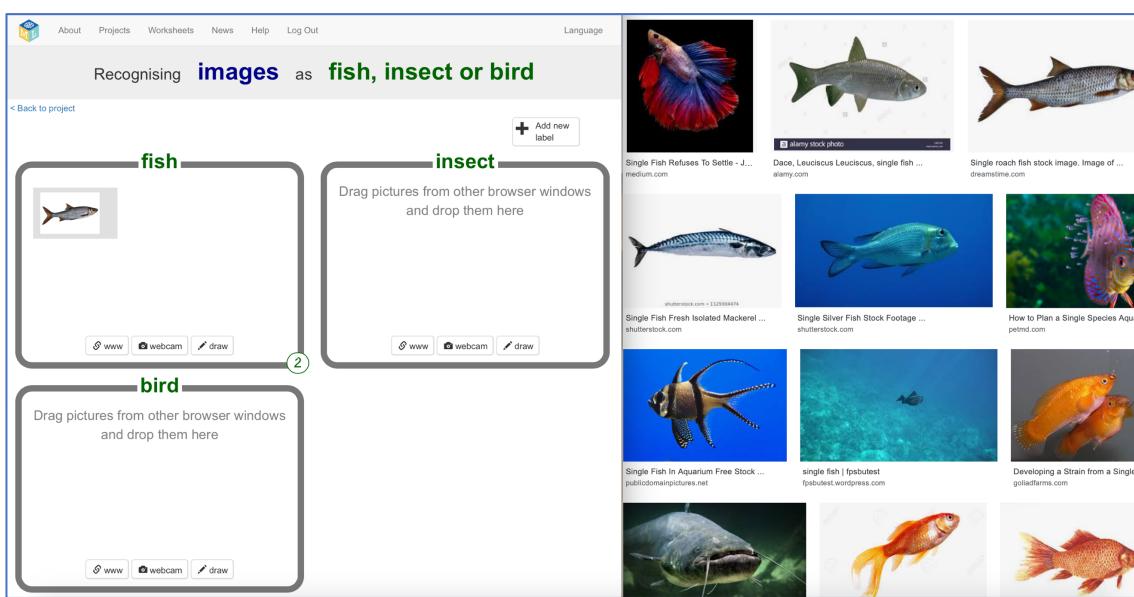
## 32. (student 2) Open another web browser window.

### 33. (student 2) Arrange the web browser windows so they are side by side.



### 34. (student 2) In the new browser window, search for pictures of fish. *Images of a single fish with a plain or blank background will work best. Try searching for "single fish".*

### 35. (student 2) Drag a picture from the new window into the training bucket for fish.



### 36. (student 2) Repeat until you've got 10 examples of pictures of fish.

## 37. (student 2) Repeat steps 33-35 for insects and birds.

The screenshot shows a web-based application for training a machine learning model. At the top, there are links for 'About', 'Projects', 'Worksheets', 'News', 'Help', and 'Log Out'. On the right, there's a 'Language' dropdown. The main title is 'Recognising images as fish, insect or bird'. Below the title, there are three categories: 'fish', 'insect', and 'bird', each with a collection of images. Each category has a counter '(10)' at the bottom right. At the very bottom, there are buttons for 'www', 'webcam', and 'draw', followed by another counter '(10)'.

## 38. (student 2) Click the “< Back to project” link.

## 39. (student 2) Click the “Learn & Test” button

## 40. (student 2) Click the “Train new machine learning model” button

The screenshot shows a 'Machine learning models' page. At the top, there are links for 'About', 'Projects', 'Worksheets', 'News', 'Help', and 'Log Out'. The main title is 'Machine learning models'. Below the title, there are two sections: 'What have you done?' and 'What's next?'. A large blue arrow points from the 'What's next?' section down to the 'Train new machine learning model' button. The 'What have you done?' section contains text about collecting images and a bulleted list: '• 10 examples of fish,' '• 10 examples of insect,' and '• 10 examples of bird'. The 'What's next?' section contains text about starting training and a note: '(Or go back to the Train page if you want to collect some more examples first.)'. At the bottom, there is a box labeled 'Info from training computer:' containing a 'Train new machine learning model' button.

## 41. (student 2) Wait for the training to finish. This can take a few minutes.

The screenshot shows a ScratchJr project titled "Machine learning models". The "What have you done?" section indicates the model started training on Wednesday, January 29, 2020, at 9:46 AM. The "What's next?" section suggests waiting for the training to finish and offers a quiz. A large blue arrow points from the "What's next?" section down to the training status information.

