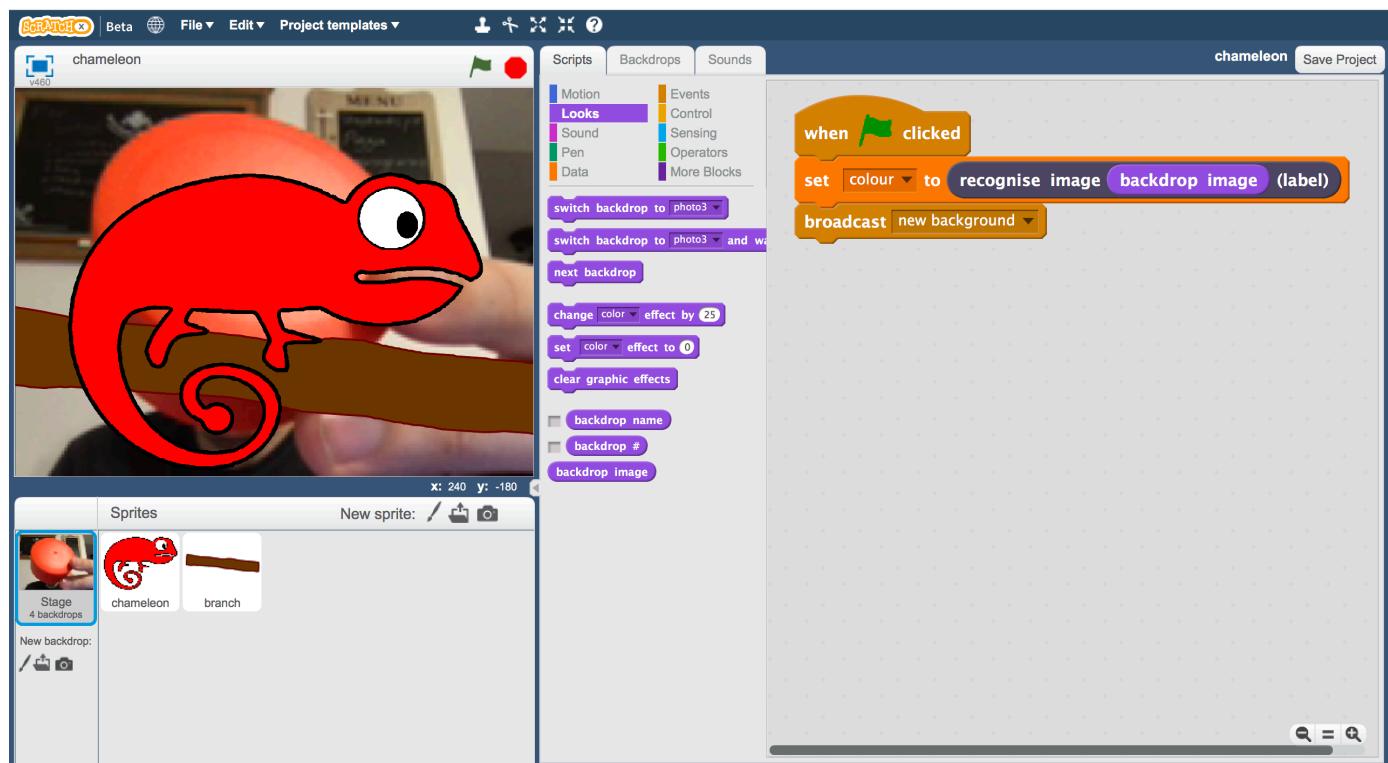


Chameleon

In this project you will make a chameleon that changes colour to match its background.

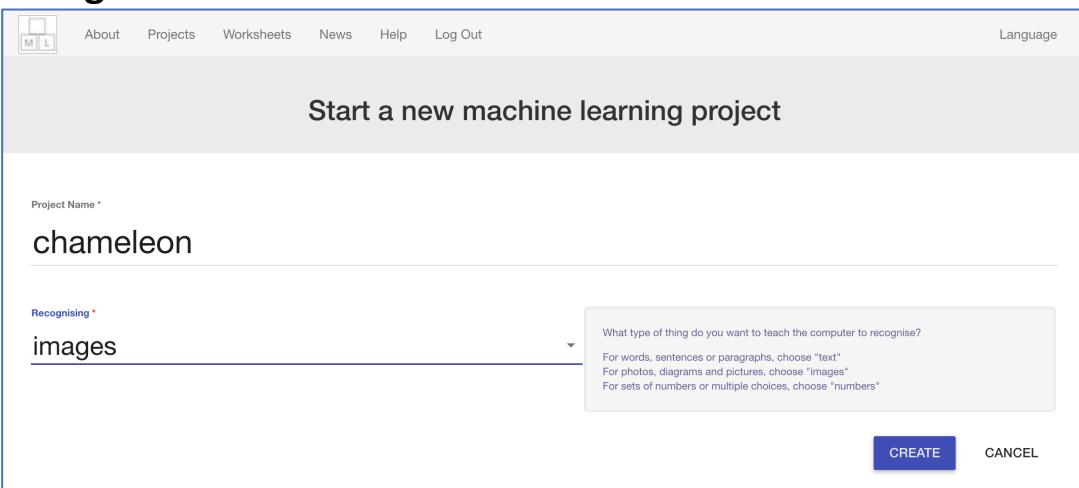
You'll use a webcam to take photos of different coloured objects, then use machine learning with those examples to train the chameleon to recognise colours.

