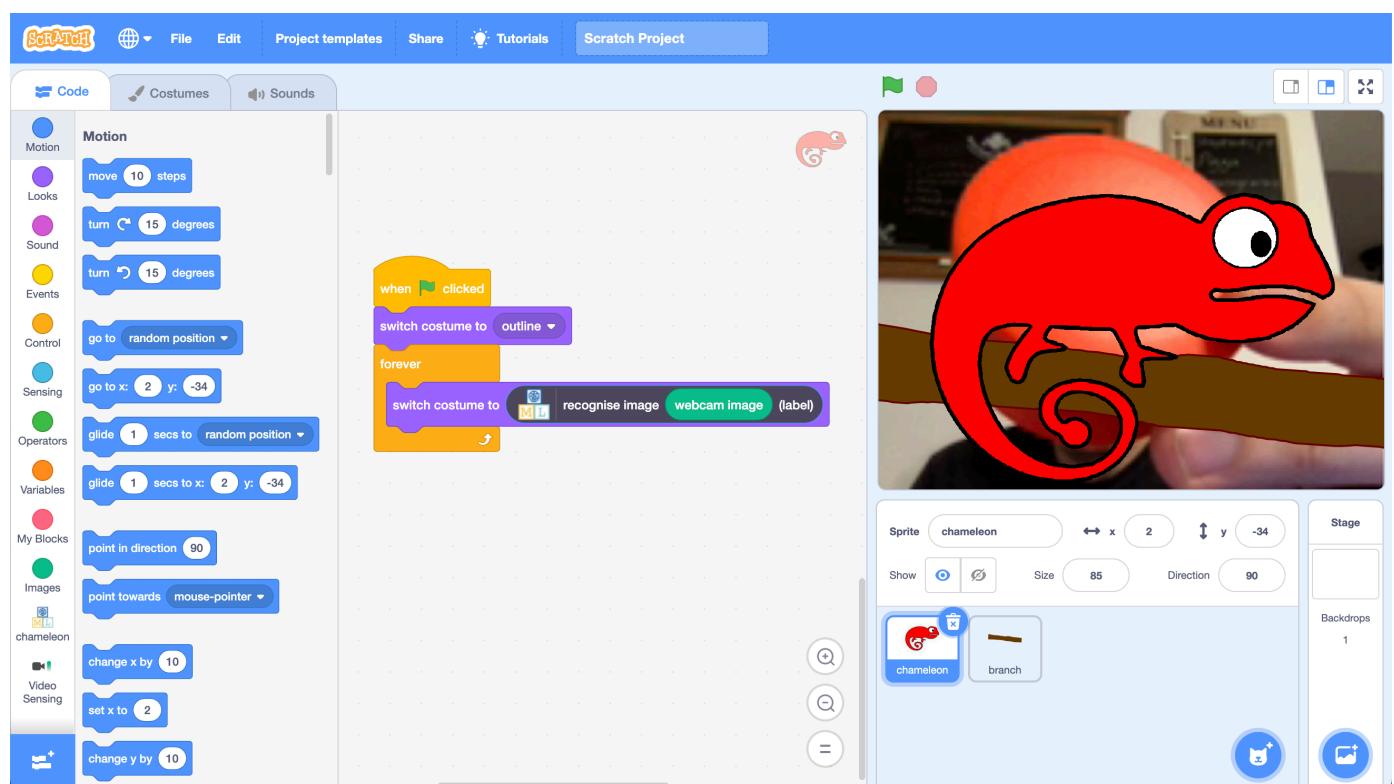


Chameleon

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

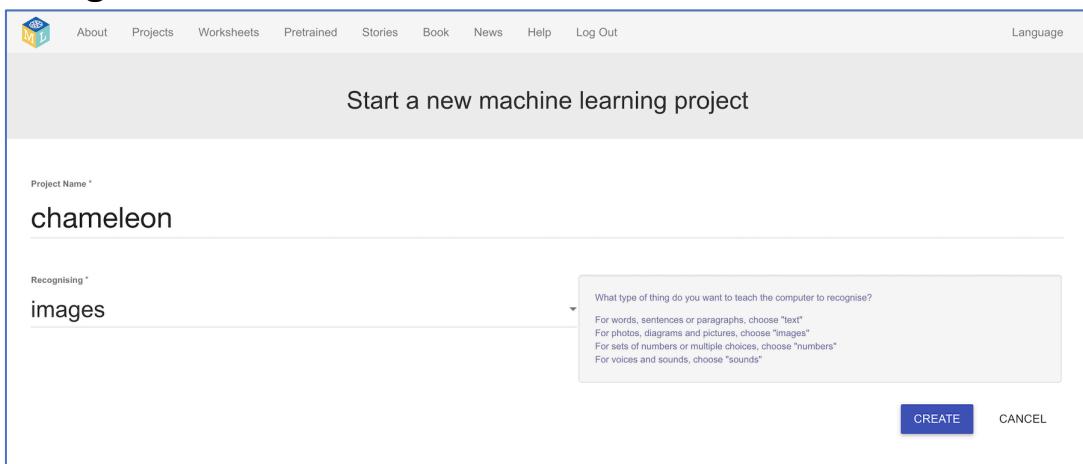
You'll use a webcam to take photos of different coloured objects, then use machine learning with those examples to train the chameleon to recognise colours.

