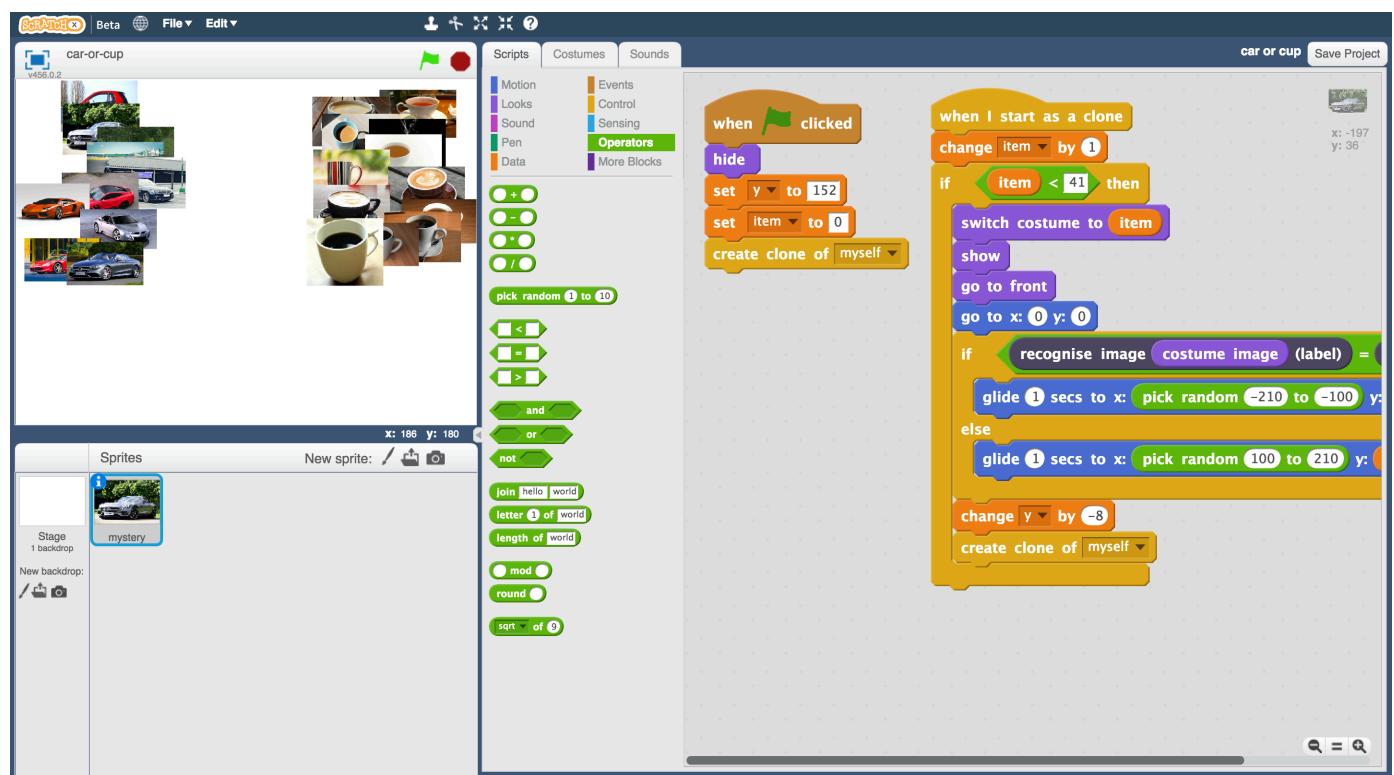


Car or Cup?