< Back to project

**What have you done?**

You've started training a machine learning model using the examples of images that you collected.

It's been training since Wednesday, January 29, 2020 9:46 AM.

This normally takes a few minutes, but can take a little longer if the training computer is very busy.

**What's next?**

You could wait for the machine learning model to finish being trained. Or, you could try the machine learning quiz below, to check what you've learned.

Info from training computer:

Model started training at: Wednesday, January 29, 2020 9:46 AM  
Current model status: Training  
Model last checked: a few seconds ago

[Cancel training](#)

## 42. (student 2) Click the “< Back to project” link.

### What have you done so far?

You've trained two different machine learning models.

One has been trained to recognize fruit in pictures. All it knows about is fruit.

The other has been trained to recognize animals in pictures. All it knows about are animals.

Next you'll use these to control two different robots and see how differently they behave at the same tasks.

**43.** (BOTH students) Click the “**Make**” button

*Student 1 will be clicking “Make” in their Fruits project*

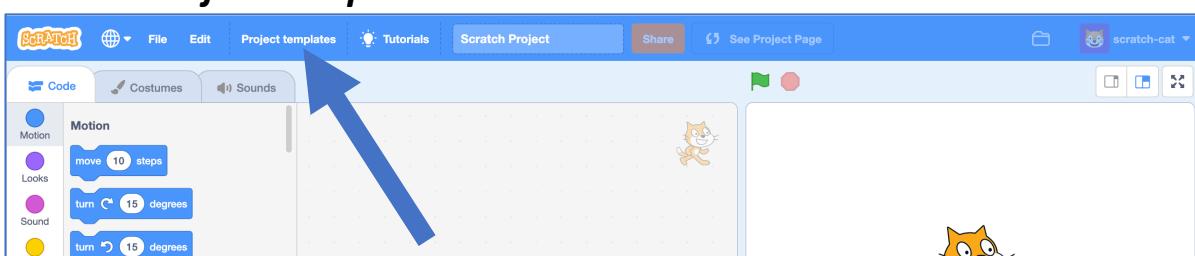
*Student 2 will be clicking “Make” in their Animals project*

**44.** (BOTH students) Click the “**Scratch 3**” button

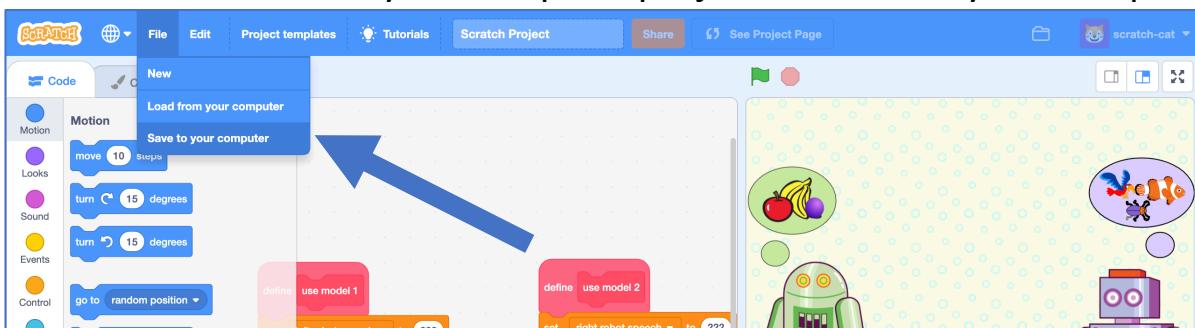
**45.** (BOTH students) Click the “**Open in Scratch 3**” button.

