

technocamps



UNDEB EWROPEAIDD
EUROPEAN UNION



Llywodraeth Cymru
Welsh Government

Cronfa Gymdeithasol Ewrop
European Social Fund



Prifysgol
Abertawe
Swansea
University



CARDIFF
UNIVERSITY
PRIFYSGOL
CAERDYDD



PRIFYSGOL
BANGOR
UNIVERSITY



Cardiff
Metropolitan
University

Prifysgol
Metropolitan
Caerdydd

it.wales



PRIFYSGOL
ABERYSTWYTH
UNIVERSITY

PRIFYSGOL
Glyndŵr
Wrecsam

Wrexham
glyndŵr
UNIVERSITY

University of
South Wales
Prifysgol
De Cymru

Machine Learning in Primary Education



Machine Learning Across the CFW

Machine Learning is a tool that can be implemented across all the Areas of Learning and Experience, reinforcing learning in the classroom and improving digital literacy in the process.

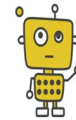
In today's world digital literacy is an essential skill for learners to develop. The technological requirements for jobs are ever increasing, and a strong start in digital skills will prepare learners and give them an advantage.



Expressive Arts



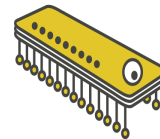
Health and Wellbeing



Humanities



Languages, Literacy and Communication



Mathematics and Numeracy



Science and Technology

Ideas for Machine Learning Across the Curriculum



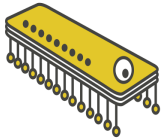
Health and Wellbeing

- Predict Healthy Foods from Contents



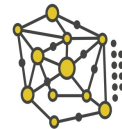
Languages, Literacy and Communication

- Recognising Authors
- Decoding Secret Codes



Mathematics and Numeracy

- Make Predictions from Statistics



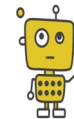
Expressive Arts

- Recognising Artists
- Recognising Musicians



Science and Technology

- Predicting Classes of Animals



Humanities

- Predicting Location of Landscapes



Using Machine Learning for Kids

Using Machine Learning for Kids

Machine Learning for Kids is a powerful tool that allows learners to train their own A.I. projects.

Educators can make an account which allows projects to be saved and class accounts to be established for group projects.

Learners are unable to make their own accounts, meaning the A.I. project itself only lasts 4 hours.

Note: the Scratch/Python code can be saved for future use, but will no longer have an A.I. to communicate with.

Using Machine Learning for Kids

Go to

machinelearningforkids.co.uk

Click on “Get started”

Click on “Try it now”

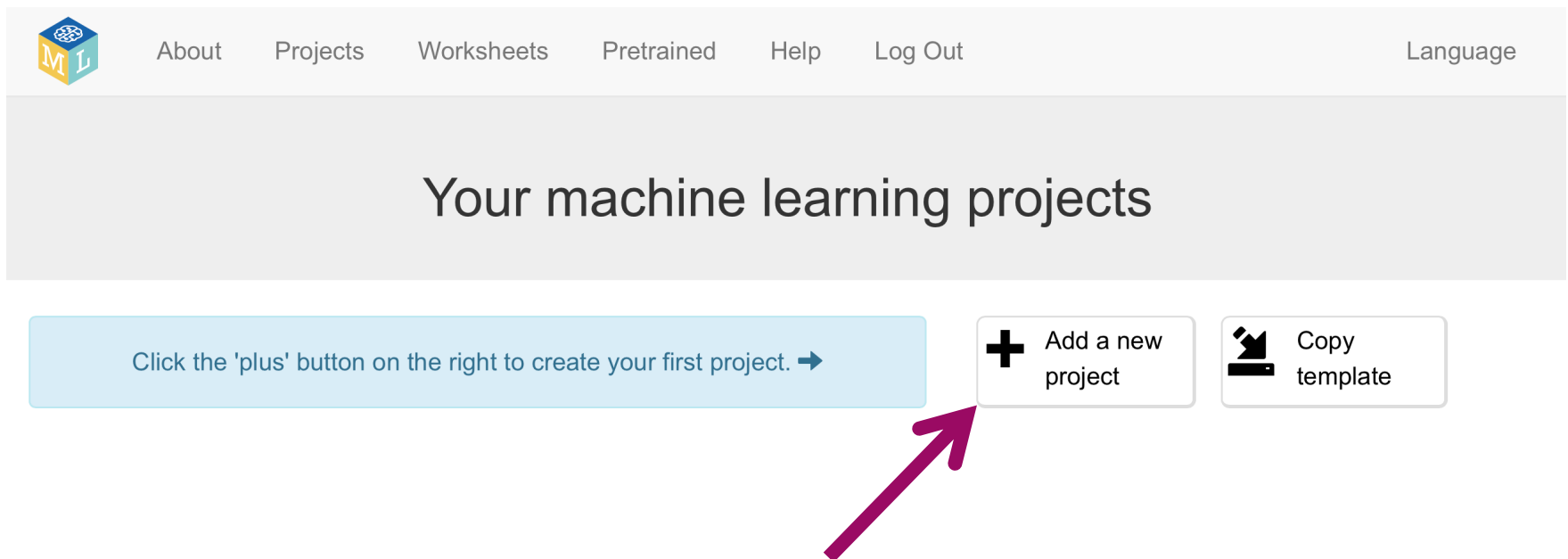


Recognising Animals

Making a Project


On your blank projects page, click “Add a new project” to start creating.

Note: trial users can only make one project at a time.



Making a Project

Create a new project called Animals, recognising Images.


