# Laser Eyes

In this project you will make voice-powered laser eyes!

This is a game where you will see laser beams shoot from your eyes in your computer's webcam. You will use these to shoot at bottles.

Your laser eyes will be voice-activated, so you will have to shout "laser eyes" to make them shoot.

You will be using two kinds of machine learning model. Speech recognition to activate the lasers and face detection to aim them!

1.   Go to https://machinelearningforkids.co.uk/ in a web browser

2.   Click on "**Get started**"

3.   Click on "**Try it now**"

4.   Click the "**+ Add a new project**" button.

5.   Name your project "laser eyes" and set it to learn to recognise "**sounds**".
Click the "**Create**" button
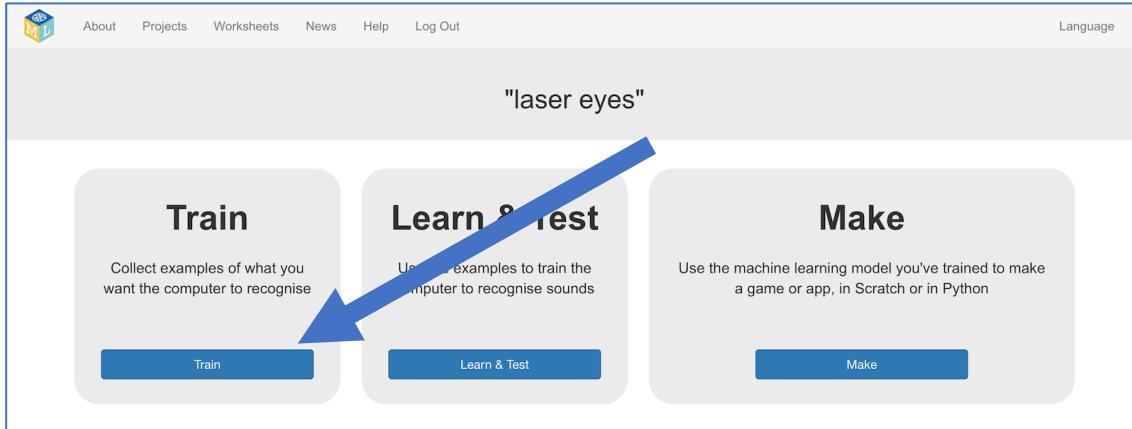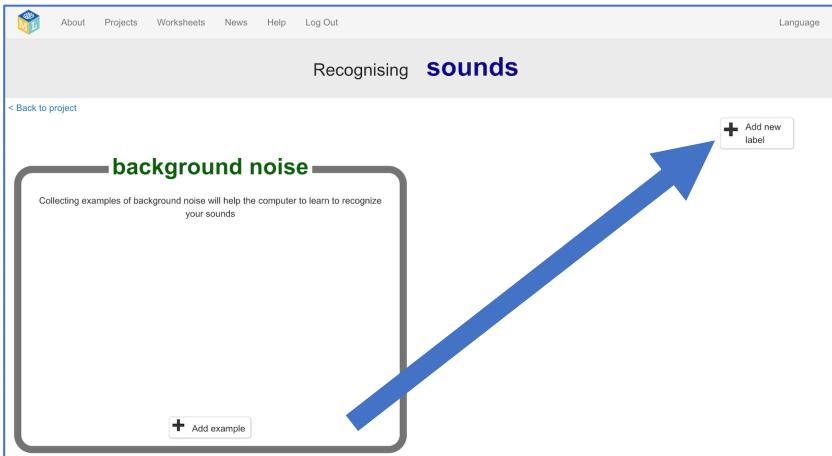
6.   You should now see "**laser eyes**" in your list of projects. Click on it.