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

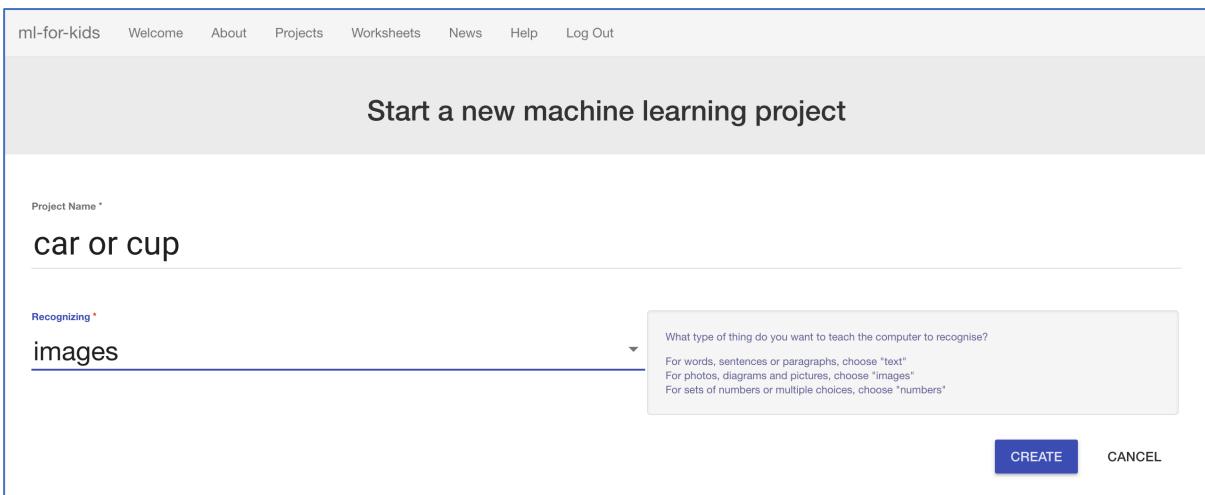
You will train the computer to be able to sort a set of photos into two piles:

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



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1. You'll need the **car-or-cup.sbx** starter file.
If you haven't got this, ask your teacher or group leader.
2. Go to <https://machinelearningforkids.co.uk/> in a web browser
3. Click on “**Get started**”
4. 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.
5. Click on “**Projects**” on the top menu bar
6. Click the “**+ Add a new project**” button.
7. Name your project “car or cup” and set it to learn how to recognise “**images**”.
Click the “**Create**” button



The screenshot shows a web page titled "Start a new machine learning project". At the top, there is a navigation bar with links: ml-for-kids, Welcome, About, Projects, Worksheets, News, Help, and Log Out. Below the navigation bar, there is a "Project Name *" input field containing "car or cup". Underneath the project name, there is a "Recognizing *" dropdown menu with "images" selected. To the right of the dropdown, there is a small info box with the following text:
What type of thing do you want to teach the computer to recognise?
For words, sentences or paragraphs, choose "text"
For photos, diagrams and pictures, choose "images"
For sets of numbers or multiple choices, choose "numbers"
At the bottom right of the form, there are two buttons: "CREATE" and "CANCEL".

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

9. Click the “Train” button to start collecting examples.

The screenshot shows the top navigation bar with links: ml-for-kids, Welcome, About, Projects, Worksheets, News, Help, and Log Out. Below this, the text "car or cup" is displayed. Three rounded rectangular boxes are present: "Train" (description: "Collect examples of what you want the computer to recognise.", button: "Train"), "Learn & Test" (description: "Use the examples to train the computer to recognise images.", button: "Learn & Test"), and "Scratch" (description: "Use the machine learning model you've trained to make a game in Scratch.", button: "Scratch").