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



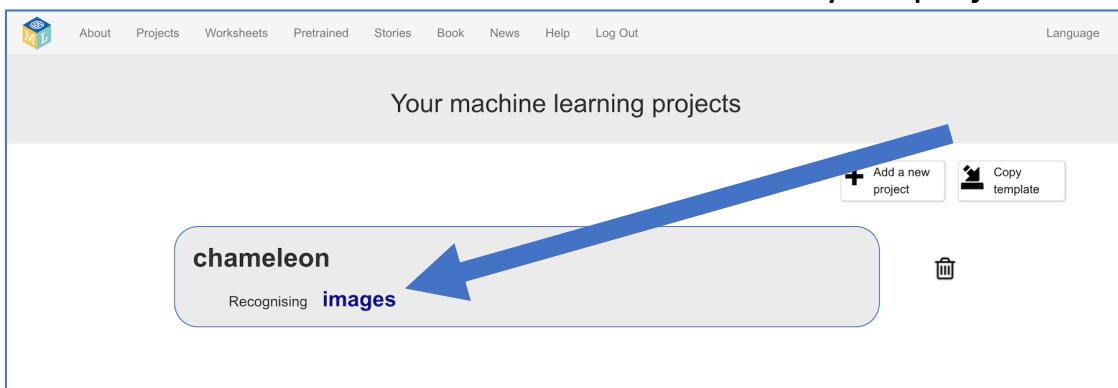
This project worksheet is licensed under a Creative Commons Attribution Non-Commercial Share-Alike License
<http://creativecommons.org/licenses/by-nc-sa/4.0/>

- 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



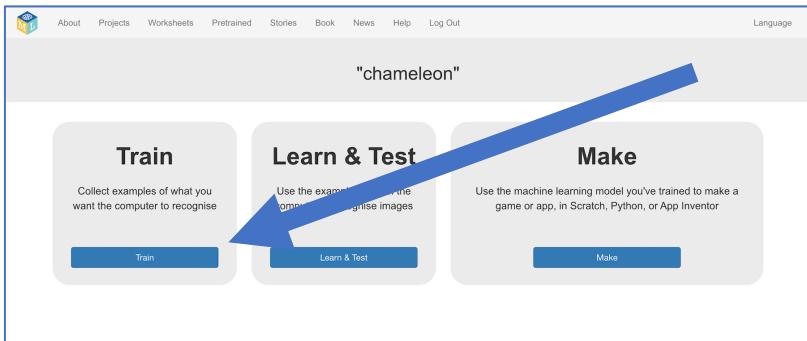
The screenshot shows a web page titled "Start a new machine learning project". At the top, there is a navigation bar with links: About, Projects, Worksheets, Pretrained, Stories, Book, News, Help, Log Out, and Language. Below the title, there is a "Project Name" field containing "chameleon". Underneath it, a "Recognising" field contains "images". To the right of these fields is a dropdown menu with the following options:
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"
For voices and sounds, choose "sounds"
At the bottom right of the form are two buttons: "CREATE" and "CANCEL".

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



The screenshot shows a list of machine learning projects under the heading "Your machine learning projects". The first project in the list is "chameleon", which is highlighted with a blue arrow pointing to it. The "chameleon" project card shows the name "chameleon" and the text "Recognising images". To the right of the project cards are three buttons: "Add a new project" (with a plus sign icon), "Copy template" (with a clipboard icon), and a trash bin icon.

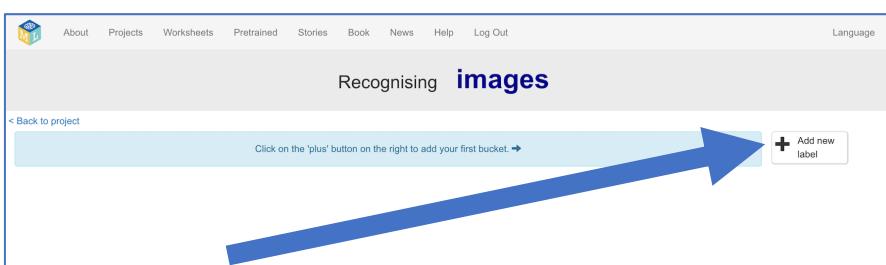
8. Click the Train button



9. Choose three colours

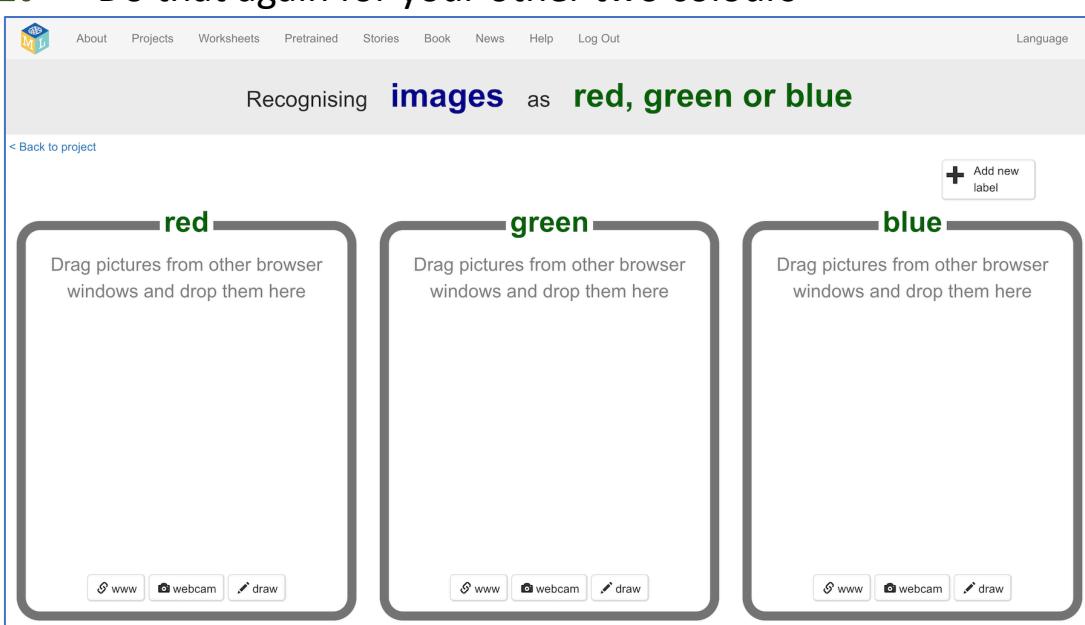
Choose colours that you'll easily be able to find. For the rest of this worksheet, I'll be using red, green, and blue.

