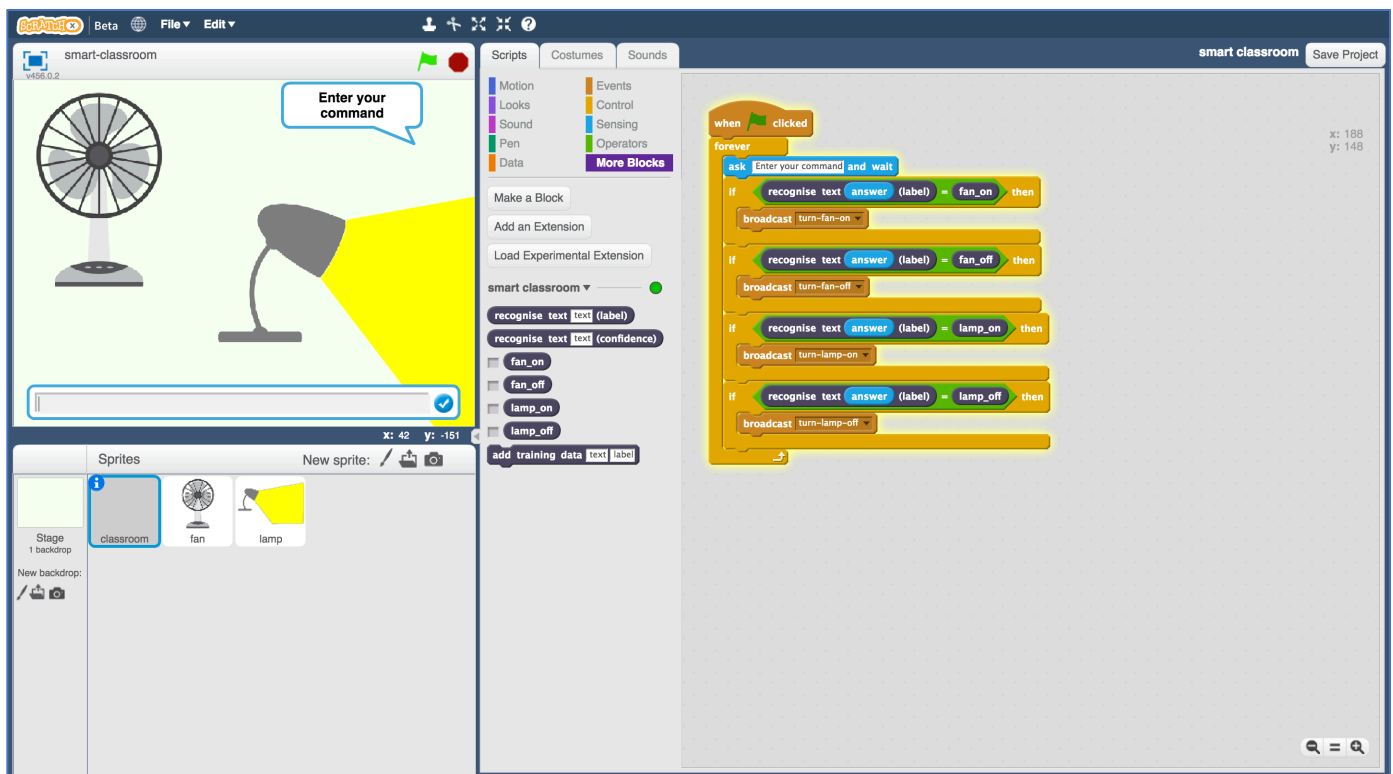


# Smart Classroom

In this project you will make a virtual classroom that can react to what you say to it.

