



Recommender

Predicting whether you will like something is a common job for machine learning. This is how online shops recommend what you might like to buy, video sites recommend what you might like to watch, and music apps recommend what you might like to listen to.

In this project, you will investigate whether it's possible to judge a book by its cover. You will make a project in Scratch to see if a computer can learn to predict whether you would want to read a book, based only on what the cover looks like.

The image shows a Scratch project titled "Recommender". The stage features a book cover for "Childhood's End" by Arthur C. Clarke. A speech bubble on the right asks, "Do you like the look of this book?". Below the book, two large circular icons represent user feedback: a green thumbs-up icon and a red thumbs-down icon. A smaller speech bubble below the icons says, "The system predicts that you will like this book".

The script area contains the following code:

```
when green flag clicked
  set size to [100%]
  switch costume to [unknown v]
  go to x: [-140] y: [40]
  hide
  Search by subject [Fiction (Science Fiction)]
  Add cover to costume
  show
  broadcast [next book v]
  say [join [Title] [join [by] [Author]]]
  if [ML recognises image costume image (label)] = [like] then
    broadcast [predict like v]
  else
    broadcast [predict dislike v]
  end
  when I receive [thumbs up v]
    add training data costume image [like v]
  end
  when I receive [thumbs down v]
    add training data costume image [dislike v]
  end
```

The script palette on the left includes the following blocks:

- Motion: recognise image image (label), recognise image image (confidence)
- Looks: like, dislike
- Events: add training data image like, train new machine learning model
- Control: Is the machine learning model ready?
- Sensing: Books
- Operators: Search by ISBN, Search by title, Search by author, Search by subject
- Variables: Books
- My Blocks: recommend
- Images: Books



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1. Go to <https://machinelearningforkids.co.uk/> in a web browser
2. Click on “Get started”
3. Click on “Try it now”
4. Click on “Projects” on the top menu bar
5. Click the “+ Add a new project” button.
6. Name your project “recommender” and set it to learn how to recognise “images”. Click “Create”