10. Click “+ Add new label”

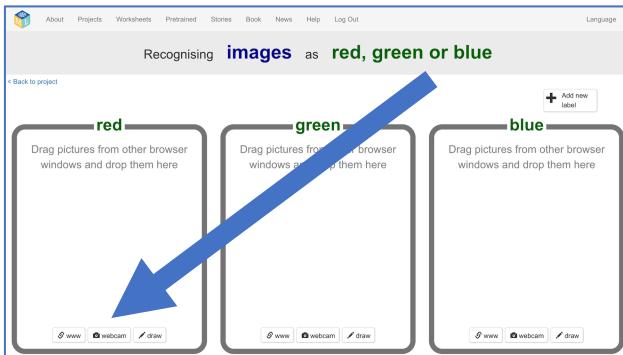


11. Type in the name of your first colour, and press Add

12. Do that again for your other two colours

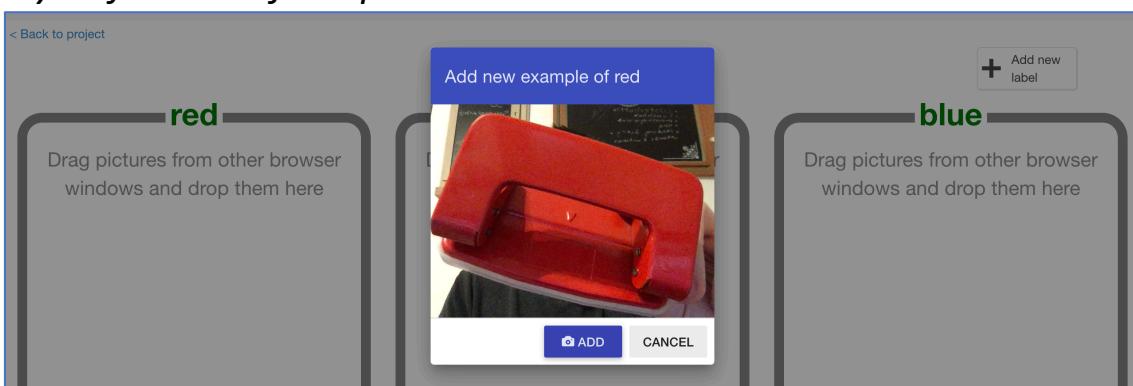


13. Click on the **webcam** button in your first colour bucket



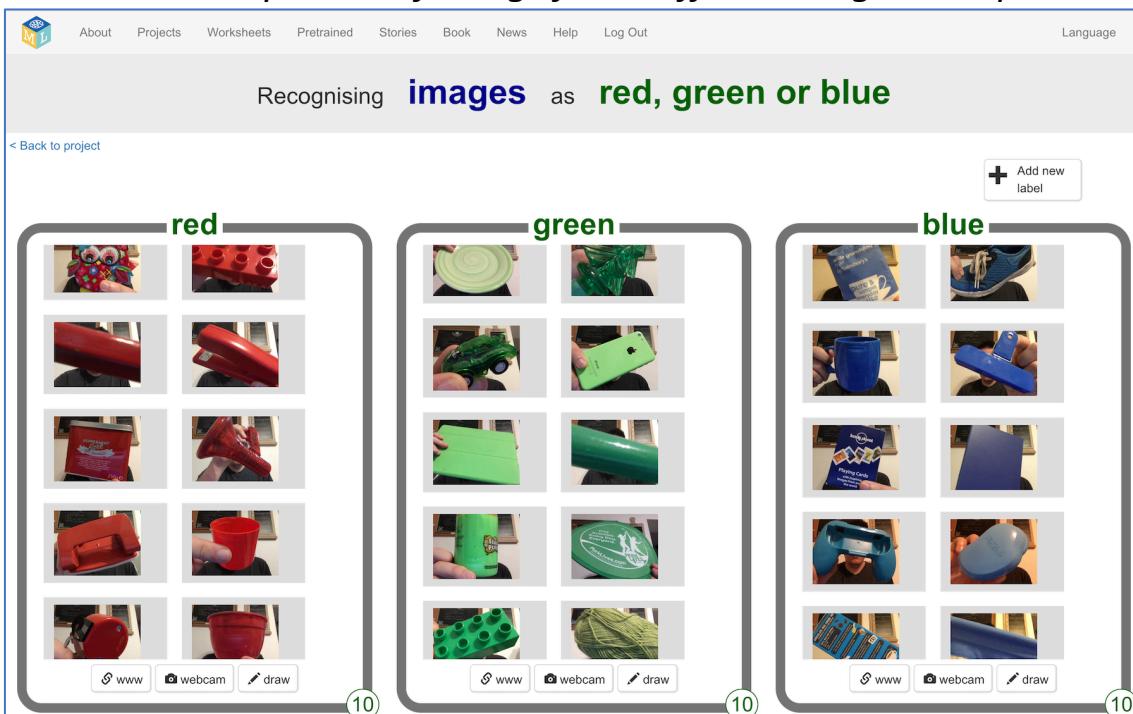
14. Take a photo of something that is that colour