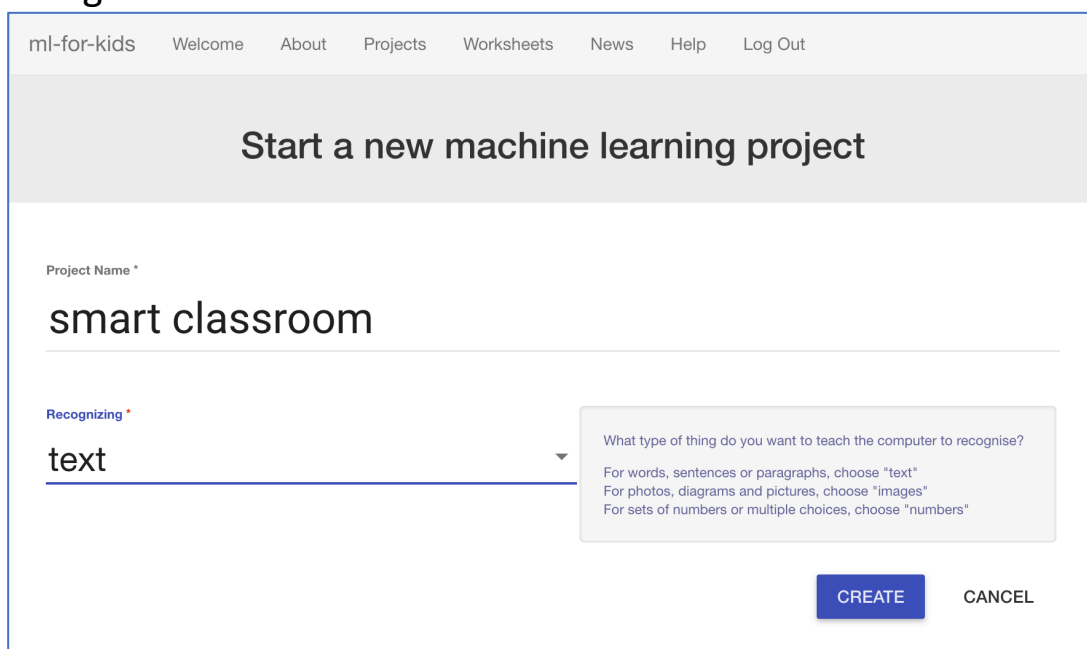
You'll be able to control the virtual devices in the classroom by saying what you want.

You will teach the computer to recognise commands for different devices by giving it examples of each.



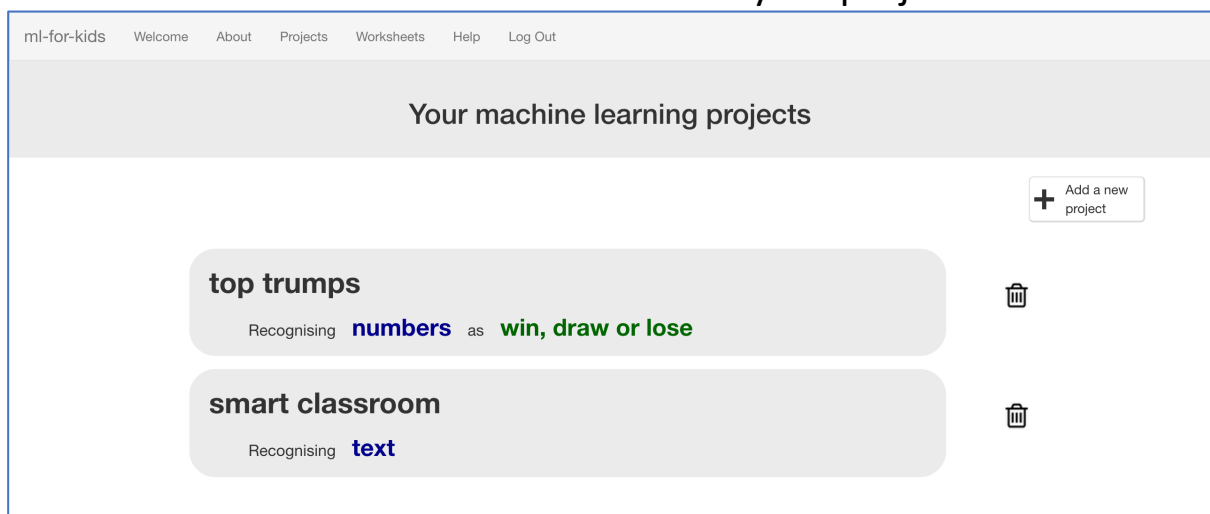
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1. Go to <https://machinelearningforkids.co.uk/> in a web browser
2. Click on “Get started”
3. Click on “Try it now”
4. Click the “+ Add a new project” button.
5. Name your project “smart classroom” and set it to learn how to recognise “text”. Click **Create**



