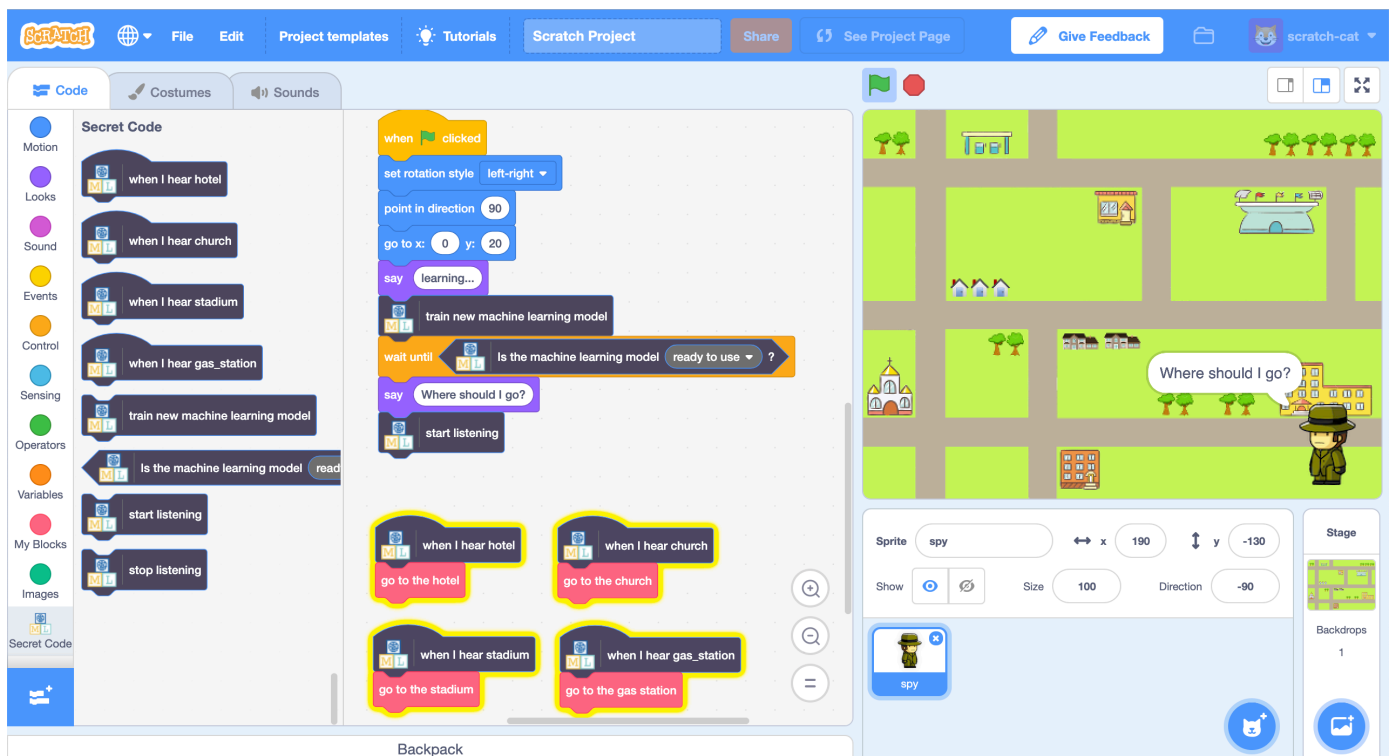




# Secret Code

In this project you will train the computer to understand secret code words.

You'll use that to say commands to a spy to guide it around a town.



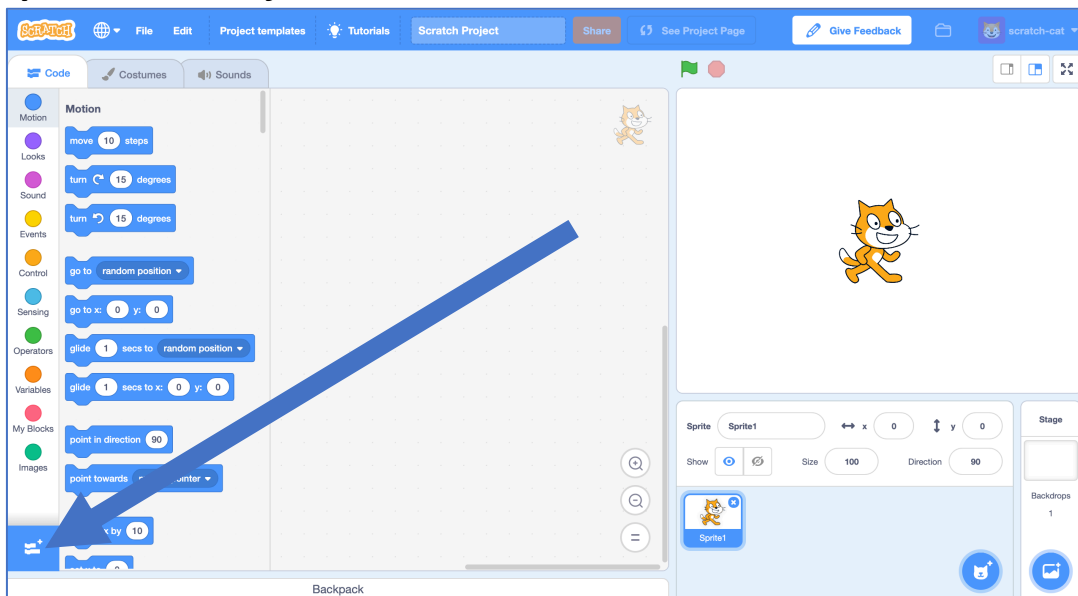
This project worksheet is licensed under a Creative Commons Attribution Non-Commercial Share-Alike License  
<http://creativecommons.org/licenses/by-nc-sa/4.0/>

This project requires a **microphone**. If you don't have a computer with a microphone, you might prefer to try a different worksheet.