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

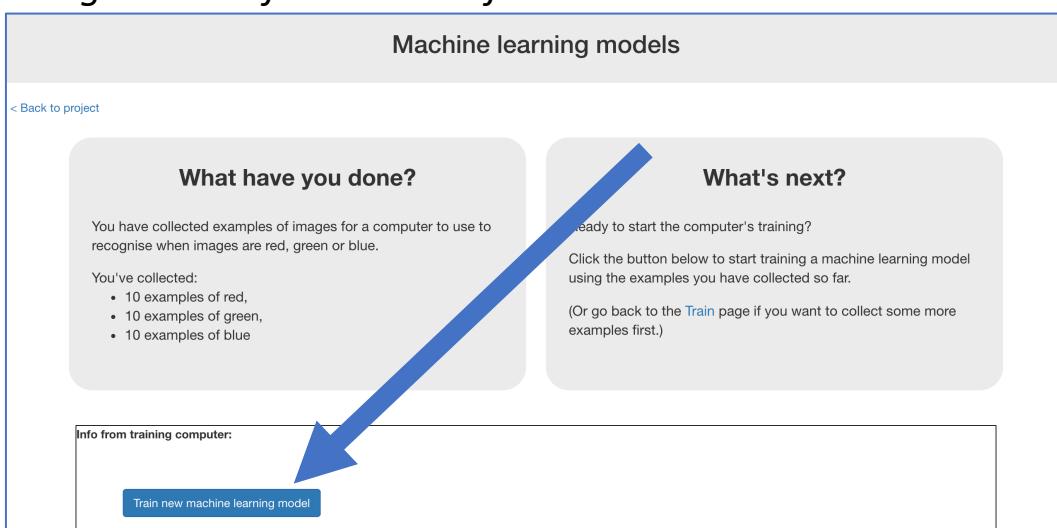


16. Click “< Back to project”

17. Click **Learn & Test**

18. Click the “**Train new machine learning model**” button

It might take a few minutes for the model to train.



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.

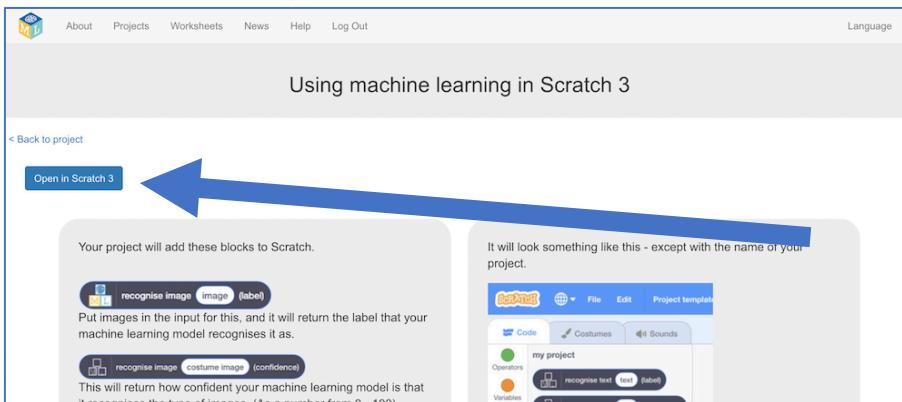
The computer will learn from patterns in the colours from each of the photos you’ve given it. These will be used to recognise new photos.