The idea for this project came from Cassie Evans. You can see her version of it at
<https://codepen.io/cassie-codes/details/ZjErdL>



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<http://creativecommons.org/licenses/by-nc-sa/4.0/>

- 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 to create one for you.
If you can't remember your password, ask your teacher 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 “chameleon” and set it to learn how to recognise “**images**”. Click the “**Create**” button



Start a new machine learning project

Project Name *

chameleon

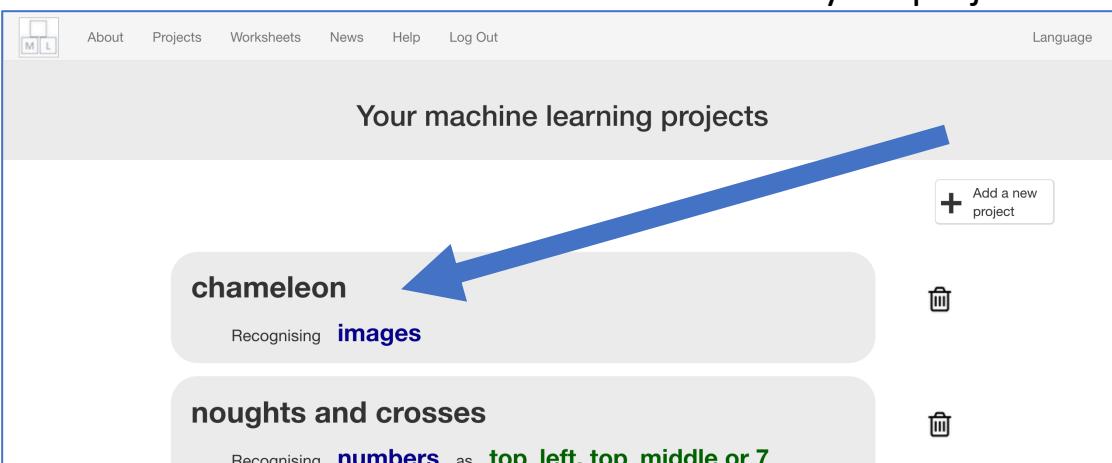
Recognising *

images

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"

CREATE CANCEL

- 7.** You should see “**chameleon**” in the list of your projects. Click on it.



Your machine learning projects

chameleon

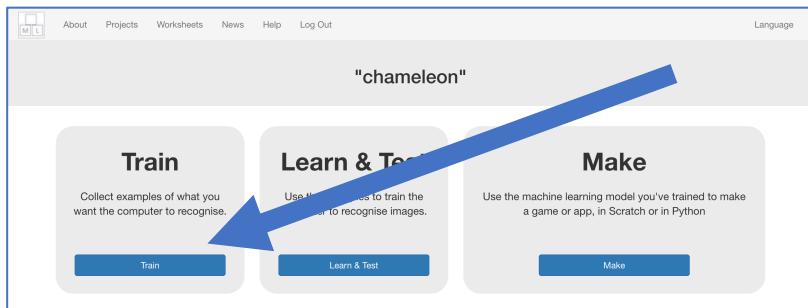
Recognising images

noughts and crosses

Recognising numbers as top left, top middle or 7

Add a new project

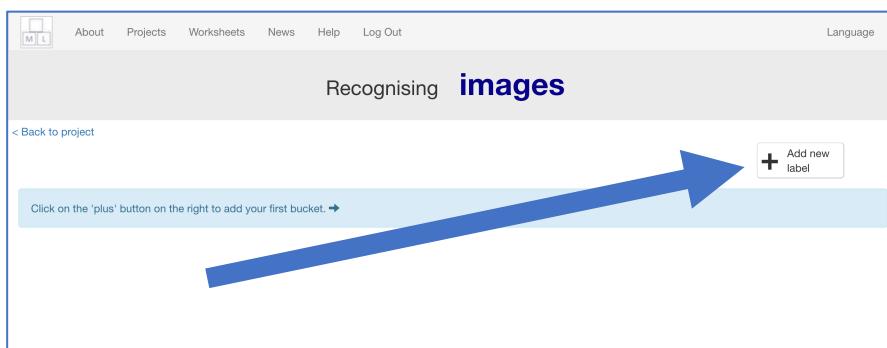
8. Click the Train button



9. Choose three colours

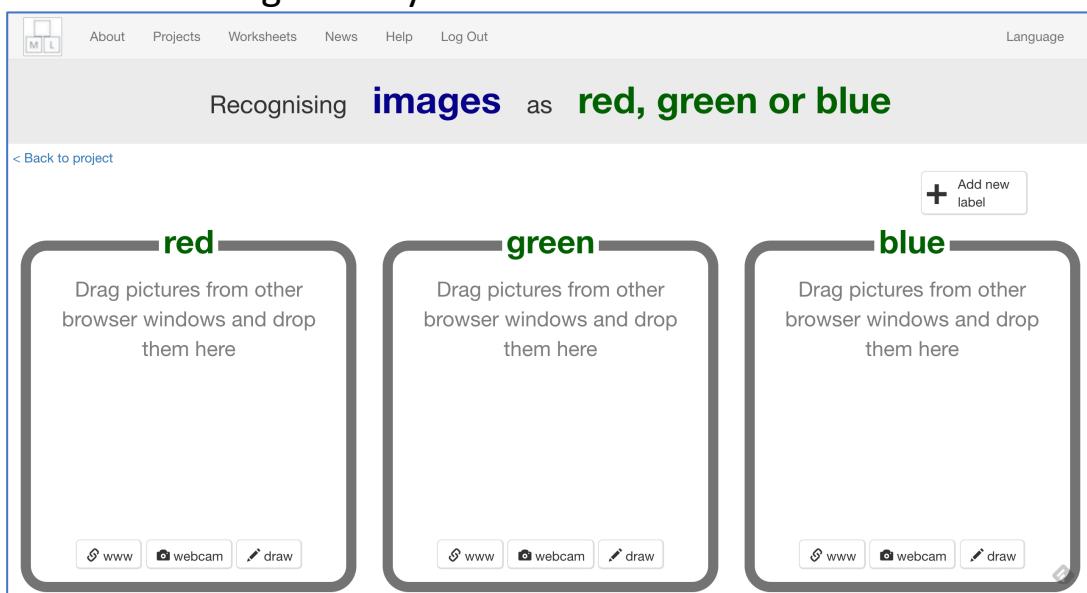
Choose colours that you'll easily be able to find. For the rest of this worksheet, I'll be using red, green, and blue.