Start a new machine learning project

Project Name *

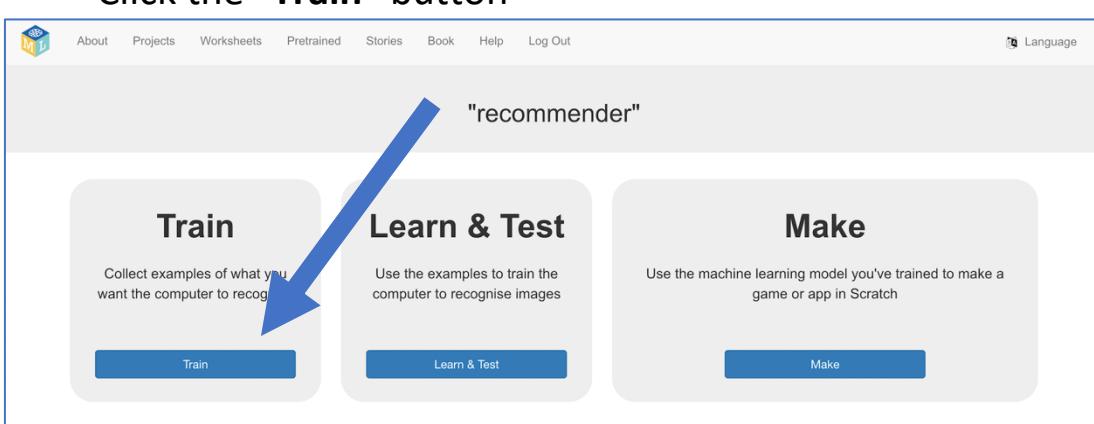
Project Type *

Storage *

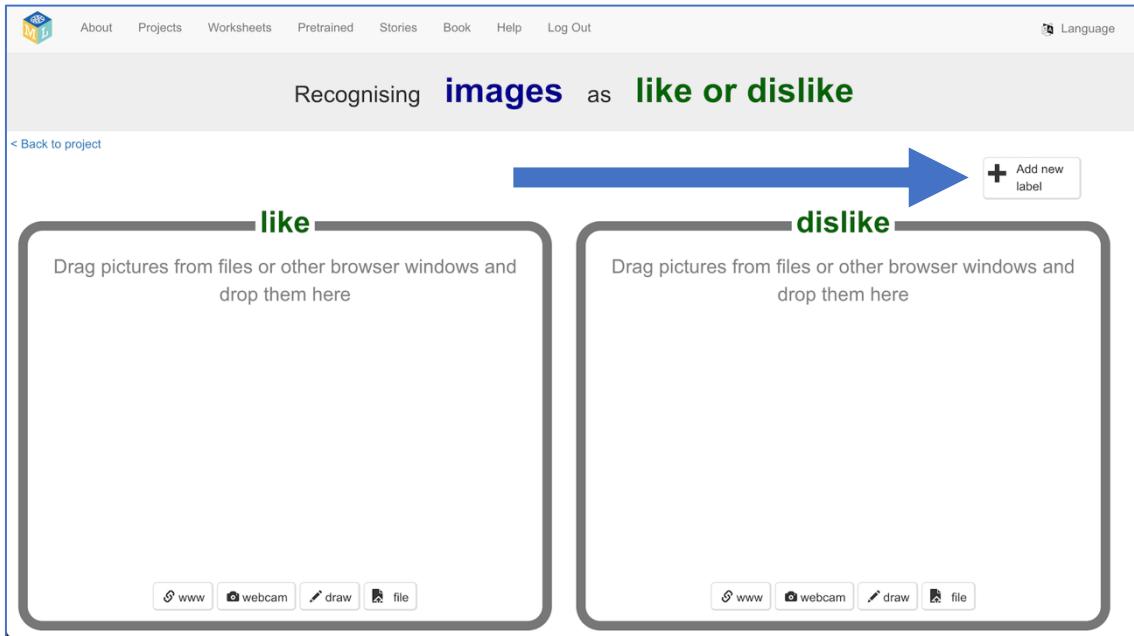
Where do you want to store this project?
Storing in your web browser removes limits on how big your project can be.
Storing in the cloud will let you access the project from any computer.
(See "What difference does it make where a project is stored?")

CREATE **CANCEL**

7. You should now see “recommender” in your projects list. Click on it.
8. Click the “Train” button

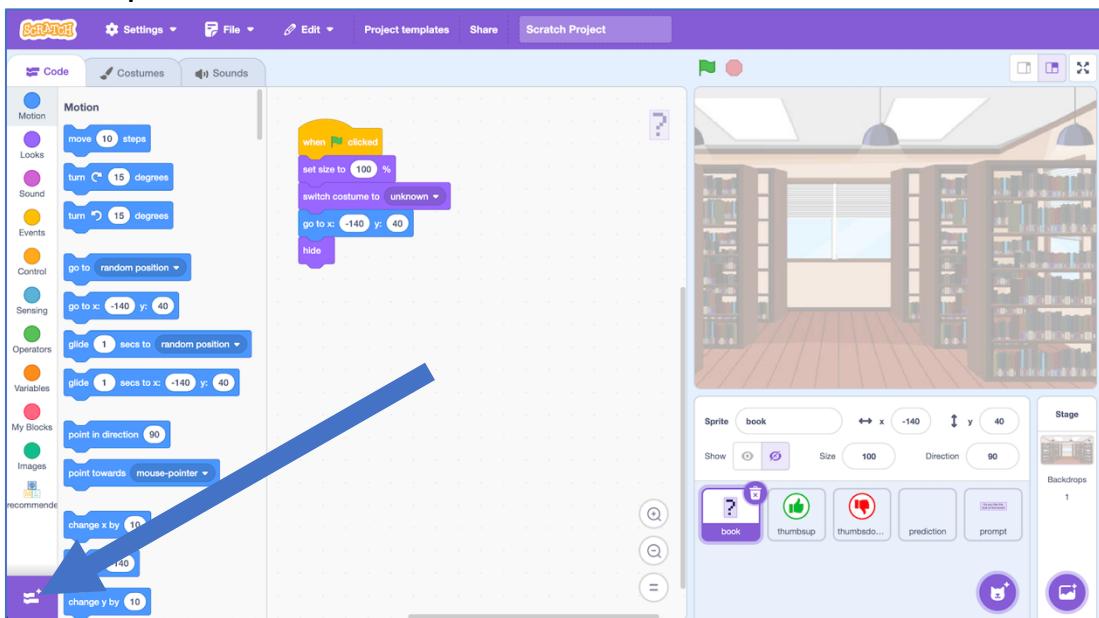


- 9.** Use the “+ Add new label” button to create two buckets
One for books with covers that you like: “like”
One for books with covers that you don’t like: “dislike”