19. Click “< Back to project”

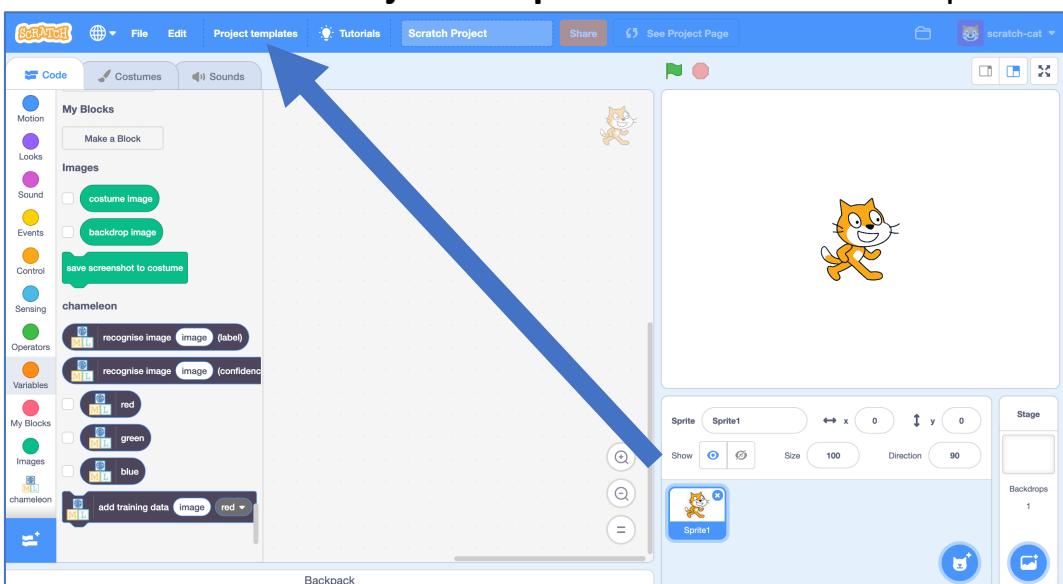
20. Click the “**Make**” button

21. Click “Scratch 3”

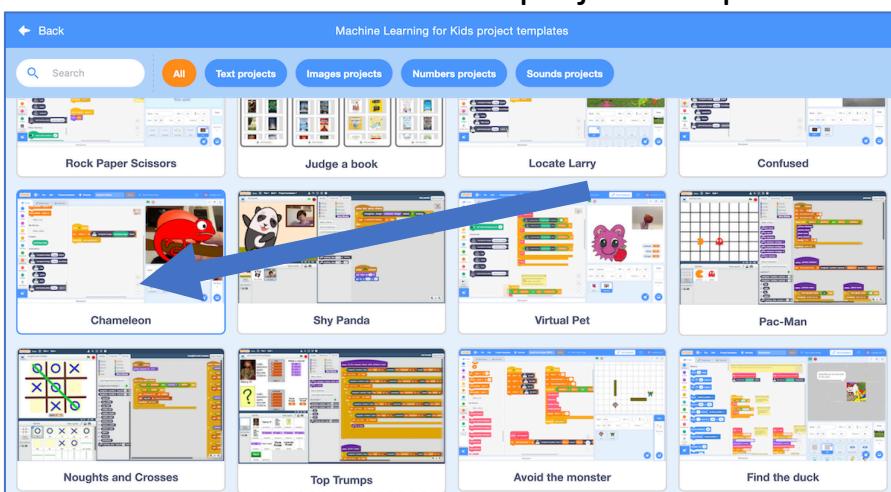
22. Click on “Open in Scratch 3”



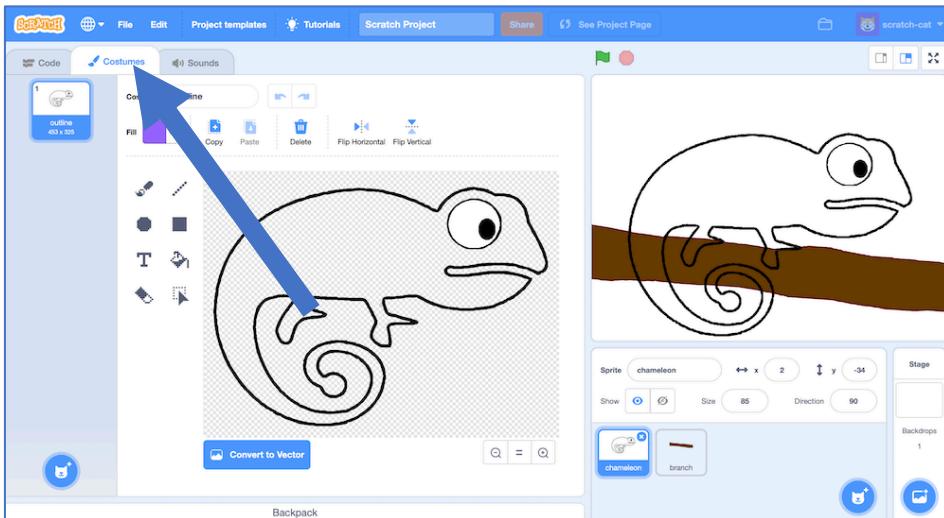
23. Click on the “Project templates” button at the top



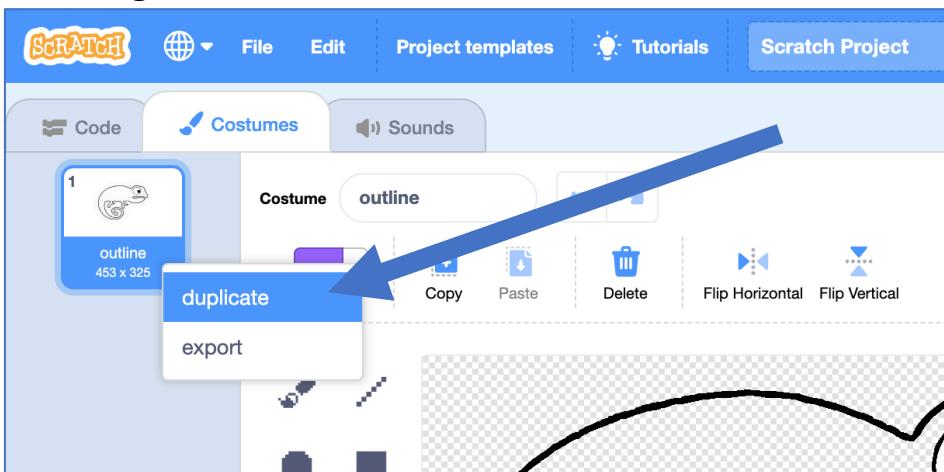
24. Click on the Chameleon project template