7.   You need examples to train the computer. Click the **Train** button.

     Last updated: 25 March 2022
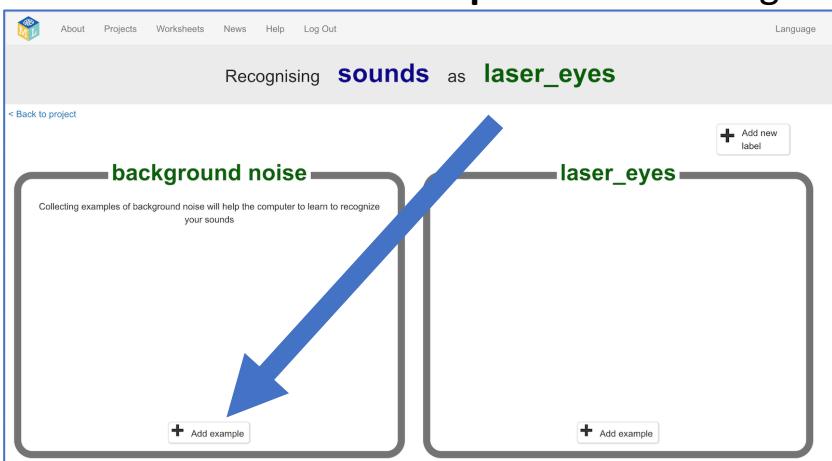
8. Click on **"+ Add new label**"
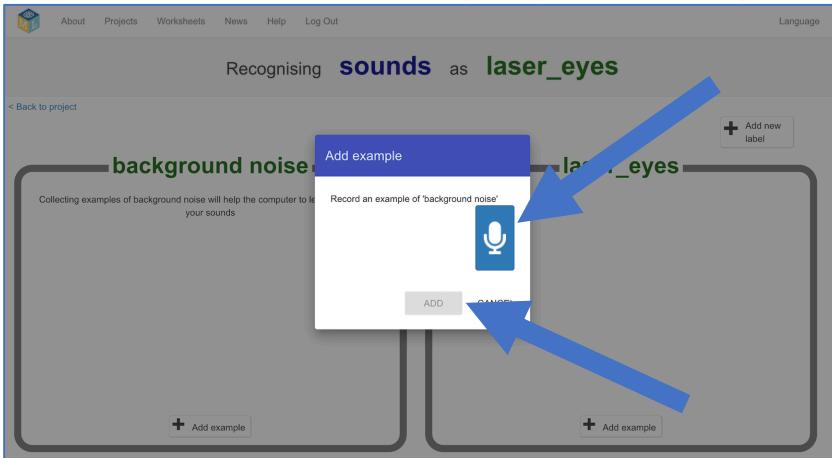
9. Enter "laser eyes" and click **OK**
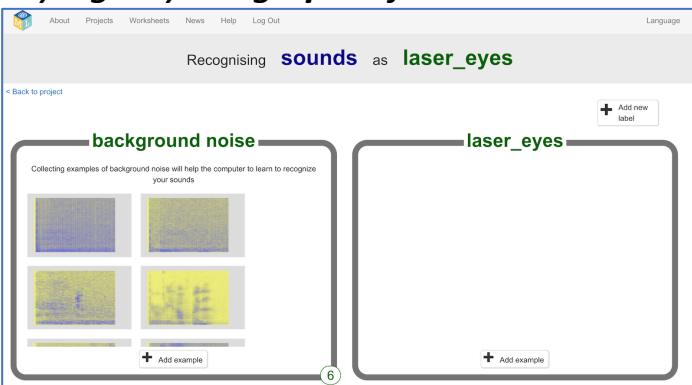
10. Click on "**+ Add example**" in the "background noise" bucket
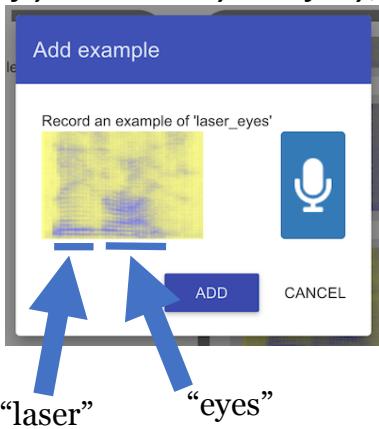