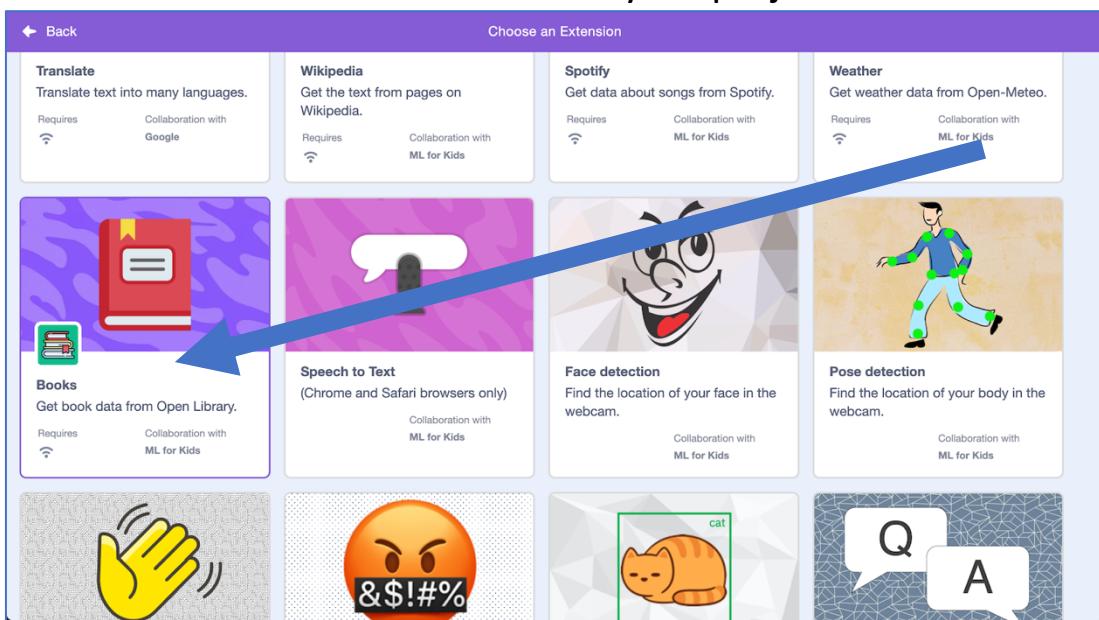


- 10.** Click the “< Back to project” link.
- 11.** Click the “Make” button
- 12.** Click the “Scratch 3” then click “straight into Scratch”
The page will warn you that you haven’t trained a machine learning model yet. That is okay, as you will be using Scratch to collect training images.
- 13.** In the Scratch window, click on “Project templates”
-
- A screenshot of the Scratch 3.0 software interface. The top menu bar includes "Scratch", "Settings", "File", "Edit", "Project templates", "Share", and "Scratch Project". A blue arrow points from the "Project templates" menu item down towards the main workspace. The workspace shows a stage with a cat sprite and a script area with some blocks. On the left, there is a palette with categories like "Code", "Motion", "Looks", and "Sound".