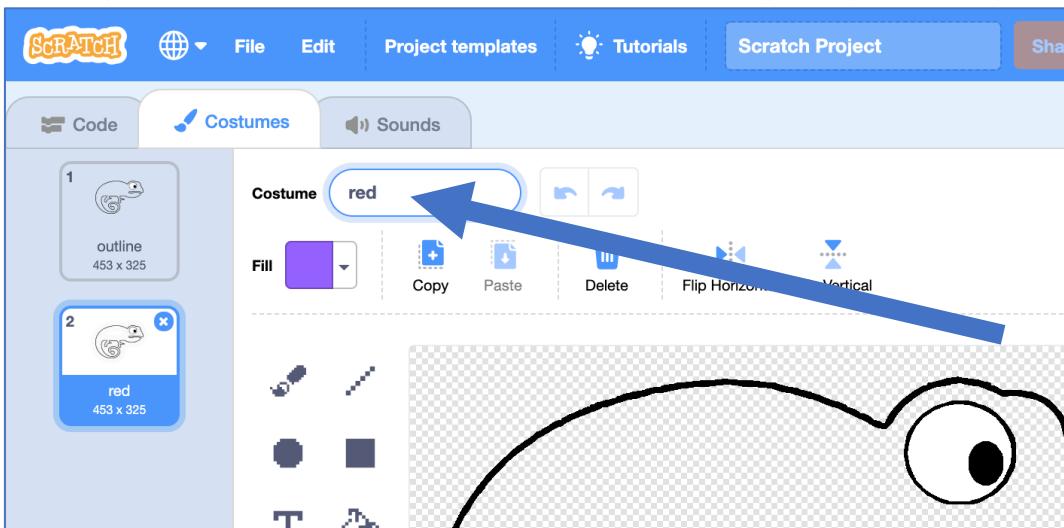
25. Click on the Costumes tab



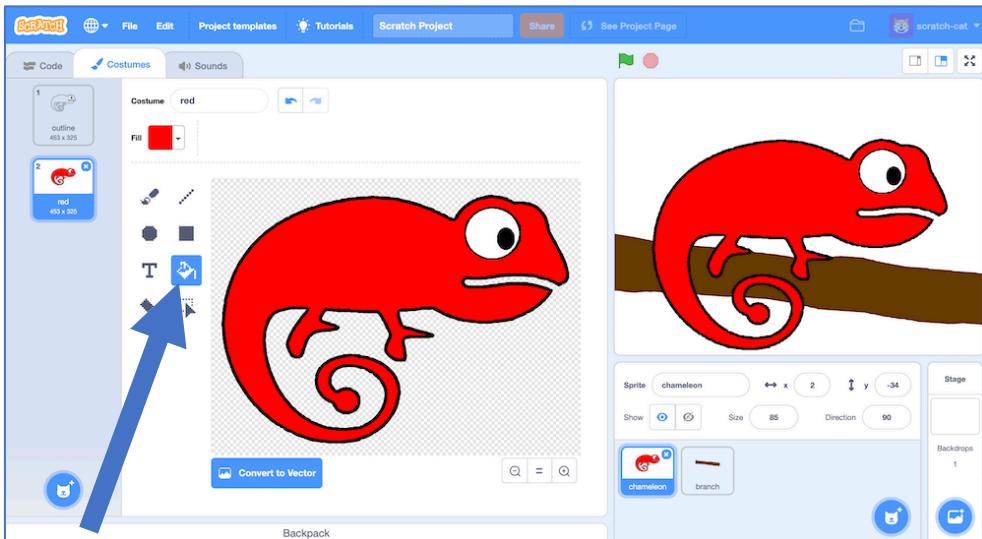
26. Right-click on the “outline” costume, and click “duplicate”



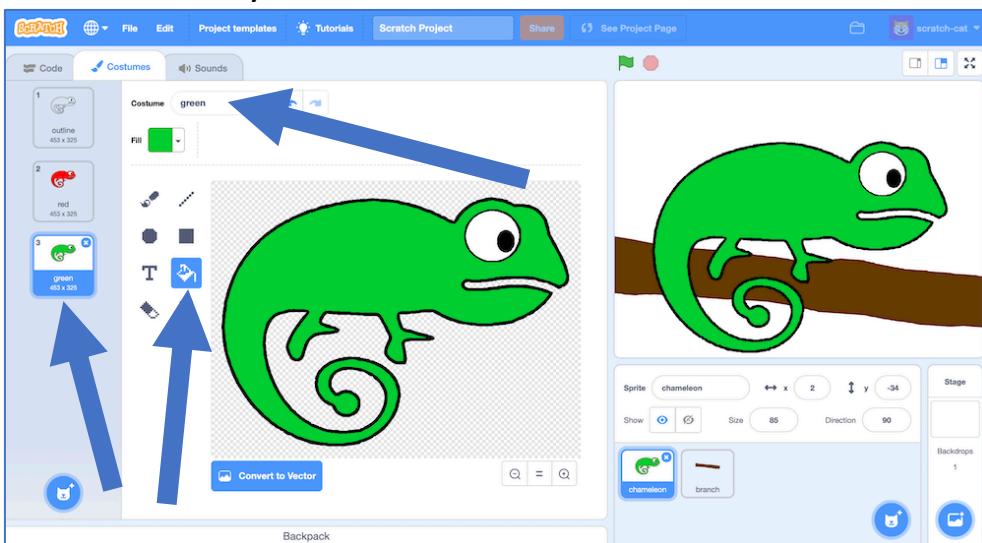
27. Name the duplicate costume the name of the first of your colours *It's important that the name matches exactly, or your script won't work.*