1. Go to <https://machinelearningforkids.co.uk/scratch3/>

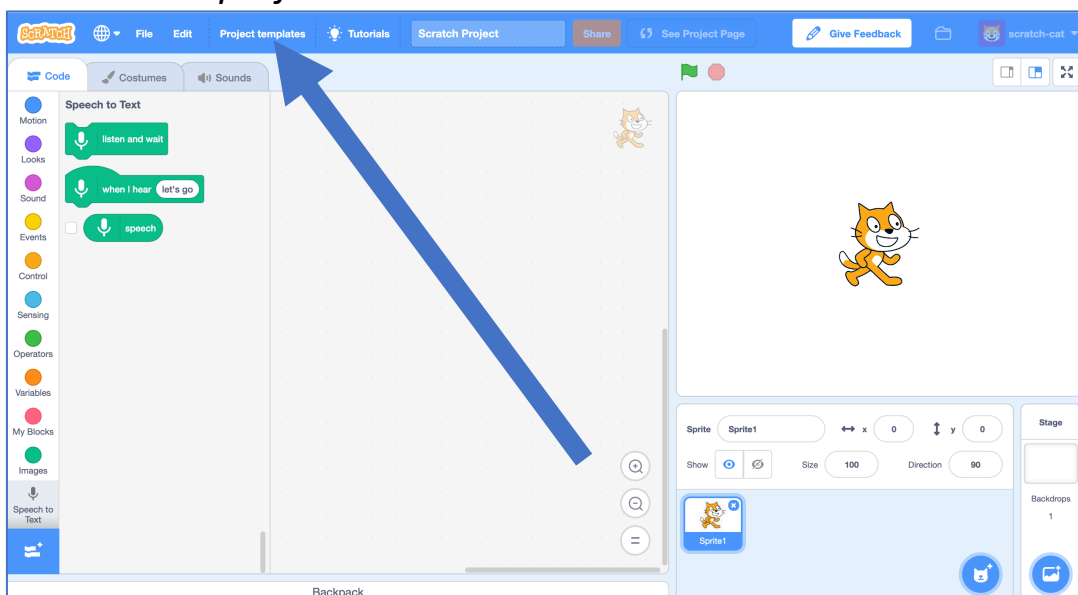
2. Load the **Speech to Text** extension

*Click on the **Extensions (plus)** button in the bottom left, and then choose **Speech to Text** from the list.*