[About](#)
[Projects](#)
[Worksheets](#)
[Pretrained](#)
[Help](#)
[Log Out](#)
[Language](#)

Start a new machine learning project

Project Name *

Animals

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"

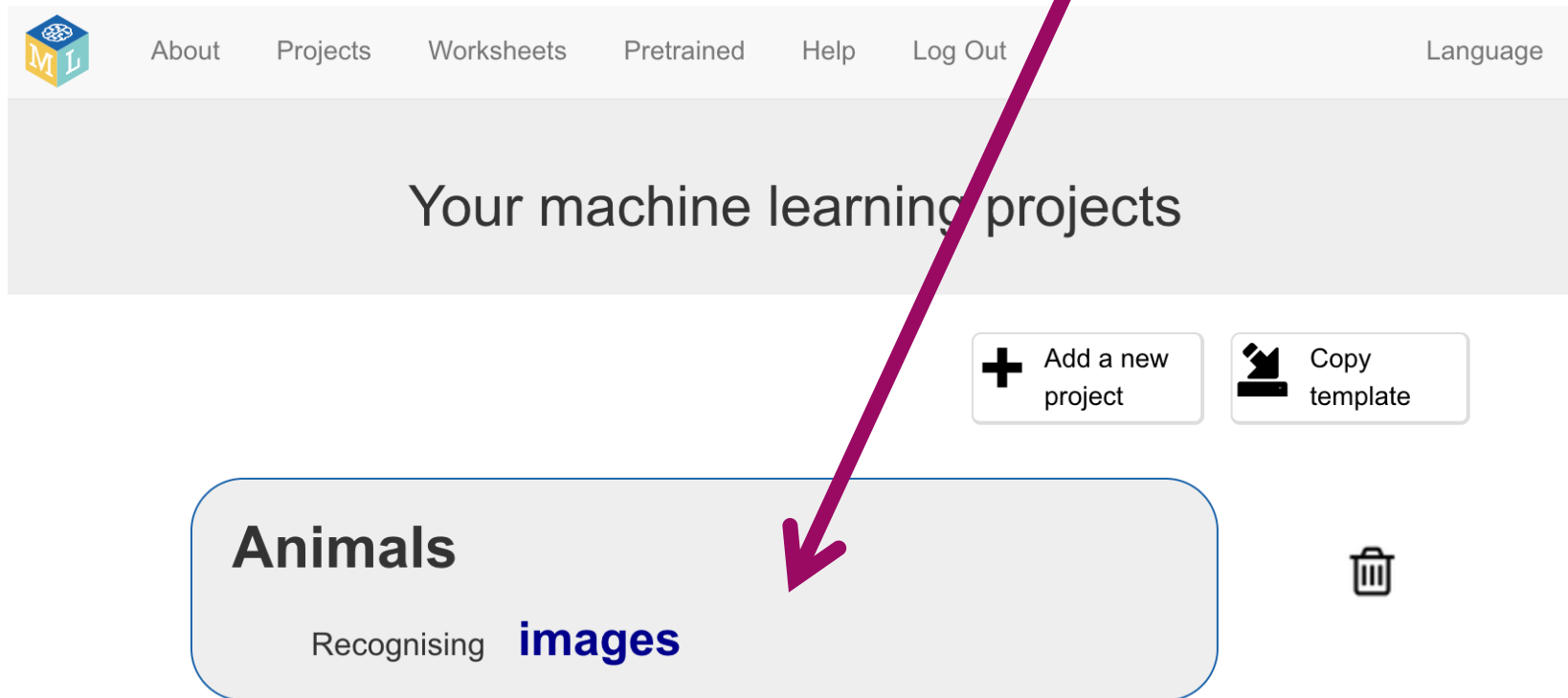
For voices and sounds, choose "sounds"

CREATE

CANCEL

Training Your Project

You'll be taken back to your Projects page, click on the project to open it.



The screenshot shows the 'Your machine learning projects' page. At the top is a navigation bar with a logo and links for 'About', 'Projects', 'Worksheets', 'Pretrained', 'Help', 'Log Out', and 'Language'. Below the navigation bar is a large grey header with the text 'Your machine learning projects'. Underneath this header are two buttons: '+ Add a new project' and a button with a template icon labeled 'Copy template'. The main content area displays a project card for 'Animals' with the subtitle 'Recognising images'. A red arrow points from the text 'click on the project to open it.' to the 'Animals' project card. To the right of the project card is a trash can icon.

