



# Car or Cup?

In this project you will make a Scratch project that learns to sort photos.

You will train the computer to be able to sort a set of photos into two piles:

- \* one pile of photos of cars, and
- \* one pile of photos of cups

The image shows a Scratch project interface. On the left, the script editor displays a script for a 'mystery' sprite. The script starts with 'when I start as a clone' and includes several conditionals based on image recognition. It uses the 'recognise image' block from the 'ML' category to identify costumes labeled 'car' and 'cup'. The 'Stage' panel on the right shows a collection of images of cars and cups. The 'Backpack' panel at the bottom contains a single image of a coffee cup.



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- 1.** Go to <https://machinelearningforkids.co.uk/> in a web browser
- 2.** Click on “**Get started**”
- 3.** Click on “**Log In**” and type in your username and password  
*If you don't have a username, ask your teacher or group leader to create one for you.*  
*If you can't remember your username or password, ask your teacher or group leader to reset it for you.*
- 4.** Click on “**Projects**” on the top menu bar
- 5.** Click the “**+ Add a new project**” button.
- 6.** Name your project “car or cup” and set it to learn how to **recognise images**.
- 7.** You can store the project **in your web browser** or **in the cloud**.
- 8.** Click the “**Create**” button

The screenshot shows a web-based form for creating a machine learning project. At the top, there's a navigation bar with links for About, Projects, Worksheets, Pretrained, Stories, Book, Help, and Log Out. On the right side of the header is a Language selection dropdown. The main title is "Start a new machine learning project". The form fields are as follows:

- Project Name \***: car or cup
- Project Type \***: recognising images
- Storage \***: In your web browser

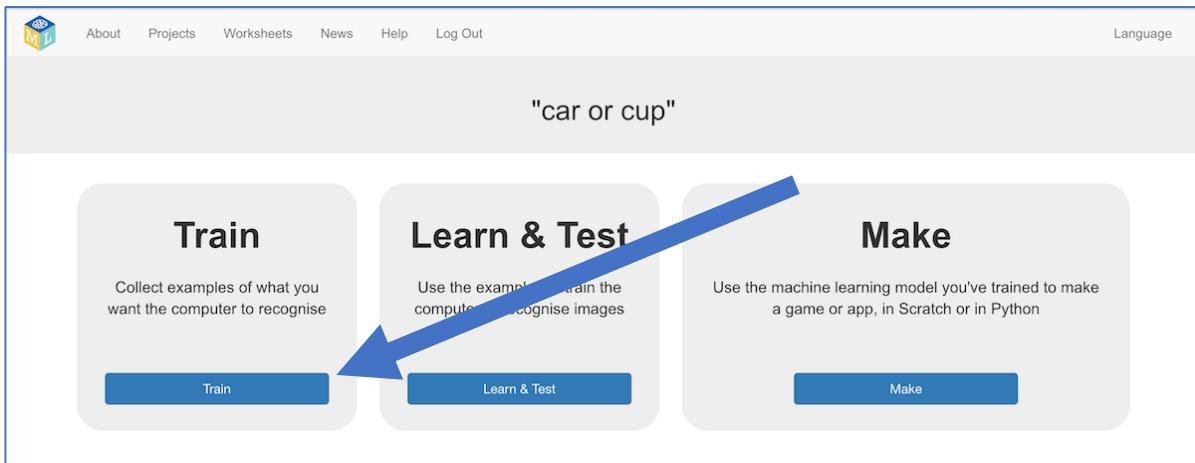
A large blue arrow points diagonally from the "Project Name" input field down towards the "CREATE" button at the bottom right of the form. A tooltip box is visible near the "Project Type" field, containing the following text:

What do you want to teach the computer to do?  
To recognise words, sentences or paragraphs, choose "recognising text"  
To recognise photos, diagrams or pictures, choose "recognising images"  
To recognise sets of numbers or multiple choices, choose "recognising numbers"  
To recognise voices or sounds, choose "recognising sounds"  
To predict numbers, choose "predicting numbers"