**46.** (BOTH students) Open the “**Ink blots**” project template.

*Click on Project templates and then click on Ink blots*

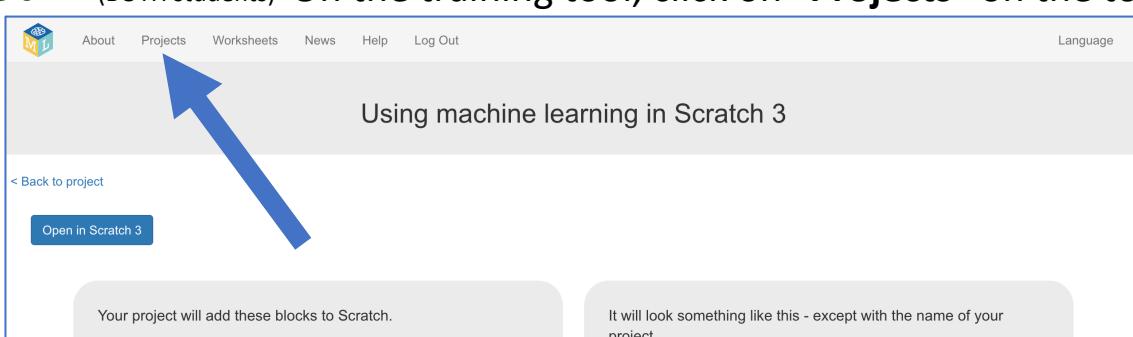


**47.** (BOTH students) Save your template project to a file on your computer.



**48.** (BOTH students) Close the Scratch 3 window.

**49.** (BOTH students) On the training tool, click on “**Projects**” on the top menu



## 50. (student 1) Click on the “Animals” project

*This is the machine learning model that “student 2” trained.*

## 51. (student 2) Click on the “Fruit” project

*This is the machine learning model that “student 1” trained.*

## 52. (BOTH students) Click the “Make” button

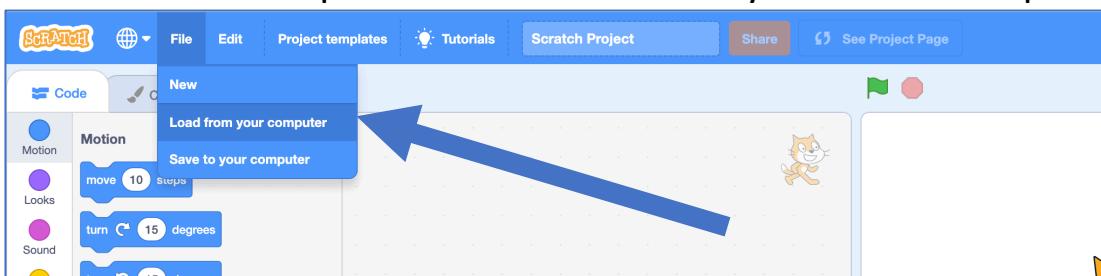
*Student 1 will be clicking “Make” in the Animals project this time.*

*Student 2 will be clicking “Make” in the Fruit project this time.*

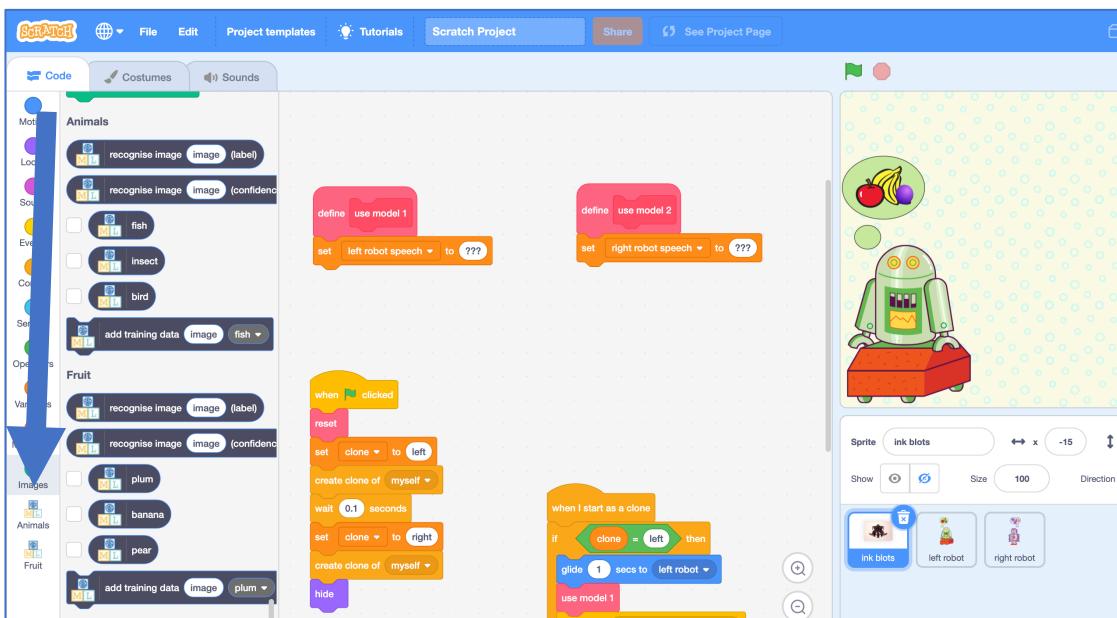
## 53. (BOTH students) Click the “Scratch 3” button