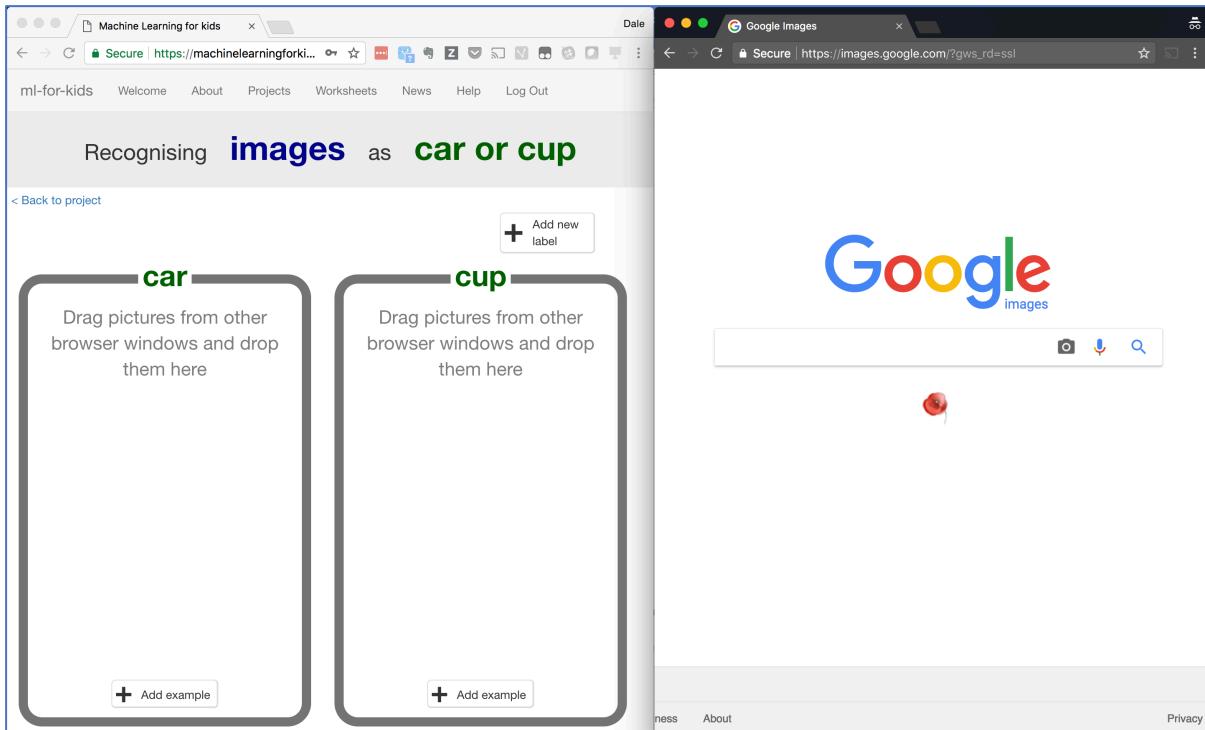
10. Click on “+ Add new label” and call it “car”.

Do that again, and create a second bucket called “cup”.

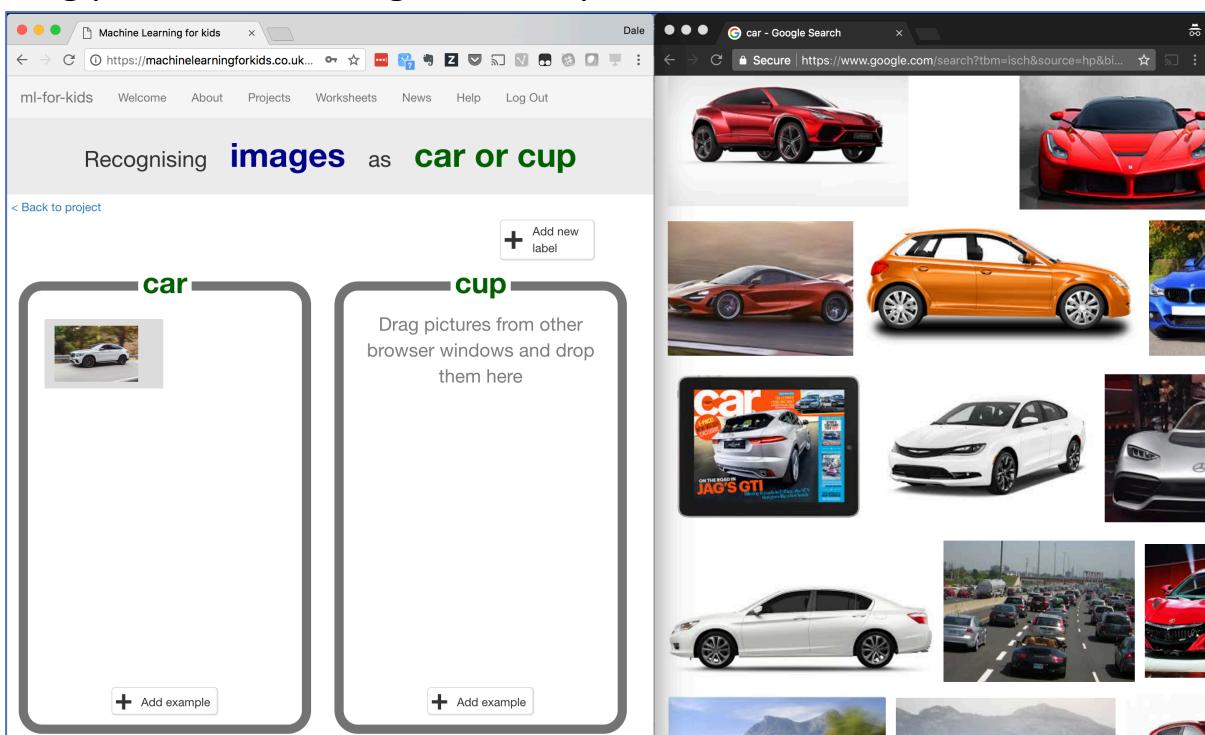
The screenshot shows the top navigation bar with links: ml-for-kids, Welcome, About, Projects, Worksheets, News, Help, and Log Out. Below this, the text "Recognising images as car or cup" is displayed. A link "< Back to project" is visible. On the right, there is a button "+ Add new label". Two large rectangular input fields are shown: one labeled "car" (description: "Drag pictures from other browser windows and drop them here", button: "+ Add example") and one labeled "cup" (description: "Drag pictures from other browser windows and drop them here", button: "+ Add example").