15. Open the extensions list



16. Add the “Books” extension to your project

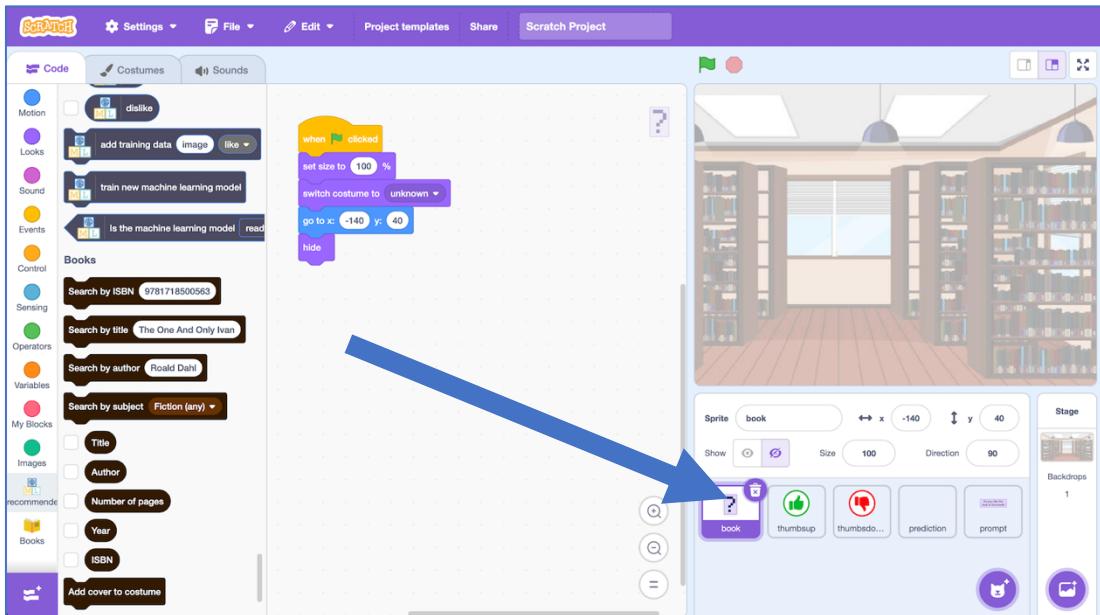


17. Choose a book subject to use for this project

In this project, you will be shown covers from random books, and asked to choose whether you would want to read it.

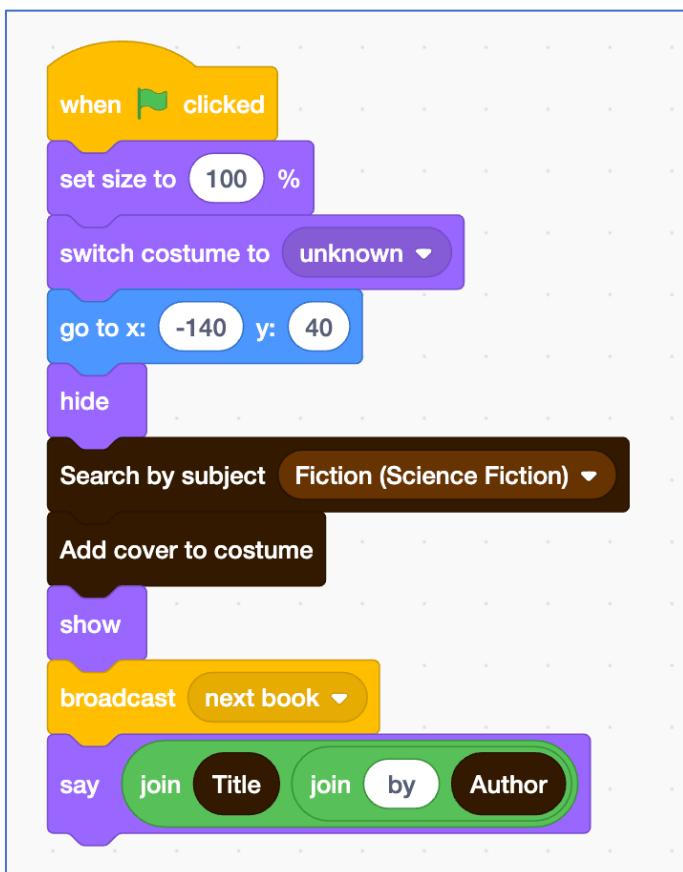
In the screenshots below, I decided to base my project on Science Fiction books, but you can choose your own subject.

18. Click on the “book” sprite



19. Update the code that is there so that it looks like this: *The first four blocks are already in the template for you.*

In the “Search by subject” block, choose a subject you would like to use.