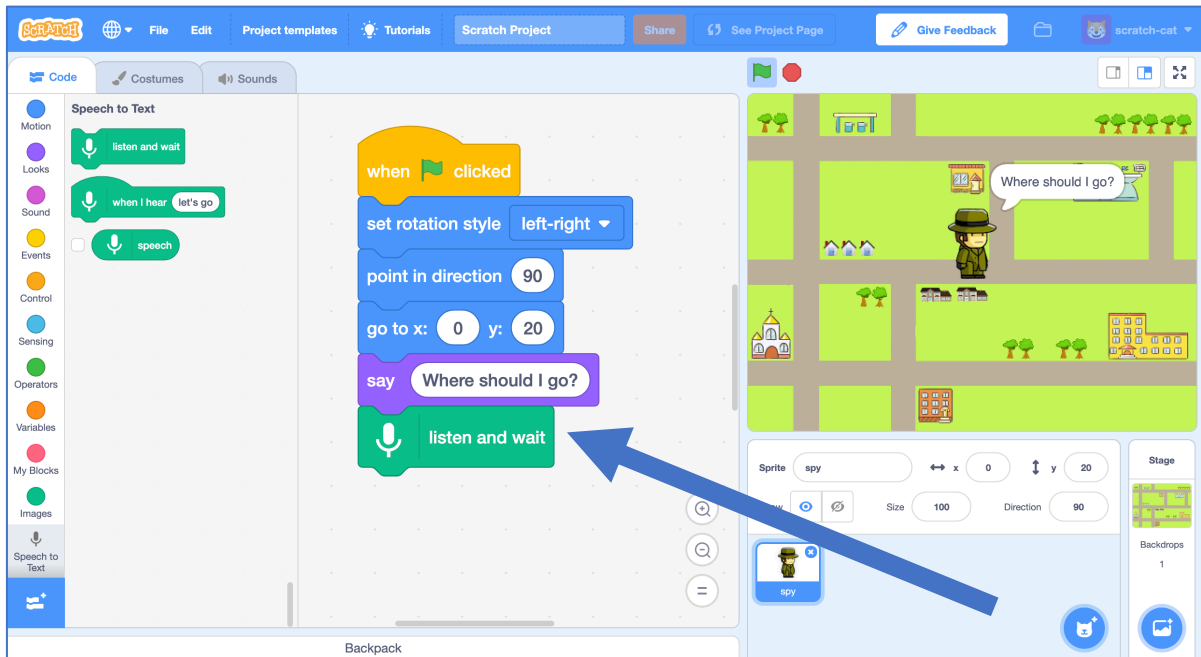


3. Load the **Secret Code** template

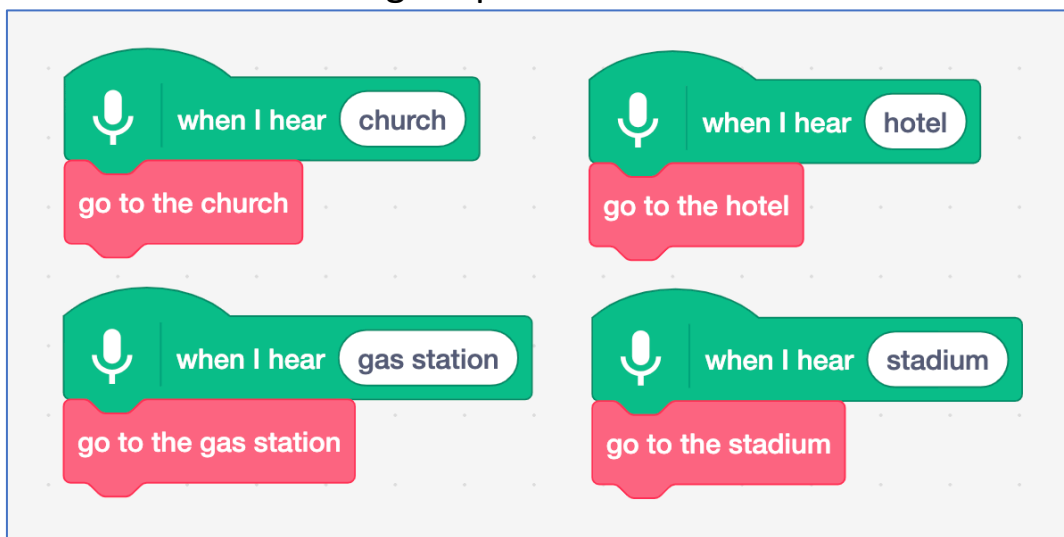
*Click on the **Project templates** menu at the top and then choose the **Secret Code** project.*



4. Add speech recognition to the script  
*Find the **When Green Flag clicked** script and add a **listen and wait** block from Speech to Text*



5. Add the following scripts.



6. Click on the **Green Flag** and give it a try  
*Say "church" or "hotel" or "gas station" or "stadium".  
The spy should go to the location that you say.*

## What have you done so far?

You've used **speech recognition** to control the spy in Scratch. You've used a machine learning model that has already been trained for you. This is a general machine learning model that has been trained to recognize English dictionary words.

Next, you'll train a machine learning model yourself to see how it is done.

For the next part of the project, you'll train a machine learning model to recognise four new words. You'll invent four new secret code words, that aren't in the English dictionary. Once you've created your secret code words, you'll train your spy to be able to recognize them. Then you will update your script so you can tell the spy where to go. The spy will understand you, but no one else will know what you mean!

### 7. Invent your secret code words!

*You need four words – a new secret code word for each of the four places in the spy project (church, stadium, gas station, hotel).*

*Invent new words that wouldn't show up in an English dictionary. They can be random noises as long as you can repeat them in the same way every time and will be recognisably different from each other.*

*If you don't want to make weird noises with your voice, that's okay - find other ways to make noises. You can click your fingers, clap your hands, squeeze a squeaky toy or do anything else you can think of!*

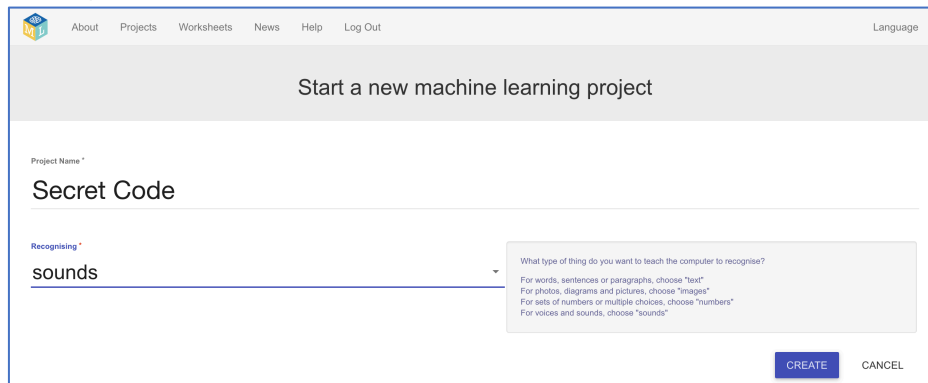
### 8. Go to <https://machinelearningforkids.co.uk/>

### 9. Click on “Log In” and type in your username and password

*If you don't have a username, ask your teacher or group leader to create one for you.*

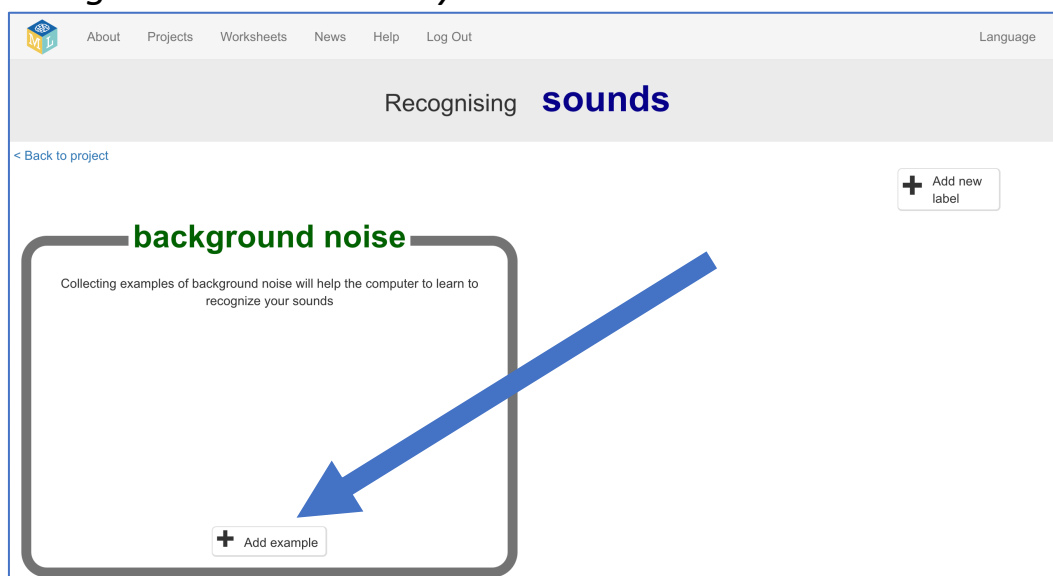
*If you can't remember your username or password, ask your teacher or group leader to reset it for you.*