11. Open another web browser window.

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



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



14. Repeat until you've got 10 examples of car photos.

15. Search for pictures of cups.

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

The screenshot shows a web application for image classification. On the left, there are two labeled boxes: 'car' and 'cup'. The 'car' box contains a grid of small car images. The 'cup' box contains a grid of small cup images. Below each box is a button labeled '+ Add example'. To the right of the boxes is a 'Google Search' results page for the query 'cup'. The search results show various images of cups, including coffee cups, a measuring cup, and a red cup. There is also a button labeled '+ Add new label'.

16. Repeat until you have 10 examples of cup photos.

The screenshot shows the same web application after more images have been added to the 'cup' bucket. The 'cup' box now contains 10 distinct cup images, including various coffee cups and a red cup. The 'car' box still contains car images. The '+ Add new label' button is visible at the top right. The navigation bar at the top includes links for ml-for-kids, Welcome, About, Projects, Worksheets, News, Help, and Log Out.

- 17.** Click the “< Back to project” link.
- 18.** Click the “Learn & Test” button
- 19.** 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: ml-for-kids, Welcome, About, Projects, Worksheets, News, Help, and Log Out. Below the navigation bar, the title 'Machine learning models' is centered. On the left, a link '[< Back to project](#)' is visible. The main content area is divided into two sections: 'What have you done?' and 'What's next?'. The 'What have you done?' section contains text about collecting images of cars and cups, and a bulleted list: '• 10 examples of car,' and '• 10 examples of cup'. The 'What's next?' section contains text about starting training, a button labeled 'Train new machine learning model', and a note about going back to the Train page. A large text input field labeled 'Info from training computer:' is at the bottom.

- 20.** Wait for the training to complete. This might take a few minutes.

The screenshot shows the 'Machine learning models' page during the training process. The navigation bar and title are the same as the previous screenshot. The 'What have you done?' section now includes text about starting training and the current status: 'It's been training since Sunday, November 12, 2017 4:52 PM.' It also notes that training can take longer if the computer is busy. The 'What's next?' section includes text about waiting for completion or taking a quiz. The 'Info from training computer:' field at the bottom displays training details: 'Model started training at: Sunday, November 12, 2017 4:52 PM', 'Current model status: Training', and 'Model will automatically be deleted after: Sunday, November 12, 2017 5:52 PM'. A red 'Cancel training' button is located at the bottom of this field.

What have you done so far?

You've started to train a computer to recognise pictures of cups and cars. Instead of trying to write rules to be able 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.

- 21.** Click the "< Back to project" link, then the "Scratch" button.
This page has instructions on how to use the new blocks in Scratch. Keep the page open if you need to check back on how to use them.