ML About Projects Worksheets Pretrained Help Log Out Language

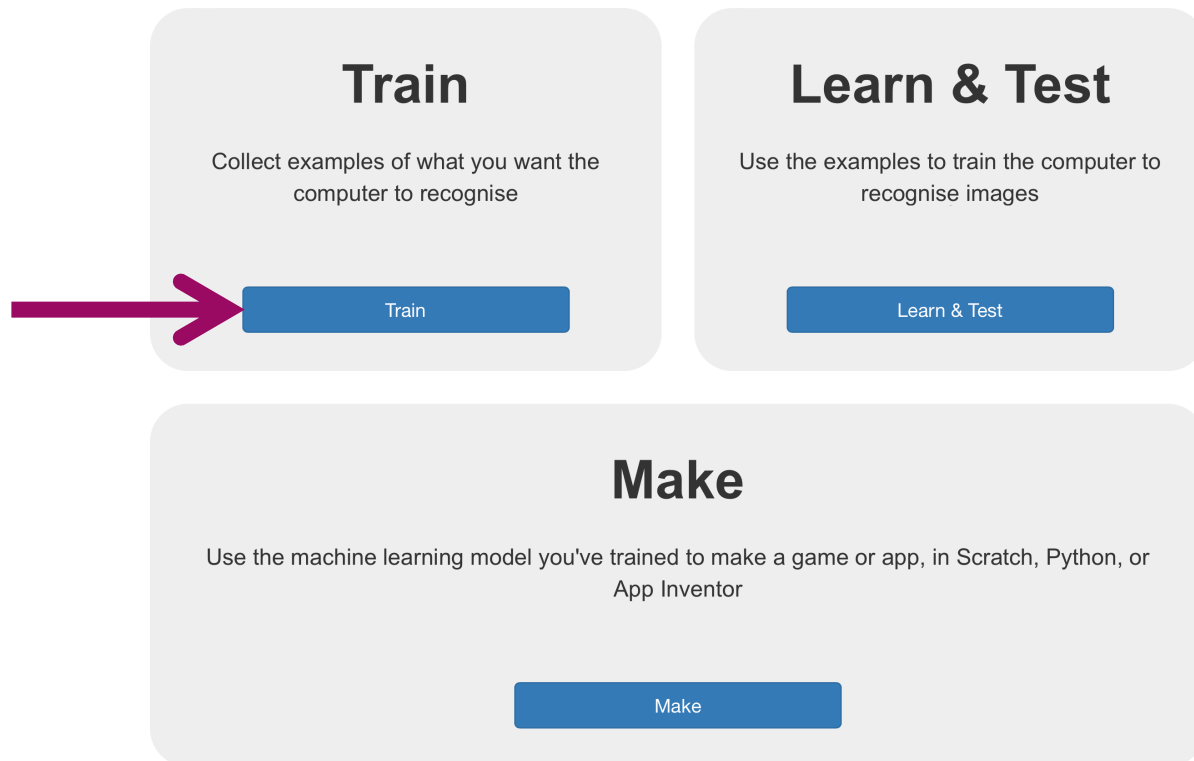
Your machine learning projects

+ Add a new project Copy template

Animals
Recognising **images**

Training Your Project

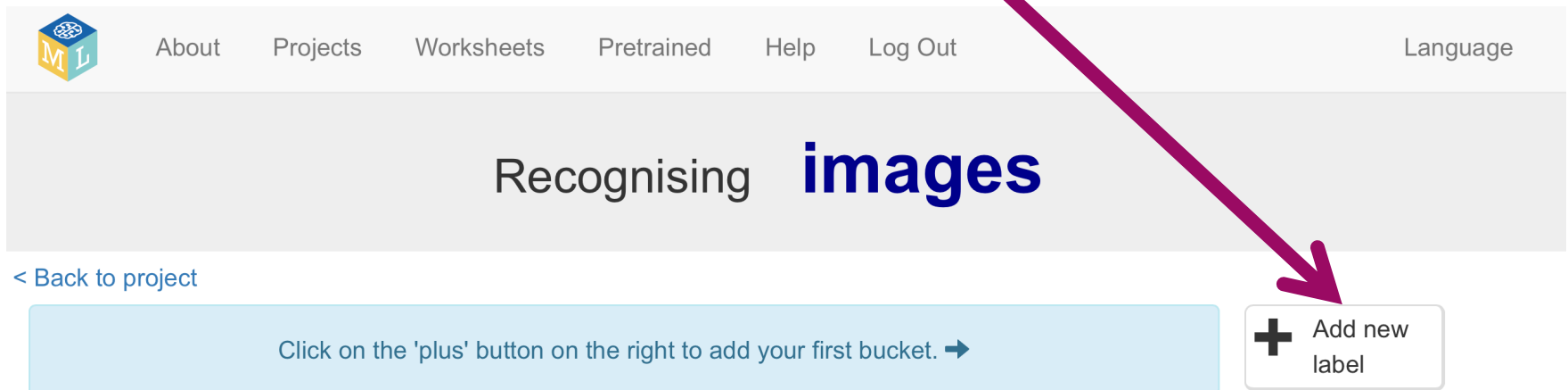
These are the three stages of making any project.
We will begin by Training our A.I.



Training Your Project

We will have to add **two** labels for our project, one for each animal we wish to train the A.I. to recognise.

So we will call these labels “Butterfly” and “Dragonfly”.



The screenshot shows the TechnoCamps interface for a project titled "Recognising images". The top navigation bar includes links for "About", "Projects", "Worksheets", "Pretrained", "Help", "Log Out", and a "Language" dropdown. Below the navigation bar, the project title "Recognising images" is displayed in a large, bold, blue font. A light blue banner at the bottom contains the text "Click on the 'plus' button on the right to add your first bucket. ➔". On the right side of the banner, there is a button with a plus sign and the text "Add new label". A purple arrow points from the word "Dragonfly" in the text above to this button.

< Back to project

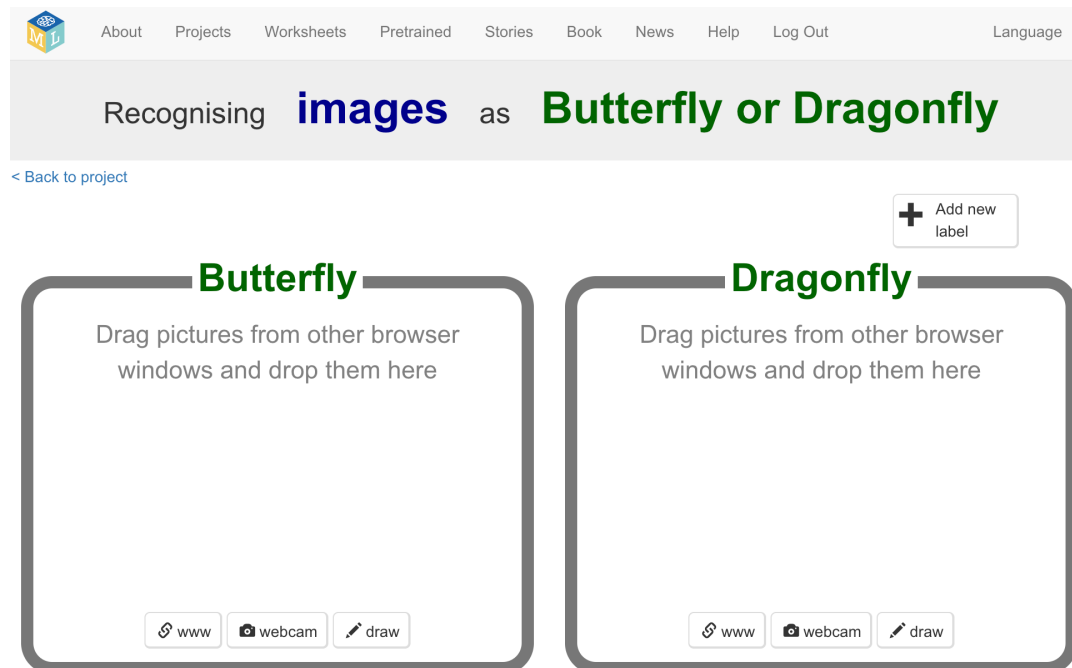
Click on the 'plus' button on the right to add your first bucket. ➔

