

In this assignment 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/#!/login>
2. Click on “Try it now”
3. Click the “+ Add a new project” button.
4. Name your project “smart classroom” and set it to learn how to recognise “text”. Click **Create**

Start a new machine learning project

Project Name \*

smart classroom

Recognising \*

text

What type of thing do you want to teach the computer to recognise?

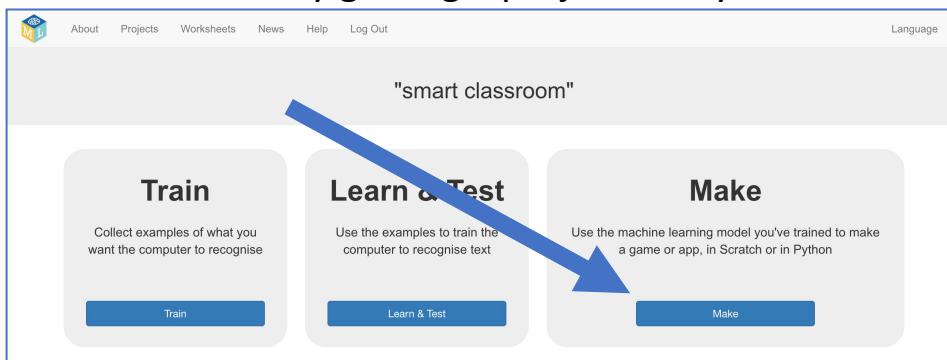
For words, sentences or paragraphs, choose "text"  
For photos, diagrams and pictures, choose "images"  
For sets of numbers or multiple choices, choose "numbers"  
For voices and sounds, choose "sounds"

Language

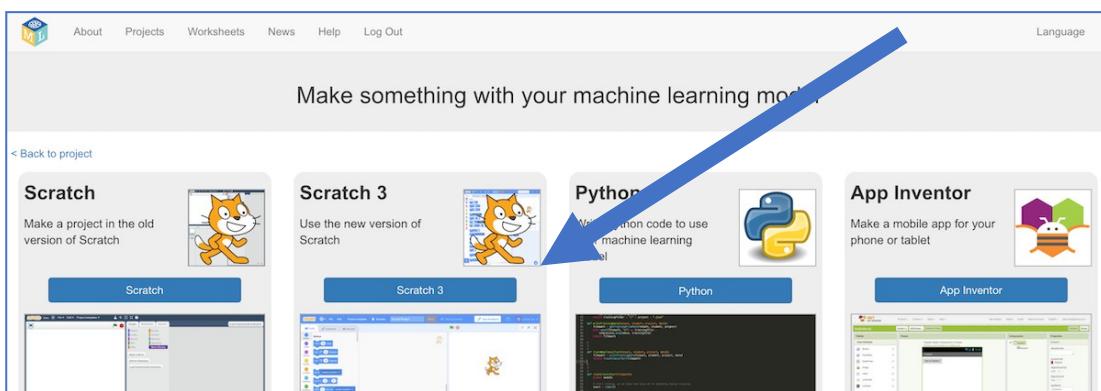
English

**CREATE**   **CANCEL**

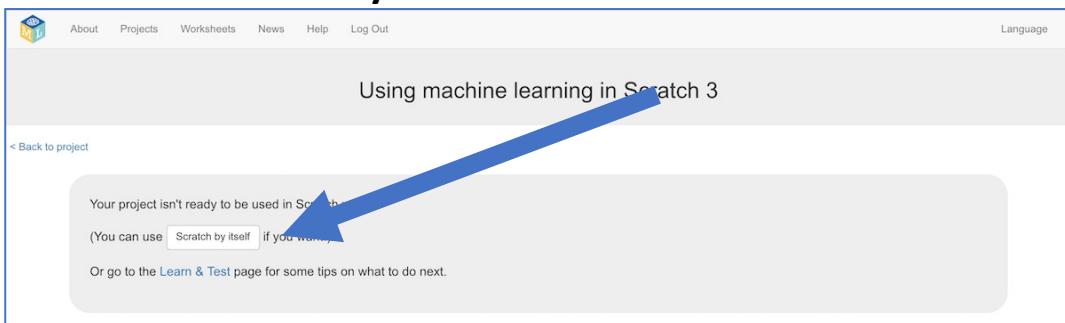
5. We'll start by getting a project ready in Scratch. Click “Make”