Using machine learning in Scratch

< Back to project

Your project will add these blocks to the **More Blocks** tab in Scripts.

recognise images [costume image] (label)
Put images in the input for this, and it will return the label that your machine learning model recognises it as.

recognise images [costume image] (confidence)
This will return how confident your machine learning model is that it recognises the type of images. (As a number from 0 - 100).

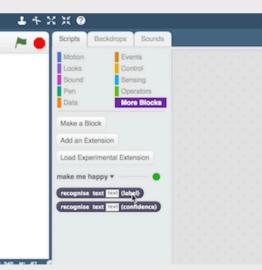
car cup
These blocks represent the labels you've created in your project, so you can use their names in your scripts.

costume image
This block is in the Looks palette for Sprites and will return the image of the currently selected costume.

This means you can do something like this:



It will look something like this - except with the name of your project.



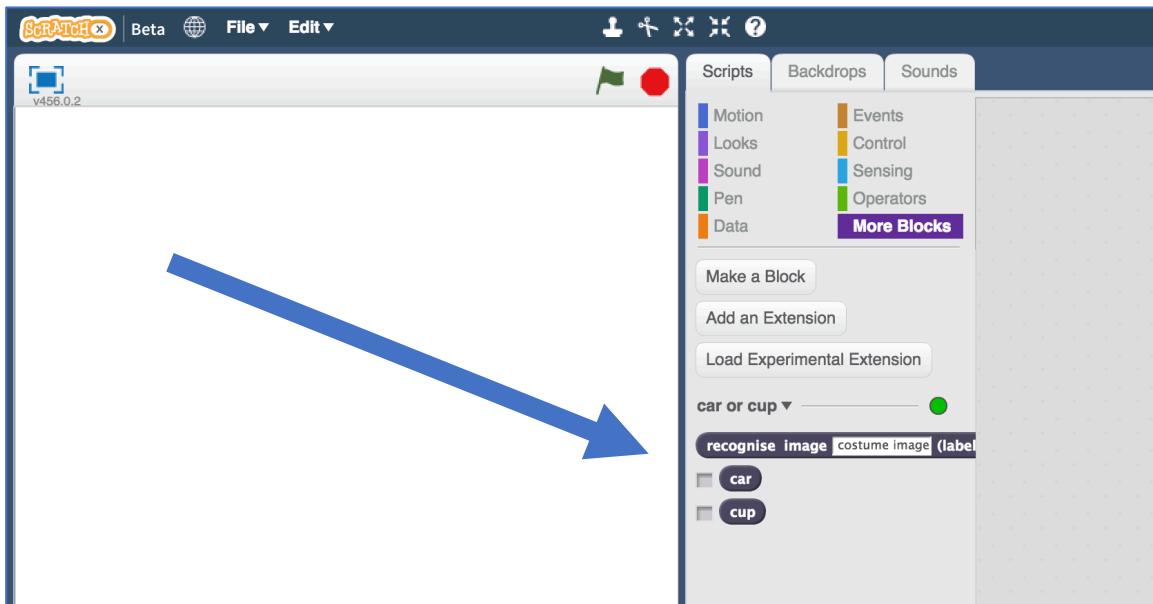
The coloured circle next to your project name tells you if your machine learning model is okay.

- ● means your model is trained and ready to go
- ● means your model hasn't finished training yet
- ● means something went wrong. Go back to the [Learn & Test](#) page to see what went wrong with training.

[Open in Scratch](#)