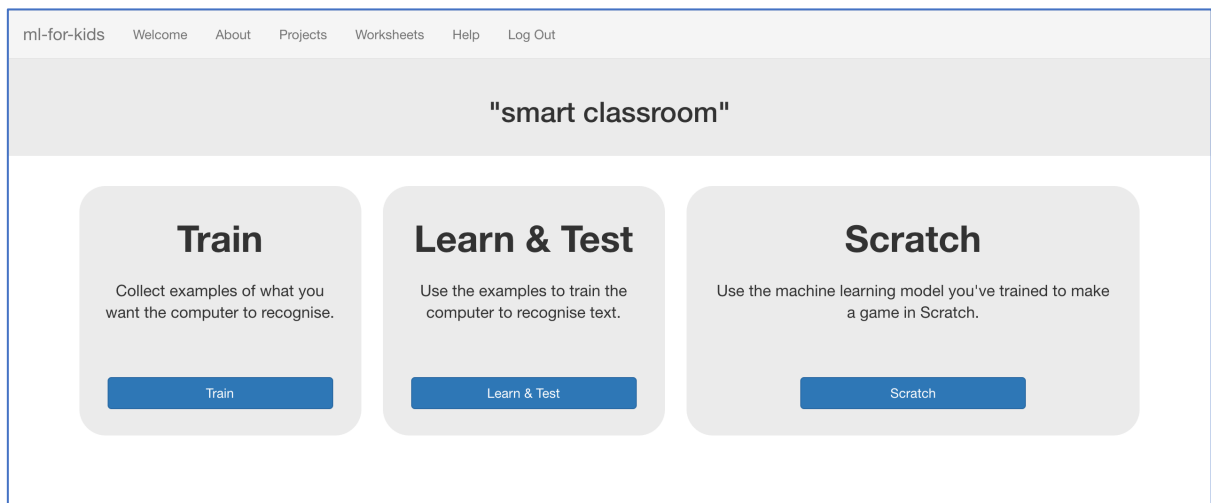
The screenshot shows the 'Start a new machine learning project' form on the machinelearningforkids.co.uk website. The form has a header with navigation links: ml-for-kids, Welcome, About, Projects, Worksheets, News, Help, and Log Out. The main heading is 'Start a new machine learning project'. Below this, there is a 'Project Name' field with the text 'smart classroom'. Underneath, there is a 'Recognizing' dropdown menu with 'text' selected. A tooltip is visible next to the dropdown, asking 'What type of thing do you want to teach the computer to recognise?' and providing instructions: 'For words, sentences or paragraphs, choose "text"', 'For photos, diagrams and pictures, choose "images"', and 'For sets of numbers or multiple choices, choose "numbers"'. At the bottom right, there are two buttons: 'CREATE' and 'CANCEL'.

6. You should see “smart classroom” in your projects list. Click it.

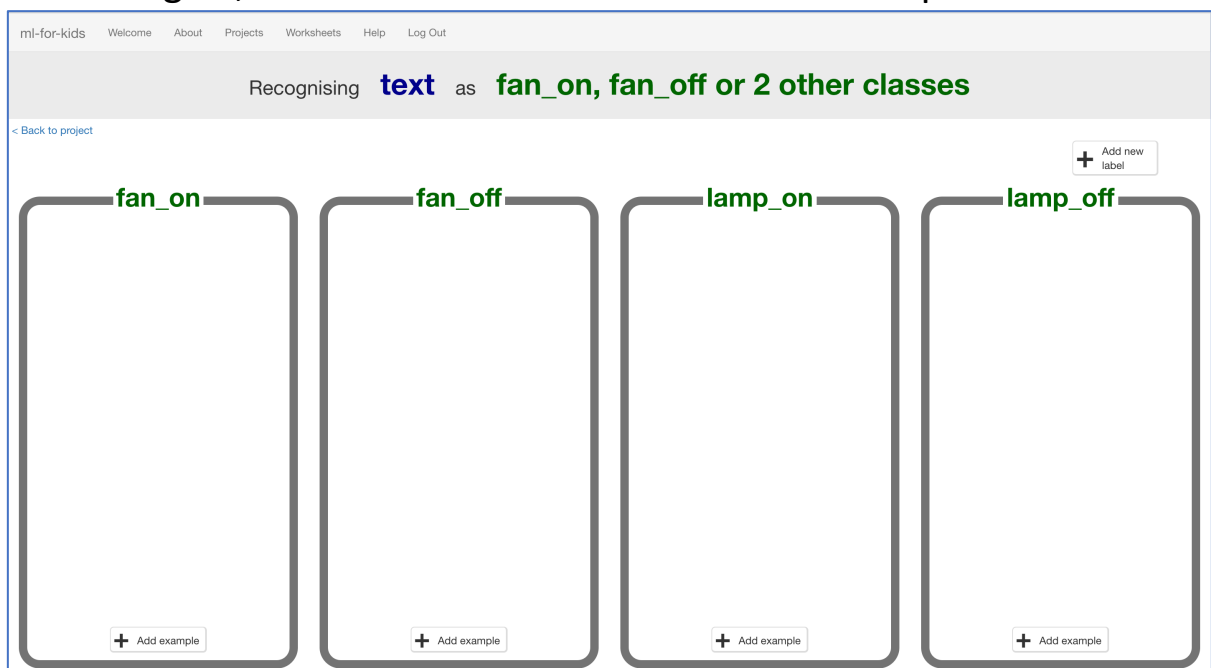


The screenshot shows the 'Your machine learning projects' page on the machinelearningforkids.co.uk website. The page has a header with navigation links: ml-for-kids, Welcome, About, Projects, Worksheets, Help, and Log Out. The main heading is 'Your machine learning projects'. In the top right corner, there is a button with a plus sign and the text 'Add a new project'. Below this, there is a list of projects. The first project is 'top trumps', which is 'Recognising numbers as win, draw or lose'. The second project is 'smart classroom', which is 'Recognising text'. Each project entry has a trash icon to its right.