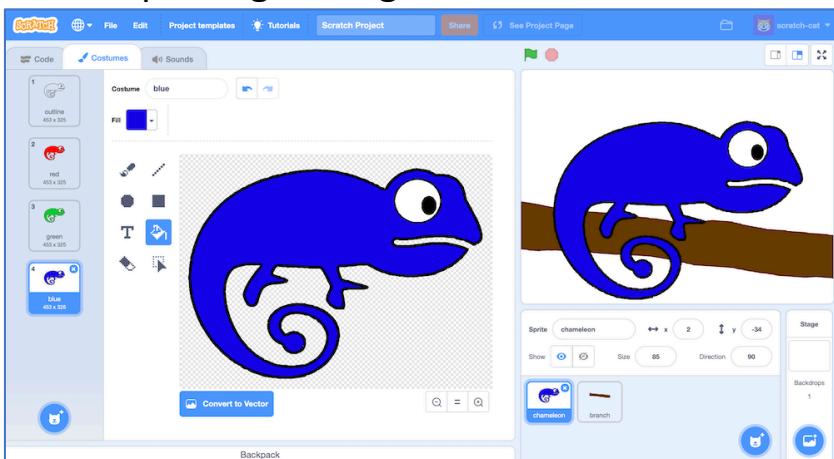
28. Use the paint bucket **Fill** tool to colour in the chameleon costume



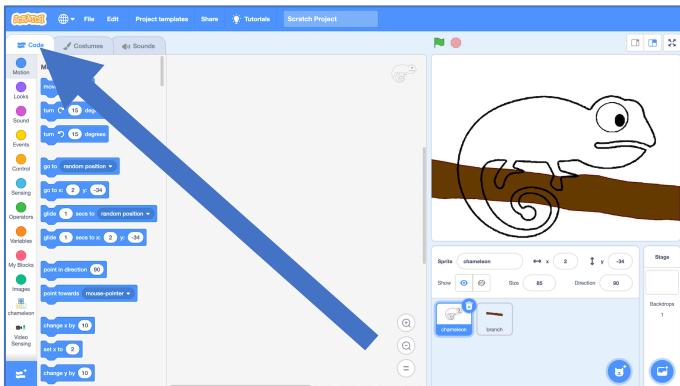
29. Repeat. Duplicate the outline costume again, name it **exactly** after the second of your colours, and colour it in



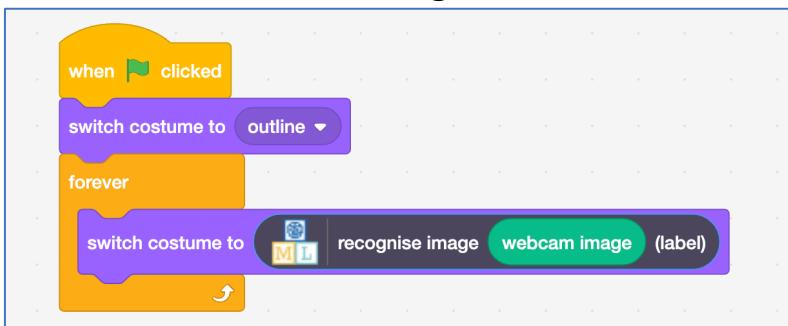
30. Repeat again to get the third colour costume



31. Click on the **Code** tab



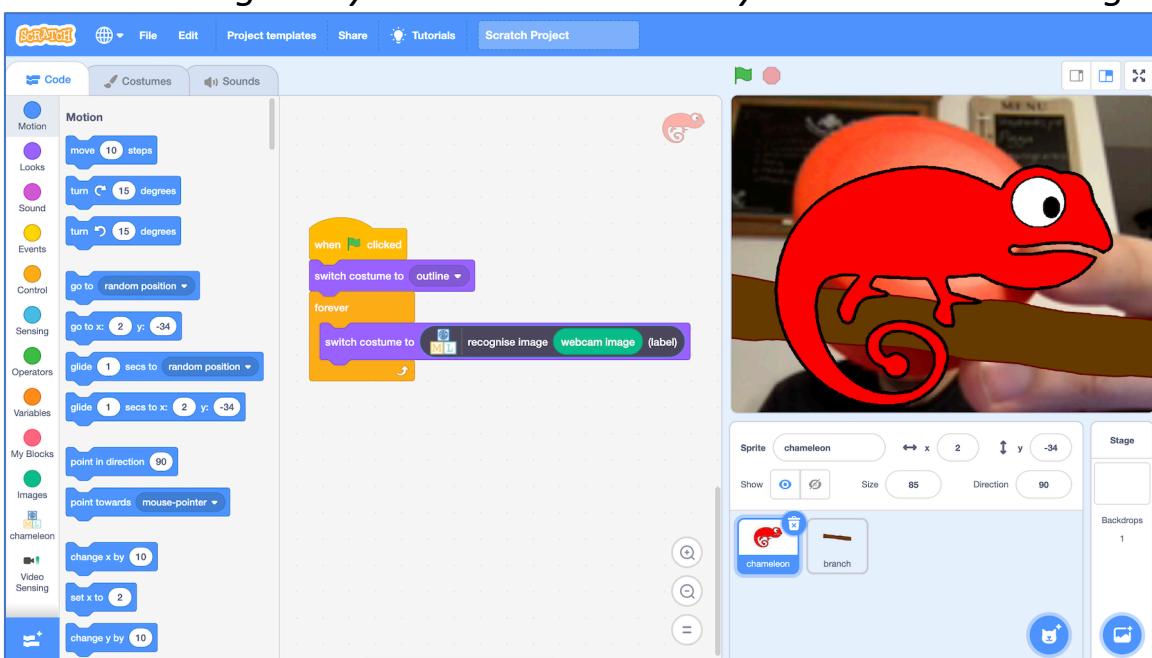
32. Create the following code



33. Click on the **Green Flag**

34. Hold something in front of your webcam to give the chameleon a new background

Use something that you didn't use to train your machine learning model.