22. Click the “Open in Scratch” button at the bottom to launch the Scratch editor.

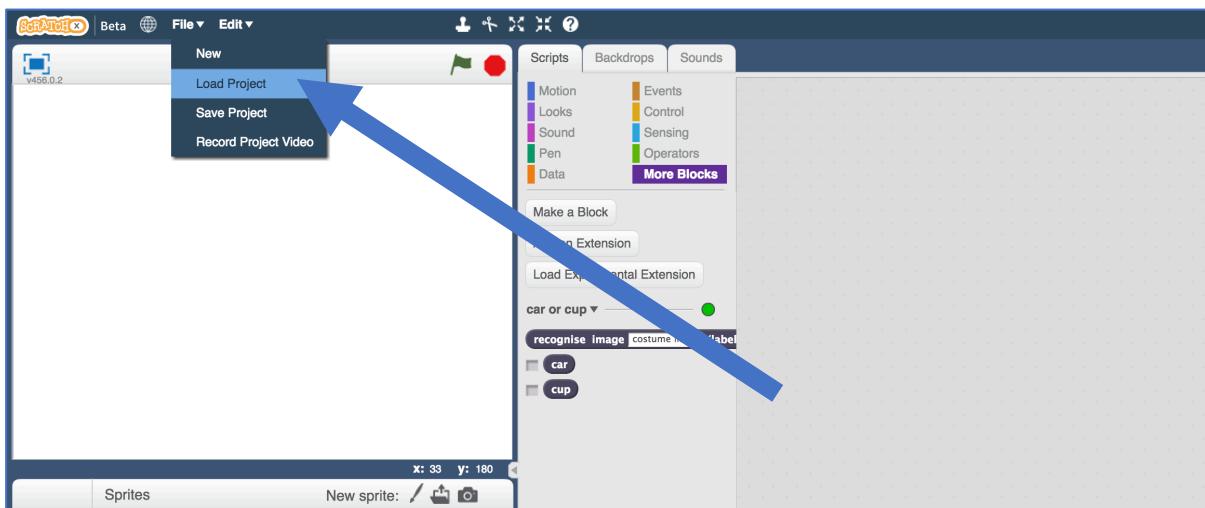
You should see three new blocks in the “More blocks” section from your “car or cup” project.



23. Load the car-or-cup.sbx template file

Use File -> Load Project as shown below.

Click OK if you're asked to replace the current project.



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.

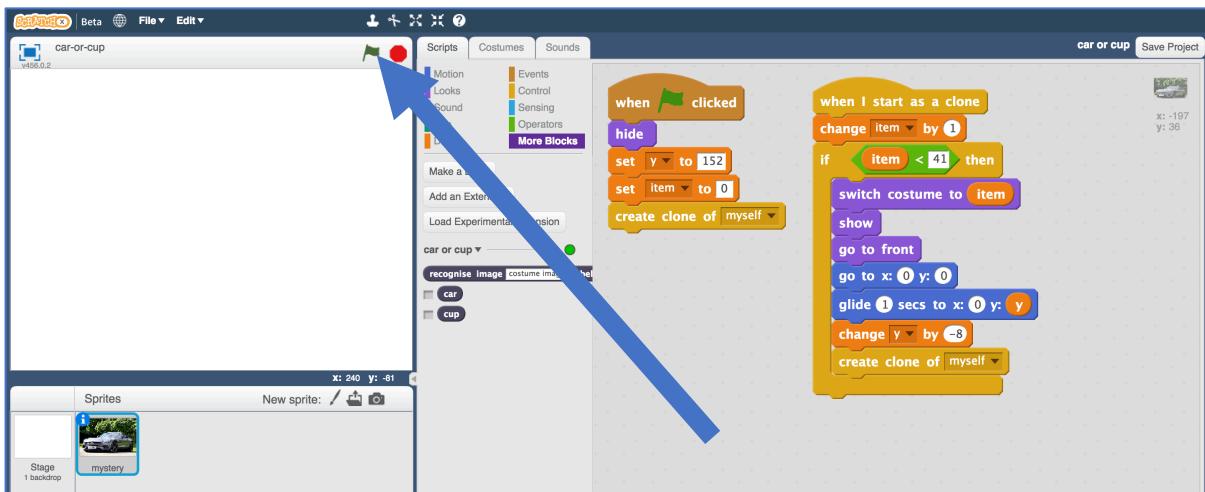
For example, make sure that you include some examples with different backgrounds.

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.