10. Click on **“Projects”** on the top menu bar
11. Click the **“+ Add a new project”** button.
12. Name your project **“Secret Code”** and set it to learn how to recognise **“sounds”**. Click the **“Create”** button



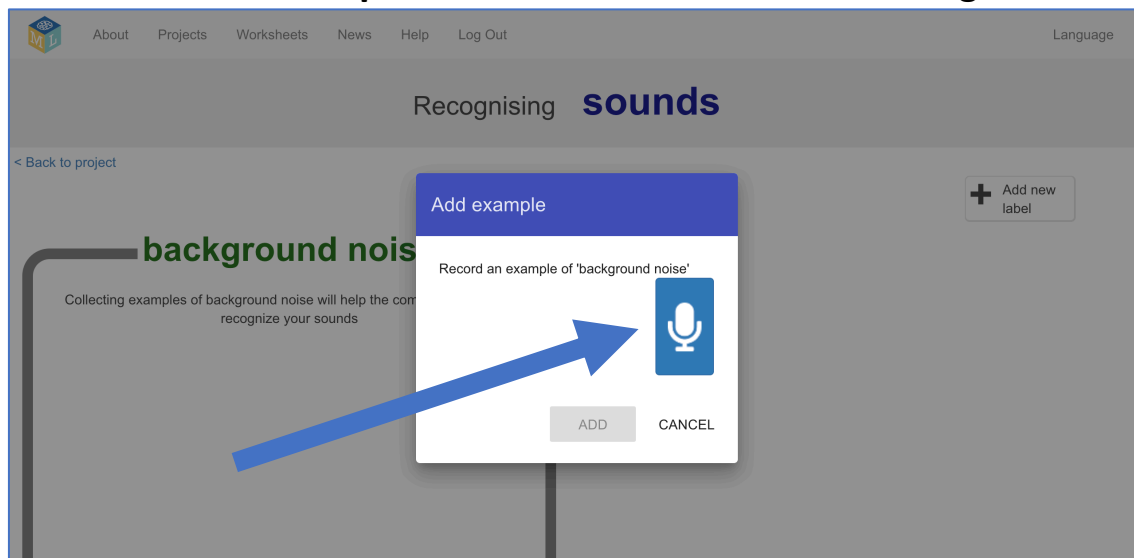
The screenshot shows a web interface for creating a new machine learning project. At the top, there is a navigation bar with 'About', 'Projects', 'Worksheets', 'News', 'Help', and 'Log Out'. The main heading is 'Start a new machine learning project'. Below this, there is a 'Project Name' field containing 'Secret Code'. Underneath is a 'Recognising' dropdown menu set to 'sounds'. A tooltip is visible, explaining the recognition 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, there are 'CREATE' and 'CANCEL' buttons.

13. You should now see **“Secret Code”** in the list of your projects. Click on it.
14. Click on the **Train** button to start collecting examples.
15. Click on the **Add example** button in the **background noise** bucket  
*Recording background noise will help your machine learning model to tell the difference between the sounds you will train it to recognize, and the background noise where you are.*

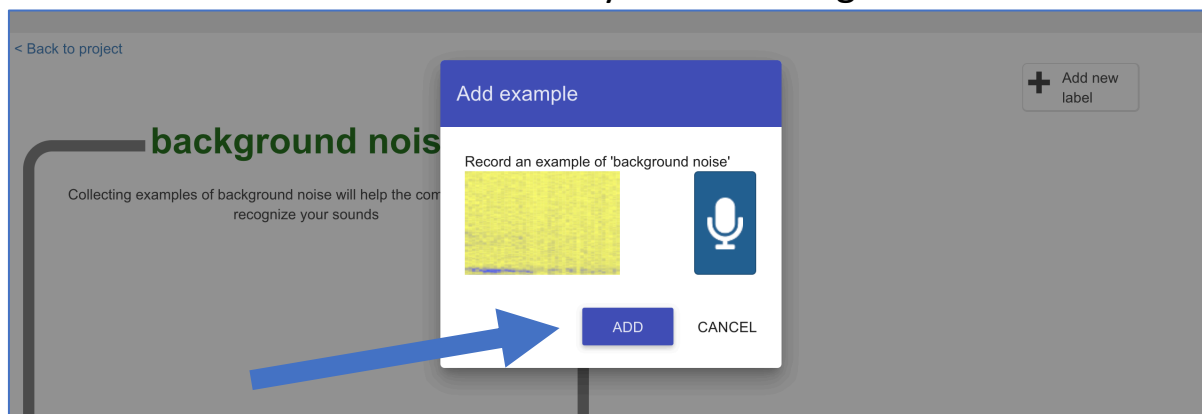


The screenshot shows the 'Recognising sounds' project page. The navigation bar is the same as in the previous screenshot. The main heading is 'Recognising sounds'. Below the heading, there is a '< Back to project' link. On the right, there is a '+ Add new label' button. The main content area is titled 'background noise' in green. Below this title, there is a text box that says 'Collecting examples of background noise will help the computer to learn to recognize your sounds'. At the bottom of this text box, there is a '+ Add example' button. A large blue arrow points from the top right towards the '+ Add example' button.