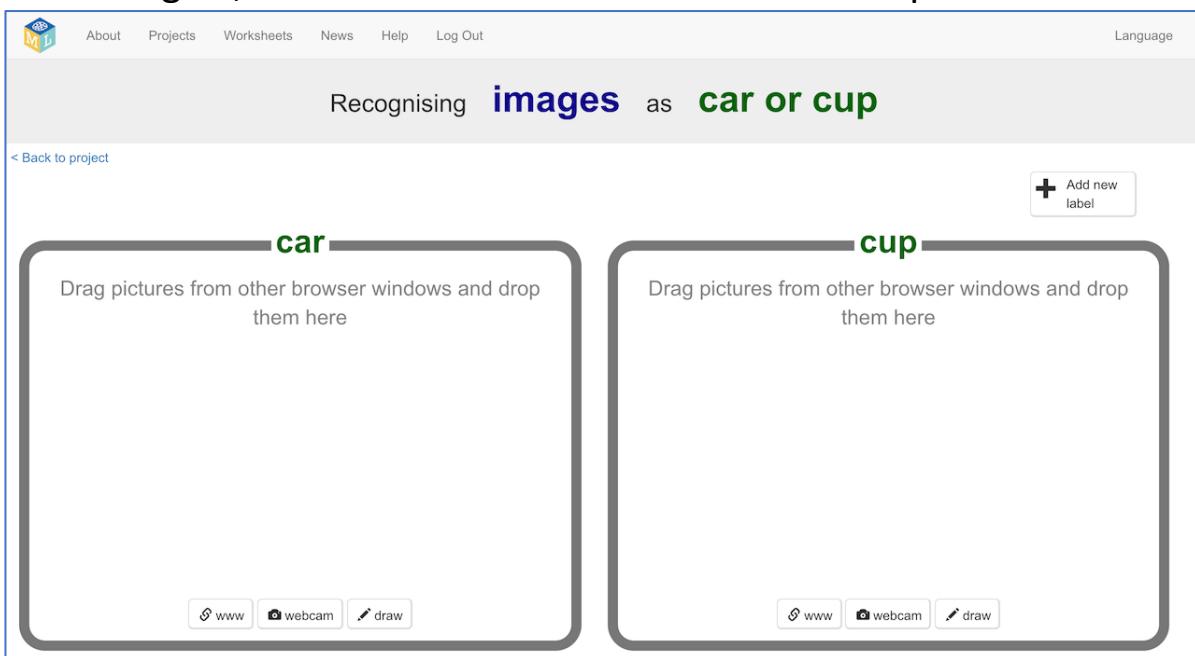
At the bottom right of the form are two buttons: a blue "CREATE" button and a white "CANCEL" button.