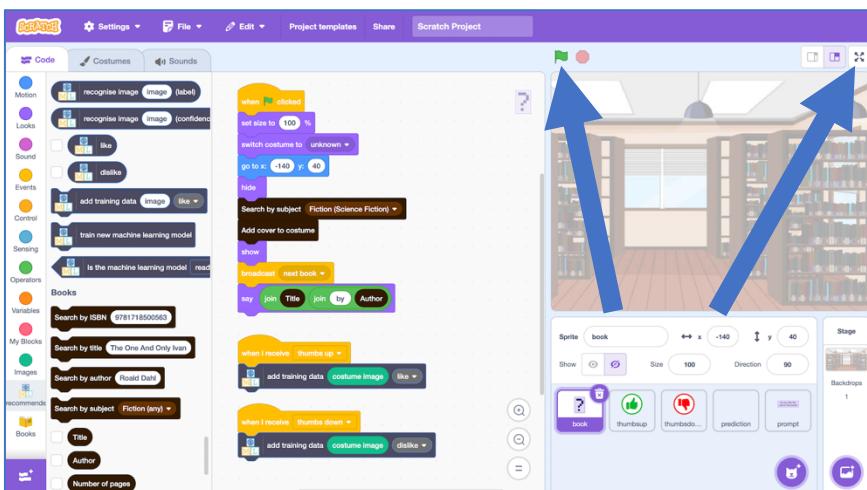


20. Add this code

You should still be in the “book” sprite



21. Click on the full-screen button then click on the Green Flag



22. You will see a random book cover.

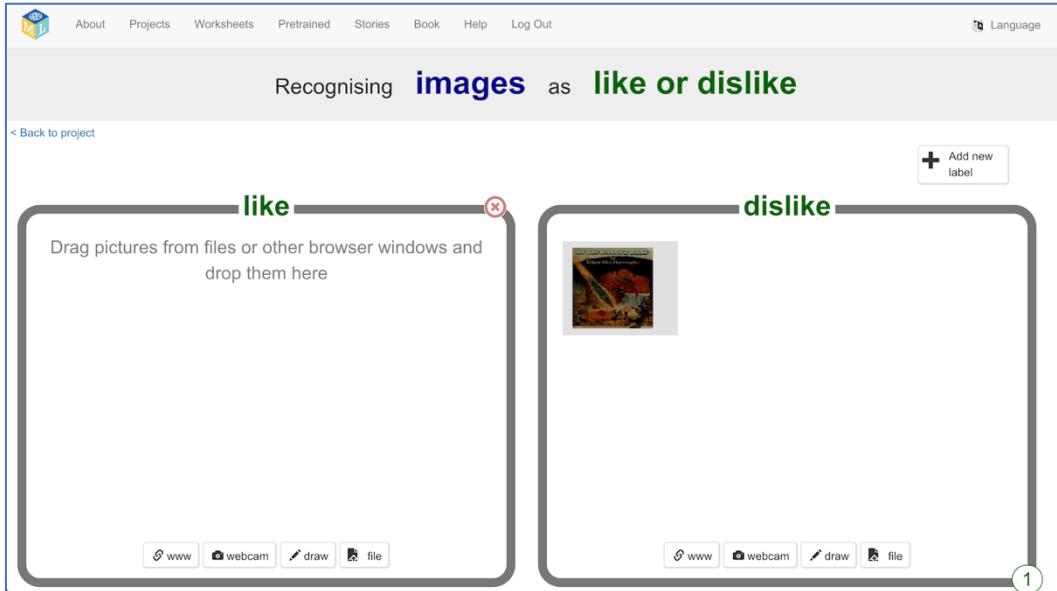
Imagine you saw this book on a shelf. Would you give it a try?
If you like the look of it, click thumbs up. Else, click thumbs down.



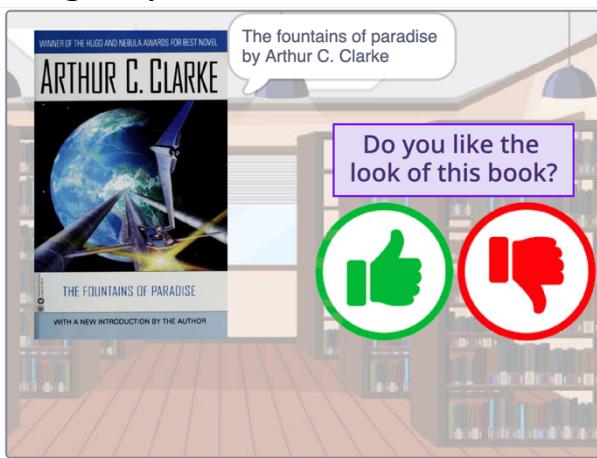
Sometimes a cover can't be found,
so you will just see a question mark.