+ Add new label

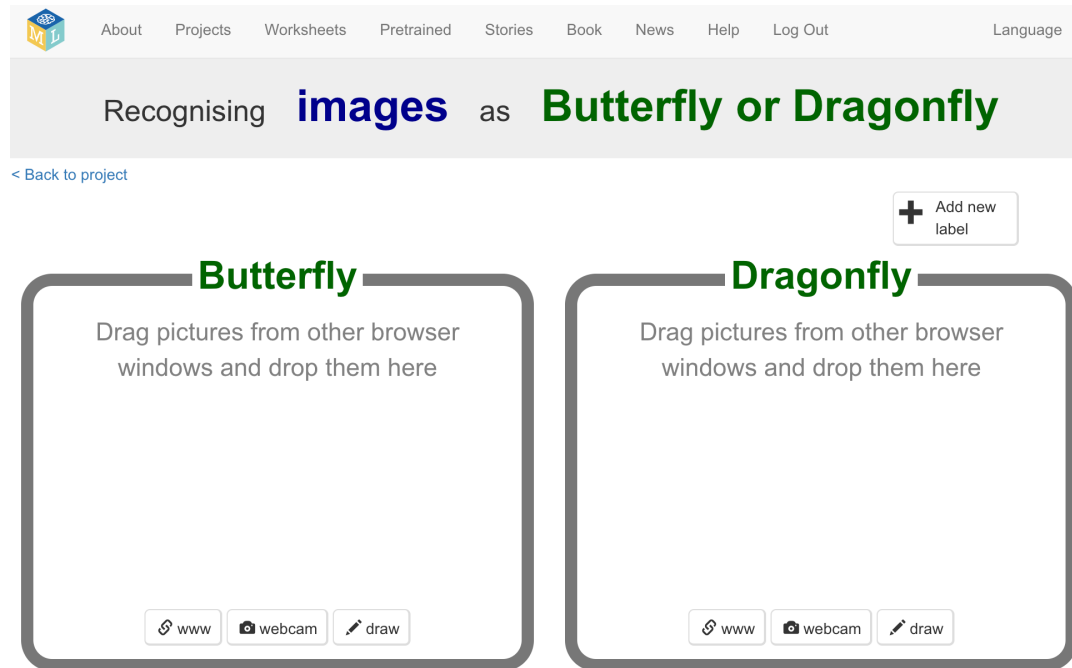
Training Your Project

Now we have a bucket where we can store images of each artist for the A.I. to learn from.

Your project should now look like this:



Training Your Project



Note: We can import images here from the web (just drag and drop). However we can not upload directly.

This is true for examples of text and sound too.

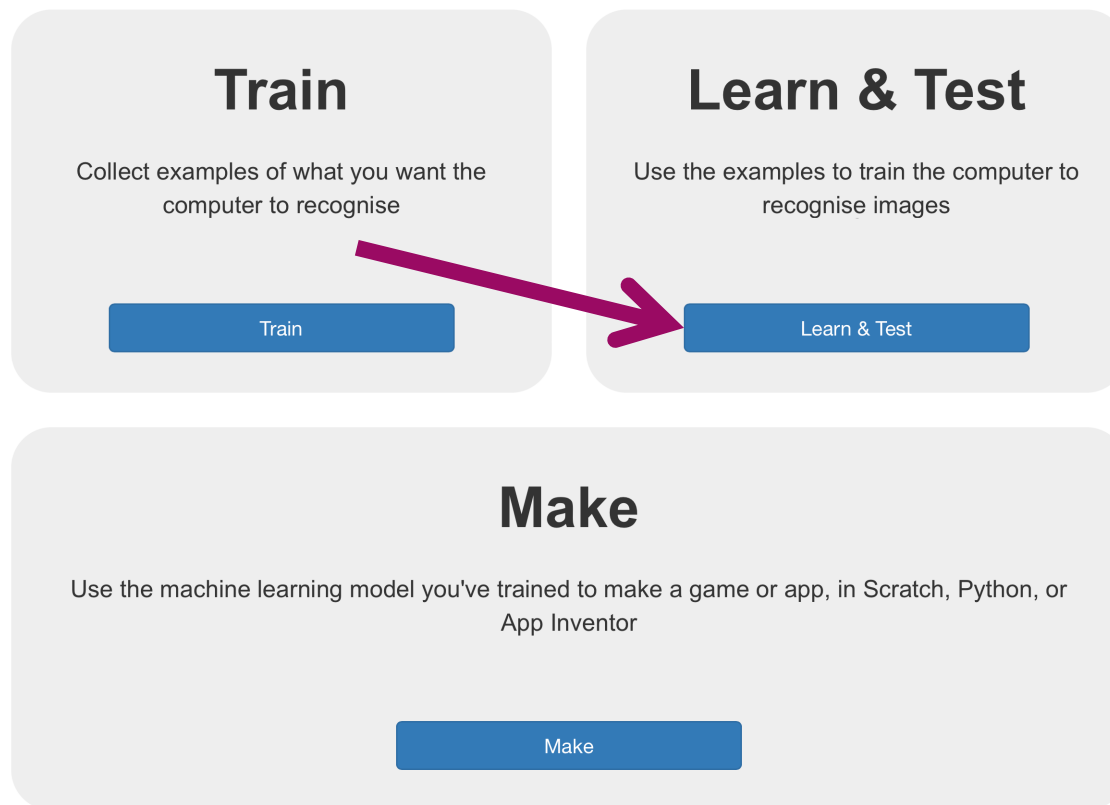
Making Your Project

Once we have begun downloading the data set, we can click back to project to return.