11. Click on the **microphone button** to record a sound clip, then click "**Add**" to add the recording to your training bucket.
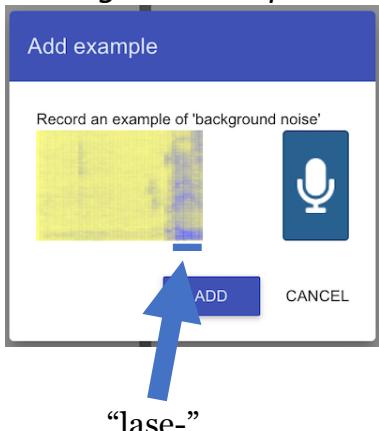
12. Repeat until you've got at least **eight** examples of background noise.
*Try and include a mixture of recordings of quiet, and recordings of you saying anything **apart** from "laser" or "eyes".*
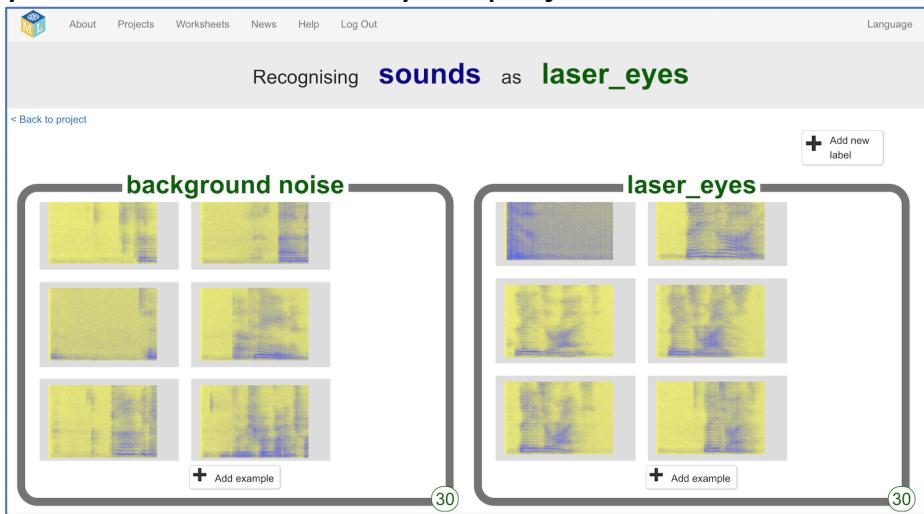
13. Click the **"+ Add example"** button in the "laser eyes" bucket.

