

Machine Learning Project

Download Project File

1. Go to:

https://selfestem.org/news_updates/latest-2024-camp-updates

2. Download the 'Street Signs Template' to your computer. Save it on your desktop

Log in to Machine Learning for Kids

1. Go to:

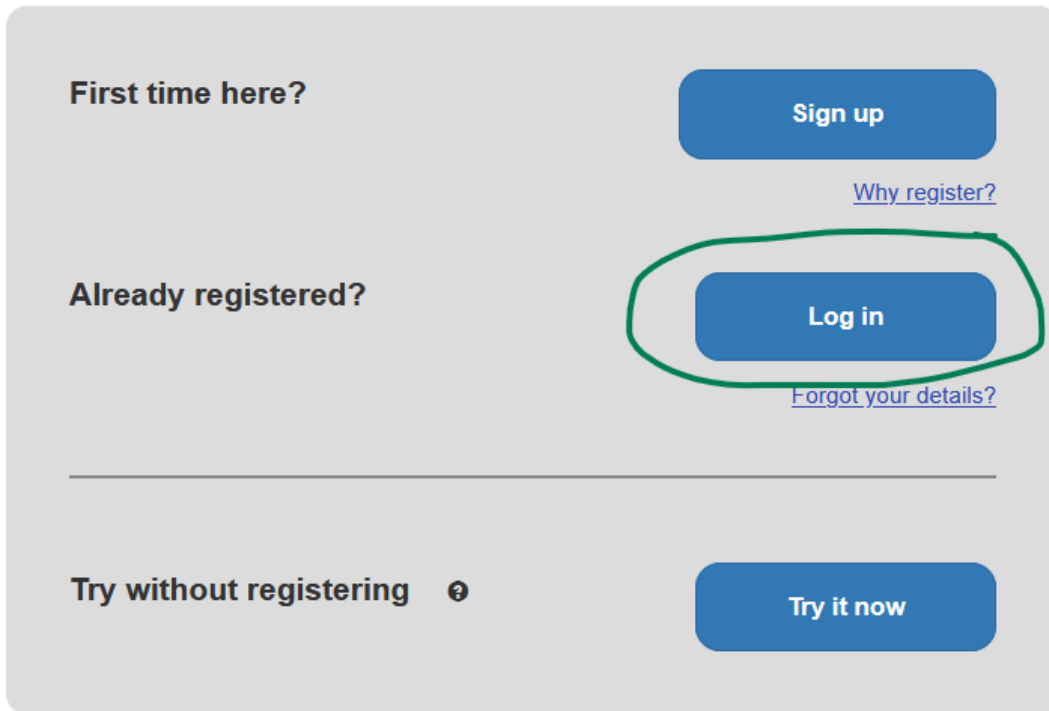
<https://machinelearningforkids.co.uk>

2. Click on 'Get Started'

Teach a computer to play a game

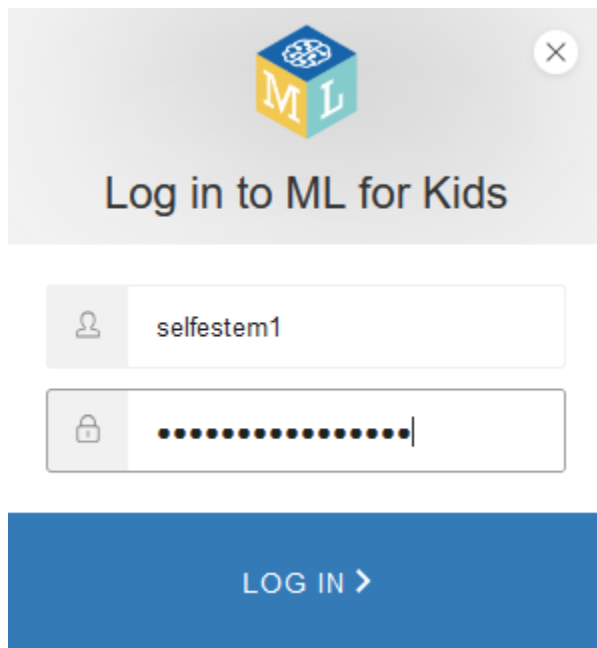


3. Click on the 2nd button labeled 'Log In'



The image shows a login and registration interface for ML for Kids. It is divided into three sections. The first section, 'First time here?', has a blue 'Sign up' button and a link for 'Why register?'. The second section, 'Already registered?', has a blue 'Log in' button circled in green and a link for 'Forgot your details?'. The third section, 'Try without registering', has a blue 'Try it now' button and a small information icon.

4. Enter the username and password for your group number, then click on 'Log in'.
Passwords will be provided.



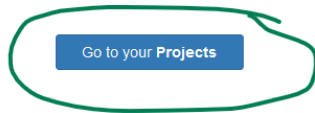
The image shows the ML for Kids login form. At the top is the ML logo and a close button. Below the logo is the text 'Log in to ML for Kids'. There are two input fields: the first contains the username 'selfestem1' and the second contains a masked password represented by dots. Below the input fields is a blue button labeled 'LOG IN >'.

Logging in may take 1-2 minutes the first time; please be patient!

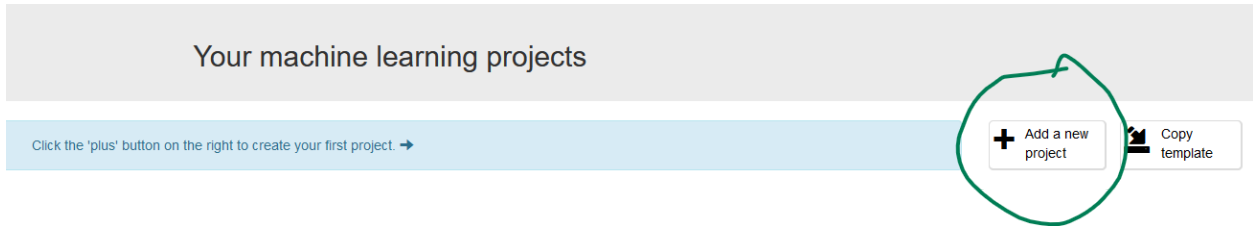
Make a Project

1. Click on 'Go to your Projects'

Teach a computer to play a game



2. Click on 'Add a new project'



3. Enter in the following information about the project you are adding

The 'Project Name' should be 'Traffic Signs for Students'

The 'Project Type' should be 'recognising images'

'Storage' should be 'In your web browser'

Project Name *

Traffic Signs for Students

Project Type *

recognising images

Storage *

In your web browser

4. Click 'Create'

Project Name *

Traffic Signs for Students

Project Type *

recognising images

Storage *

In your web browser

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

5. Click on the grey box with your project name


Traffic Signs for Students

Recognising **images**



Traffic Signs for Students

Recognising **images**



6. Click on the blue 'Train' button

"Traffic Signs"