10. Click "+ Add new label"

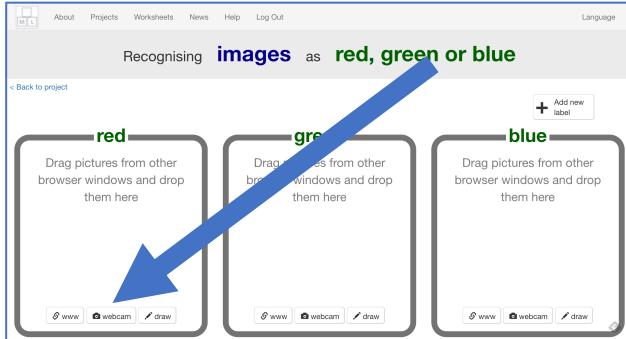


11. Type in the name of your first colour, and press Add

12. Do that again for your other two colours

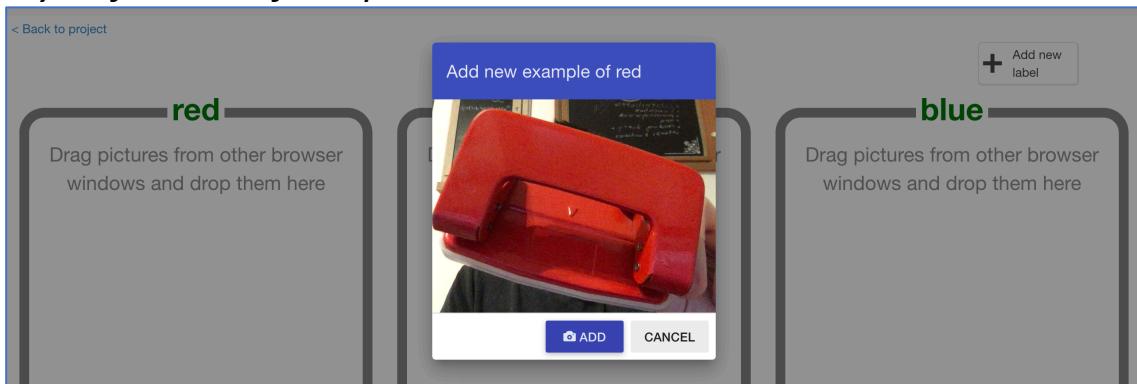


13. Click on the webcam button in your first colour bucket



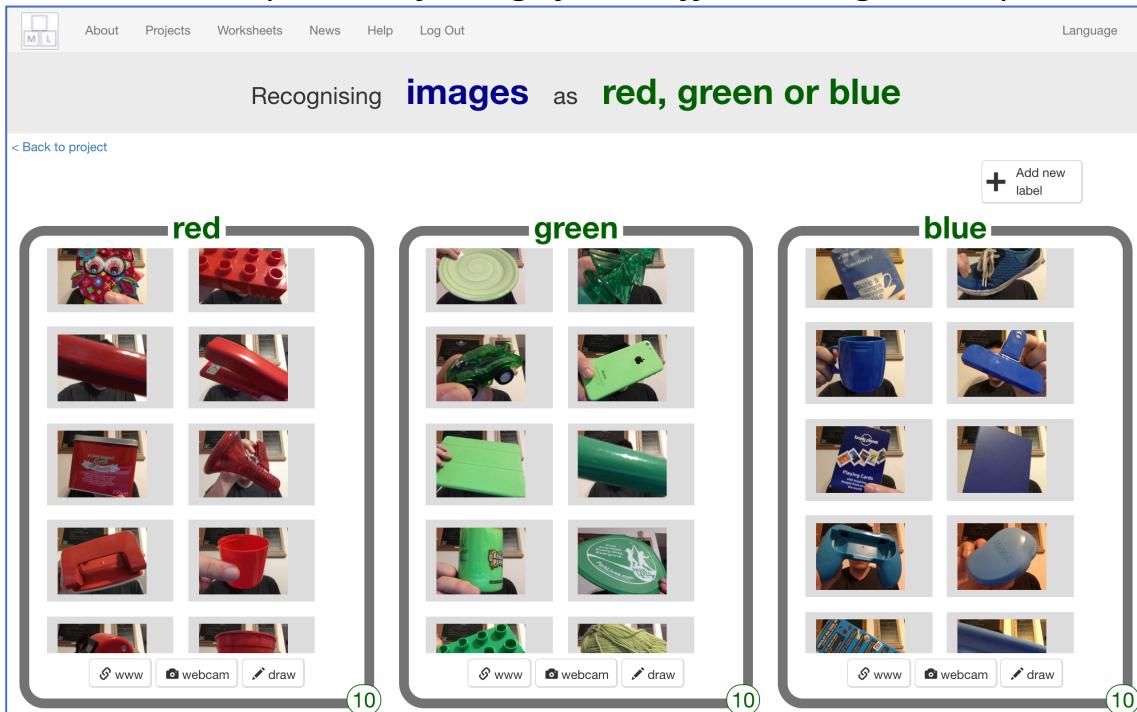
14. Take a photo of something that is that colour

Try to fill a lot of the picture



15. Repeat until you've got **ten examples** in each colour

Try to find different objects for each colour. If that's not possible, take more than one picture of things from different angles or upside-down



- 16.** Click “< Back to project”
- 17.** Click **Learn & Test**
- 18.** Click the “**Train new machine learning model**” button
It might take a few minutes for the model to train.

The screenshot shows a web-based interface for training a machine learning model. At the top, it says "Machine learning models". Below that is a link "< Back to project". The main 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 for red, green, and blue colors, and a list of collected items: 10 examples of red, 10 examples of green, and 10 examples of blue. The "What's next?" section asks if the user is ready to start training and provides a button to do so. A blue arrow points from the "What's next?" section down to the "Train new machine learning model" button.

What have you done so far?

You've started to train a computer to recognise colour of a picture. You are doing it by taking example photos. These examples are being used to train a machine learning “model”.