14. Click on the microphone and record yourself saying "**laser eyes!**"
Use the graphic of your recording to check that you've recorded all of it.
If you look very carefully, you can sometimes tell where each word is.

"laser"   "eyes"

Use the graphic of your recording to check that you've recorded all of it.
An empty section at the start might mean you waited too long to start talking after clicking the microphone. Try to avoid that!

"lase-"
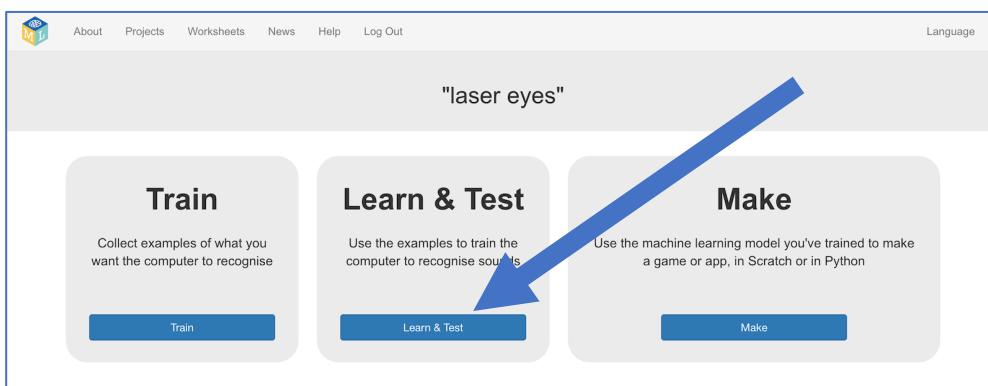
15.   Collect at least **eight** examples in each buckets. The more examples you collect, the better your project should work.
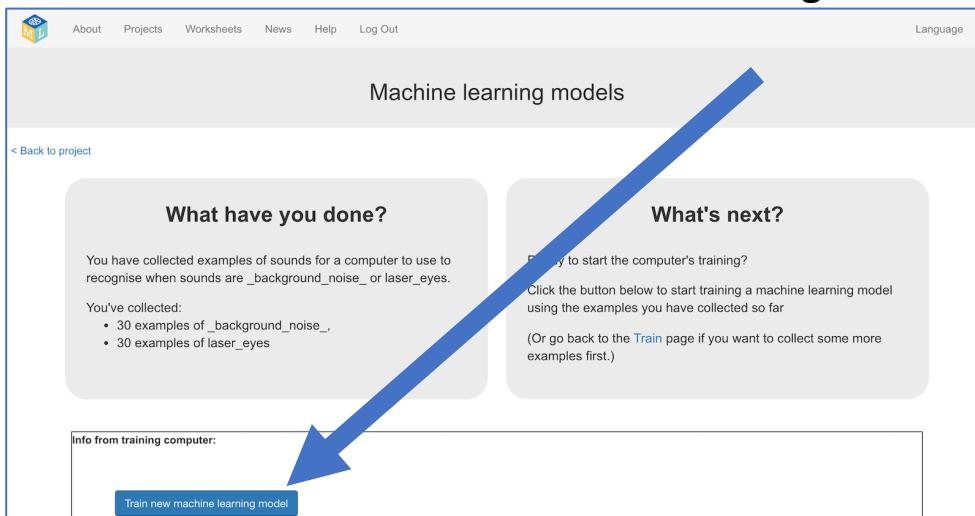
16.   Click the "**< Back to project**" link in the top left.

17.   Click the "**Learn & Test**" button

18.   Click on the "**Train new machine learning model**" button.

19.   Click on the "**Start Listening**" button.

Try saying "laser eyes". If your machine learning model recognises it, it will be displayed below.

20.   Decide if you need to do more training.

If your machine learning model thinks you've said "laser eyes" when you didn't say it, that's called a "false positive".

If your machine learning model doesn't recognize when you say "laser eyes", that's called a "false negative".

*If you see either of those problems, go back to the "Train" page and collect more training examples in both buckets.*

I found that my model worked okay after 18 examples in each bucket, and really well after 30 examples. Your results will be different! Test and see!

When you think it's working well enough, carry on to step 21.

21.   Click on the "**Make**" button.

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What have you done so far?

You've started to train a computer to recognise a particular sound: the sound of you saying "laser eyes". You've done that by collecting examples of what you sound like saying it, and examples of background noise so it has something to compare against. 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 recordings you've made, and this will be used to be able to recognise your commands.

What is next?

This project needs two machine learning models.

One, that you've trained, to recognize your commands.
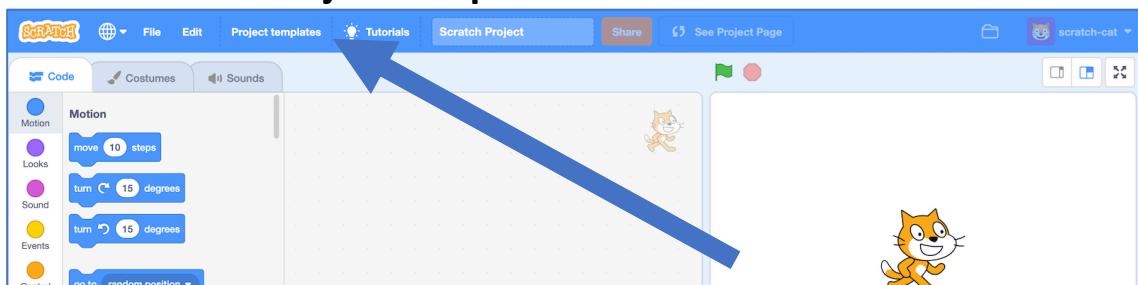
The second model is to recognize what your face looks like in the webcam. To save time, instead of training this second model yourself, you're going to use a pre-trained model.