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

Make

7. Click the 'Add a new label' button

Recognising **images**

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

+ Add new label

8. Name the label 'Stop' and click 'Add'

Add new label

Enter new label to recognise *

Stop|

4 / 30

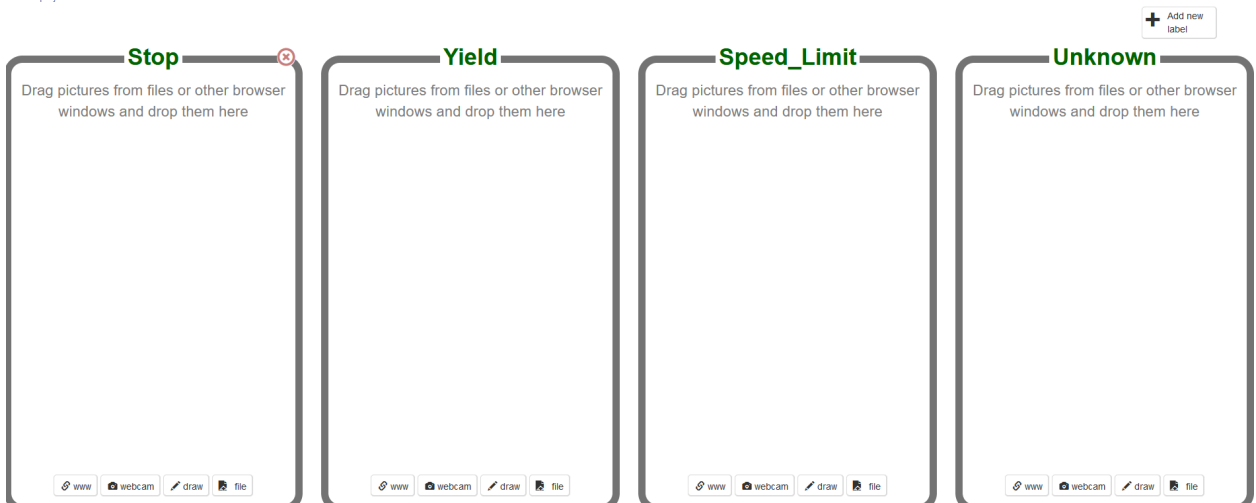
ADD CANCEL

9. Repeat the previous two steps to add 3 more labels:

Yield

Speed Limit

Unknown



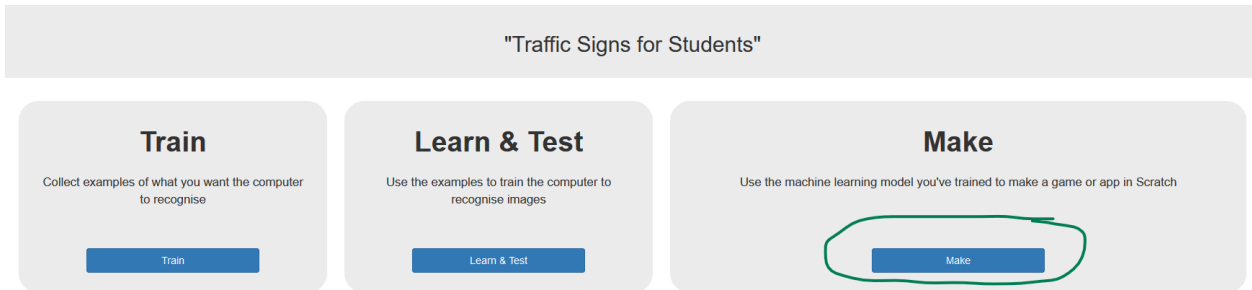
You will be training your machine learning model to recognize 3 different types of street signs: stop signs, yield signs, and speed limit signs. All other signs will be categorized as 'Unknown'

10. Click on 'Back to Project'

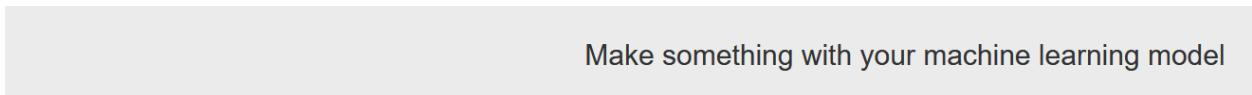


Open Scratch

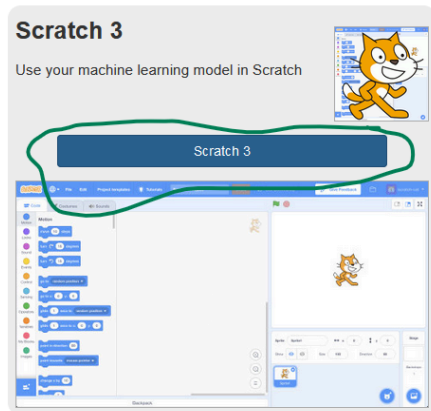
1. Click on the blue 'Make' button



2. Click on the blue 'Scratch 3' button



[Back to project](#)



3. Click on the 'straight into Scratch' button

Using machine learning in Scratch 3

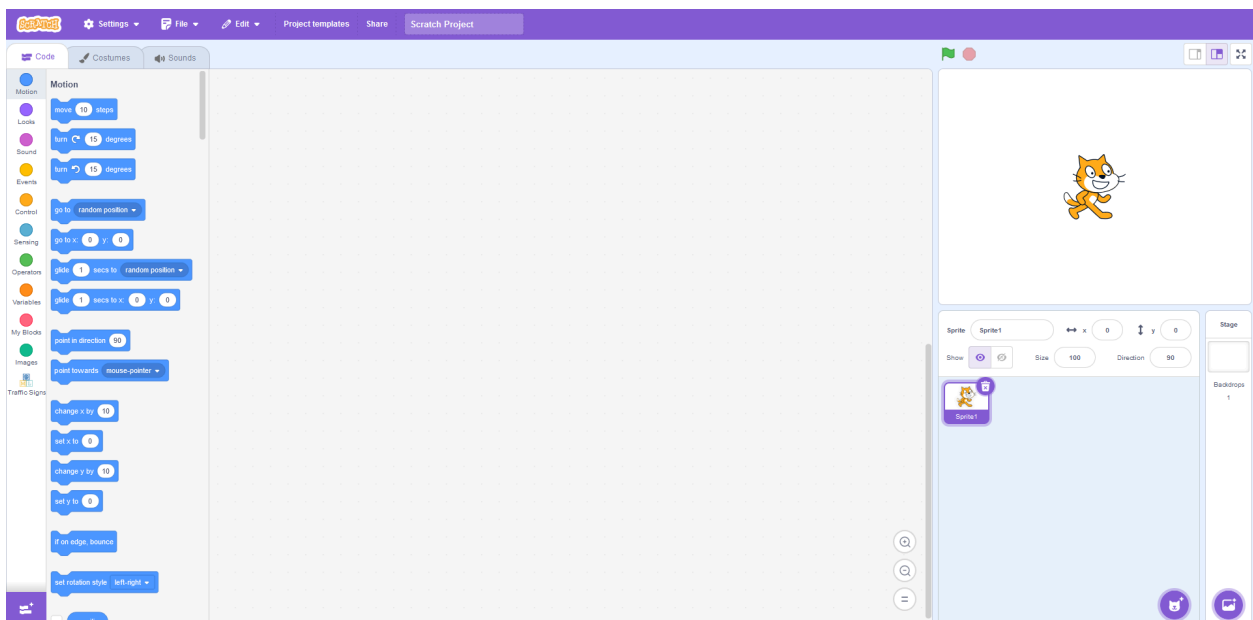
[Back to project](#)

You haven't trained a machine learning model yet.

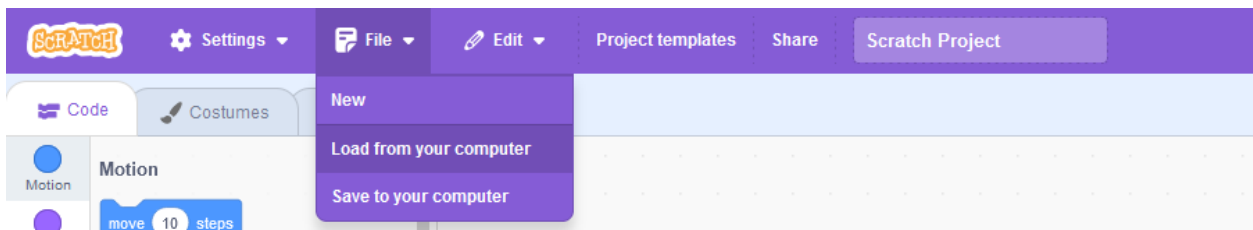
You can [train one now](#) and then come back to open Scratch.

Or you can go [straight into Scratch](#) now.

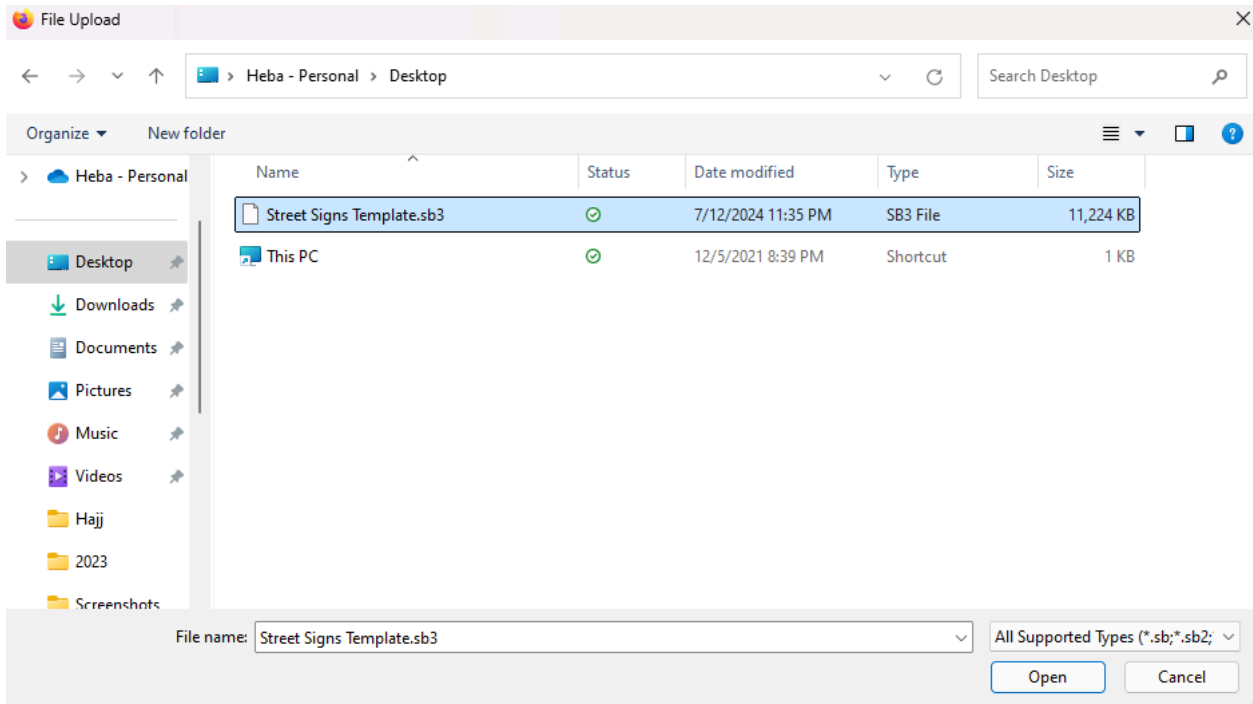
4. A new window should pop up that looks like this:



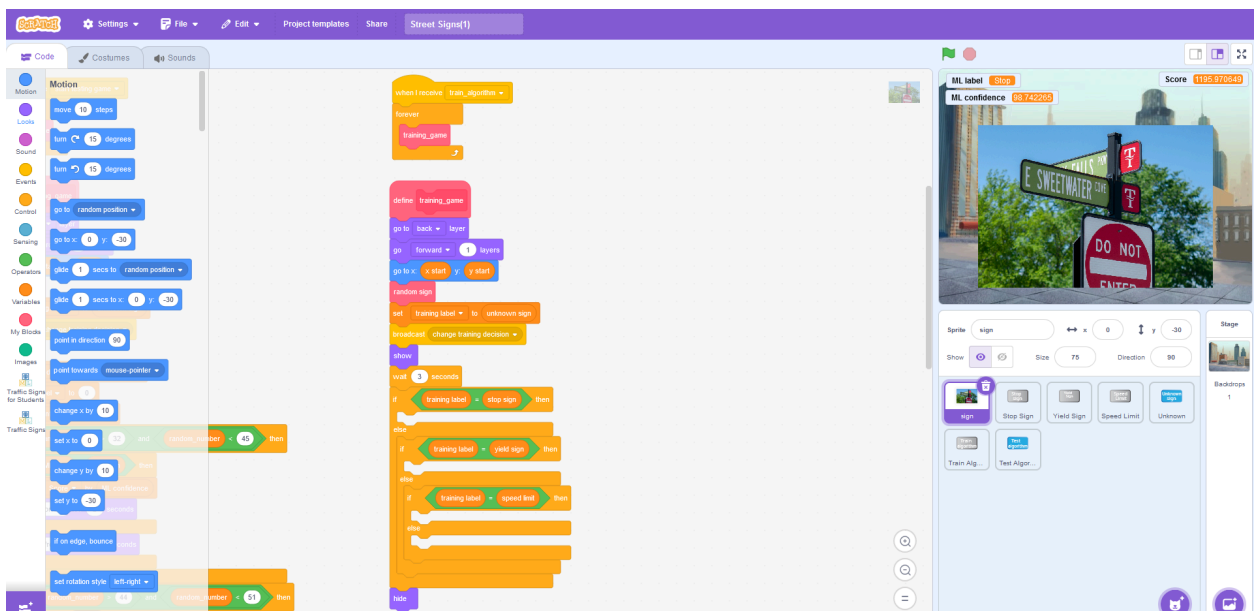
5. In the top purple bar, select 'File' -> 'Load from your computer'



6. Navigate to the 'Street Signs Template.sb3' file you downloaded to your desktop, and Open it

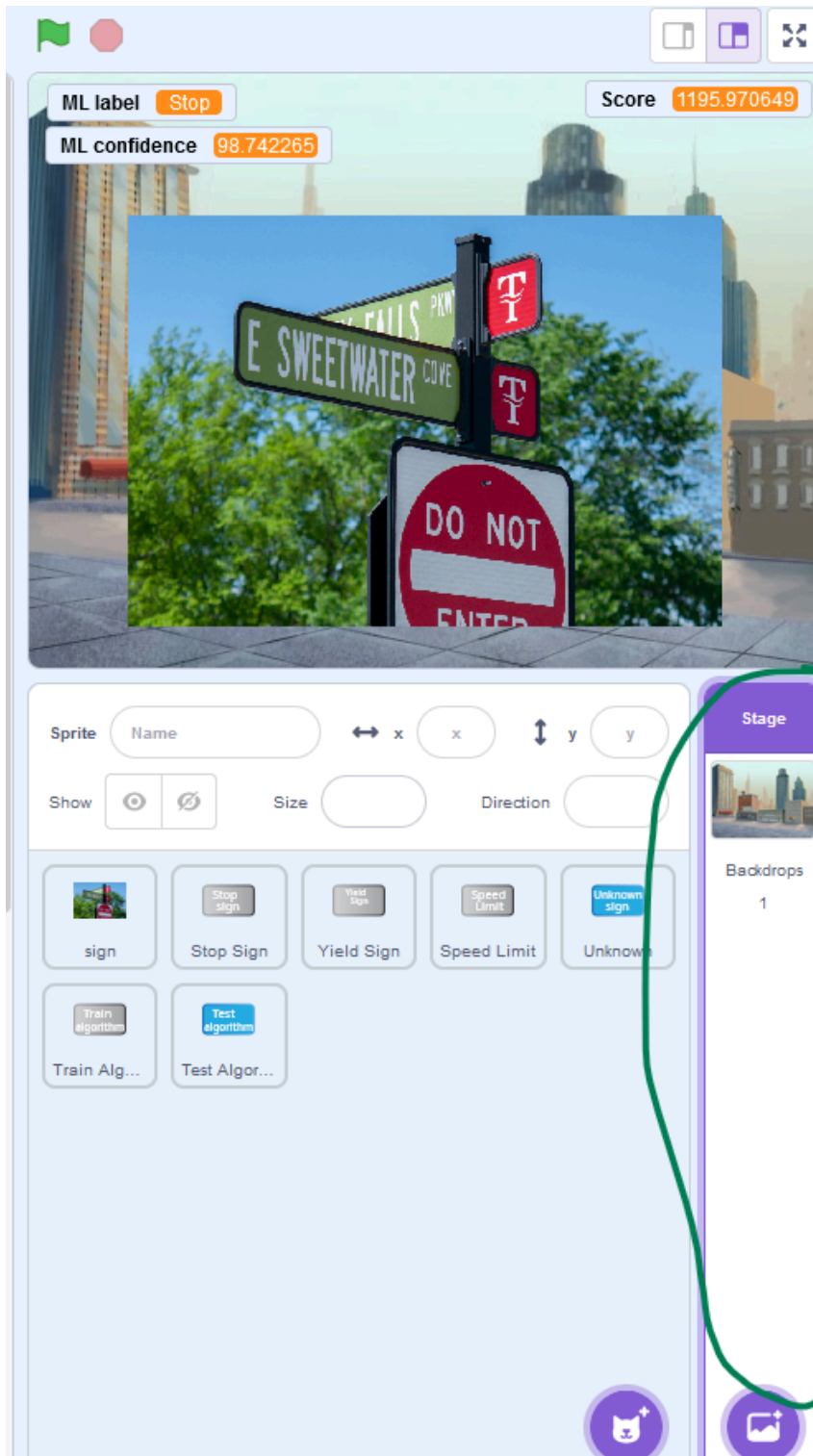


7. The project should be loaded, and the screen should look like this:



Configure Your Scratch Project

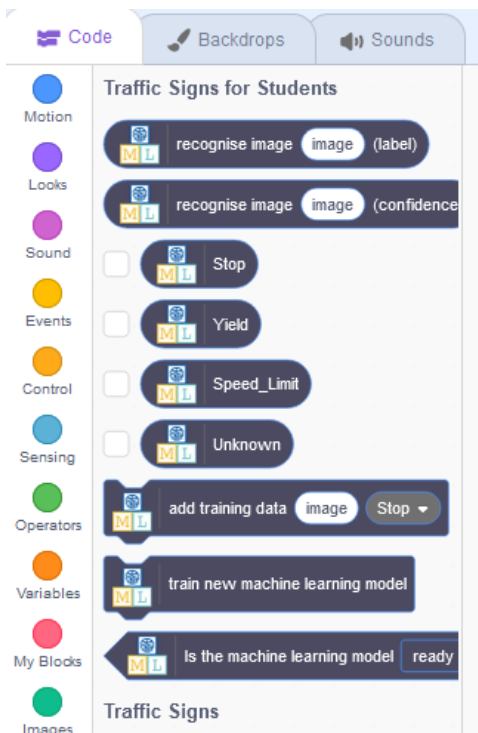
1. Click on 'Stage' on the bottom right of the screen



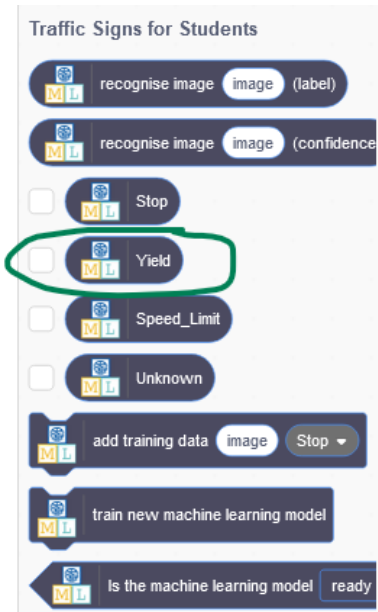
- In the middle section of the screen, find the pink code block called 'define prepare training labels'