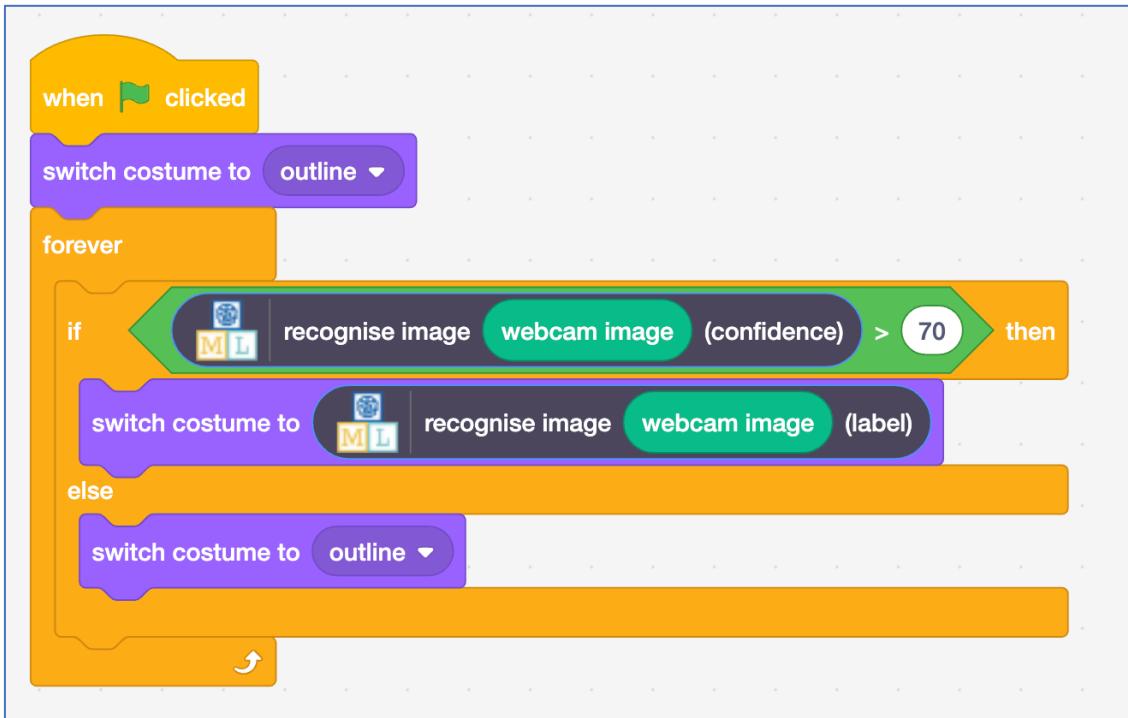
35. Try improving the code

Can you tell what this code would do differently?

Do you think this is an improvement?

Try experimenting with different confidence numbers instead of “70”.

What confidence threshold do you think works best with your model?



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.

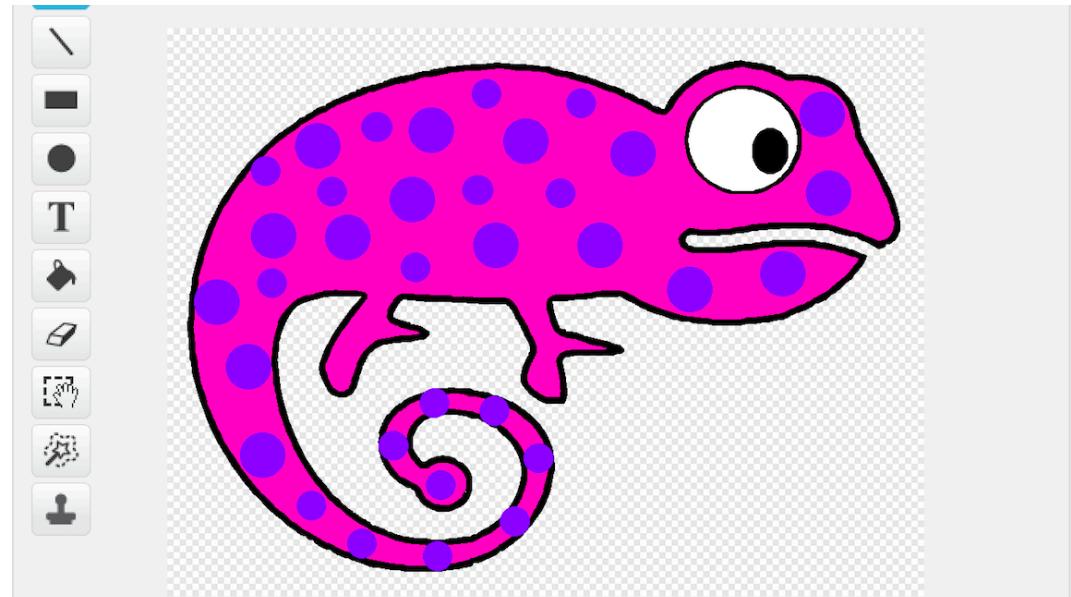
Ideas and Extensions

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!