**9.** You should now see “**car or cup**” in the list of your projects.  
Click on it.

**10.** Click the “**Train**” button to start collecting examples.

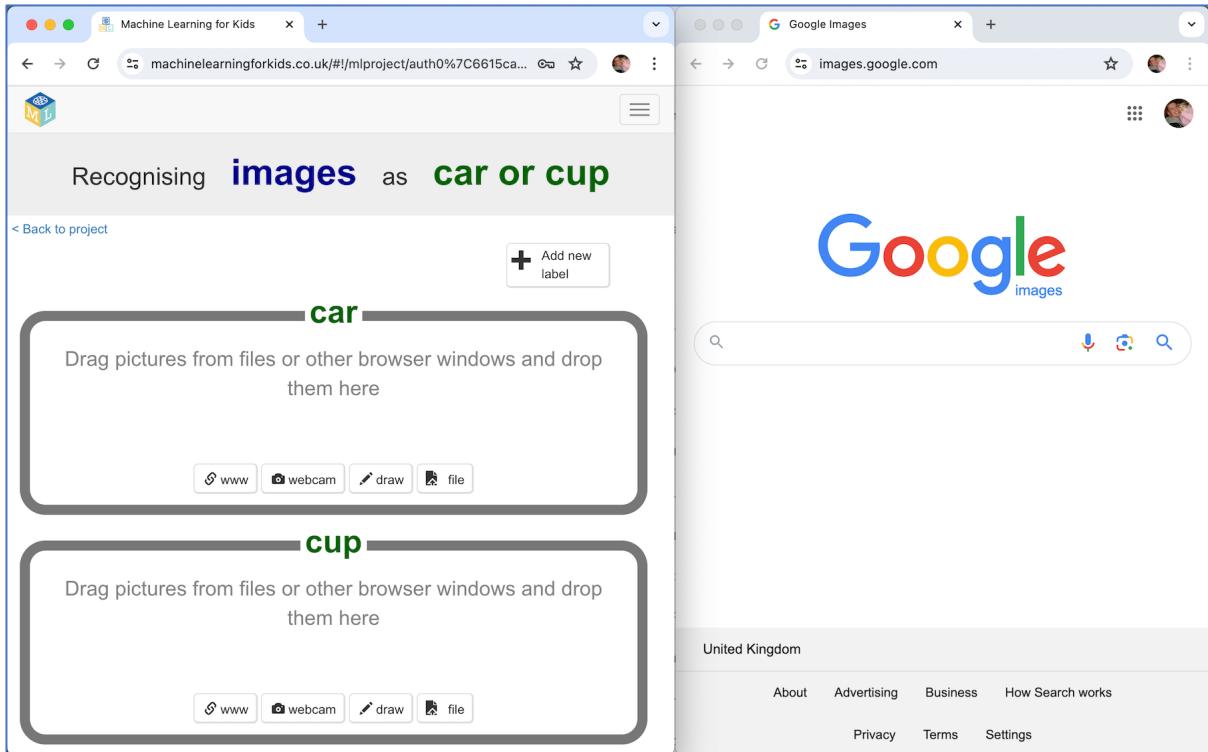


**11.** Click on “**+ Add new label**” and call it “**car**”.  
Do that again, and create a second bucket called “**cup**”.