Over 32,000 photos were collected by academics at a university, who went through them all and noted the location of the 390,000 faces they found in them. All of those examples of what bits of photos look like faces were used to train a machine learning model how to recognize faces in photos.
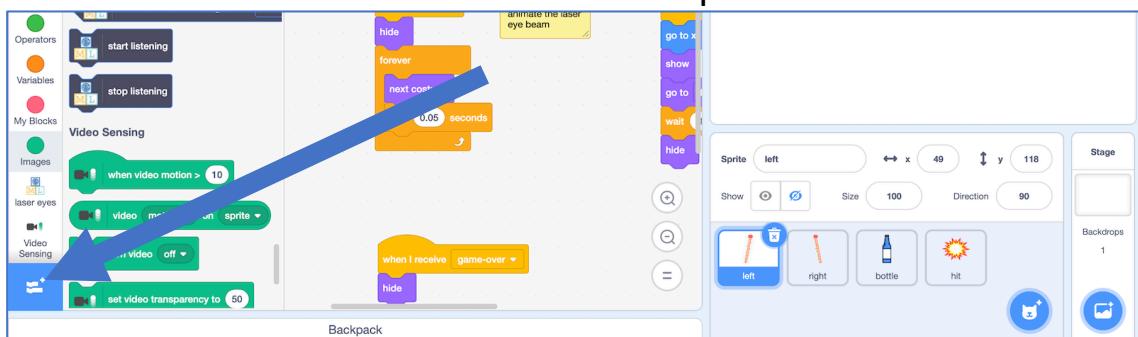
Real-world machine learning projects often use models already trained by other people. It is a good way to quickly make a project when you don't have the time to collect your own training data.