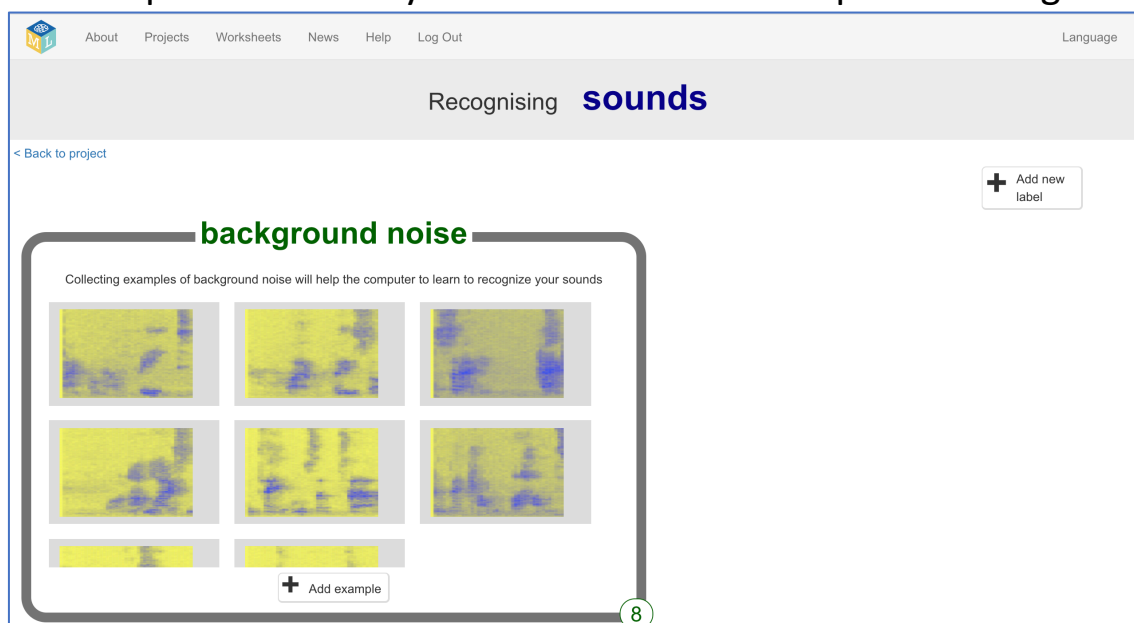
## 16. Click the **microphone** to record 2 seconds of background noise



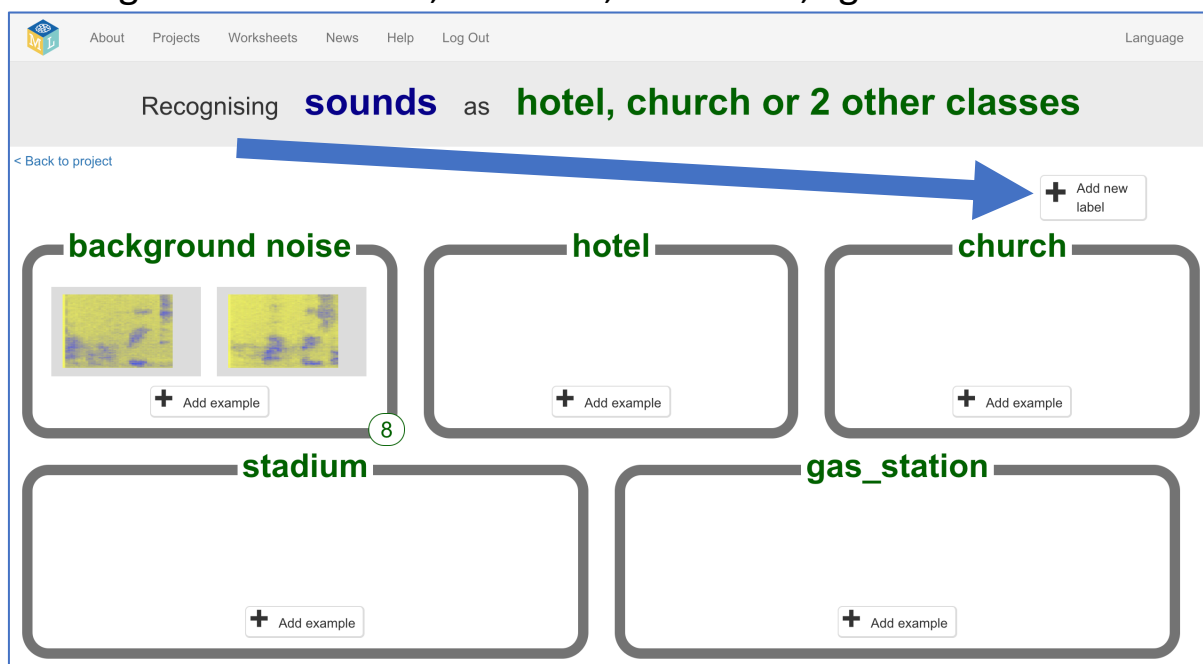
## 17. Click the **Add** button to save your recording