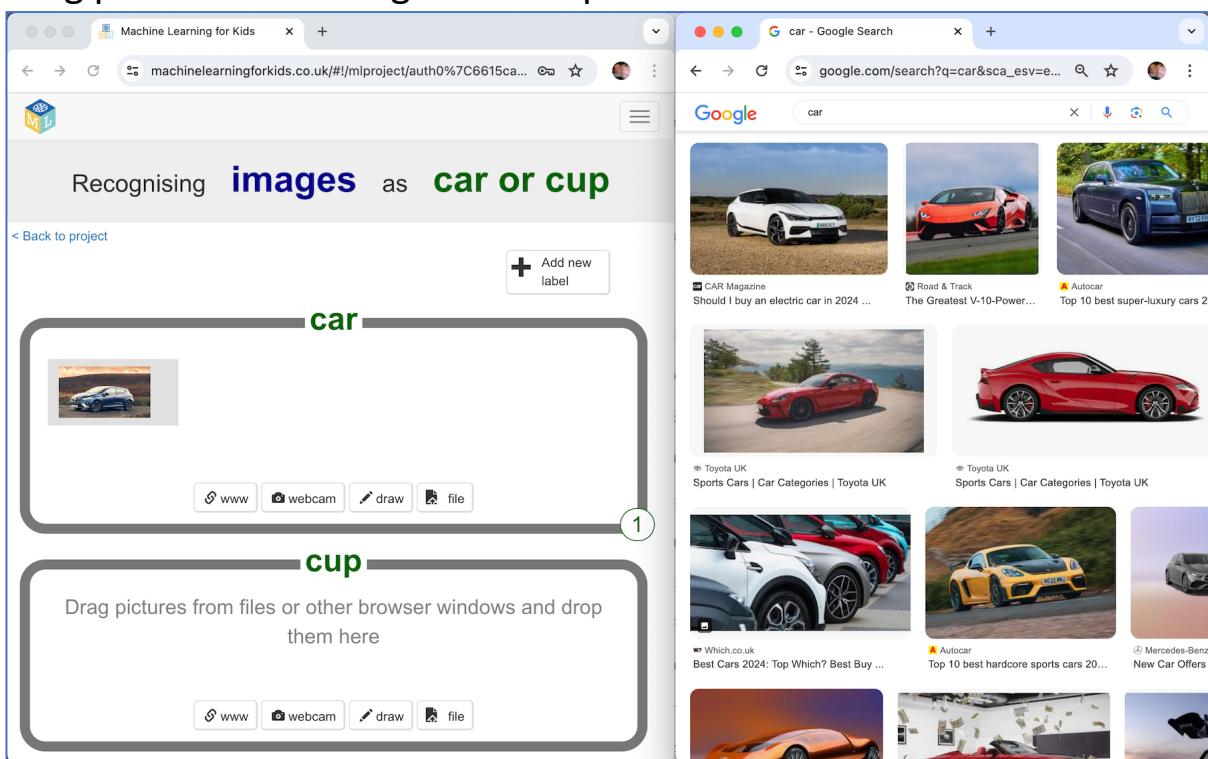


**12.** Open another web browser window.

### 13. Arrange the web browser windows so that they are side by side.



### 14. In the new browser window, search for pictures of cars. Drag pictures that are good examples of a car into the first bucket.



### 15. Repeat until you've got at least 10 examples of car photos.

## 16. Search for pictures of cups.

Drag pictures that are good examples of a cup into the second bucket.

The screenshot shows a machine learning project interface with two main sections for labeling images:

- car Bucket:** Labeled "car" at the top. It contains 10 images of various cars (sedans, SUVs, etc.).
- cup Bucket:** Labeled "cup" at the top. It contains 1 image of a white cup on a wooden surface.

At the bottom of each bucket are four buttons: "www", "webcam", "draw", and "file".

## 17. Repeat until you have at least 10 examples of cup photos.

The screenshot shows the same machine learning project interface after more images have been added to both buckets:

- car Bucket:** Labeled "car" at the top. It contains 10 images of various cars.
- cup Bucket:** Labeled "cup" at the top. It contains 10 images of various cups and mugs, including coffee cups, tea cups, and mugs with different designs.

At the bottom of each bucket are four buttons: "www", "webcam", "draw", and "file".

- 18.** Click the “< Back to project” link.
- 19.** Click the “Learn & Test” button
- 20.** Click the “Train new machine learning model” button

The screenshot shows the 'Machine learning models' page. 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 title 'Machine learning models' is displayed. A blue arrow points from the text in step 20 to the 'Train new machine learning model' button.

**What have you done?**

You have collected examples of images for a computer to use to recognise when images are car or cup.

You've collected:

- 10 examples of car,
- 10 examples of cup

**What's next?**

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.)

**Info from training computer:**

**Train new machine learning model**

- 21.** Wait for the training to complete.

The screenshot shows the 'Machine learning models' page after the training has started. A blue arrow points from the text in step 21 to the 'Cancel training' button.

**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 Monday, April 15, 2019 9:28 PM.

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:** Monday, April 15, 2019 9:28 PM  
**Current model status:** Training

**Model last checked:** a few seconds ago

**Cancel training**

## What have you done so far?

You've started to train a computer to recognise pictures of cups and cars. Instead of writing rules to do this, you are doing it by collecting examples. These examples are being used to train a machine learning "model".

This is called "supervised learning" because of the way you are supervising the computer's training.