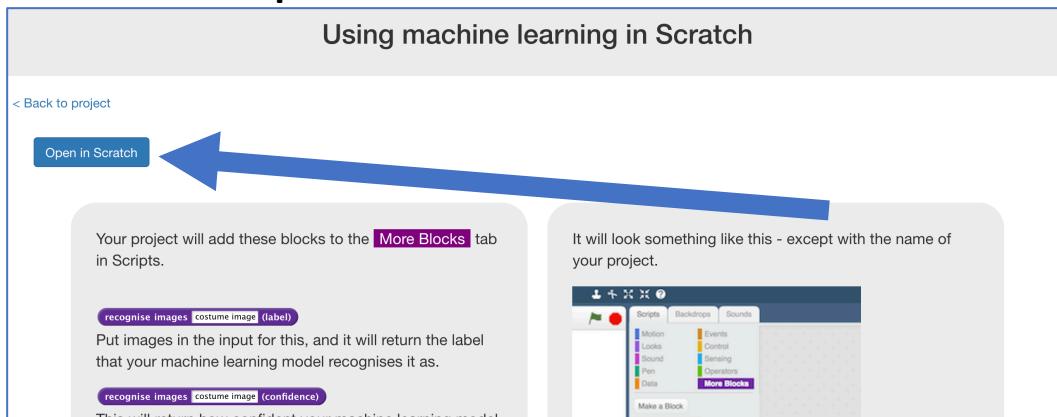
This is called “supervised learning” because of the way you are supervising the computer’s training.

The computer will learn from patterns in the colours from each of the photos you’ve given it. These will be used to recognise new photos.

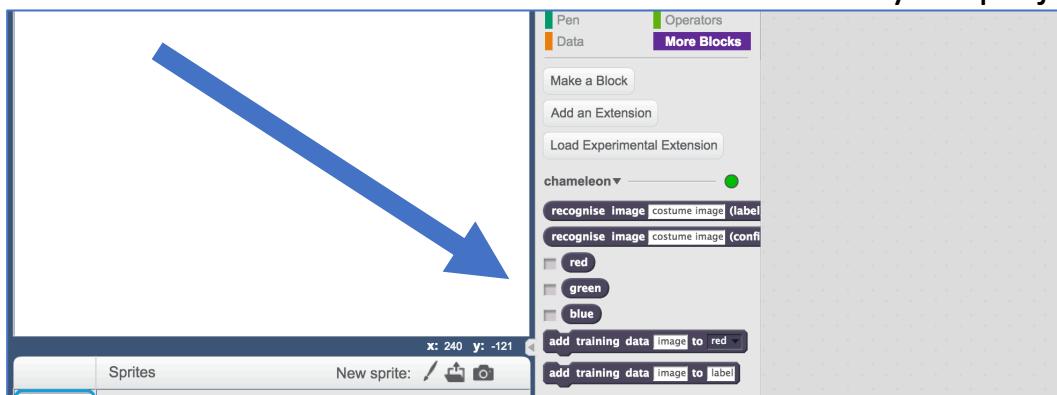
- 19.** Click “< Back to project”
- 20.** Click the “**Make**” button