If this happens, click the Green Flag
again to try a new book.

- 23.** In the training window, click on the “< Back to project” link and then go back to the “Train” screen
You should see the book from Scratch in one of your training buckets. If it is not there, go back to steps 19 and 20, and check your code.



- 24.** In the Scratch window, click the **Green Flag** to try another book.
If you see the same book again, skip it by clicking the Green Flag again. Imagine you saw this book on a shelf. Would you give it a try?



- 25.** Keep going!
Click on the Green Flag to get the next book, then choose one of the buttons.
You want to collect a variety of examples of books that you would try reading, and a variety of examples of books that you don't like the look of. Try to avoid duplicates when you see books you remember seeing before.

- 26.** Use the training tool to keep track of how many examples you have
Once you have at least ten examples for both like and dislike, you can continue to the next step.

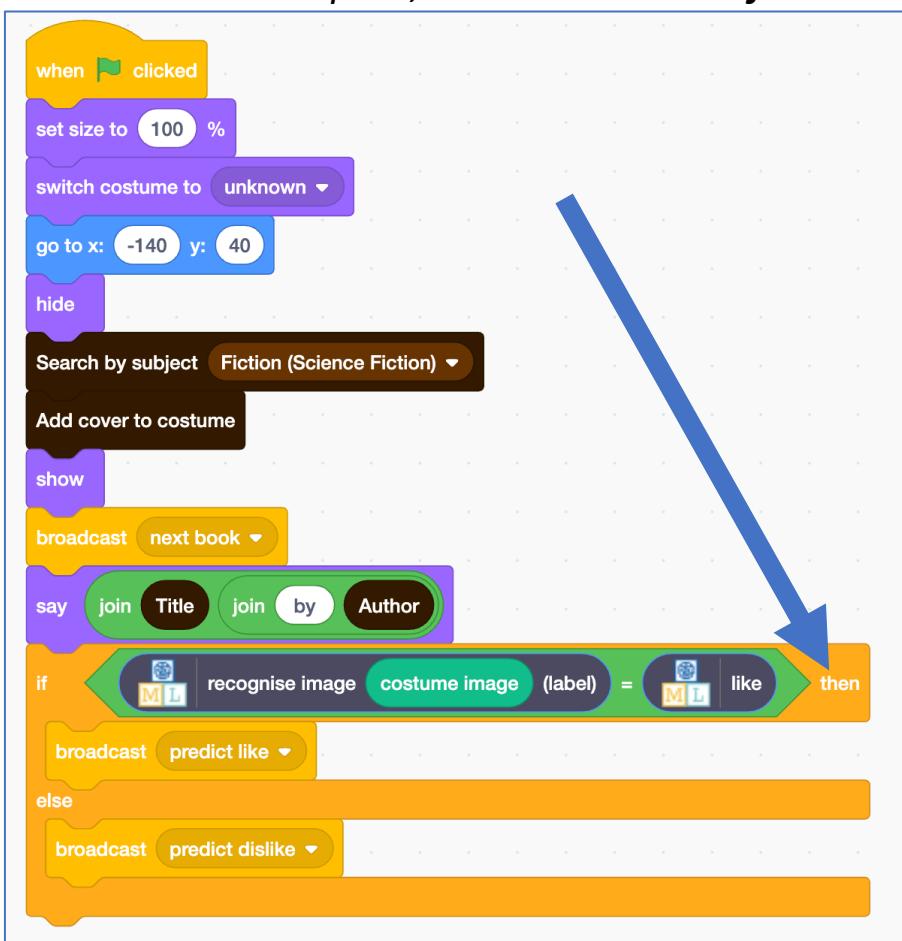
The screenshot shows a web-based application for training a machine learning model. At the top, there's a navigation bar with links for About, Projects, Worksheets, Pretrained, Stories, Book, Help, Log Out, and Language. Below the navigation is the title "Recognising images as like or dislike". A "Back to project" link is on the left, and an "Add new label" button is on the right. Two main sections are displayed: "like" and "dislike", each containing 12 examples represented by small book covers. Below each section are four buttons: "www", "webcam", "draw", and "file".