## 54. (BOTH students) Click the “Open in Scratch 3” button.

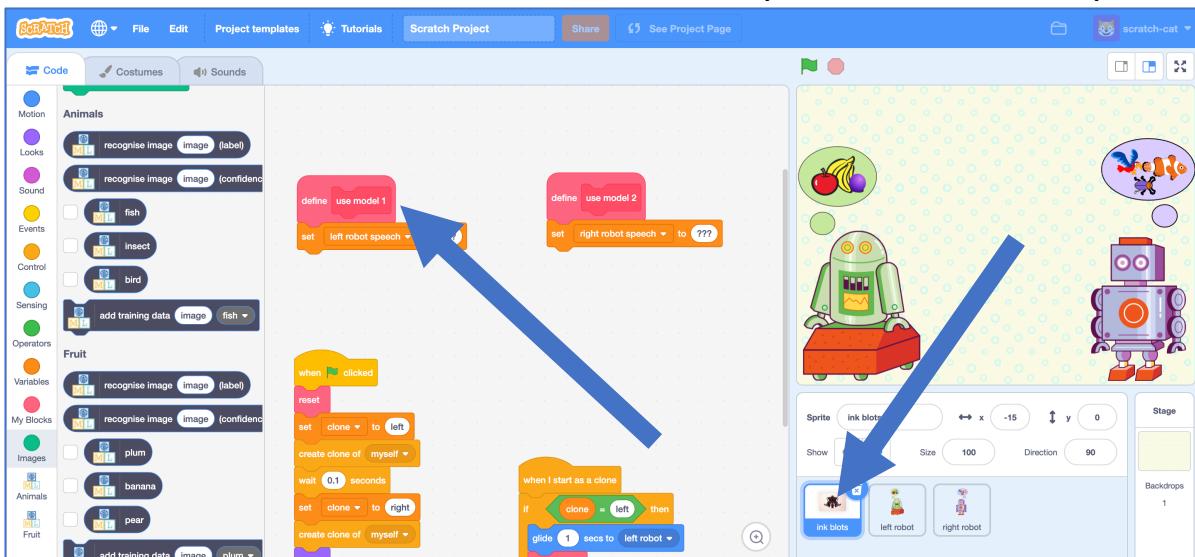
## 55. (BOTH students) Open the Scratch file that you saved in step 47.



## 56. (BOTH students) Check the Animals & Fruit models are both in the toolbox



**57.** (BOTH students) Find the “use model 1” script in the ink blots sprite.

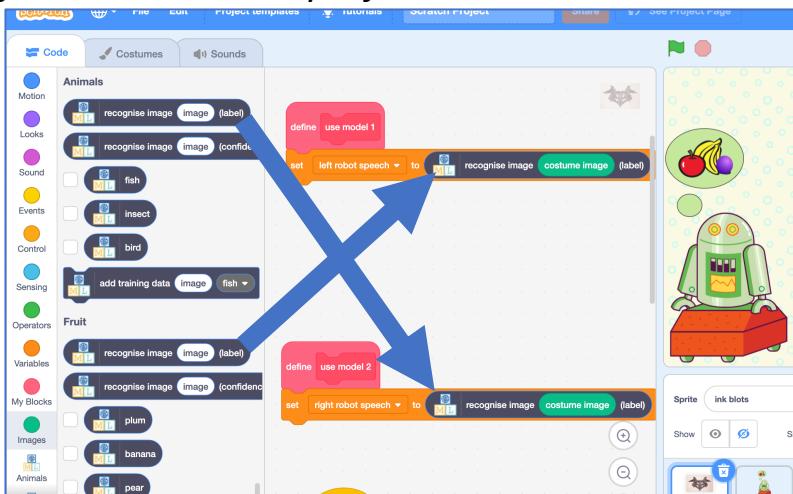


**58.** (BOTH students) Update the script so that it uses the **Fruit** ML model  
*The blocks for the two projects look the same. Make sure you get the one from the Fruit project.*