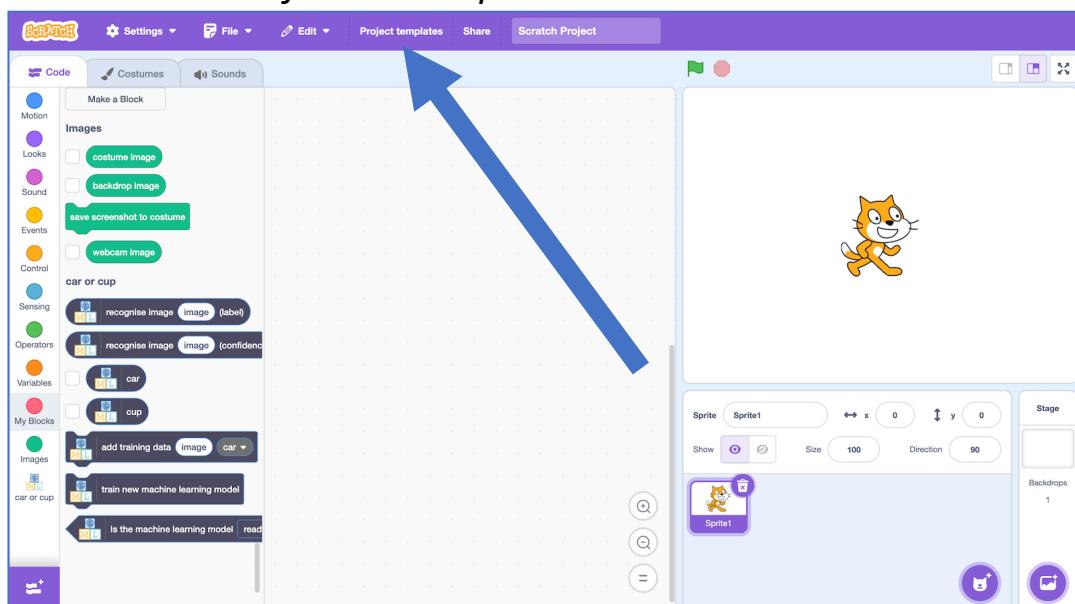
The computer will learn from patterns in the example photos you've chosen, such as the shapes and the use of colour. These will be used to be able to recognise new images.

- 22.** Click the "**< Back to project**" link
  
- 23.** Click the "**Make**" button, and then the "**Scratch 3**" button.
  
- 24.** Click the "**Open in Scratch 3**" button

- 25.** Load the **Car or cup** template

*Click on **Project templates** and then click on **Car or Cup***

*Wait a moment for the template to download*



## Tips

### More examples!

The more examples you give it, the better the computer should get at recognising whether a photo is a cup or car.

### Try and be even

Try and come up with roughly the same number of examples for cups and cars.

If you have a lot of examples for one type, and not the other, the computer might learn that type is more likely, so you'll affect the way that it learns to recognise photos.

### Mix things up with your examples

Try to come up with lots of different types of examples.

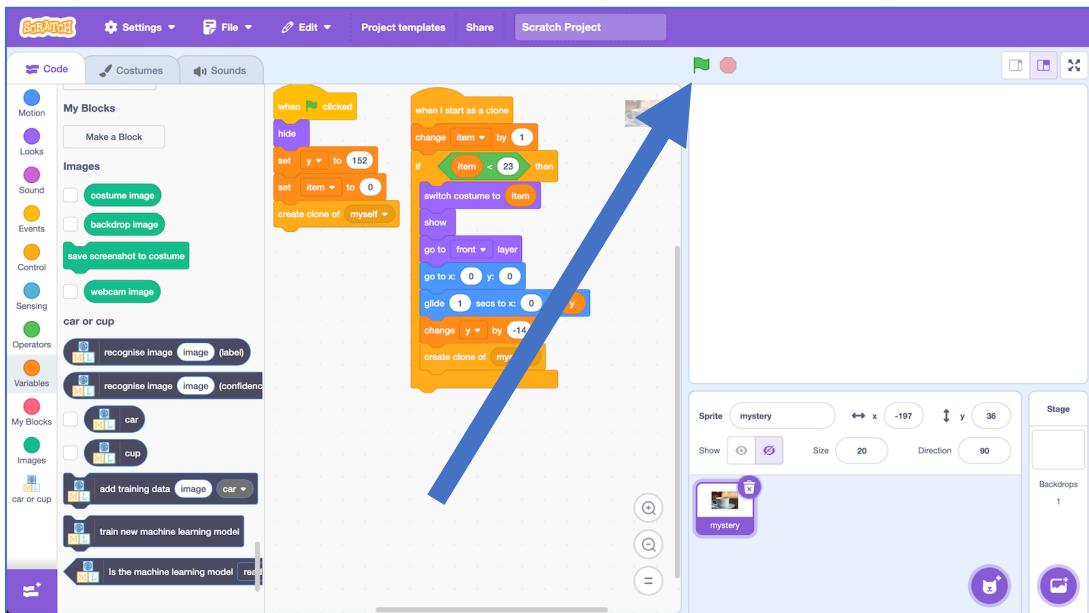
For example, make sure that you include some examples with different backgrounds.