21. Click “Scratch”

22. Click on Open in Scratch

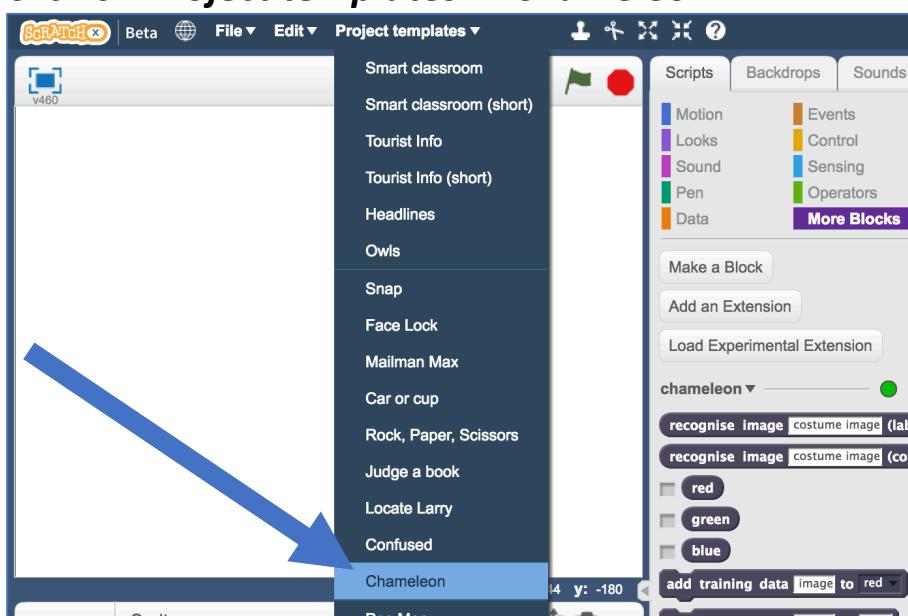


23. You should see blocks in “More blocks” from your project.

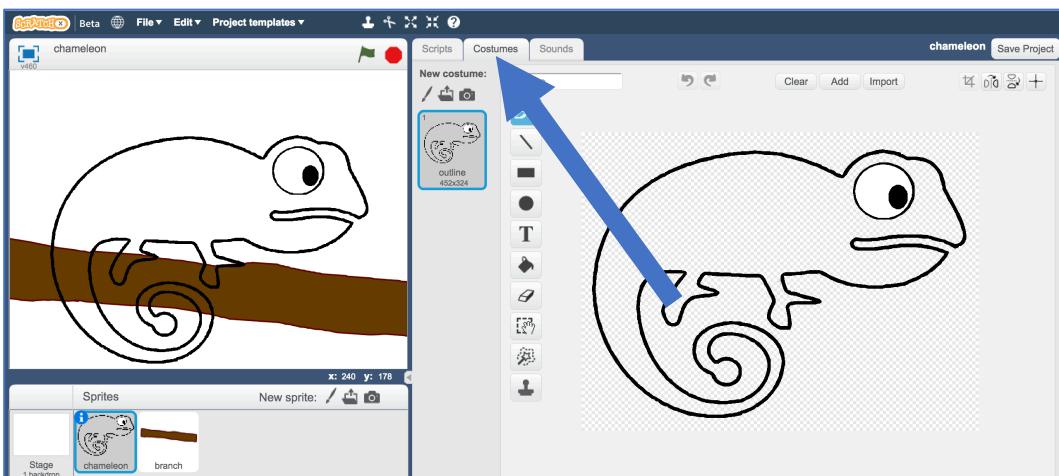


24. Open the project template

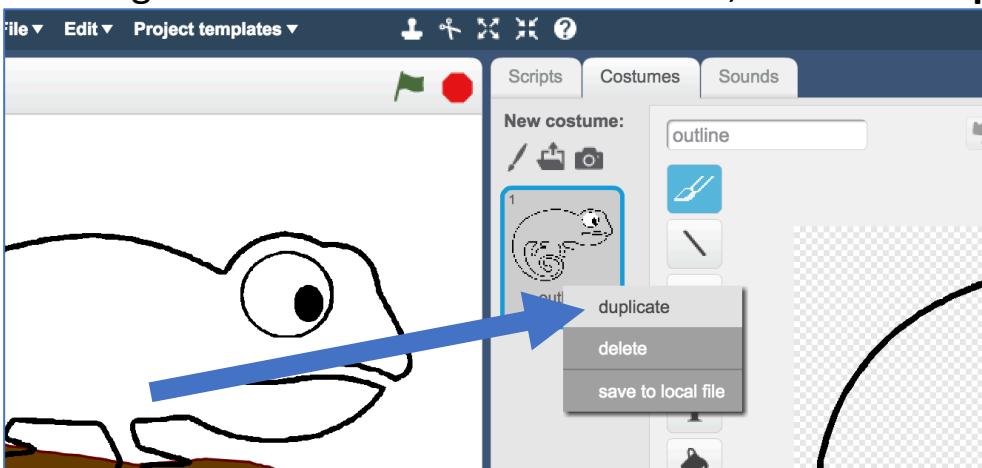
Click on Project templates -> Chameleon



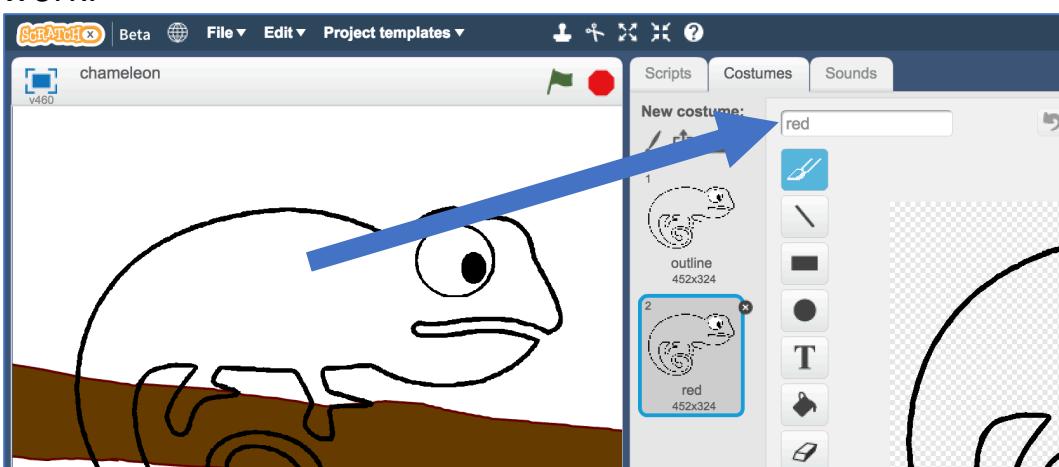
25. Click on the Costumes tab



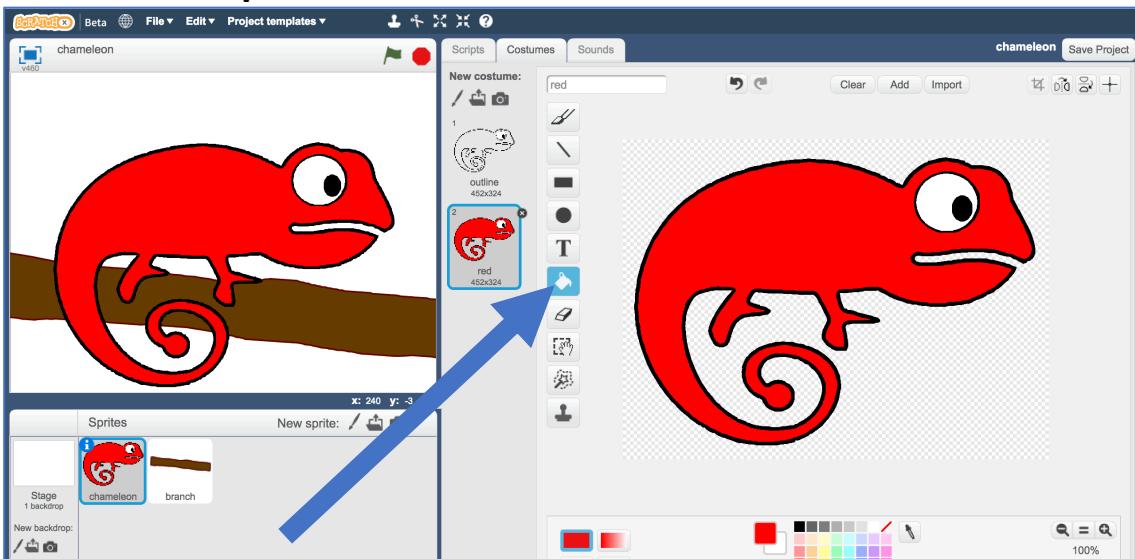
26. Right-click on the “outline” costume, and click “duplicate”