7. We need to collect some examples to train the computer.  
*Click the **Train** button.*



8. Click on **"+ Add new label"** and call it **"fan on"**.  
Do that again, and create a second bucket called **"fan off"**.  
Do that again, and create a third bucket called **"lamp on"**.  
Do that again, and create a fourth bucket called **"lamp off"**.



9. Click on the **"Add example"** button in the **"fan on"** bucket, and type in a way to ask for the fan to be turned on.  
*For example, you could type "Please can you switch on the fan".*

**10.** Click on the “**Add example**” button in the “fan off” bucket, and type in a way to ask for the fan to be switched off.

*For example, you could type “I want the fan off now”*

**11.** Do the same for the “lamp on” and “lamp off” buckets.

**12.** Repeat steps 9-11 until you’ve got at least **six** examples of each.

*Be imaginative!*

*Try and think of lots of different ways to ask each command.*

*For “fan on” you could complain that you’re too hot.*

*For “fan off” you could complain that it’s too breezy.*

*For “lamp on” you could complain that it’s too dark or that you can’t see.*

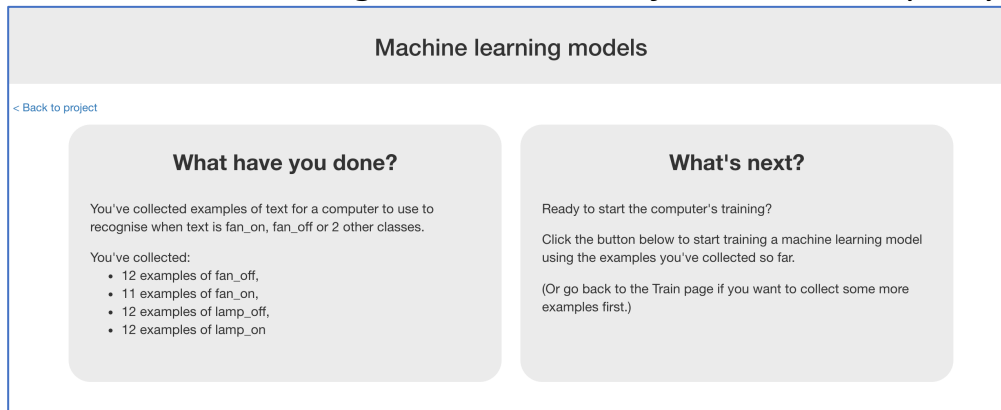
*For “lamp off” you could complain that it’s too bright.*

The screenshot shows the 'ml-for-kids' web interface. At the top, there's a navigation bar with links: 'Welcome', 'About', 'Projects', 'Worksheets', 'Help', and 'Log Out'. Below this, a header indicates the current task: 'Recognising **text** as **fan\_on, fan\_off or 2 other classes**'. A '< Back to project' link is on the left, and an 'Add new label' button is on the right. The main area is divided into four columns, each representing a class:

- fan\_on**: Contains examples like 'Can we turn the fan on?', 'Can you switch on the fan?', 'fan on', 'I need some air', 'I want the fan on', 'I'd like the fan on, please', 'I'm too hot', 'It's too hot in here', 'Please switch the fan on', 'Please turn on the fan', and 'Turn on the fan'. It has an 'Add example' button at the bottom.
- fan\_off**: Contains examples like 'Can we have the fan off now', 'fan off', 'I don't want the fan on any more', 'I'm cold', 'I'm feeling too cold', 'It's too breezy', 'It's too windy', 'It's too windy in here', 'Please can you turn off the fan', 'Switch off the fan', and 'Turn the fan off'. It has an 'Add example' button at the bottom.
- lamp\_on**: Contains examples like 'Can we have some light on?', 'Can we have the lamp on?', 'I can't see', 'I can't see. Let's have some light.', 'It's too dark', 'It's too dark in here.', 'It's too dark. I can't see anything.', 'Lamp on', 'Light on', 'Please turn on the lamp', and 'Turn on the lamp'. It has an 'Add example' button at the bottom.
- lamp\_off**: Contains examples like 'Can you turn off the lamp?', 'Can you turn the light off', 'Could you turn the light off please?', 'It's too bright', 'Lamp off', 'Lamp off please', 'Please can you switch the light off', 'Please make it darker', 'Please turn off the lamp', and 'Turn off the lamp'. It has an 'Add example' button at the bottom.