## 18. Repeat that until you have **at least 8** examples of background noise

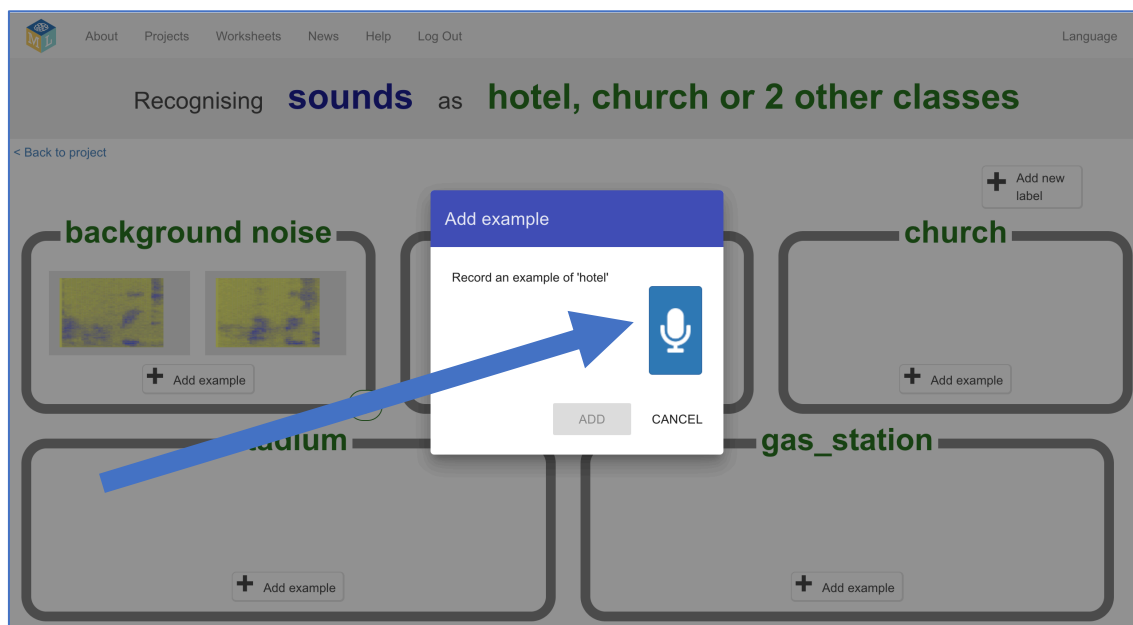


19. Use the **Add new label** button in the top right to create four new training buckets: “hotel”, “church”, “stadium”, “gas station”.



20. Click the **Add example** button in the **hotel** training bucket

21. Click on the microphone and record yourself saying your secret code word for “hotel”



22. Click on the **Add** button to save the recording

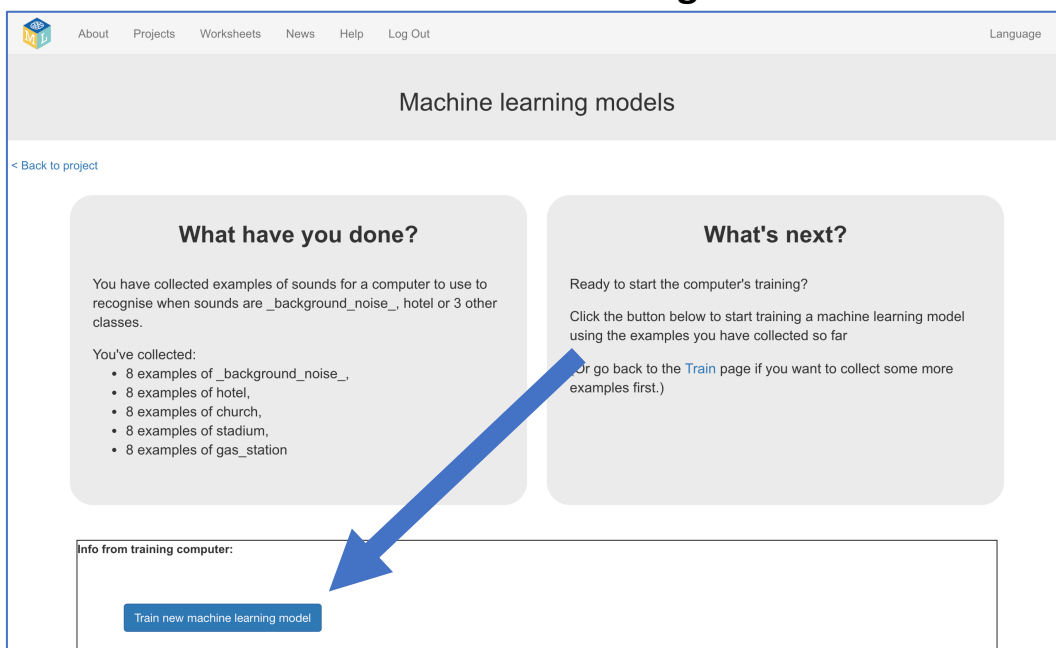
**23.** Repeat until you've got at least 8 examples of each of your four code words