22. Click the "**Scratch 3**" button.

23. Click the "**Open in Scratch**" button
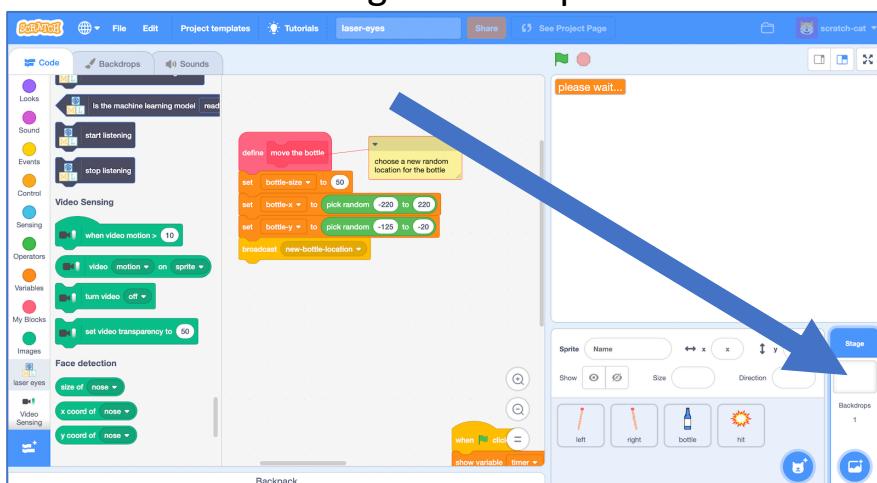
24. Click on "**Project templates**"

25. Click on the "**Laser Eyes**" project template

26. Click on the "**Add Extension**" blue plus button in the bottom left.
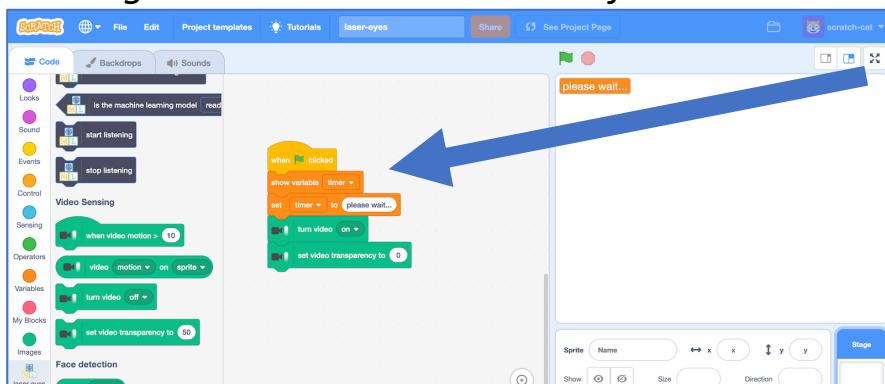

**27.** Click on "**Face detection**" to add the pre-trained model

28. Click on the Stage Backdrop
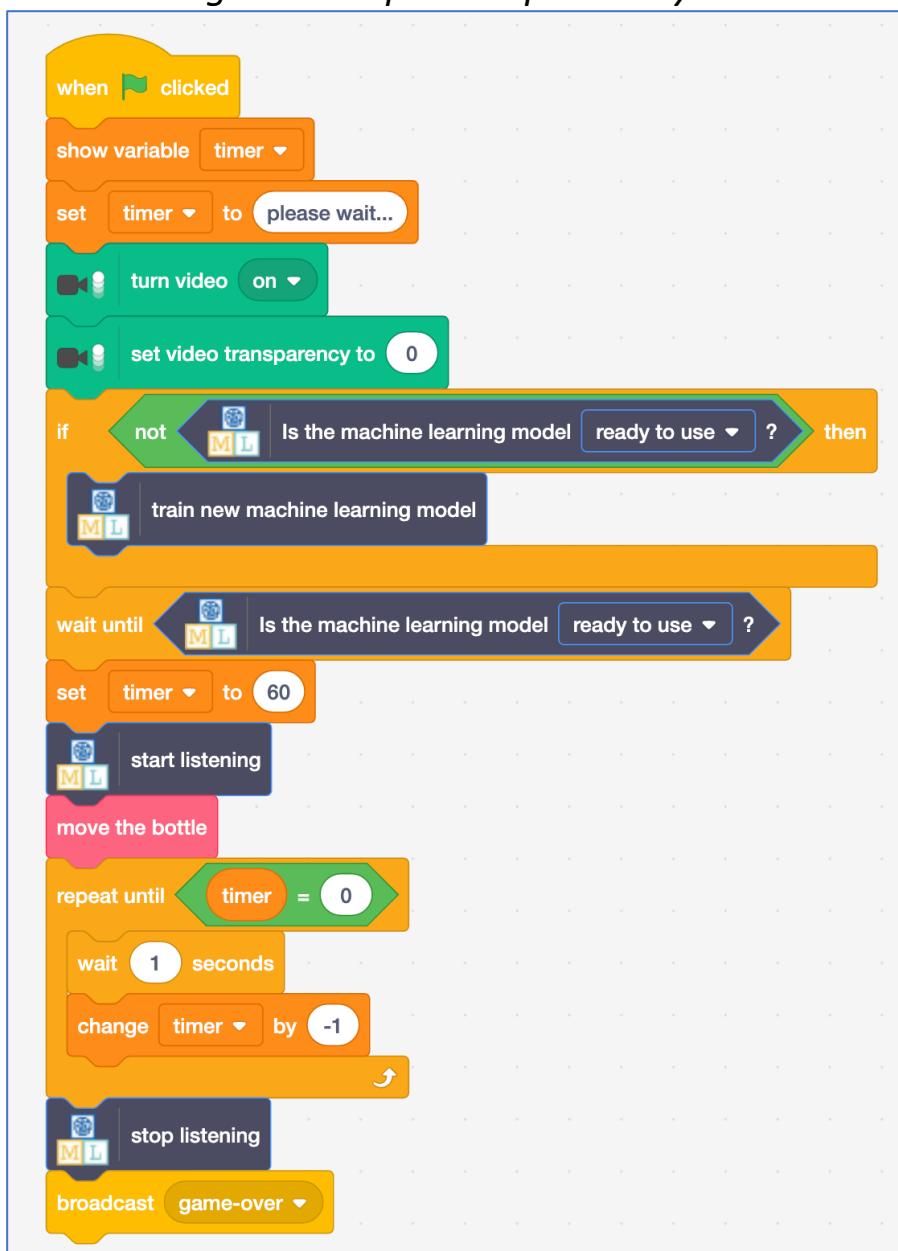
29. Find the "**When Green Flag clicked**" script