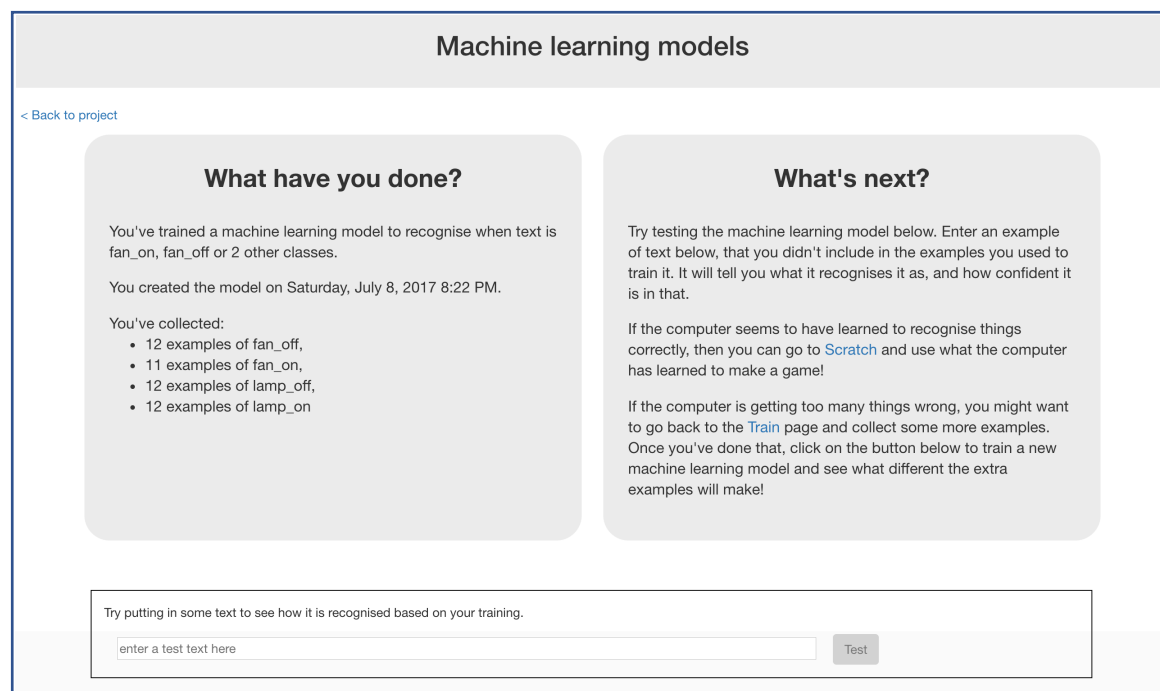
**13.** Click the “< Back to project” link, then click “**Learn & Test**”.

- 14.** Click on the **“Train new machine learning model”** button.  
*As long as you’ve collected enough examples, the computer should start to learn how to recognise commands from the examples you’ve written.*