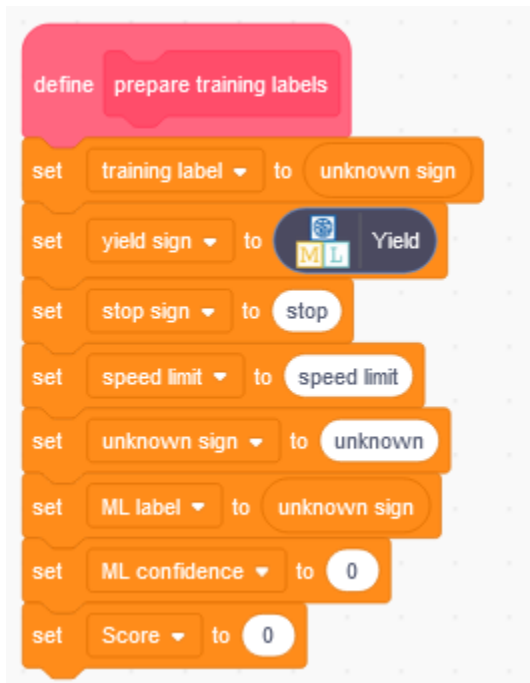
- In the right section of the screen, click on 'Code' then 'Traffic Signs for Students'



4. In the left section, find the bubble that says 'Yield' in the section labeled 'Traffic Signs for Students'



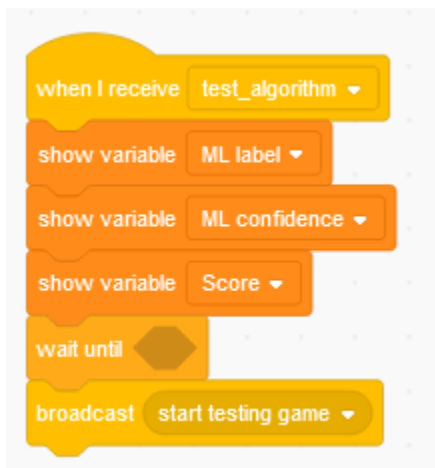
Drag the 'Yield' bubble to the 'set yield sign to yield' block so it looks like this:



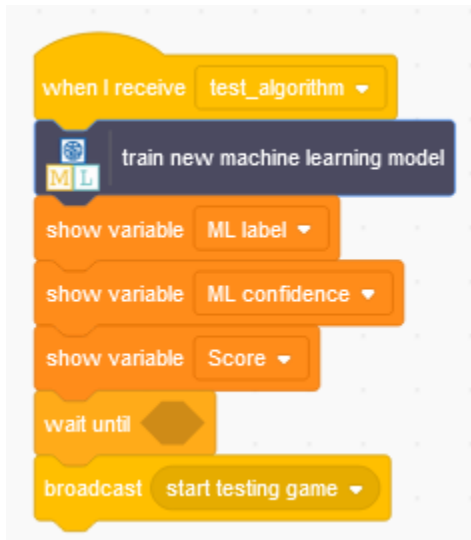
5. Repeat the previous step where you drag:
'Stop' to 'set stop sign to stop'
'Speed_Limit' to 'set speed limit to speed limit'
'Unknown' to 'set unknown sign to unknown'. It should look like this



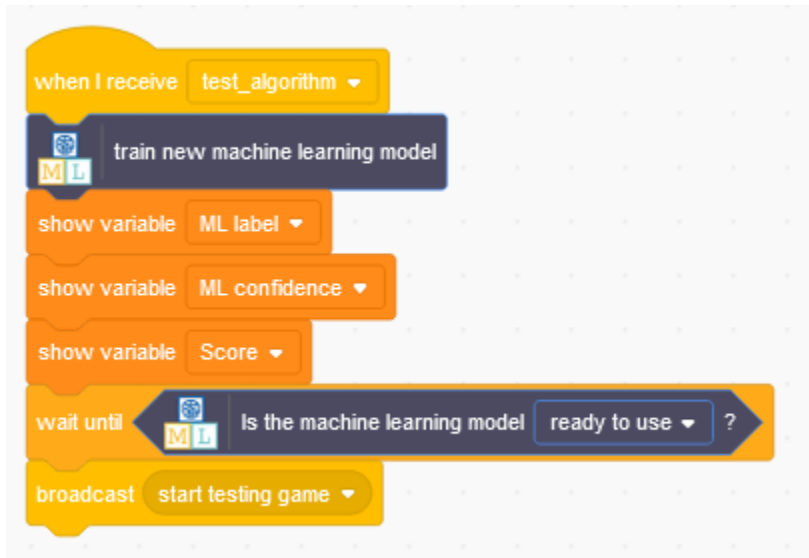
6. In the middle section, find the yellow code block labeled, 'when I receive test_algorithm'



- On the left side of the screen under 'Traffic Signs for Students' drag the 'train new machine learning model' between the first and second block of the code. It should look like this:



- On the left side of the screen under 'Traffic Signs for Students' drag the 'is the machine learning model ready' to the empty spot next to 'wait until'. It should look like this:



9. On the right side of the screen, click on the button that signs 'sign'

The screenshot displays a machine learning interface. At the top, there are two status boxes: "ML label" with the value "Stop" and "ML confidence" with the value "98.742265". To the right, a "Score" box shows "1195.970649". The central area features a photograph of a street signpost with a green sign for "E SWEETWATER COVE", a red sign with a white 'T', and a red "DO NOT ENTER" sign. Below the image is a control panel with the following elements:

- Sprite:** A dropdown menu set to "sign".
- Position:** X-axis at 0, Y-axis at -30.
- Show:** A checked radio button.
- Size:** 75.
- Direction:** 90.
- Buttons:** "Train algorithm" and "Test algorithm".
- Sign Selection:** A row of buttons: "sign" (circled in green), "Stop Sign", "Yield Sign", "Speed Limit", and "Unknown".

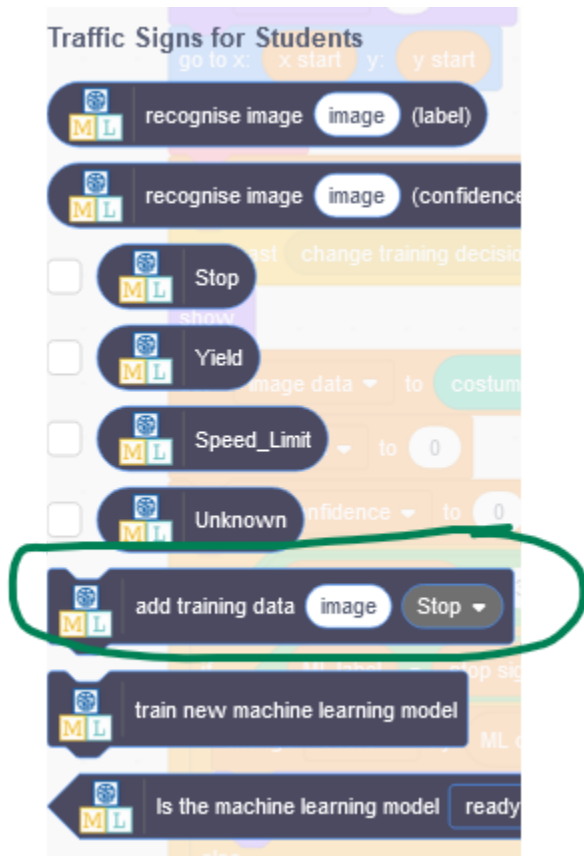
On the right side of the interface, there is a "Stage" section with a small preview image and a "Backdrops" section with the number "1".