You might need to scroll around to find it.
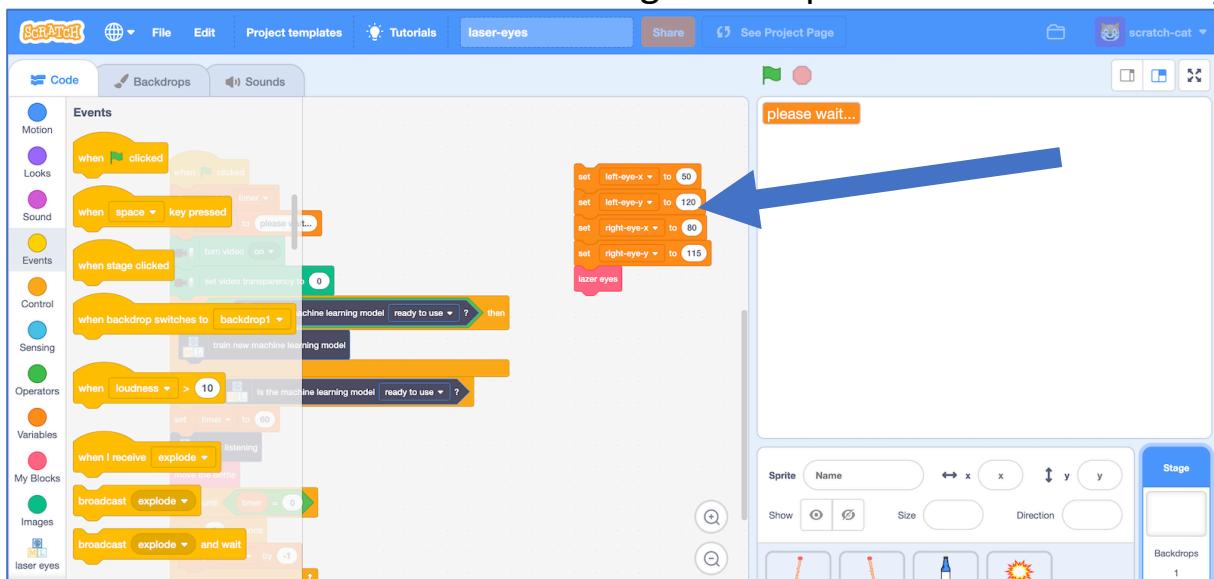
30. Add additional blocks to that script to make the main game script.

This is a long and complex script. Take your time!

31. Find the starter for the second game script. It ends with "lazer eyes"

32. Finish the second game script using both of your ML models

33. Click the "**Green Flag**".

It's time to test! The first time you click Green Flag, it will take a little while to get the two machine learning models ready.
*You should see yourself in the webcam.*
When the game is ready, bottles will appear on the stage at random places. Say "laser eyes" to shoot lasers from your eyes.
Try to hit the bottle before the timer runs out!
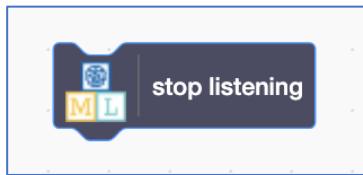
Your machine learning model will keep listening, even after you press the red Stop button.
*If you want it to stop, run the "**stop listening**" block.*

What have you done?

You've made a Scratch project using a machine learning technique known as face detection: detecting the location of faces in photos.

There are two stages to how it does this.

First stage: "object detection". It finds the part of the photo that looks like it contains a face. Think of it as the computer drawing a box around where it predicts a face is.

The second stage: shape prediction. It predicts where the eyes, nose and mouth are most likely to be in the box drawn in the first stage. This is sometimes described as detecting "facial landmarks".

This is being used to predict the best place to start your laser eyes from.

You're also using a speech recognition model. You've trained a machine learning model to recognize a single command: "laser eyes". This is like smart assistant devices that have been trained to recognize when you say their name, like "Alexa".