The screenshot shows the TechnoCamps web interface. At the top is a navigation bar with links: About, Projects, Worksheets, Pretrained, Stories, Book, News, Help, Log Out, and Language. Below this is a header for the current project: "Recognising **images** as **Butterfly or Dragonfly**". A pink arrow points to a blue link "< Back to project" located below the header. To the right of the header is a button labeled "+ Add new label". Below the header are two large, rounded rectangular boxes. The left box is titled "Butterfly" and the right box is titled "Dragonfly". Both boxes contain the text "Drag pictures from other browser windows and drop them here". At the bottom of each box are three buttons: "www" (with a globe icon), "webcam" (with a camera icon), and "draw" (with a pencil icon).

Learn & Test

Now you can click on Learn & Test.



Learn & Test

Now that we have images of butterflies and dragonflies, we can train the machine.

Machine learning models

[< Back to project](#)

What have you done?

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

You've collected:

- 30 examples of Butterfly,
- 30 examples of Dragonfly

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.)

from training computer:

[Train new machine learning model](#)

Learn & Test

Once the machine is trained, we can drag and drop new images from the web to see if it works.


Try putting in an image to see how it is recognised based on your training.

Test with webcam

Test by drawing

Test with a web address for an image on the Internet

Test with www



Info from training computer:

Model started training at: Tuesday, November 29, 2022 12:47 PM
Current model status: Available

Delete this model

Train new machine learning model

Learn & Test

Now that we have trained the machine and have tested it works, we can click back to project.

[< Back to project](#)



What have you done?

You have trained a machine learning model to recognise when images are Butterfly or Dragonfly.

You created the model on Tuesday, November 29, 2022 12:47 PM.

You have collected:

- 30 examples of Butterfly,
- 30 examples of Dragonfly

What's next?

Try testing the machine learning model below. Enter an example image below, that you didn't include in the examples you used to train it. It will tell you what it recognises it as, and how confident it is in that.


If the computer seems to have learned to recognise things correctly, then you can go to Scratch and use what the computer has learned to make a game!

If the computer is getting too many things wrong, you might want to go back to the [Train](#) page and collect some more examples

Once you've done that, click on the button below to train a new machine learning model and see what difference the extra examples will make!

Try putting in an image to see how it is recognised based on your training.

 Test with webcam

 Test by drawing

Test with a web address for an image on the Internet

Test with [www](#)

Making Your Project

Now you can click on Make.