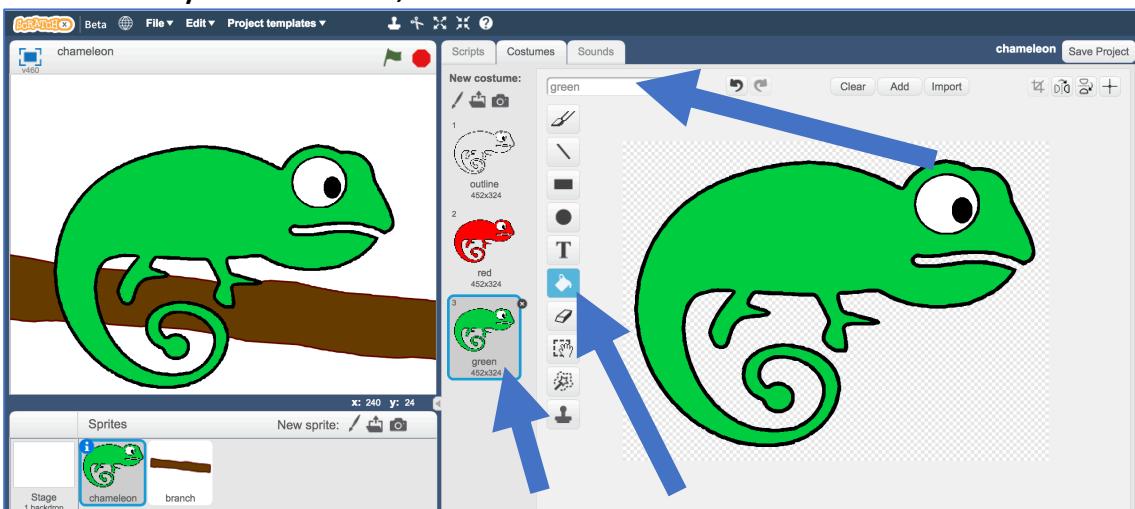
27. Name the duplicate costume the name of the first of your colours
It's very important that the name matches exactly, or your script won't work.



28. Use the paint fill tool to colour in the chameleon costume



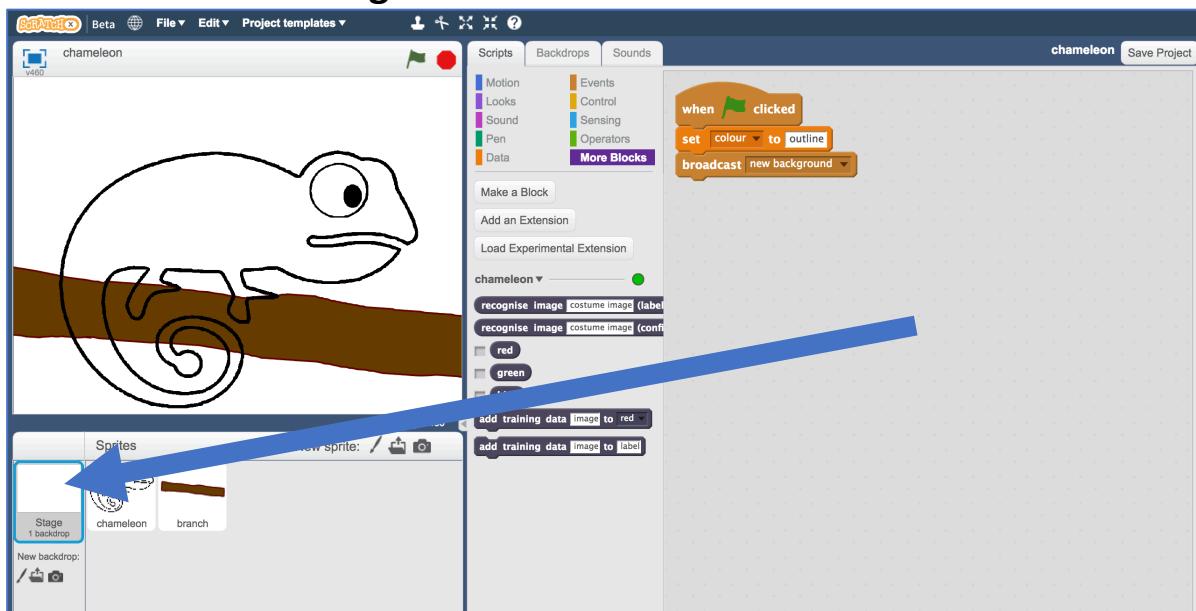
29. Repeat. Duplicate the outline costume again, name it after the second of your colours, and colour it in