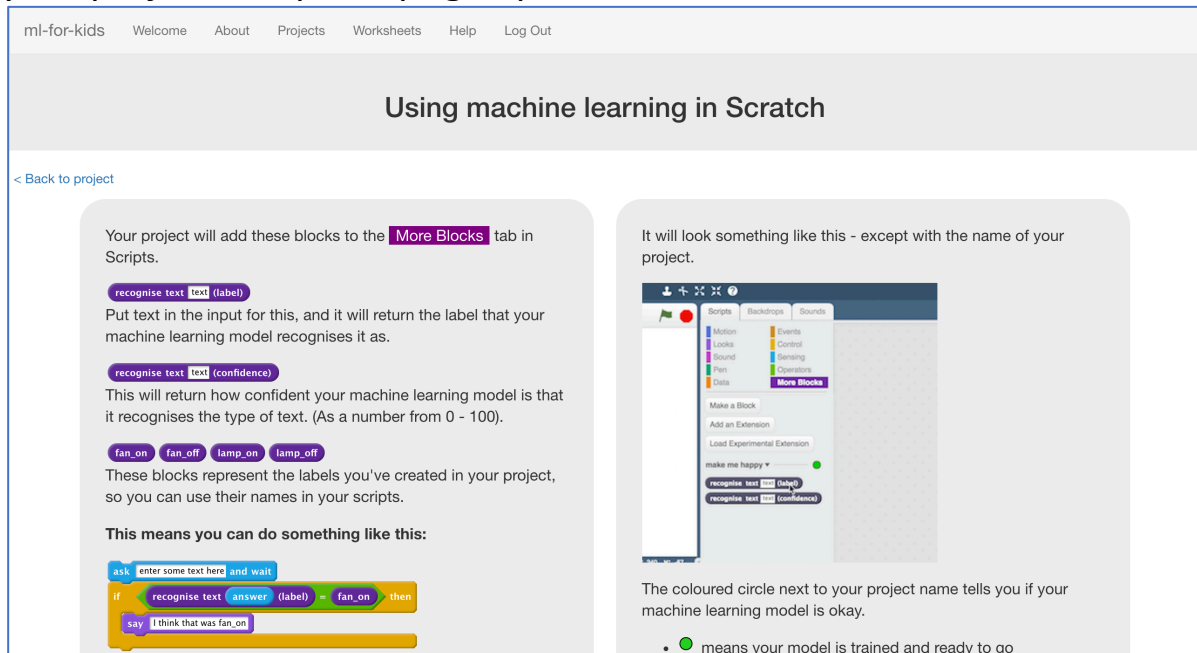


- 15.** Wait for the training to complete. This might take a minute or two.  
*While waiting, try to complete the machine-learning multi-choice quiz.*

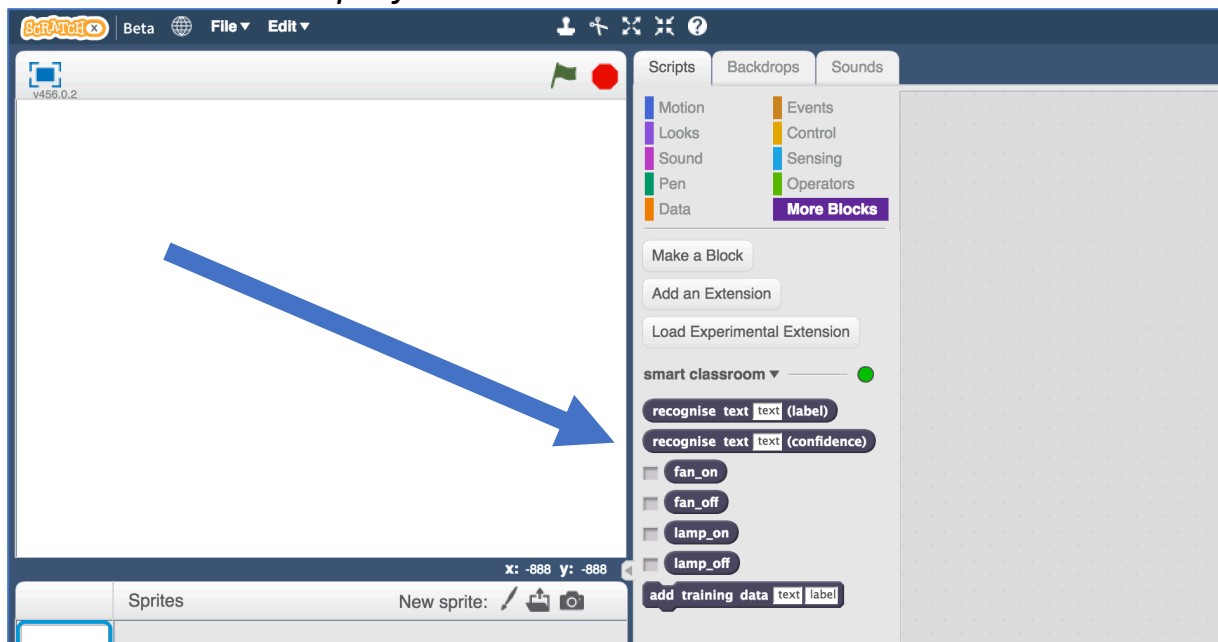
- 16.** Once the training has completed, a Test box will appear.  
Try testing your machine learning model to see what it has learned.  
Type in a command, and press enter.  
*Test it with examples that you haven't shown the computer before.*  
*If you're not happy with how the computer recognises the messages, go back to step 12, and add more examples.*  
*Make sure you repeat step 14 to train with the new examples though!*