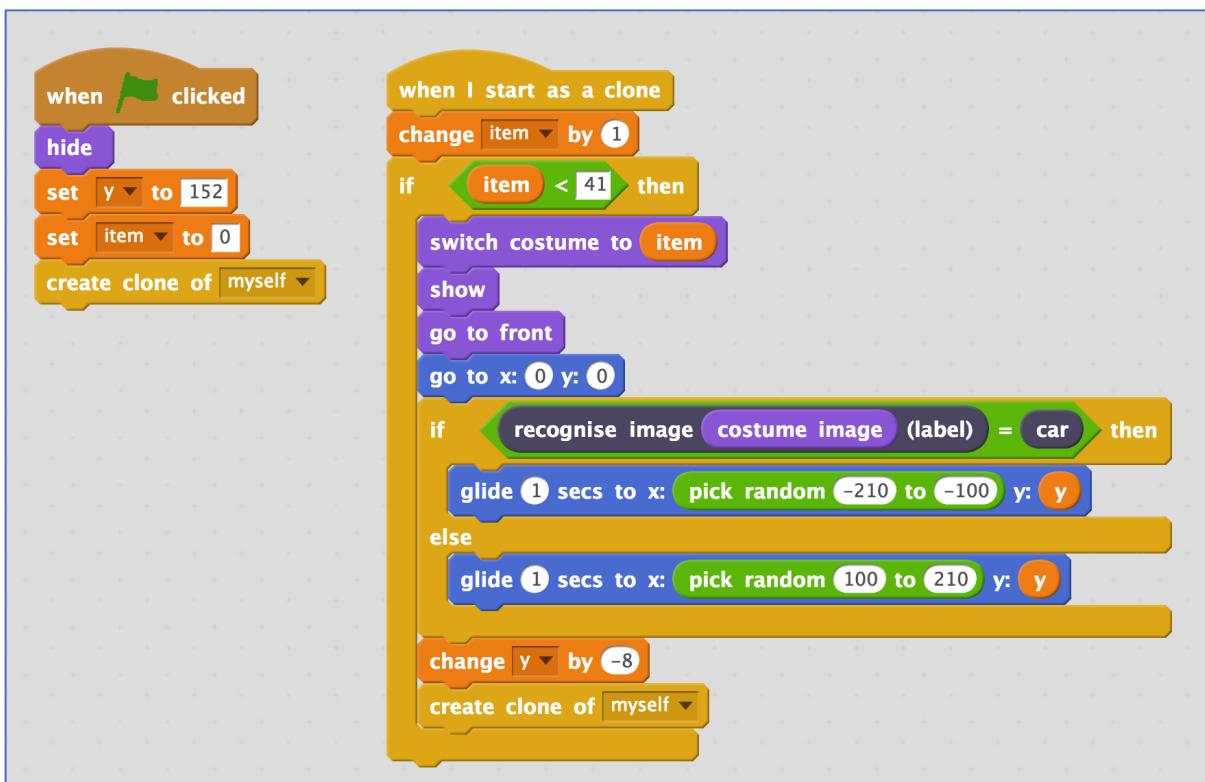
24. Click the green flag to give it a try.

The project has forty random photos or cars or cups.

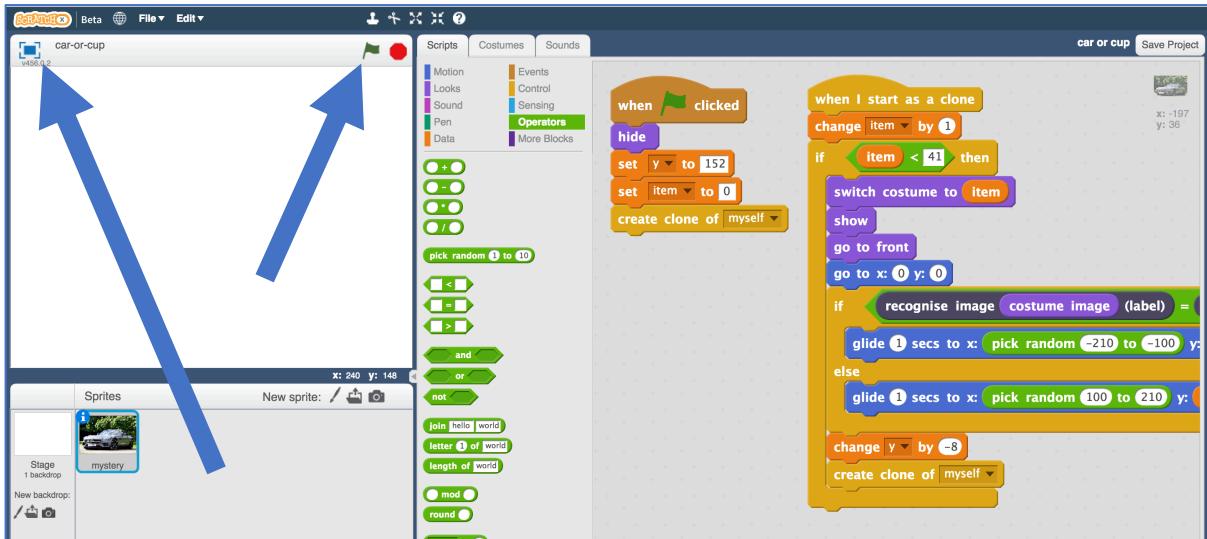
Next you will modify the project to use the training you've given the computer, so that it can sort these photos into two piles.