30. Repeat again to get the third colour costume

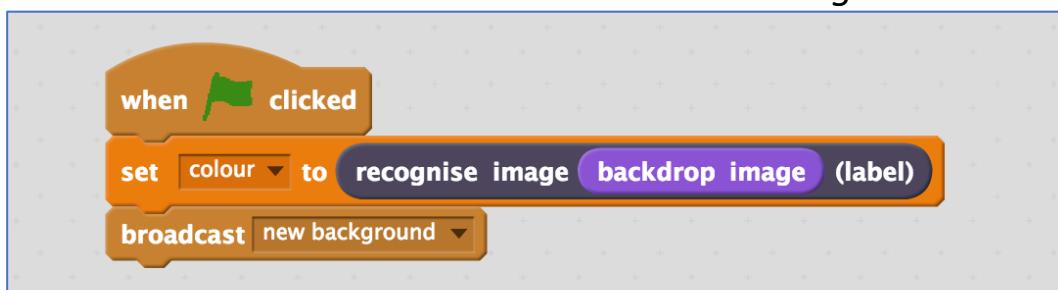


31. Click on the Stage



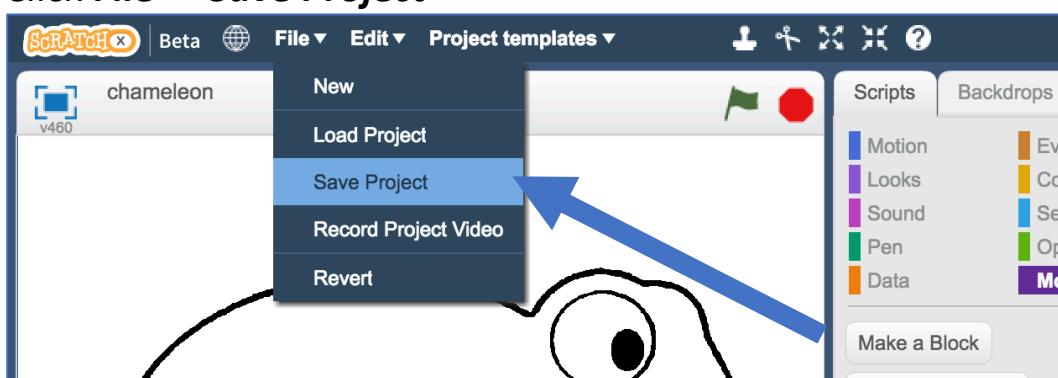
32. Change the script (that is there already) so it matches this

This will recognise the colour of the background, then send an event to let the chameleon know what colour it should change to.