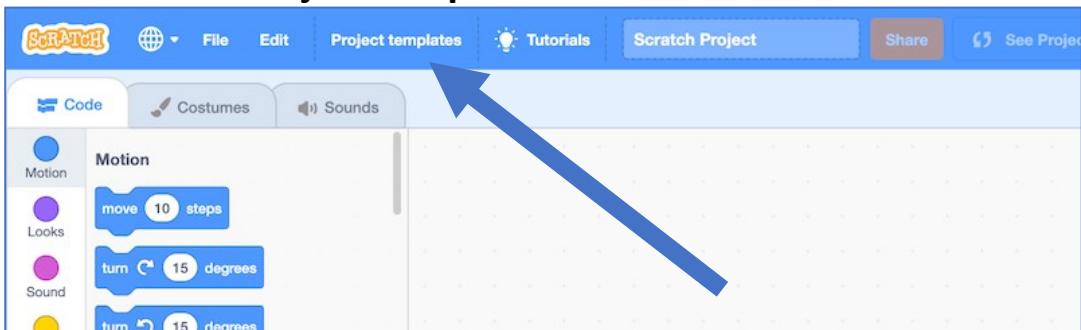
6. Click “Scratch 3”



## 7. Click “Scratch by itself”

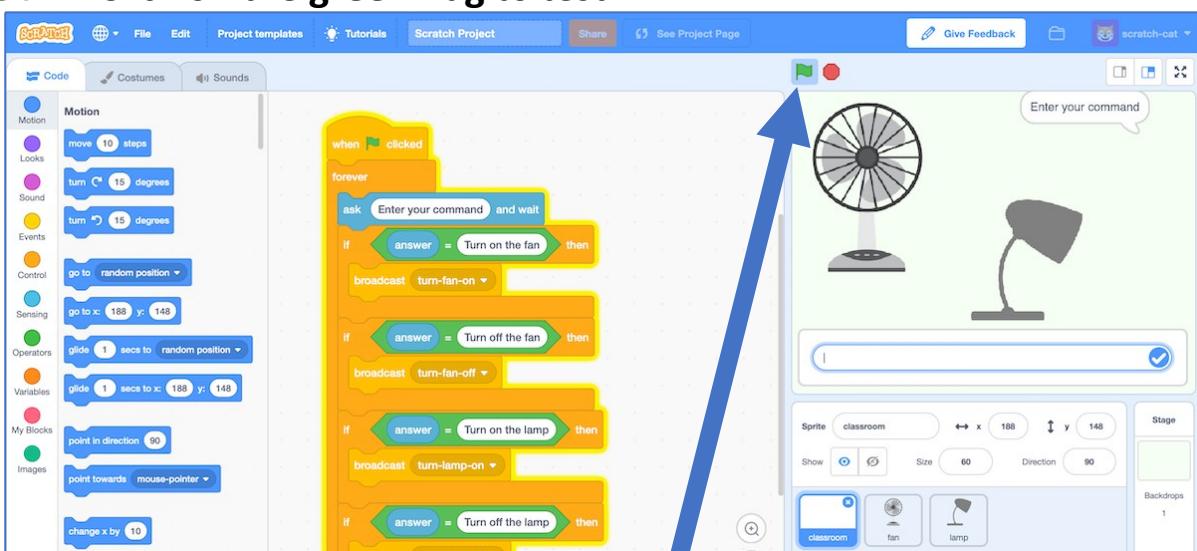


## 8. Click on Project templates



## 9. Click on the Smart Classroom (easy) template

## 10. Click on the green flag to test.

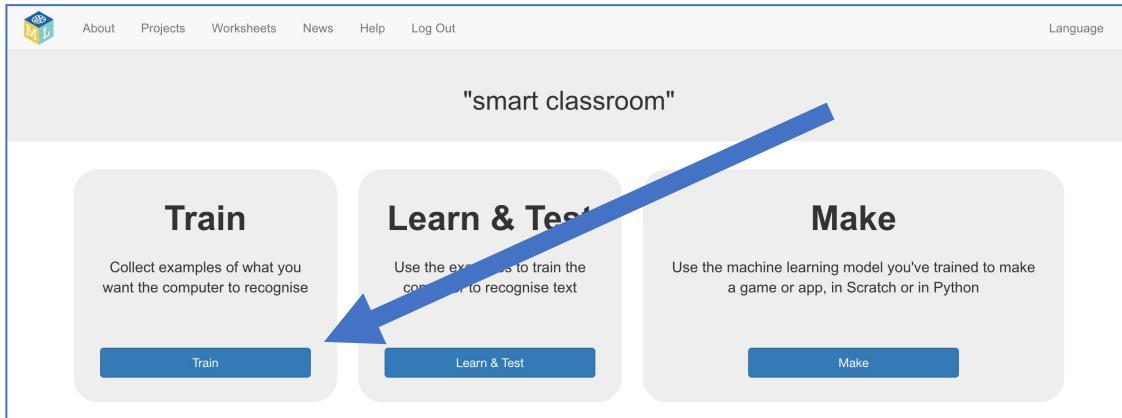


## 11. Type in a message and watch it react!

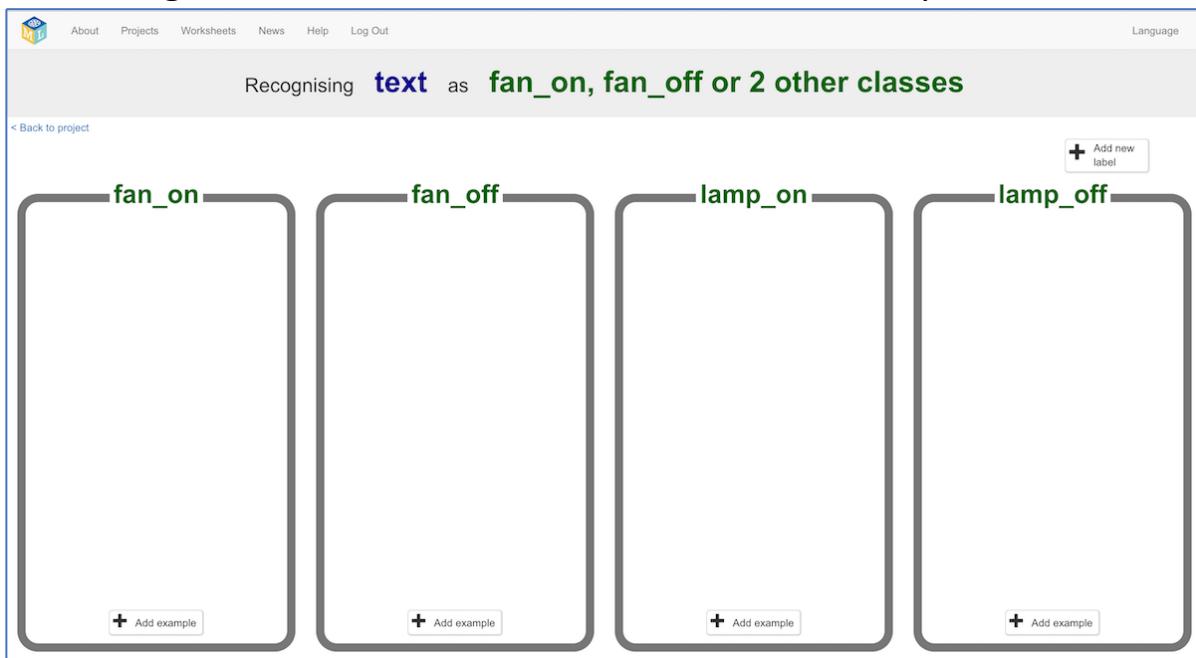
Try “Turn on the lamp”, “Turn off the lamp”, “Turn on the fan”, and “Turn off the fan”. They should all work.

Type anything else, and nothing will happen!

- 12.** Close the Scratch window and go back to the Training tool.
- 13.** Click on the “< Back to project” link.
- 14.** We need to collect some examples to train the computer.  
*Click the **Train** button.*



- 15.** 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”.



- 16.** Click on the “Add example” for the four labels and put the following examples:

The screenshot shows a web application for collecting text examples. At the top, it says "Recognising text as fan\_on, fan\_off or 2 other classes". Below this are four sections: "fan\_on", "fan\_off", "lamp\_on", and "lamp\_off". Each section contains a list of text examples and a "+ Add example" button. The numbers 11, 12, 12, and 11 are circled next to the "+ Add example" buttons for each section respectively.

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

- 18.** Click on the “Train new machine learning model” button.

The screenshot shows a "Machine learning models" page. It has two main sections: "What have you done?" and "What's next?". The "What have you done?" section contains text about collected examples and a list of items. 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 have you done?" section towards the "Train new machine learning model" button.

- 19.** Wait for the training to complete. This might take a minute or two.