**24.** Click the “Back to project” link in the top left

**25.** Click the **Learn & Test** button

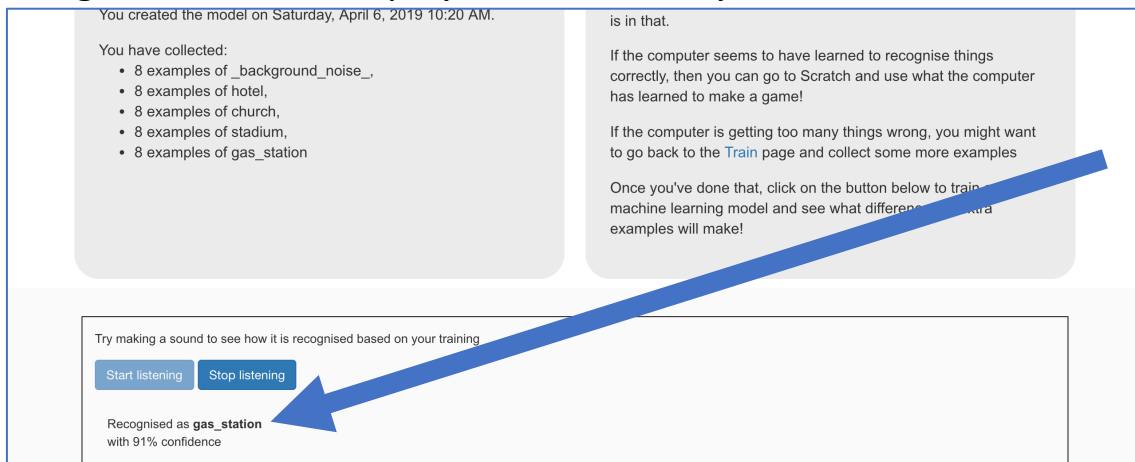
**26.** Click “Train new machine learning model”





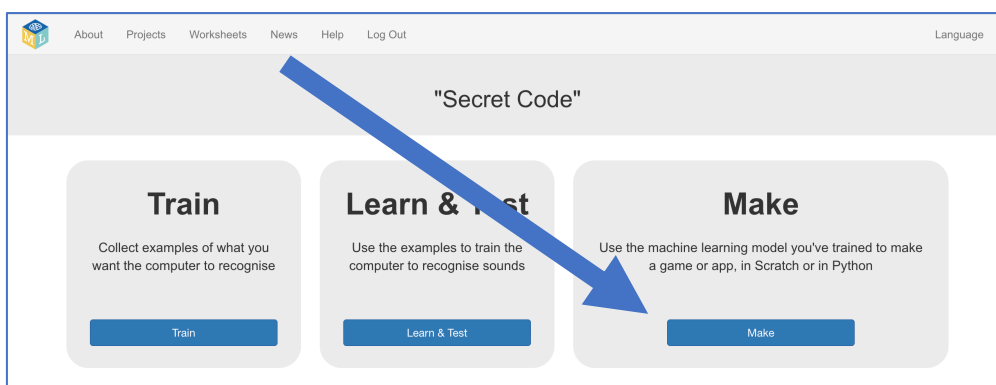
**27.** Once the training is finished, click the **Start listening** button to test your machine learning model

*Say one of your secret code words. If your machine learning model recognizes it, it will display what it thinks you said.*



**28.** If you're not happy with how the model is working, go back to the **Train** page and add more examples to all the training buckets.

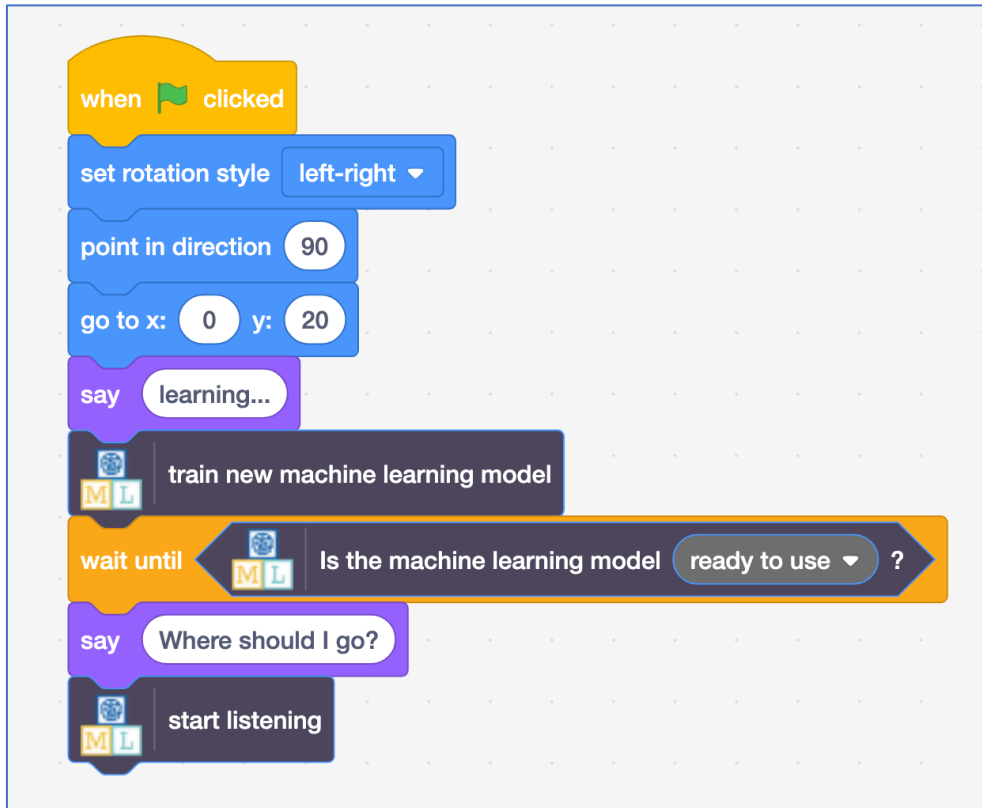
**29.** When you're happy with your machine learning model, click on the **Make** button