10. Find the pink code block labeled 'define training_game'

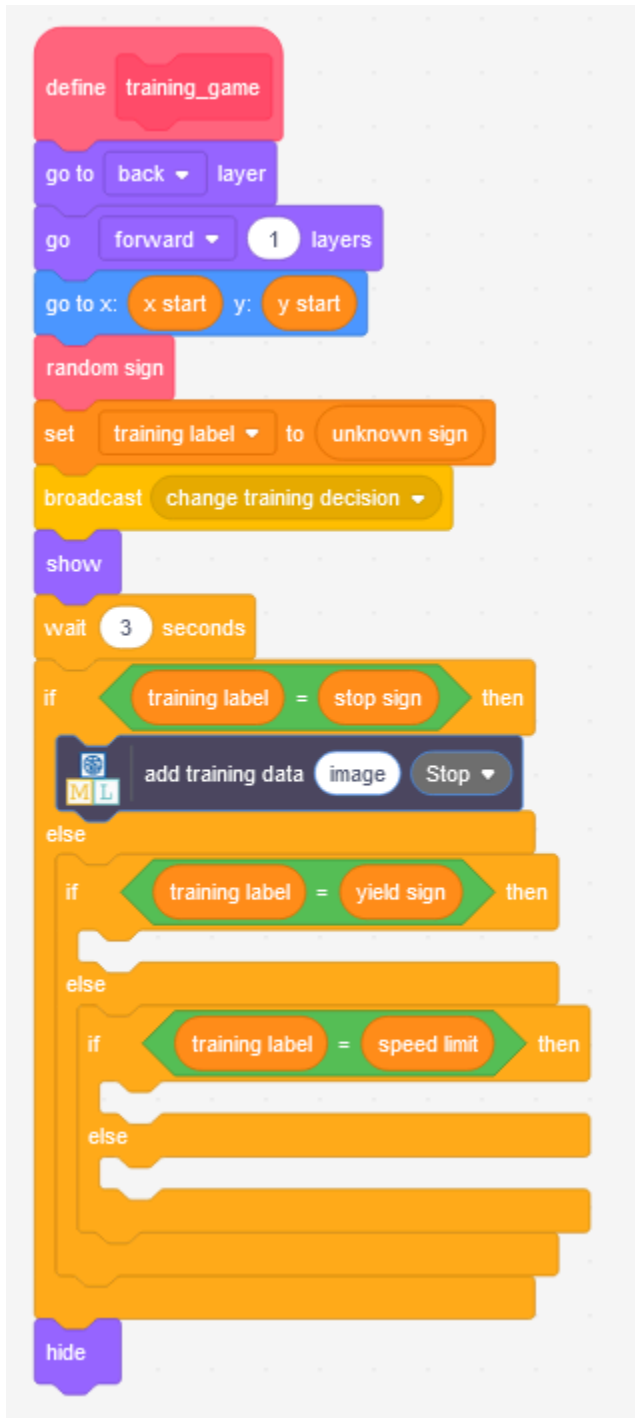
```
define training_game
  go to back layer
  go forward 1 layers
  go to x: x start y: y start
  random sign
  set training label to unknown sign
  broadcast change training decision
  show
  wait 3 seconds
  if training label = stop sign then
  else
    if training label = yield sign then
    else
      if training label = speed limit then
      else
  hide
```

The image shows a Scratch code block for a function named 'define training_game'. The block is pink and contains several sub-blocks: a 'go to back layer' block, a 'go forward 1 layers' block, a 'go to x: x start y: y start' block, a 'random sign' block, a 'set training label to unknown sign' block, a 'broadcast change training decision' block, a 'show' block, a 'wait 3 seconds' block, a series of nested 'if-else' blocks checking for 'stop sign', 'yield sign', and 'speed limit', and finally a 'hide' block.

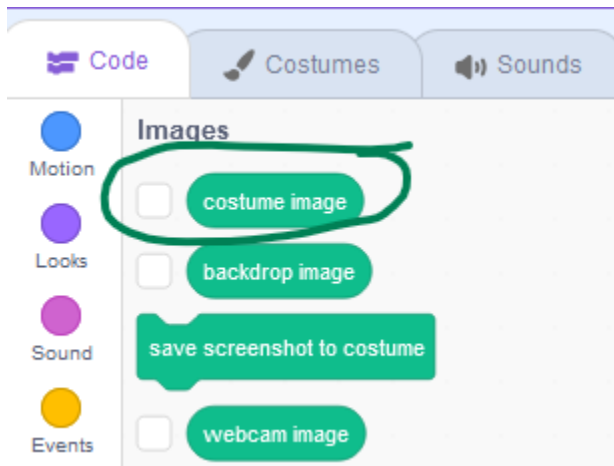
11. On the left side of the screen under 'Traffic Signs for Students', find the 'add training data image Stop' button.



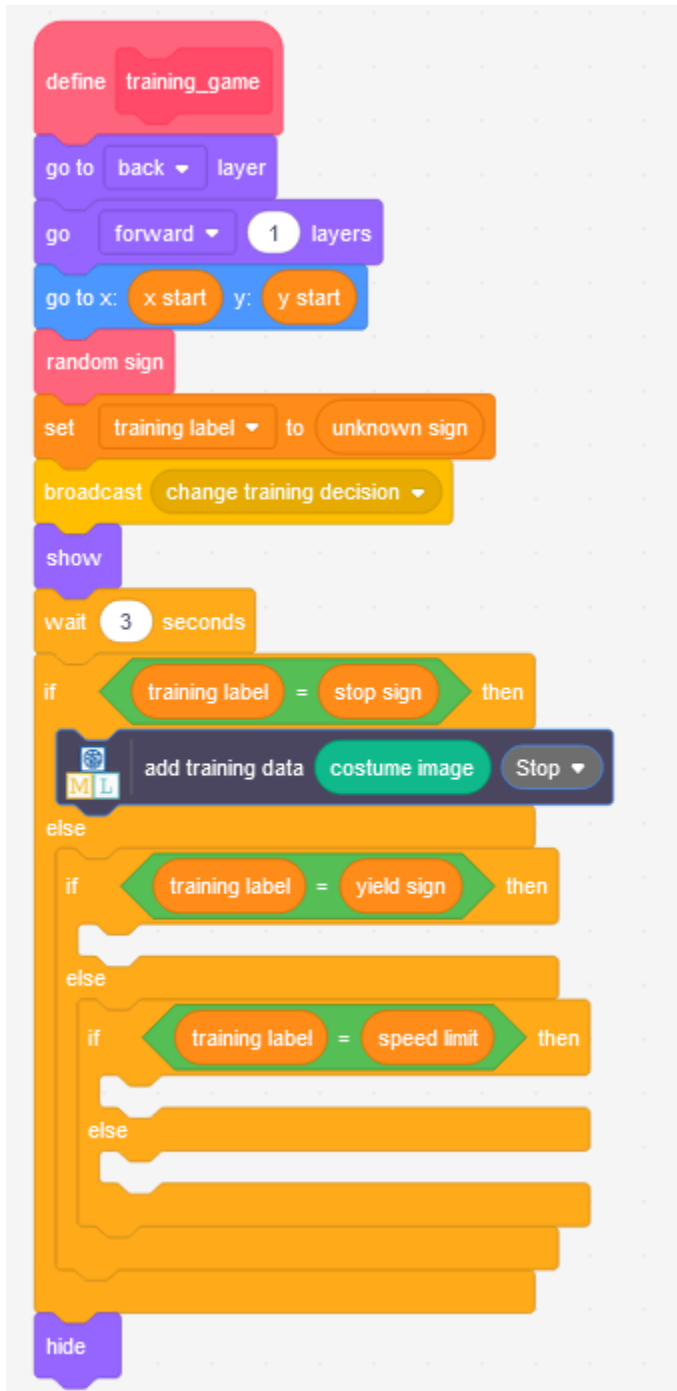
12. Drag the 'add training data image to Stop' button to the open area under 'if training label = stop sign then'



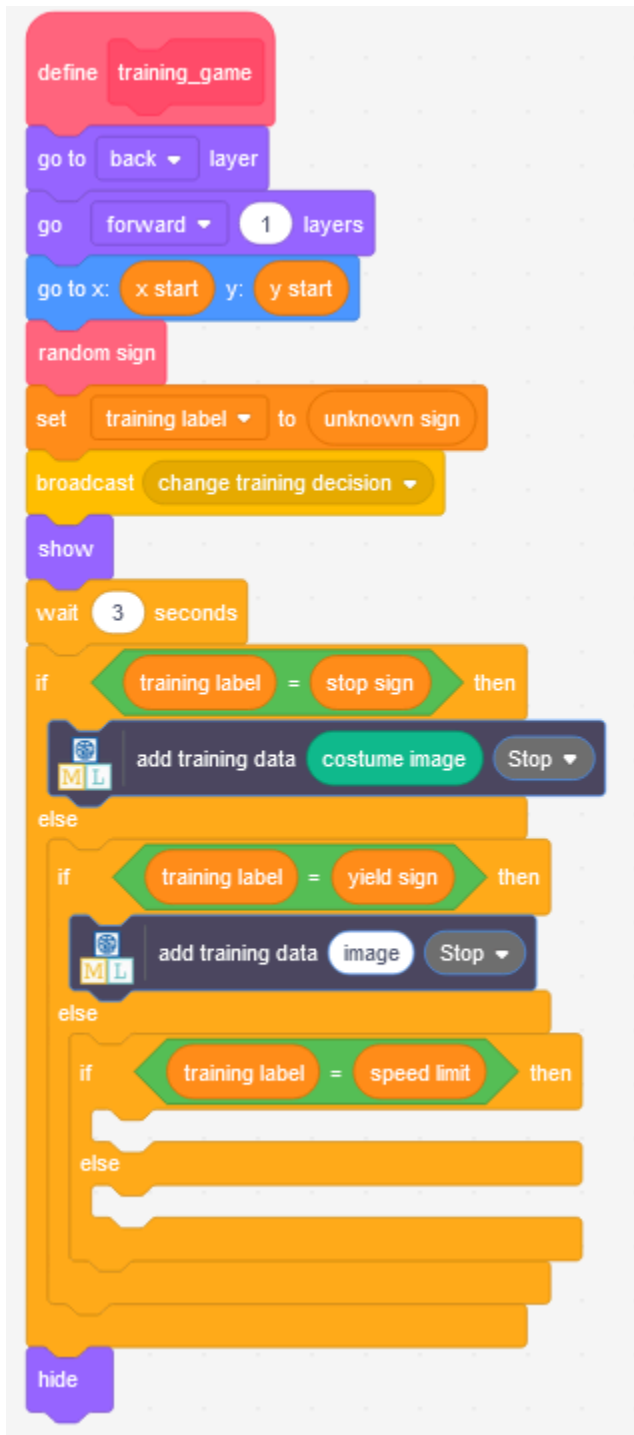
13. On the left side of the screen under 'Images' find the button labeled 'costume images'