The screenshot shows the ScratchML interface for training a machine learning model. The top navigation bar includes links for About, Projects, Worksheets, News, Help, Log Out, and Language. The main title is "Machine learning models". Below it, a link says "< Back to project".

**What have you done?**

You have trained a machine learning model to recognise when text is fan\_on, fan\_off or 2 other classes.

You created the model on Saturday, April 13, 2019 9:44 PM.

You have collected:

- 11 examples of fan\_on,
- 12 examples of fan\_off,
- 12 examples of lamp\_on,
- 11 examples of lamp\_off

**What's next?**

Try testing the machine learning model below. Enter some example of text below, that you didn't include in the examples you used to train it. It will tell you what it recognises it as, and how confident it is in that.

If the computer seems to have learned to recognise things correctly, then you can go to Scratch and use what the computer has learned to make a game!

If the computer is getting too many things wrong, you might want to go back to the Train page and collect some more examples.

Once you've done that, click on the button below to train a new machine learning model and see what difference the extra examples will make!

Try putting in some text to see how it is recognised based on your training.

enter a test text here  Test

A large blue arrow points from the text "Test it with examples that you haven't shown the computer before." to the "Test" button in the input field.

**20.** Once the training has completed, a Test box will be displayed. 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.*

## What have you done so far?

You've started to train a computer to recognise commands to control two classroom devices.

Instead of writing rules to do this, you are doing it by collecting examples. These examples are being used to train a machine learning “model”.

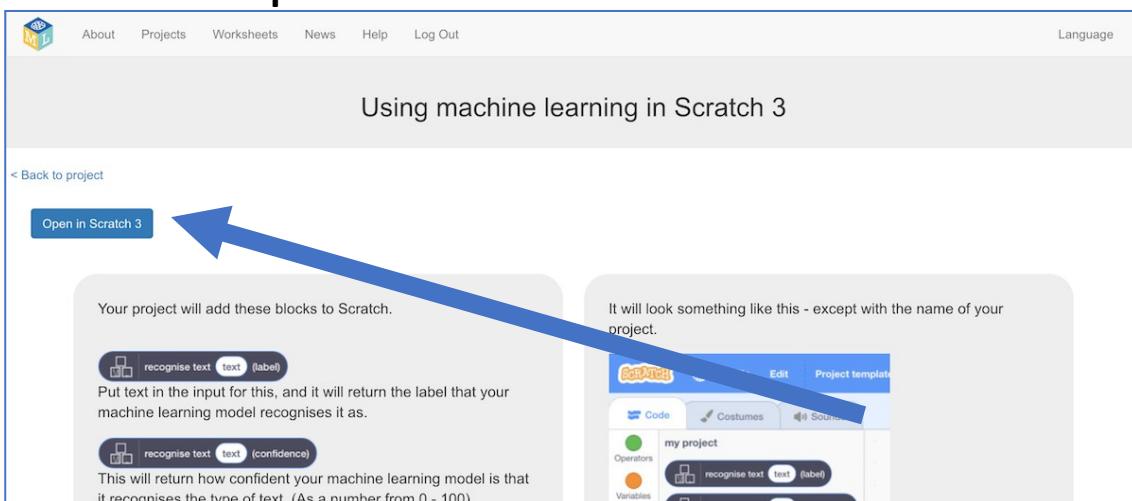
The computer will learn from patterns in the examples you've given it, such as the choice of words, and the way sentences are structured. These will be used to be able to recognise commands.