- 27.** Click on the “< Back to project” link.
28. Click on the “Learn & Test” button
29. Click on the “Train new machine learning model” button
*The button will not be there if you don't have enough training examples.
Wait for the model to finish training.*

The screenshot shows the "Machine learning models" page. It has a "What have you done?" section and a "What's next?" section. The "What have you done?" section contains text about collecting examples and a list of items collected. The "What's next?" section contains text about starting training and a "Train new machine learning model" button. A large blue arrow points from the "What's next?" section down to the "Train new machine learning model" button.

30. Update your Green Flag code to look like this.

Still in the “book” sprite, the new bit is the *if ... then ... else* at the bottom.



31. Click on the full-screen button and then the Green Flag like before

Click **thumbs-up / thumbs-down** buttons like before.

Try to avoid duplicates when you see books you remember seeing before.
This time, you will also see a prediction from your machine learning model



What have you done?

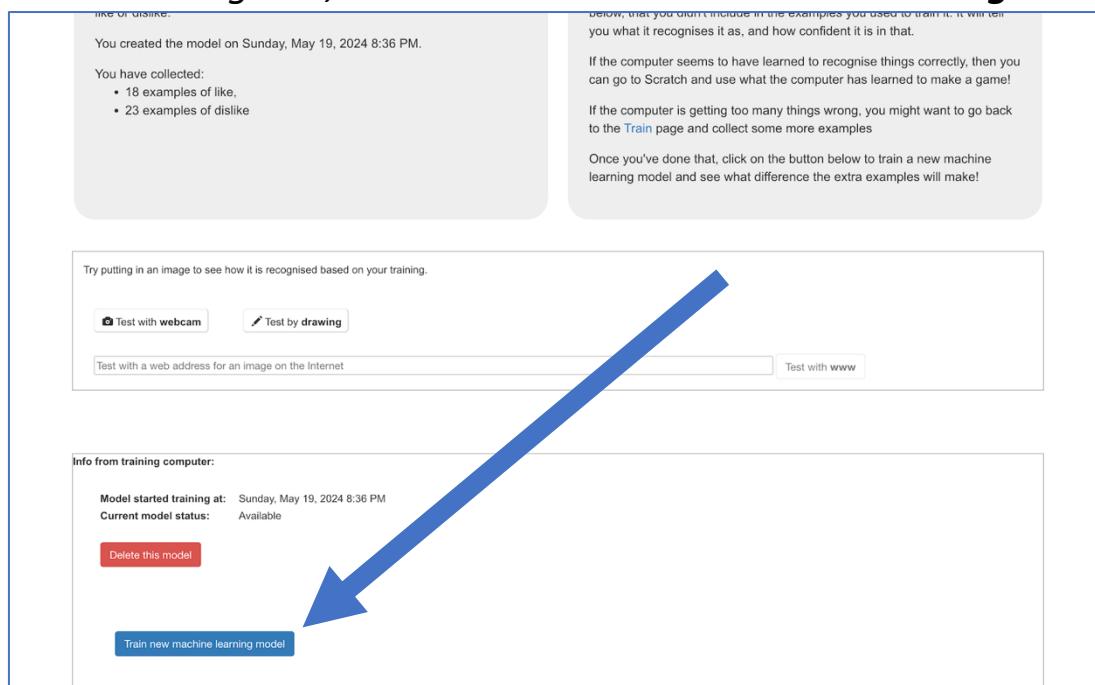
You've trained a machine learning model to classify pictures. The computer learned from patterns in the colours and shapes from each of the images you've given it. These were used to recognise new covers.

If the computer has recognised patterns in the sorts of books that you like the look, then it should be good at predicting books you might try reading.

If it hasn't identified patterns in your answers yet, then it might still be making mistakes. Giving it more examples may help it to learn what you like.

32. When you have collected extra examples for the computer to learn from, you should train a new model.

*In the training tool, click the “**Train new machine learning model**” button.*



33. Go back to the Scratch window

Have the extra training examples improved the predictions that the machine learning model is making?

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?

Predict which covers you like from your favourite author

Instead of looking at books about a particular subject, you could try basing a project on books by your favourite author.

Make sure you choose an author that has written enough books to base a project on!

Replace the search by subject block with this:



Search by author Roald Dahl

Add a third category

If you think two categories isn't enough, try adding a third.

Instead of like/dislike, you could base a project on like / don't mind / dislike.