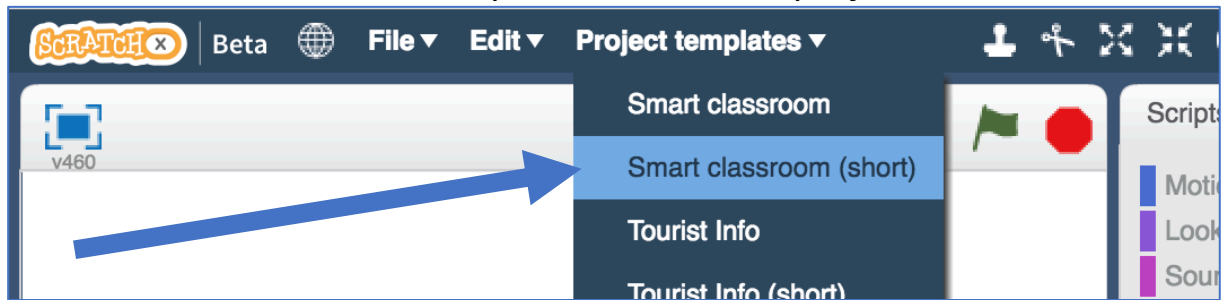
- 17.** Click on the “< Back to project” link, then the “Scratch” button.  
*This page has instructions on how to use the new blocks in Scratch from your project. Keep this page open so can check back on how to use them.*



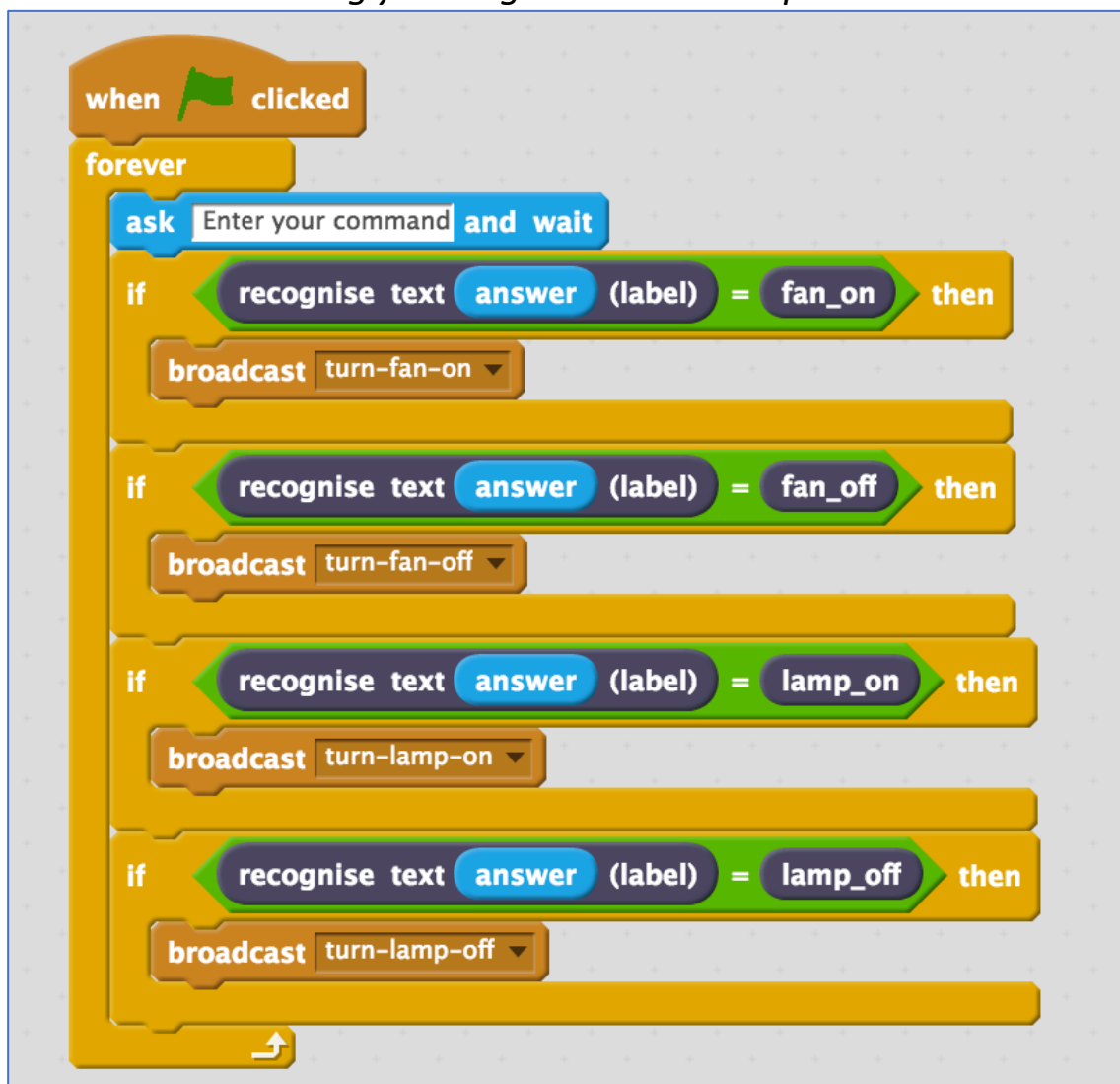
- 18.** Click “Open in Scratch” to launch the Scratch editor.  
*You should see new blocks in the “More blocks” section from your “smart classroom” project.*