Train

Collect examples of what you want the computer to recognise

Train

Learn & Test

Use the examples to train the computer to recognise images

Learn & Test

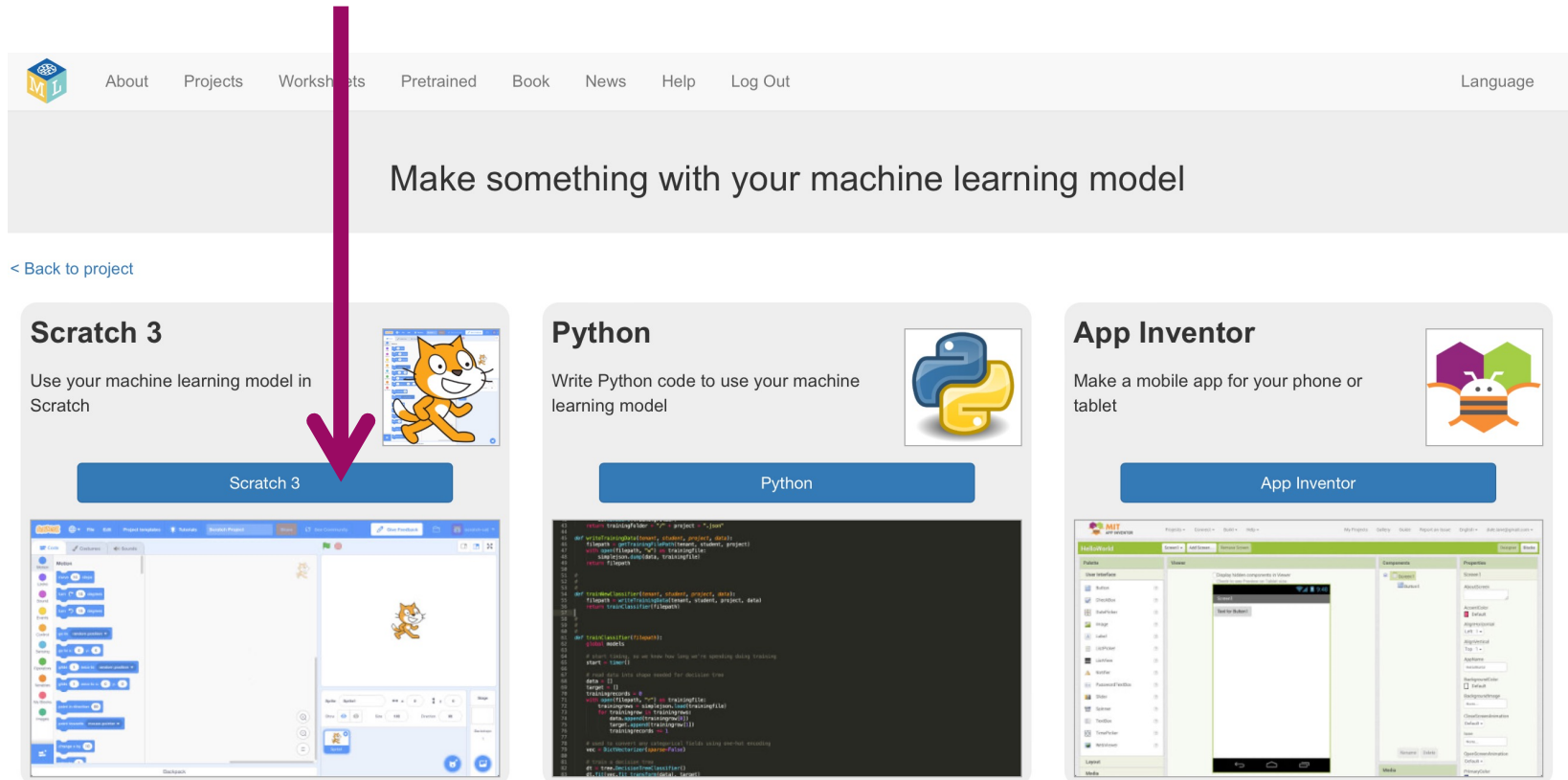
Make

Use the machine learning model you've trained to make a game or app, in Scratch, Python, or App Inventor

Make

Making Your Project

Today we will be making our Project in Scratch 3.

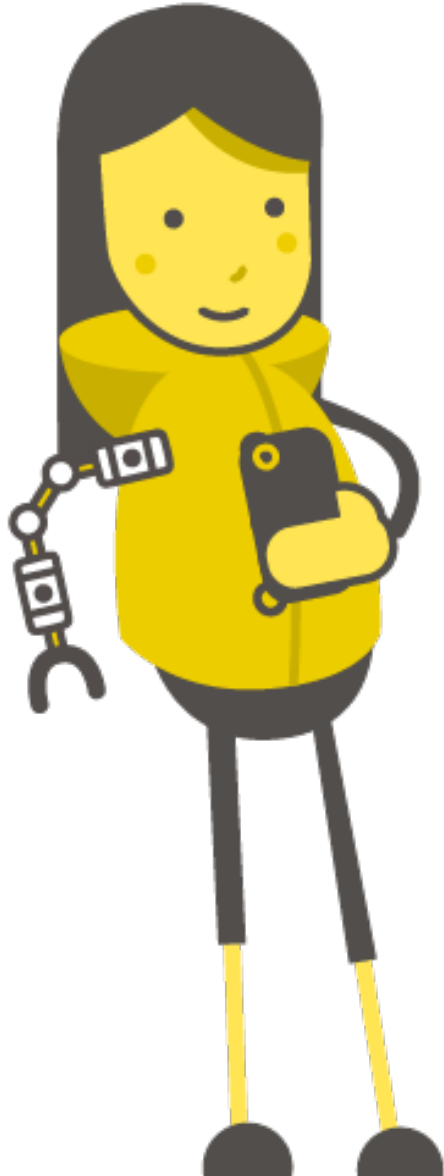


The screenshot shows the top navigation bar of the ML Playground with links: About, Projects, Worksheets, Pretrained, Book, News, Help, Log Out, and a Language dropdown. Below the navigation bar is a large grey banner with the text "Make something with your machine learning model". Underneath the banner is a link "< Back to project".

There are three main options displayed in grey boxes:

- Scratch 3**: "Use your machine learning model in Scratch". It features the Scratch cat icon and a blue button labeled "Scratch 3". Below the button is a preview of the Scratch 3 interface showing a cat sprite on a stage.
- Python**: "Write Python code to use your machine learning model". It features the Python logo icon and a blue button labeled "Python". Below the button is a preview of a Python code editor with pre-installed ML libraries.
- App Inventor**: "Make a mobile app for your phone or tablet". It features the MIT App Inventor logo icon and a blue button labeled "App Inventor". Below the button is a preview of the MIT App Inventor interface showing a mobile app design.