14. Drag the 'costume image' button to the white section labeled 'image' in the block you just added. It should look like this:



15. Drag the 'add training data image to Stop' button to the open area under 'if training label = yield sign then'



16. Add a 'costume image' button where it says 'image' just as before. Click on 'Stop' and change it to 'Yield'



It should now look like this:



17. Repeat the previous two steps for the empty area under 'if training label = speed limit then', add 'costume image', and change 'Stop' to 'Speed_Limit' in the drop down menu



It should look like:



18. Drag one more 'add training data image stop' button from the left side of the screen to the last empty space in the middle under 'else', add 'costume image', and change the drop down to 'Unknown'



It should look like:



19. Find the pink block in the middle section of the screen labeled, 'define testing game'

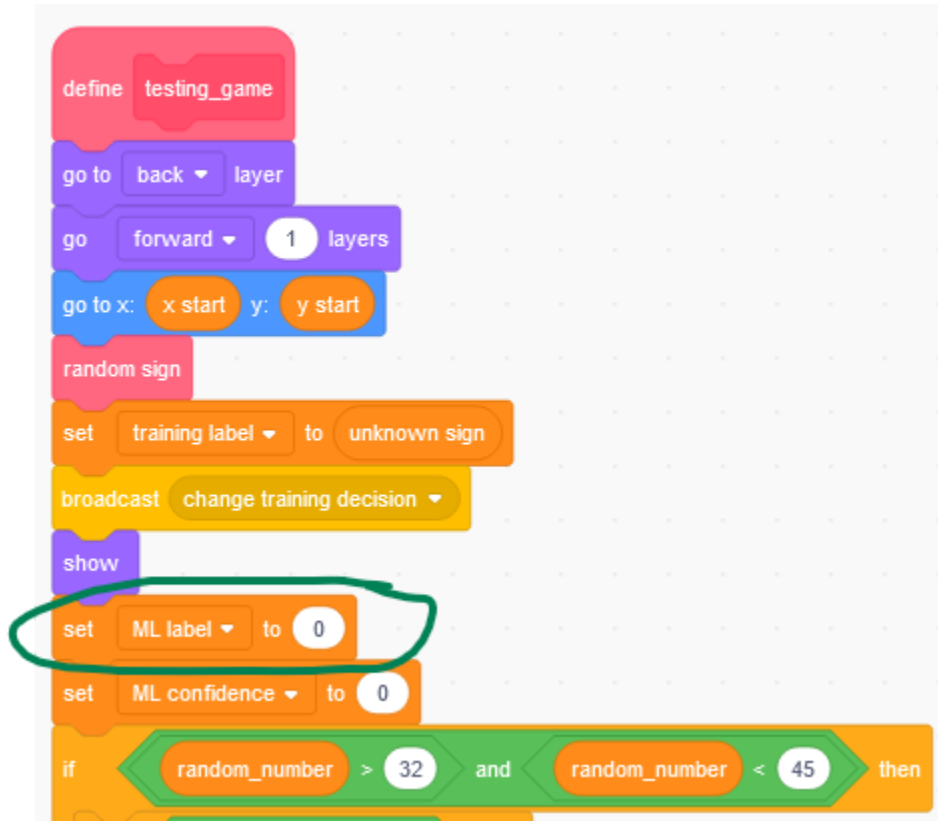


20. Find the block labeled 'recognise image 'image' (label)' under 'Traffic Signs for Students' in the left section.

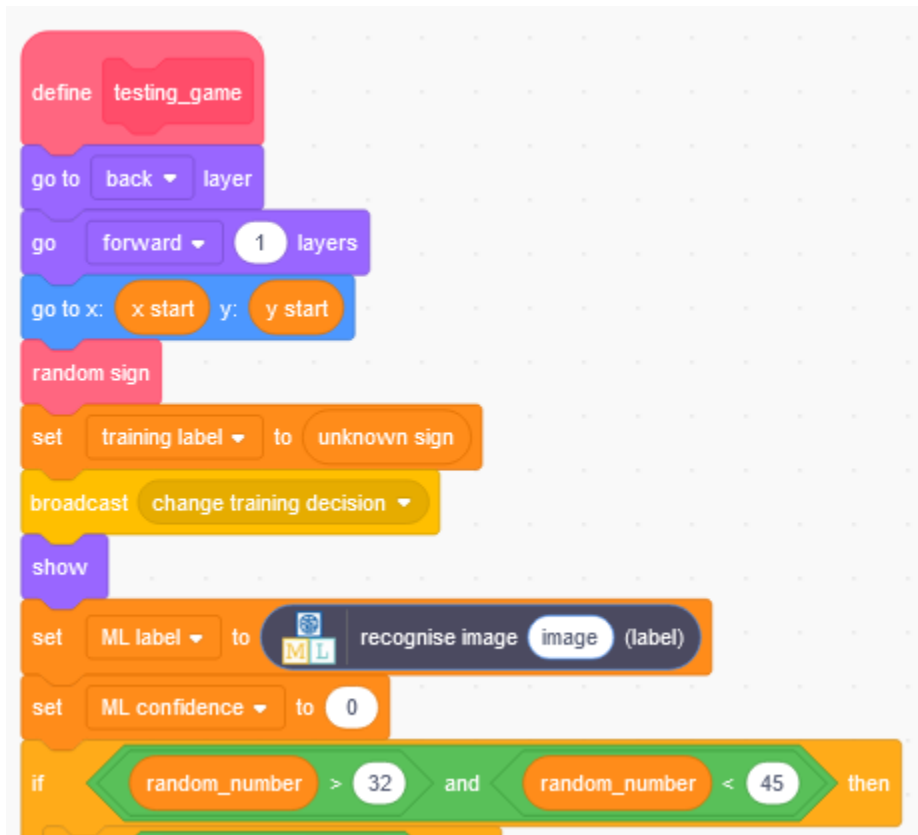
The image shows a vertical list of machine learning blocks under the heading "Traffic Signs for Students". The blocks are as follows:

- recognise image 'image' (label)**: This block is highlighted with a green circle. It features a blue ML icon, a yellow ML icon, and a white input field containing the text "image".
- recognise image 'image' (confidence)**: This block features a blue ML icon, a yellow ML icon, and a white input field containing the text "image".
- Stop**: A block with a blue ML icon, a yellow ML icon, and a radio button to its left.
- Yield**: A block with a blue ML icon, a yellow ML icon, and a radio button to its left.
- Speed_Limit**: A block with a blue ML icon, a yellow ML icon, and a radio button to its left.
- Unknown**: A block with a blue ML icon, a yellow ML icon, and a radio button to its left.
- add training data 'image' Stop**: A block with a blue ML icon, a yellow ML icon, a white input field containing "image", and a dropdown menu set to "Stop".
- train new machine learning model**: A block with a blue ML icon and a yellow ML icon.
- Is the machine learning model ready**: A block with a blue ML icon, a yellow ML icon, and a white input field containing "ready".

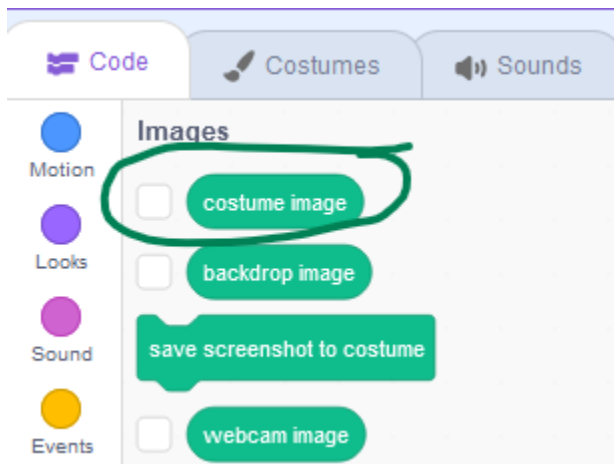
21. Drag this block to the white '0' in the orange block labeled 'set ML label to '0''



It should look like this:



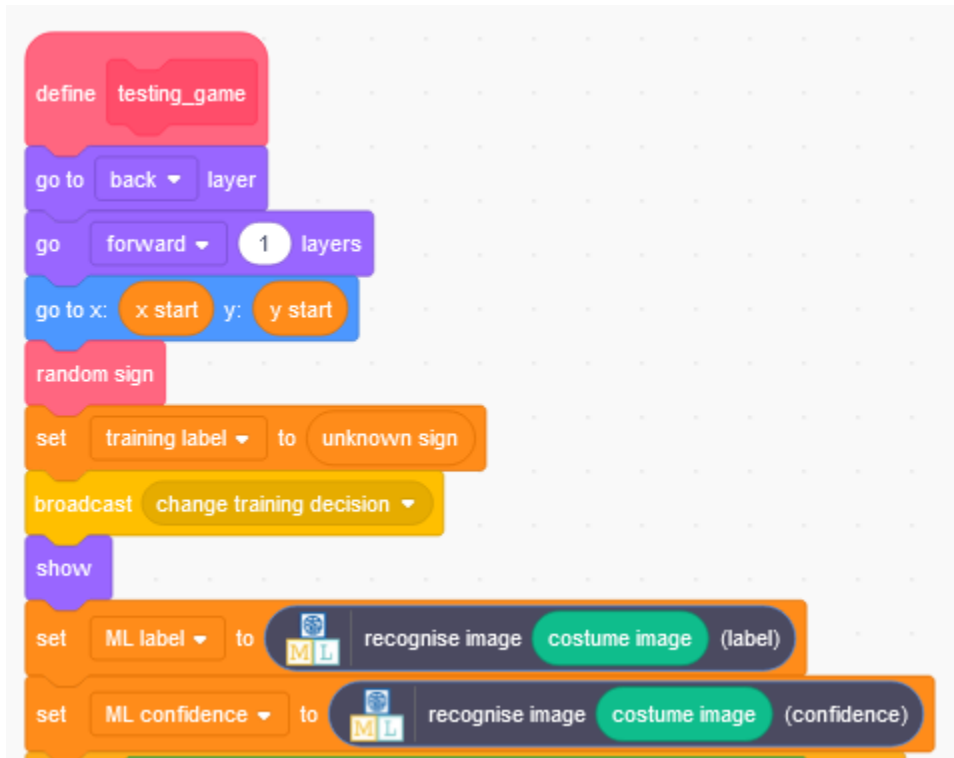
22. On the left section of the screen under 'Images', find the 'costume image' block



23. Drag the 'costume image' block to the white 'image' of the block you just added.
It should look like this:



24. Repeat the previous three steps for 'recognise image 'image' (confidence) button and drag it to the orange 'set ML confidence to 0' block. It should look like this:



Activities

Activity 1: Read the code

Read all the code blocks under 'define training game' (the code block you just added to).

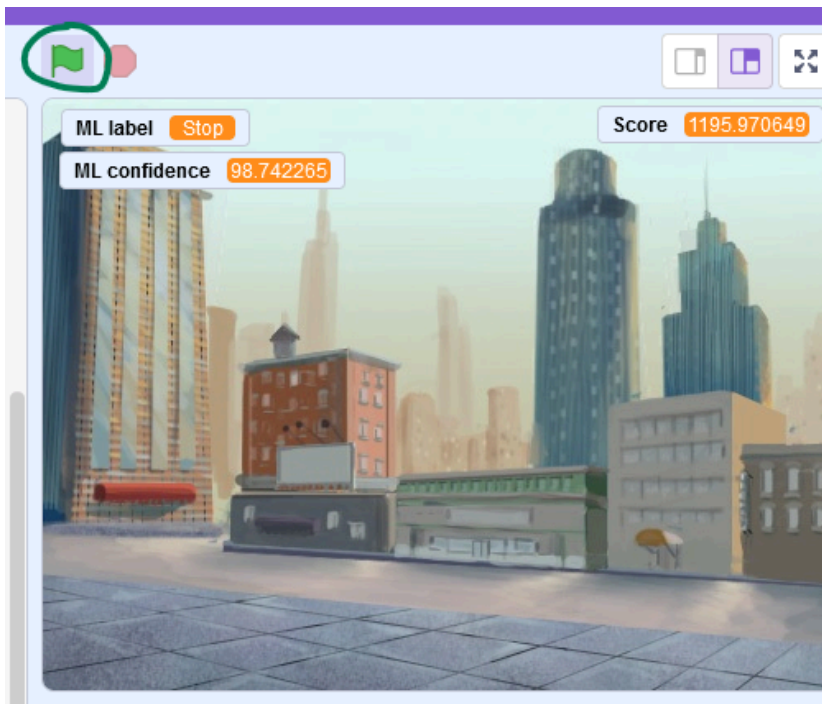
```
define training_game
  go to back layer
  go forward 1 layers
  go to x: x start y: y start
  random sign
  set training label to unknown sign
  broadcast change training decision
  show
  wait 3 seconds
  if training label = stop sign then
    add training data costume image Stop
  else
    if training label = yield sign then
      add training data costume image Yield
    else
      if training label = speed limit then
        add training data costume image Speed_Limit
      else
        add training data costume image Unknown
  hide
```

The image shows a Scratch code editor with a 'define training_game' function. The code starts with 'go to back layer', 'go forward 1 layers', and 'go to x: x start y: y start'. It then generates a 'random sign' and sets the 'training label' to 'unknown sign'. A 'broadcast change training decision' message is sent, and the sign is shown. After a 3-second wait, a series of 'if-then-else' blocks check the 'training label' against 'stop sign', 'yield sign', 'speed limit', and 'Unknown'. Each match results in an 'add training data' block with a 'costume image' and a specific label. Finally, the sign is hidden.

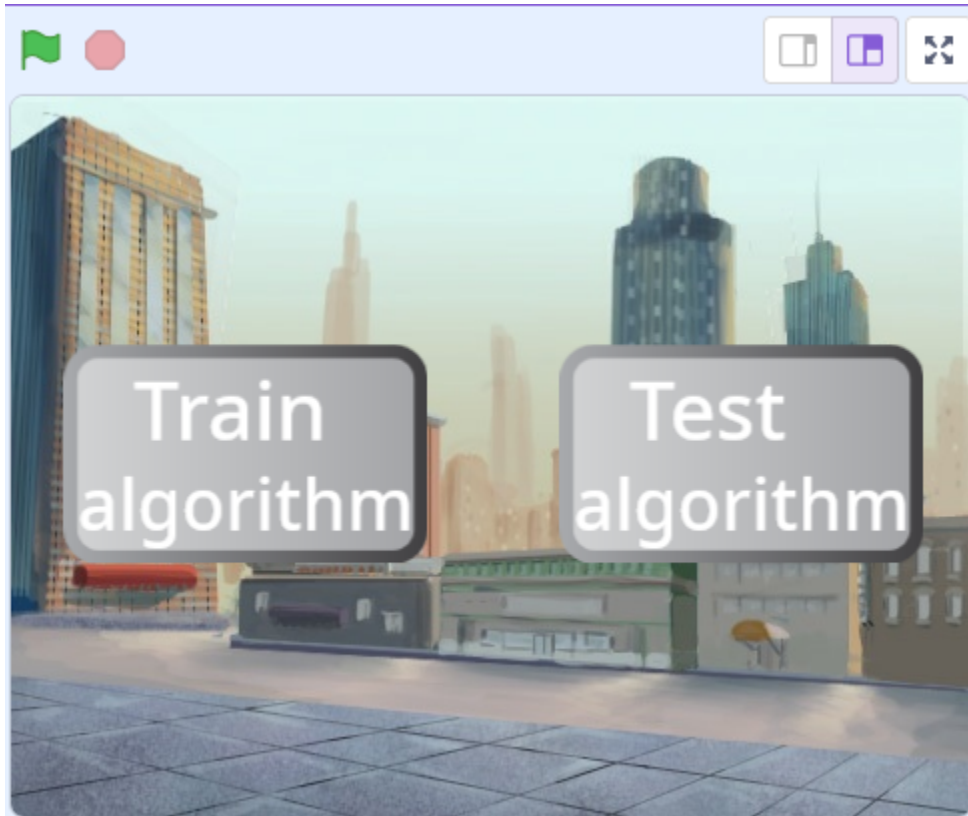
What do you think this code is doing? Write your answer here:

Activity 2: Train on 5 Images

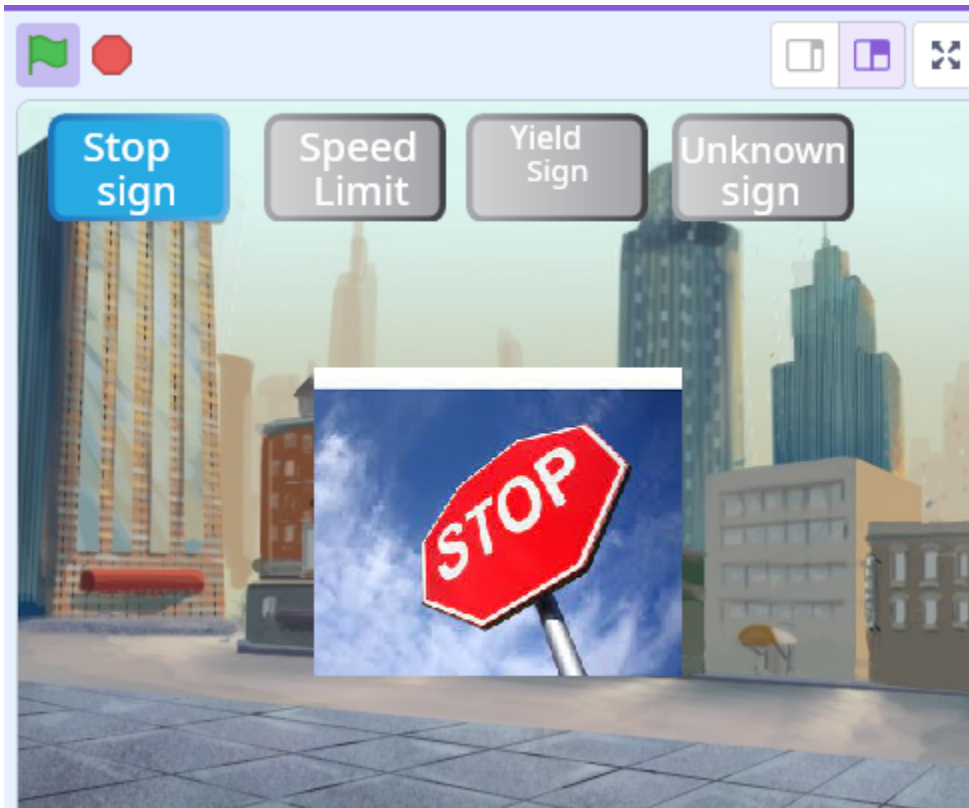
1. Click on the green flag above the picture on the top right of the screen