- 19.** Load the **Smart Classroom (short)** template  
Click on “Project templates” -> “Smart Classroom (short)”  
Click “OK” when it asks to replace the current project



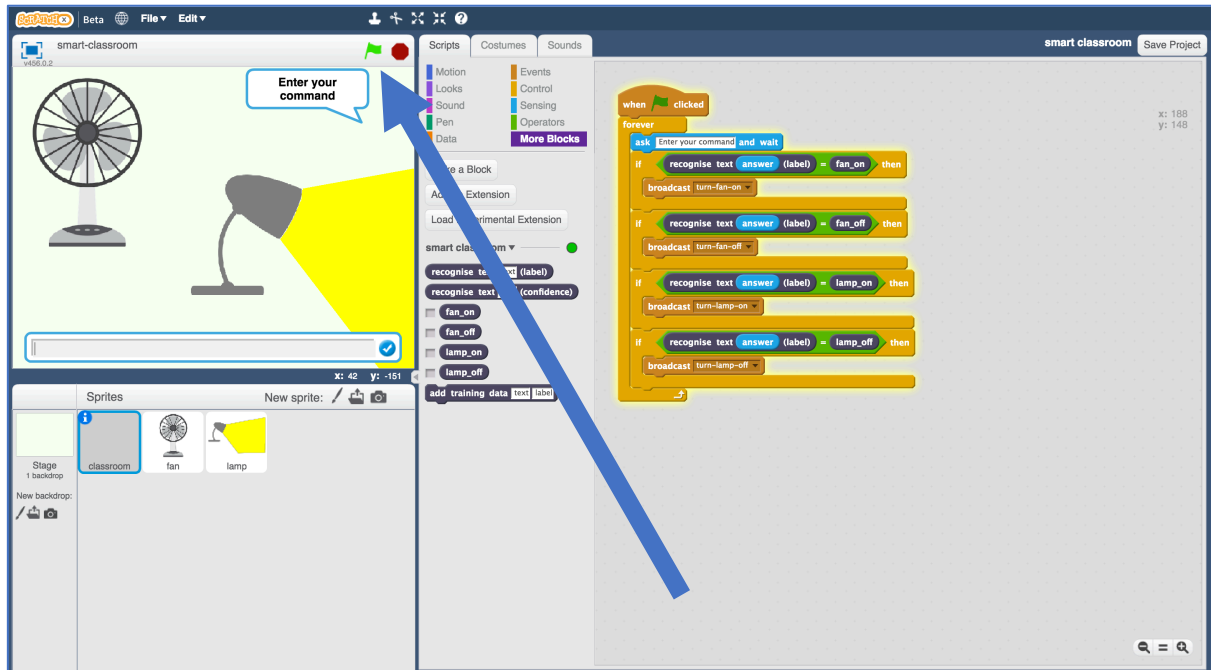
- 20.** Click on the “Scripts” tab, and **change** the existing script, to use your machine learning model **instead** of the rules that are already there.  
The “recognise text ... (label)” block is a new block added by your project.  
If you give it text, it will return the label for one of the four commands based on the training you’ve given to the computer.



## 21. Click the **green flag** to test

*Type a command and press enter. The fan or lamp should react to your instructions.*

*Make sure you test that this works **even for messages that you didn't include in your training**.*



## What have you done?

You've trained a smart assistant – like a simple version of assistants you can get on modern smartphones (like Apple's Siri or Google's Assistant) or virtual assistant devices (like Amazon's Alexa or Google's Home).

Training the computer to be able to recognise instructions for itself should be much quicker than trying to make a list of every possible command.

The more examples you give it, the better it should get at recognising instructions correctly.



## Ideas and Extensions

Now that you've finished, why not give one of these ideas a try?

### Try another device

Instead of just a fan and a lamp, can you add another device to your smart classroom?

### Use the confidence score

The other new Scratch block from your project gives the score for how sure your machine learning model is that it has recognised the message.

If you give it a command like "Please make me a cheese sandwich", the confidence score should be very low.

How can you use this to improve your script for commands that the computer can't recognise?

### Do it for real!

Have a look at the smart assistants that developers have made for Amazon's Alexa : <http://amzn.to/2sxy1hw>

Developers made these in the same way that you did this project – creating labels for the commands they wanted it to recognise, and then collecting examples of how those commands might be phrased to train the Alexa to be able to understand them.

Find an Alexa Skill that you think sounds good. Look at the commands it can understand – can you think how you could've trained it?