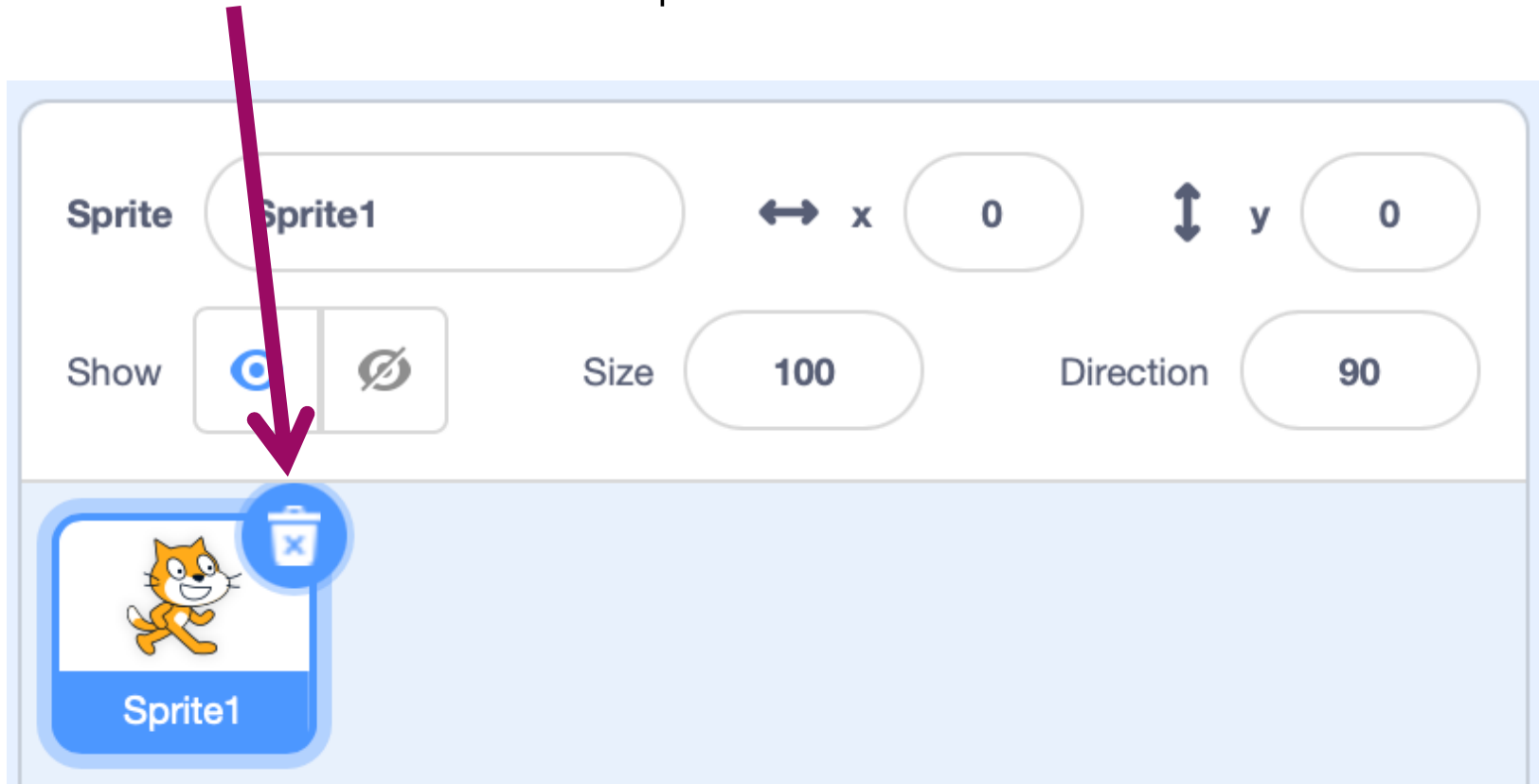
A large red arrow points from the top of the page down to the "Scratch 3" button, indicating the selected path for the project.



Machine Learning in Scratch

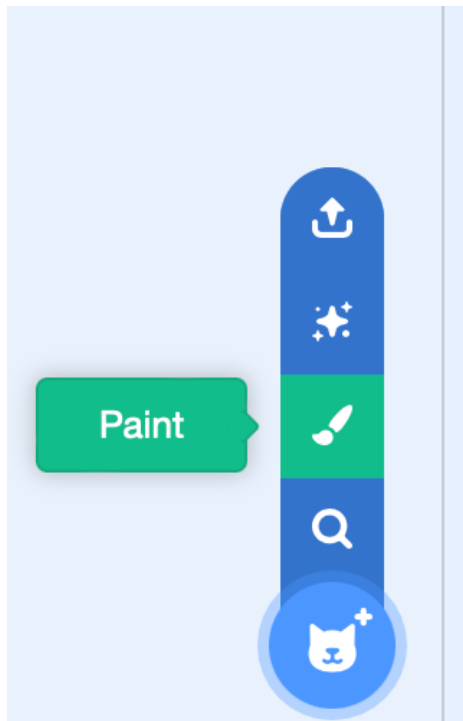
Deleting Sprites

To begin we will delete the default sprite for Scratch, by clicking the rubbish can next to the sprite.

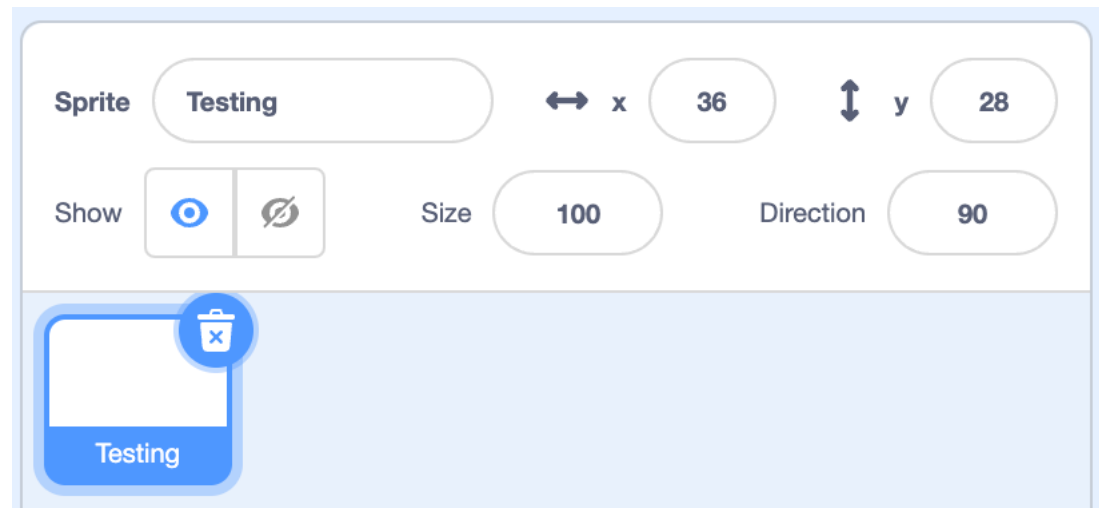


Creating Sprites

Down in the bottom left corner we can hover over the “Choose a Sprite” button for more options. Then choose “Paint”.

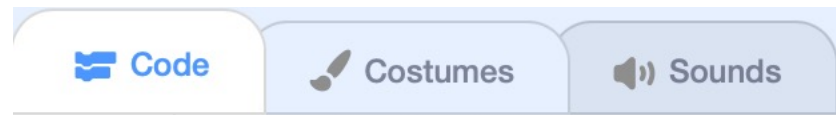


We will not paint a Sprite but name it **Testing**.