2. Select 'Train algorithm'



3. Images of traffic signs will appear for 3 seconds each. For each sign, click on the buttons at the top to train your machine learning model about how to label signs.



Select 'Stop sign' when you see a stop sign, 'Speed Limit' when you see a speed limit sign, 'Yield Sign' when you see a yield sign, and 'Unknown sign' for all other signs

4. After you've trained 5 images, click on the red octagon next the green flag to stop the game



Congratulations! You just trained a machine learning model! Scratch will use the information you provided to teach the machine learning model how to recognize and label street signs.

5. Go to the previous tab (where you clicked on 'straight into Scratch' to open a new window) and click on 'Back to Project'

Using machine learning in Scratch 3

Back to project

You haven't trained a machine learning model yet.

You can [train one now](#) and then come back to open Scratch.

Or you can go [straight into Scratch](#) now.

6. Click on the blue 'Train' button

"Traffic Signs for Students"

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

Make


7. The images from when you trained the algorithm should be in the right boxes. If you made any mistakes (example: there's a picture of a stop sign labeled 'yield'), feel free to remove those pictures from the training data by clicking the small 'x' when you hover over the picture.

Recognising **images** as **Stop, Yield or 2 other classes**

Back to project

+ Add new label

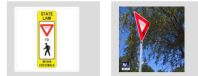
Stop



www webcam draw file

1

Yield



www webcam draw file


2

Speed_Limit

Drag pictures from files or other browser windows and drop them here

www webcam draw file

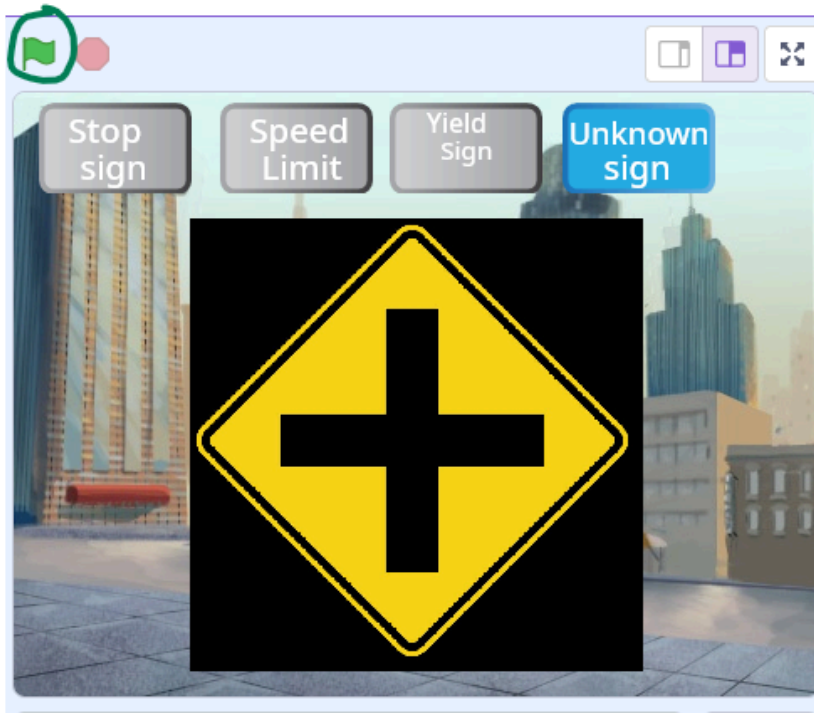
Unknown



www webcam draw file

2

8. If you were teaching a little kid about street signs, is the information in your training data enough for them to understand how to recognize a stop sign, yield sign, and speed limit sign? Why or why not? Write your answer below.
9. Go back to the tab with the 'Scratch' game and click the green flag at the top of the right section of the screen:



10. This time click on 'Test algorithm'



'Test algorithm' will pick 15 random images of street signs and use your training data to try to label each image. Don't worry if it takes a minute for the game to start – training a model can take time!

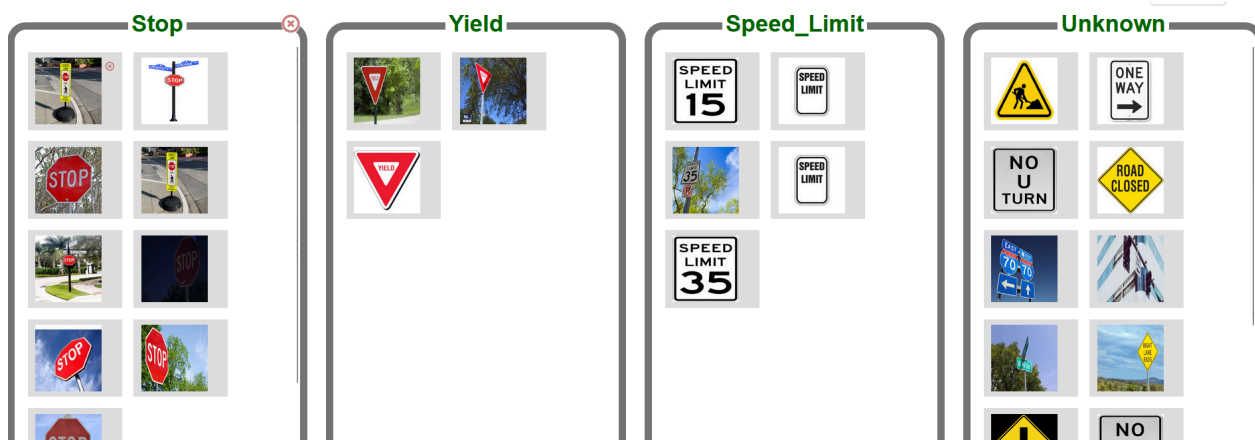
You don't need to click anything, just watch as your algorithm labels each image and see how many you got correct. For each image labeled correctly, your score will increase by how confident your algorithm is that it labeled the image correctly.

11. What is your score? Write it down here:

12. Did your algorithm recognize most of the images correctly? Why or why not?

Activity 3: Train on at least 20 Images

1. Repeat all the training steps in Activity 2, but this train on at least 20 images. Make sure your training data shows at least 3 images for each category.



2. Before testing your new training data, verify the training will work. Click on 'Back to Project'

Recognising **images** as **Stop, Yield or 2 other classes**

[< Back to project](#)

3. Click on the blue 'Learn & Test' button

"Traffic Signs for Students"

| Train | Learn & Test | Make |
|---|--|--|
| Collect examples of what you want the computer to recognise | Use the examples to train the computer to recognise images | Use the machine learning model you've trained to make a game or app in Scratch |
| Train | Learn & Test | Make |

4. The screen should look like this with a blue 'Train new machine learning model' button at the bottom of the screen:

Machine learning models

[ck to project](#)

What have you done?

You have collected examples of images for a computer to use to recognise when images are Stop, Yield or 2 other classes.

You've collected:

- 9 examples of Stop,
- 3 examples of Yield,
- 5 examples of Speed_Limit,
- 12 examples of Unknown

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.)

Info from training computer:

[Train new machine learning model](#)

If you don't see this button, go back to Scratch and train more data.

5. Click the blue, 'Train new machine learning model' button and wait for training to complete

What have you done?

You have collected examples of images for a computer to use to recognise when images are Stop, Yield or 2 other classes.

You've collected:

- 9 examples of Stop,
- 3 examples of Yield,
- 5 examples of Speed_Limit,
- 12 examples of Unknown

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.)

Info from training computer:

[Train new machine learning model](#)

6. You should see something like this:

Info from training computer:

Model started training at: Friday, July 12, 2024 11:59 PM
Current model status: Available

Delete this model

Train new machine learning model

7. Go back to Scratch and test your improved algorithm using the same method as last time.

8. Write down your score:

9. Did your algorithm recognize more images correctly this time? Why or why not?