If every photo of a car you use for training has grass in the background, and every photo of a cup you use for training is on a wooden table, you might end up training the computer to recognise grass or wood instead.

## 26. Click the green flag to give it a try.

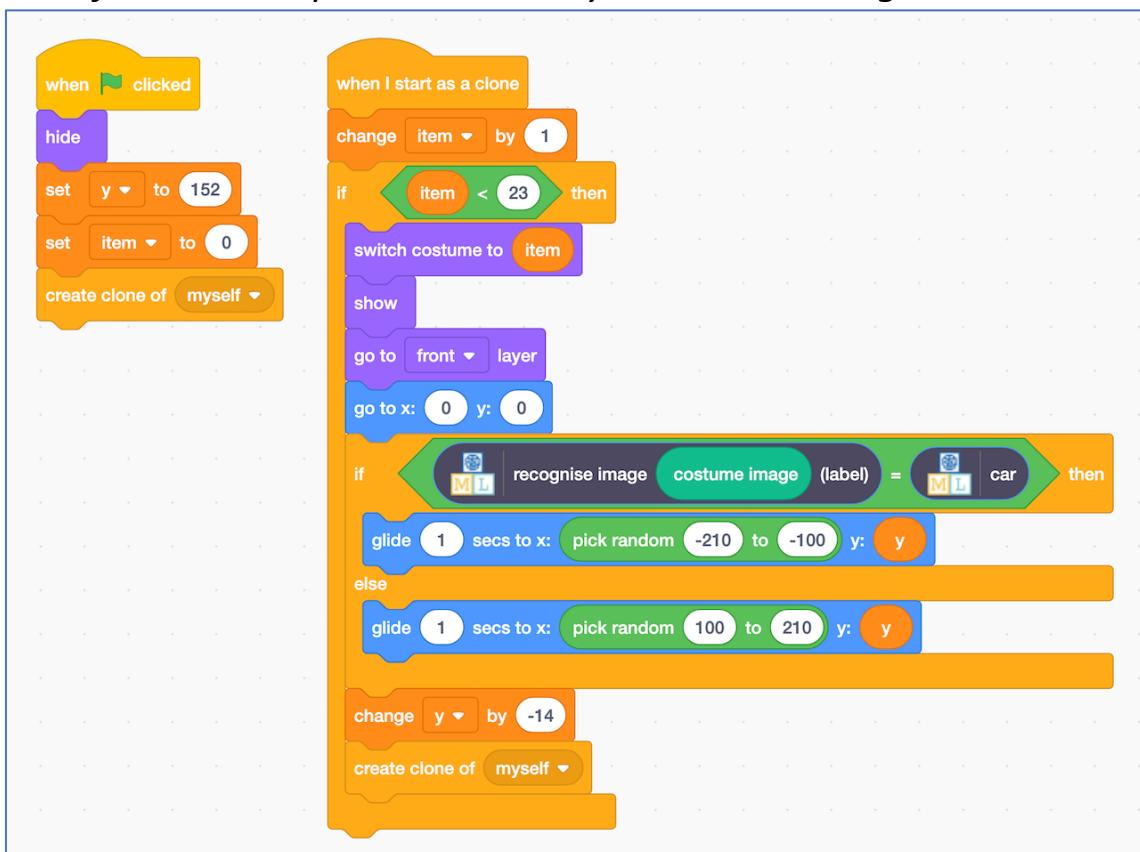
The project has several random photos or cars or cups.

Next you will modify the project to use the training you've given the computer, so that it can sort these photos into two piles.