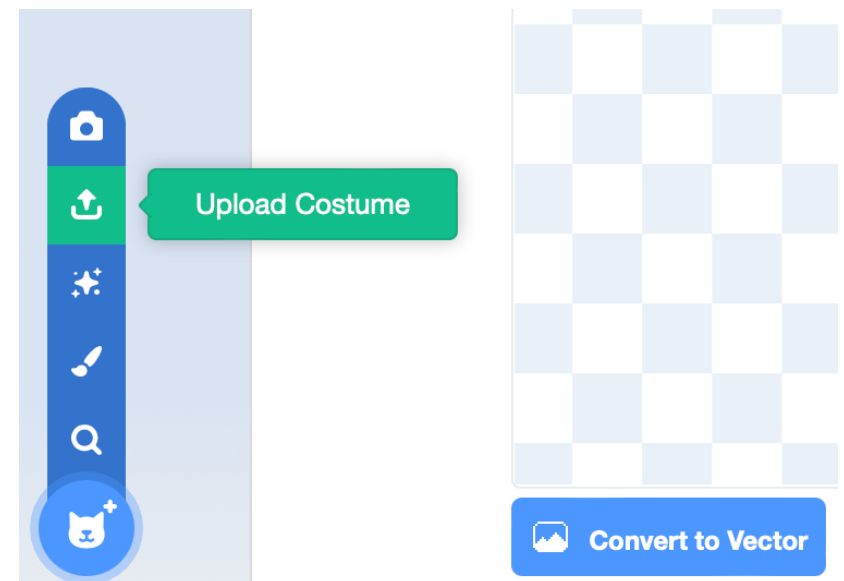


Uploading Images

Select your Testing sprite and in the top left corner choose “Costumes”.



In the bottom left corner hover over the “Choose a Costume” button and select “Upload Costume”.



Downloading the Testing Set

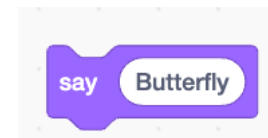
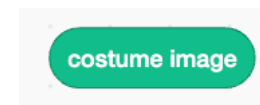
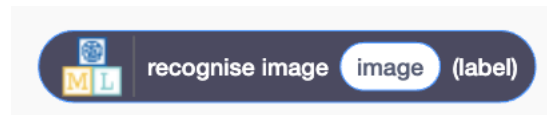
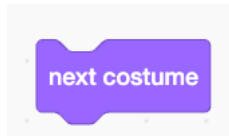
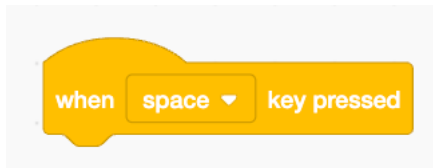
You can download the images at:

tc1.me/educonf22resources

Select all images within the testing folder downloaded and click upload.

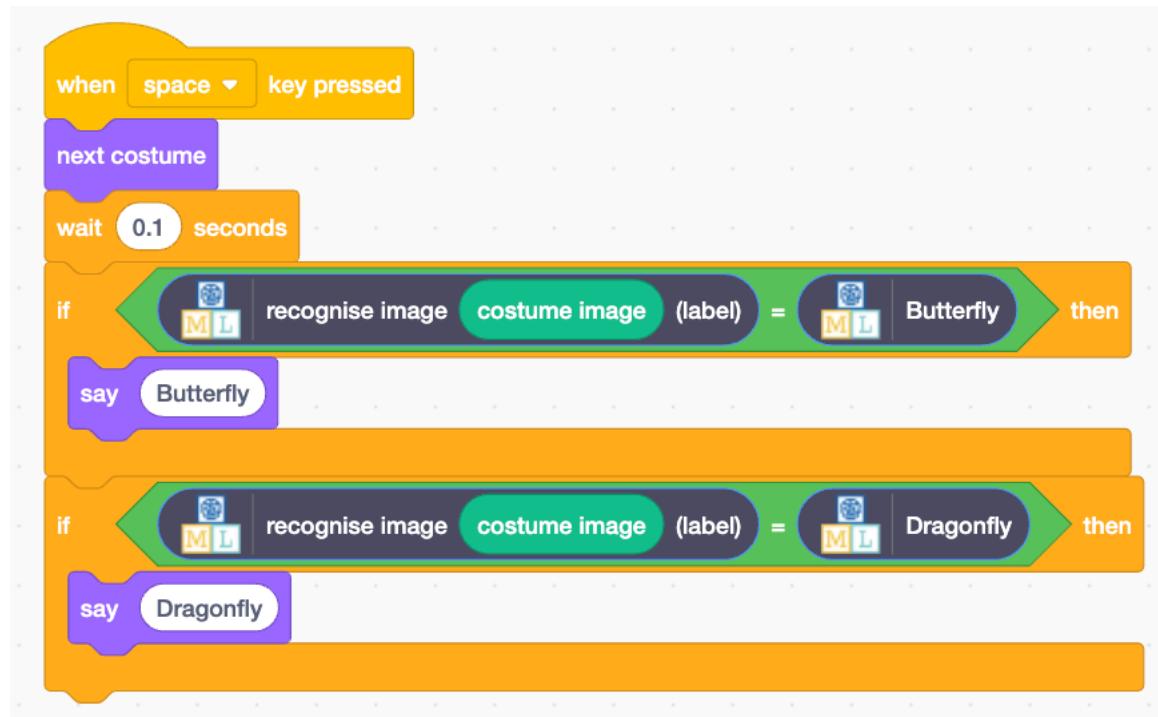
Testing Sprite

Find these blocks in the palette:



Testing Sprite

Add these blocks into the code as shown:



Extensions

Learners can try drawing their own pictures of Animals, either on paper or directly within Scratch, and see if the A.I. correctly identifies the animal.

The confidence level of the A.I. can be checked and either displayed on screen or used as an extra filter (i.e. program says it's unsure below 50% confidence)

The testing images can be sent back into the A.I. as further training data to try and improve its accuracy.