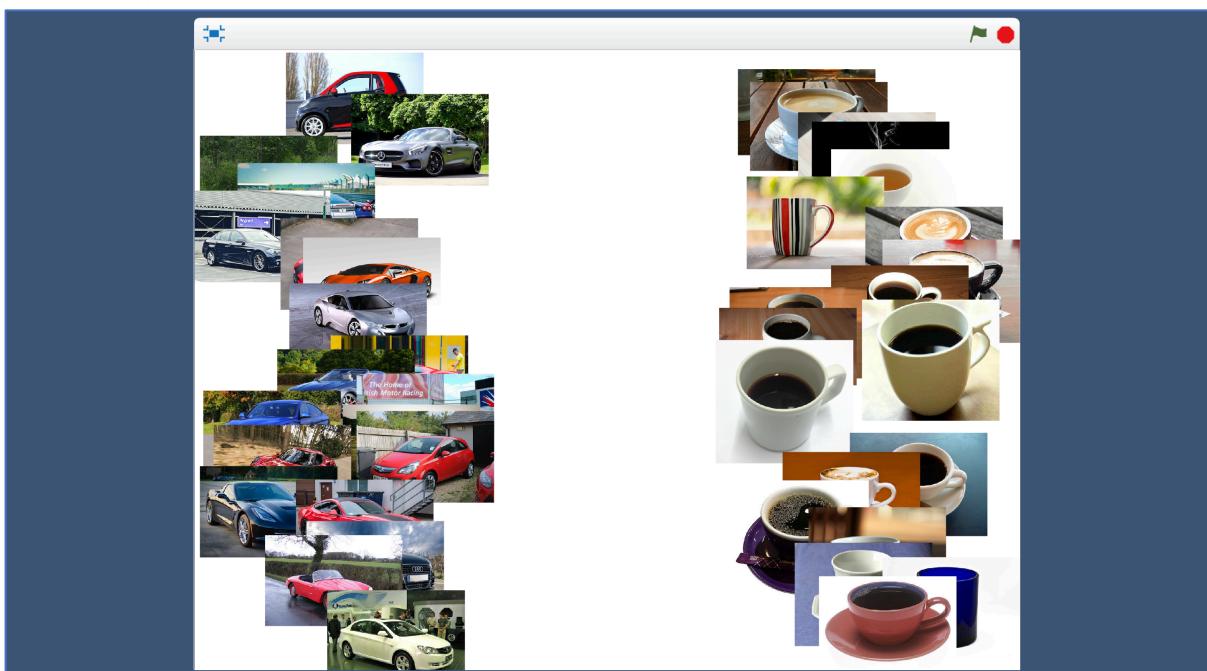
25. Click on the “mystery” sprite, and then click “Scripts” tab, and change the script to use your machine learning model.



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



27. Watch your script use the machine learning model you've trained to sort the photos into two piles.



28. If your trained system makes mistakes, you'll need to go back to step 15, and collect more examples.

Make sure you repeat step 19 to train a new model with the extra examples that you've collected.

29. Save your project.

*Click **File** -> **Save project***

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.

And 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.