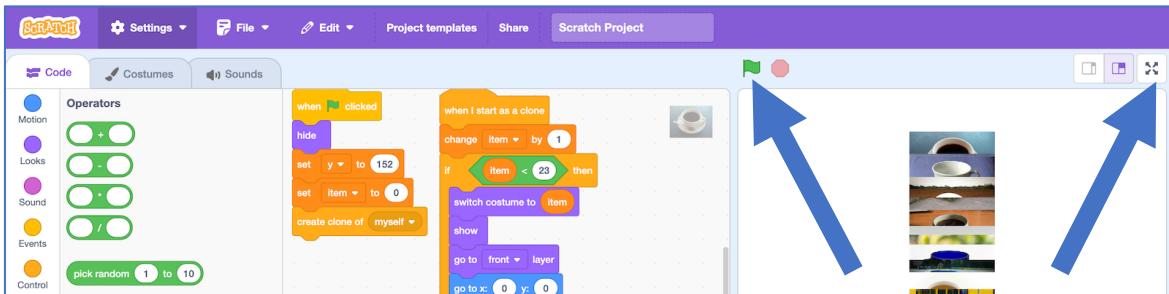


## 27. Click on the “mystery” sprite, then the “Code” tab, and change the script to use your machine learning model.

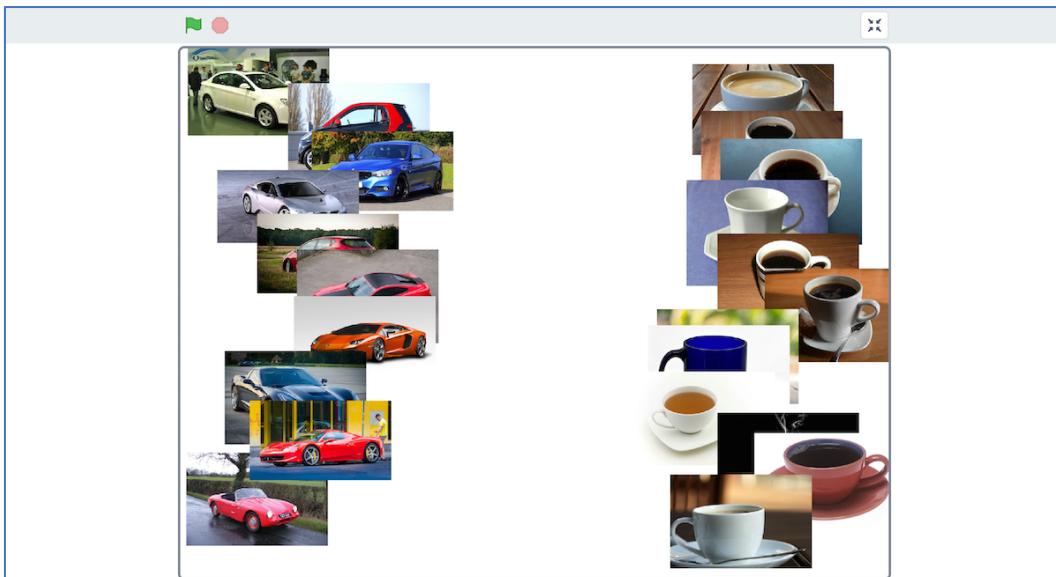
Start from the script that is already there and change it to look like this.



**28.** Click the full screen icon, and then click the green flag



**29.** Watch your script use your model to sort the photos into two piles.



**30.** If your trained system makes mistakes, you'll need to go back to step 16, and collect more examples.

*Make sure you repeat step 20 to train a new model.*

## What have you done?

You've used machine learning to build an automatic photo sorter.

Training the computer to be able to recognise photos for itself is much much quicker than trying to sort thousands of photos manually.

The more examples you give it, the better it should get at recognising photos correctly.

## Ideas and Extensions

Now that you've finished, why not give one of these ideas a try?

Or come up with one of your own?

### Add a third type of photo

Instead of just recognising cups and cars, can you add a third type as well?

### Try confusing the computer

Train the computer to recognise cars with ten photos of a car on a grass background.

Train the computer to recognise cups with ten photos of a cup on a plain white background.

Now see if the computer recognises a car on a plain white background.

Or if it can recognise a cup on a grass background.

Does the computer get confused? Did it learn to recognise the cup and car? Or was it more influenced by the background?

Experiment to find out how the computer learns, and how it behaves.