**59.** (BOTH students) Find the “use model 2” script, still in the ink blots sprite.

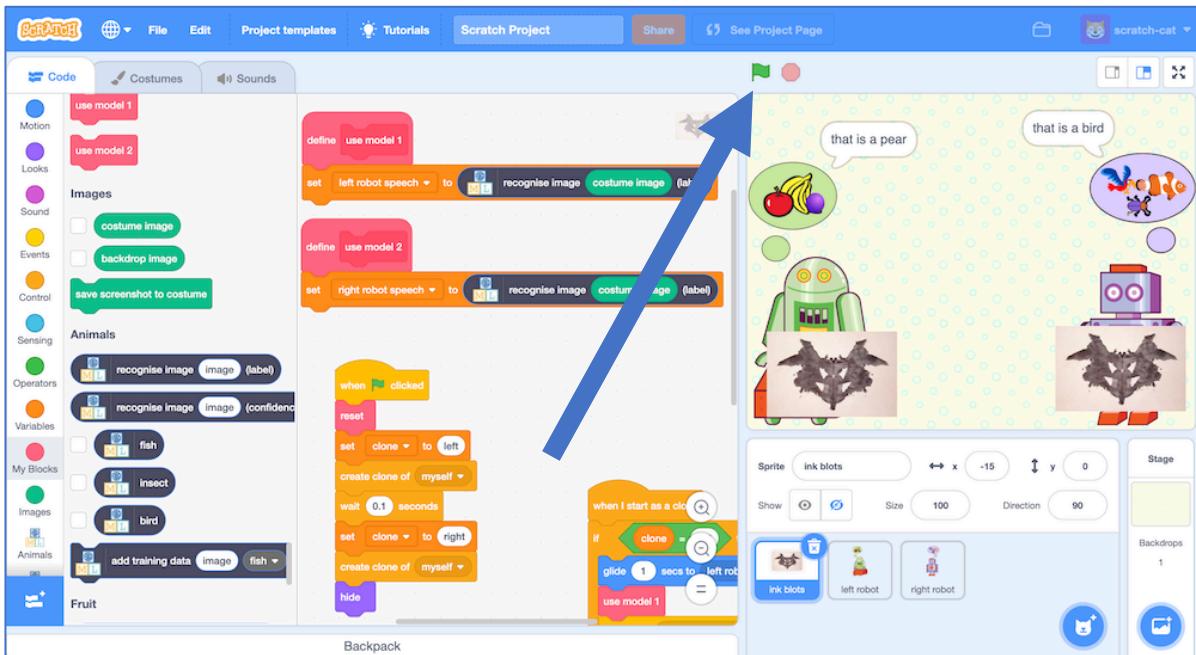
**60.** (BOTH students) Update the script so that it uses the **Animals** ML model  
*The blocks for the two projects look the same. Make sure you get the one from the Animals project.*



## 61. (BOTH students) It's time to test!

Press the **Green Flag**

An ink blot picture will be shown to both robots, and each of them will use their machine learning model to recognize what the ink blot looks like.



## 62. (BOTH students) Click the **Green Flag** again to try a different ink blot.

### What have you done?

You're giving the same pictures to two different machine learning models and asking them the same question – to recognize what they recognize in the picture.

Compare the answers that they're giving.

Why do you think they don't give the same answers?

Why does the green robot always say it thinks the ink blot looks like a fruit?

## Rorschach tests

Asking someone to tell you the object that they can recognize in an ink blot painting is sometimes described as a “Rorschach test”.

Some people claim that you can use this as a psychological test, and that you can tell things about people’s character or emotions based on the answers that they give. (Not all psychologists think this is a useful test).

You trained two different machine learning models and performed a Rorschach test on both of them to compare their answers.

## Norman, the “psychopath” AI

This project is a recreation of an artificial intelligence research project from MIT (Massachusetts Institute of Technology) in 2018.

They trained machine learning models to recognize what was in a picture, and tested them with ink blots (just as you have).

One of their machine learning models was trained to recognize upsetting things using training images from scary movies.

When tested with ink blot pictures, that ML model always gave answers that were scary or upsetting.

They called this ML model “Norman” and described it as the “world’s first psychopath AI” because it always gave disturbing answers to the ink blot picture tests.

You can learn more about this project at [norman-ai.mit.edu](http://norman-ai.mit.edu)

What do you think? Why did “Norman” give upsetting answers to the ink blot test? Was this AI really a psychopath?

<http://norman-ai.mit.edu/#press> has links to how the media described this project. Do you agree with the descriptions of AI in those stories?