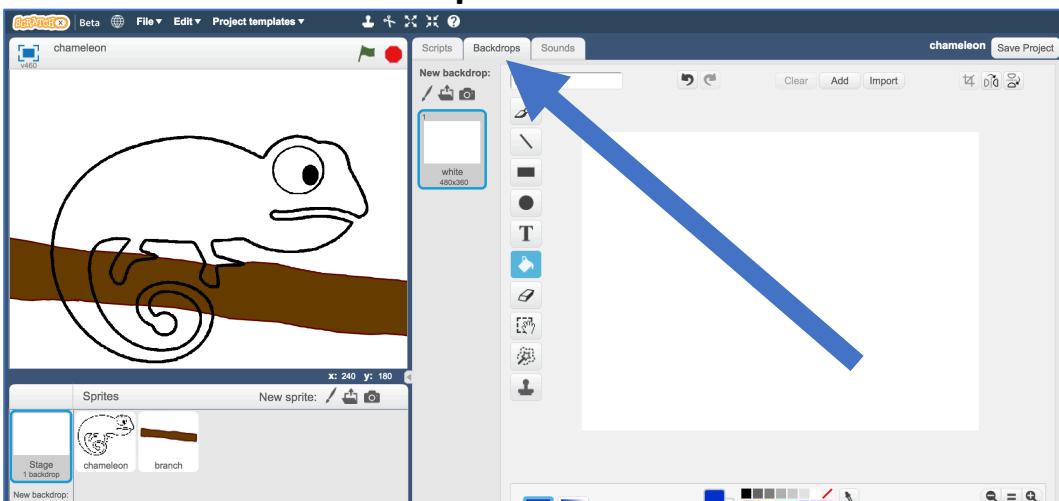


33. Save your project

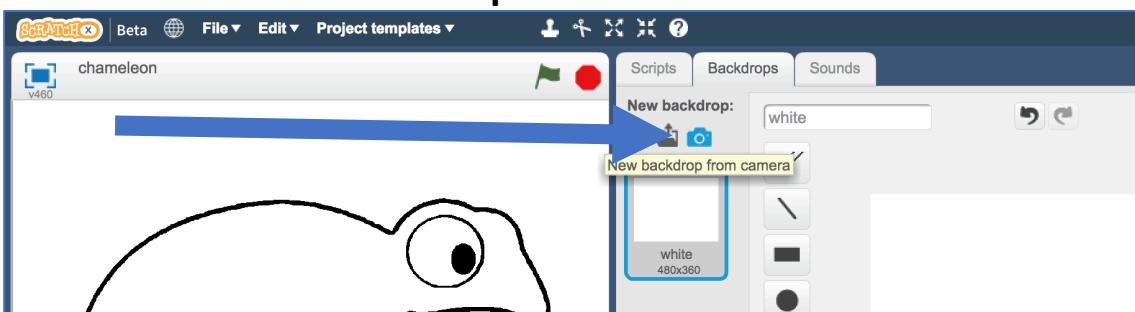
Click File -> Save Project



34. Click on the Backdrops tab

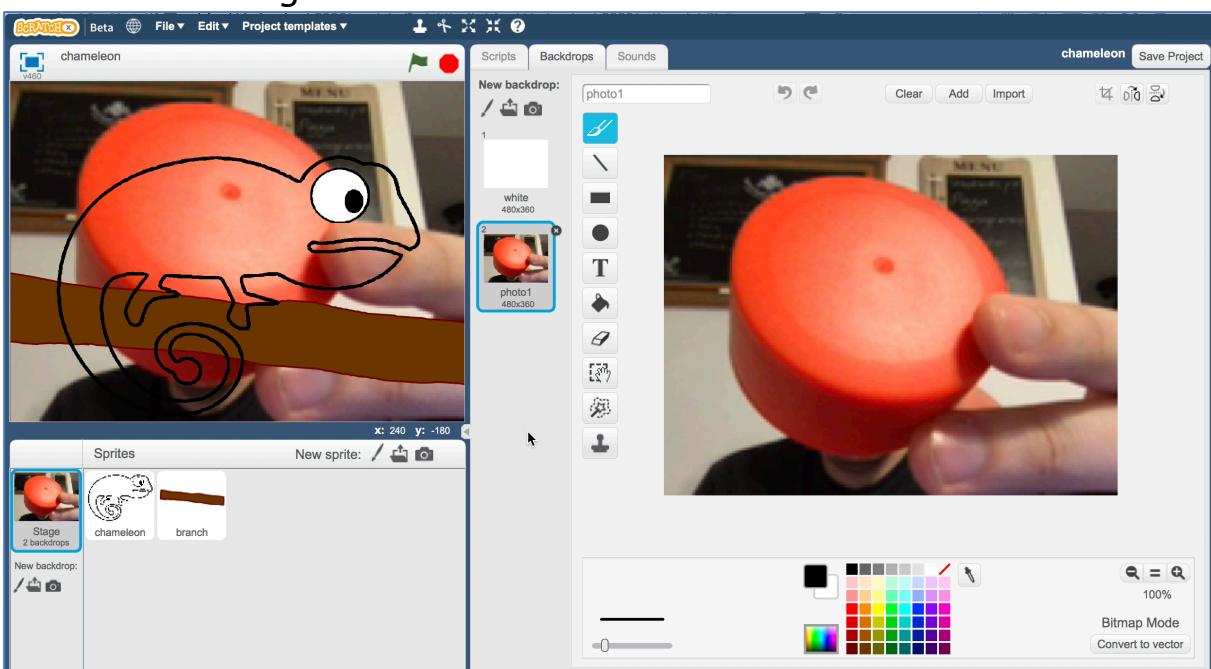


35. Click the New backdrop from camera button



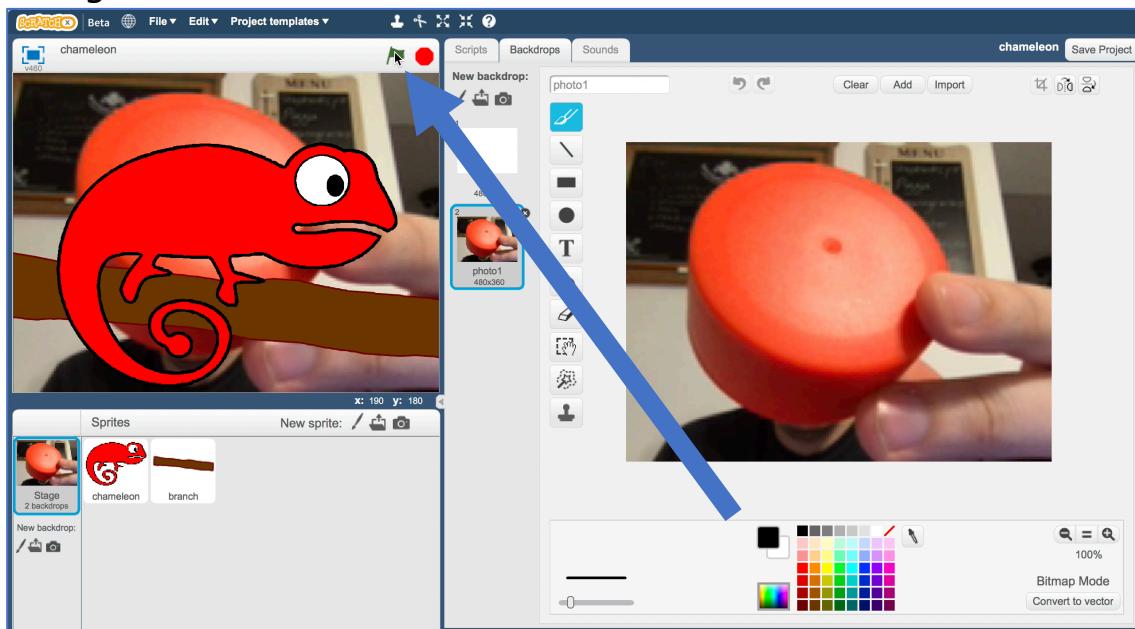
36. Take a photo to give the chameleon a new background

Try to take a photo of something different that you didn't use to train your machine learning model.



37. Click on the Green Flag

The chameleon should change to the colour of the object in the background.



What have you done?

You've created a chameleon in Scratch that uses machine learning to recognise the colour of the backdrop, and uses that to switch the costume to match.

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

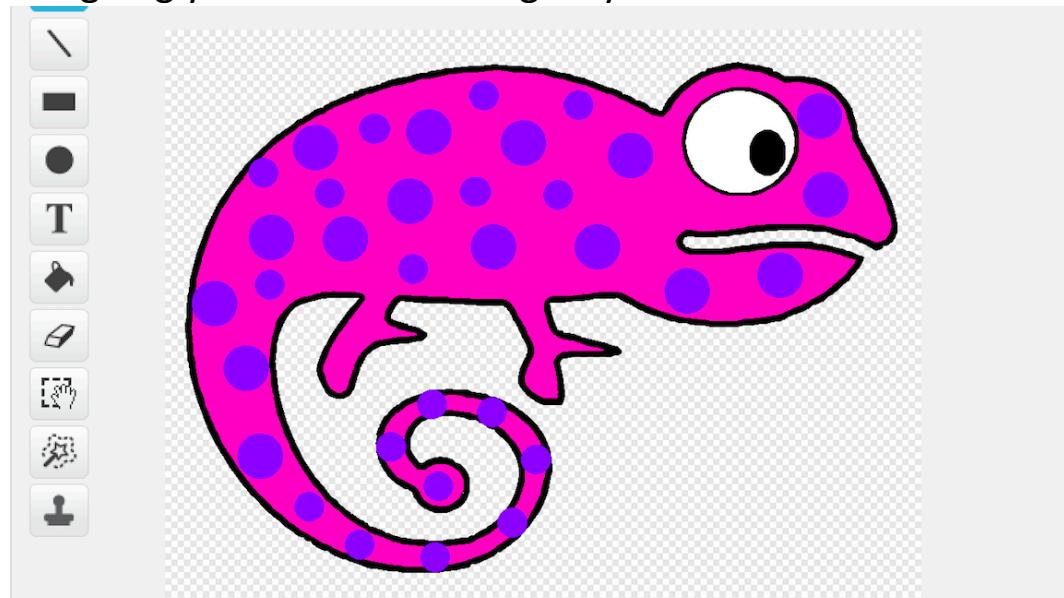
Ideas and Extensions

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

Or come up with one of your own?

Style your chameleon

You don't have to have a plain chameleon. Why not try designing your own camouflage styles?



Cheeky chameleon

Try adding a fourth bucket to your training data, with ten photos of you sticking your tongue out.

Add another costume of the chameleon and draw on a tongue sticking out.

When the machine learning model recognises you sticking your tongue out, you can switch to this costume, so your chameleon sticks out its tongue too!