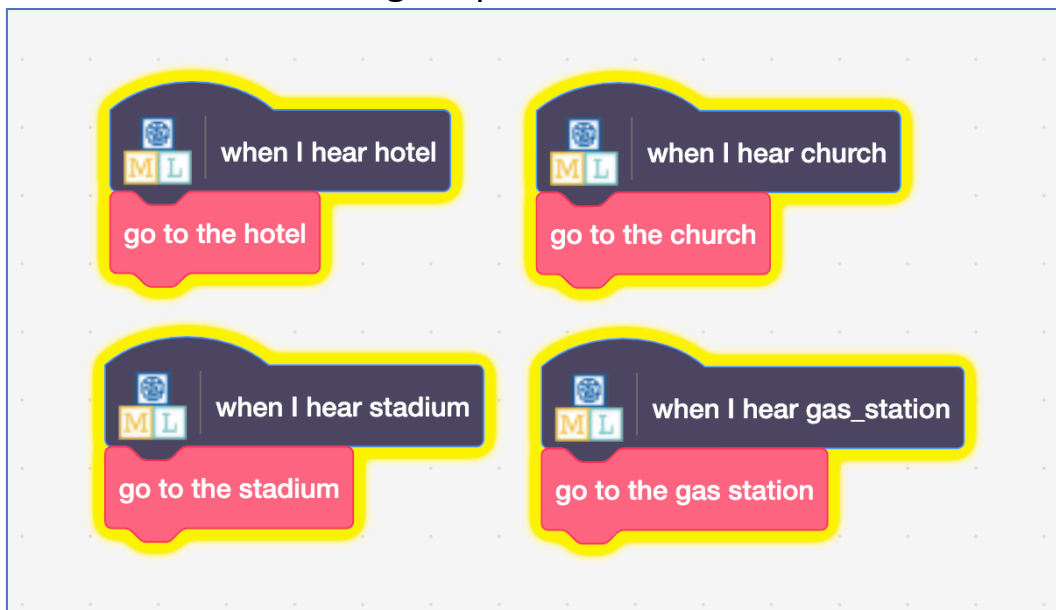
**30.** Click on the **Scratch 3** button and then click **Open in Scratch 3**

**31.** Click on the **Project templates** button at the top of the screen and open the "Secret Code" project template again

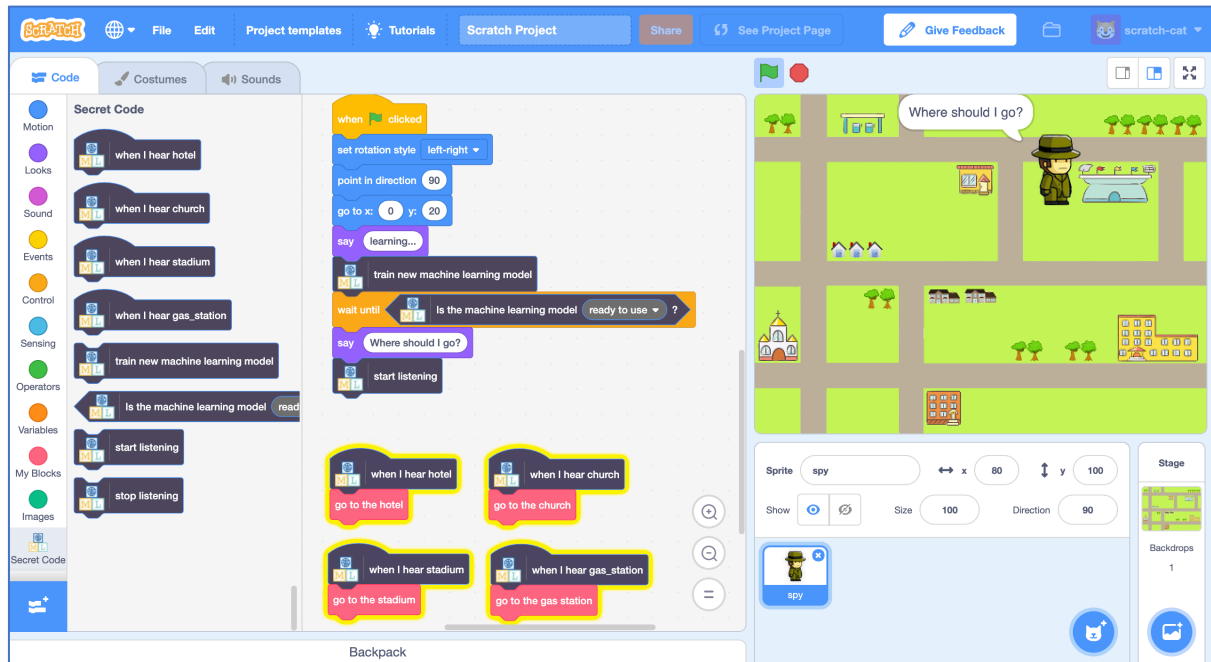
**32.** Add the following blocks to the **When Green Flag clicked** script



**33.** Add the following scripts



**34.** It's time to test! Click the **Green Flag**  
*After your spy has finished learning, it will ask "Where should I go?".  
Use your secret code words to guide the spy around the town.*



## What have you done?

You've trained your own machine learning model to do speech recognition. You used that to control a character in Scratch.

Unlike the pre-trained model you used at first, which has been trained to recognize tens of thousands of words, you've only trained it to recognize four different words. But the principle is the same.

Can you think of an example of a system like this you've seen used before? For example, some cars use speech recognition systems that have been trained to recognize the different commands you can give to the in-car computer. What other examples have you used?

## 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?

### **Try a different voice**

Ask a friend to test your spy. Does it understand them?

If it has trouble with their voice, ask them to add some training examples of their voice to your training buckets and then try again.

How much training does it need for your machine learning model to be able to work with a variety of voices?