**21.** Click on the “< Back to project”

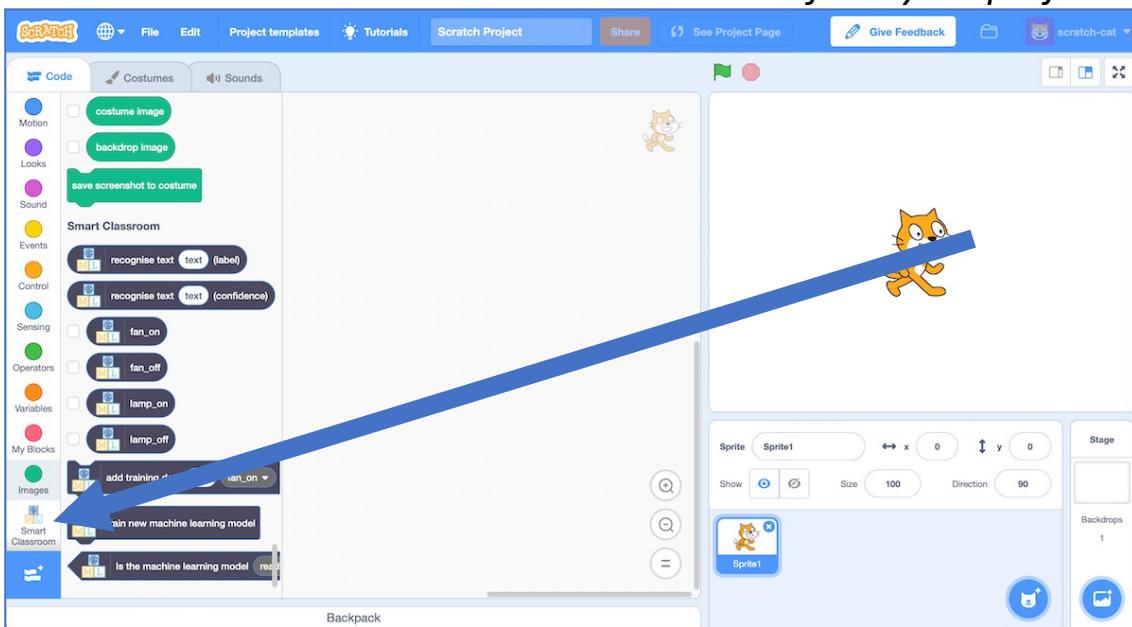
**22.** Click on **Make**

**23.** Click on **Scratch 3**

**24.** Click on **Open in Scratch 3**



**25.** You should see new blocks in the toolbox from your project.

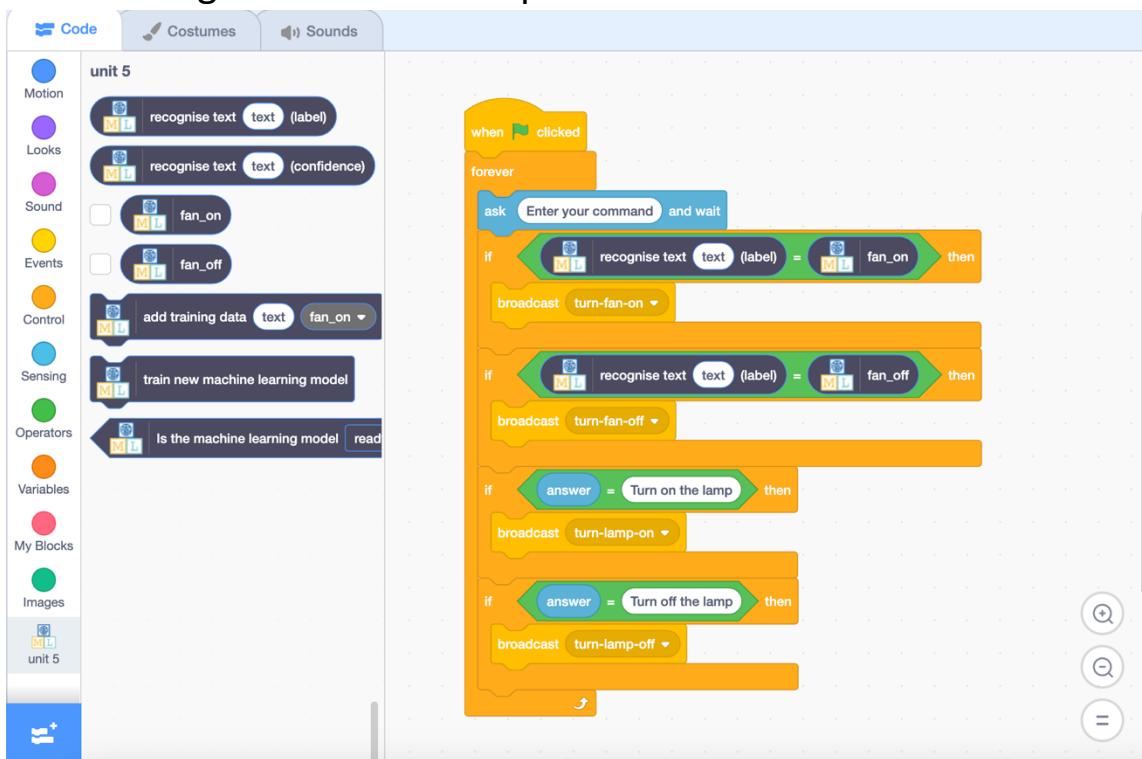


**26.** Load the same starter Scratch project you opened before.

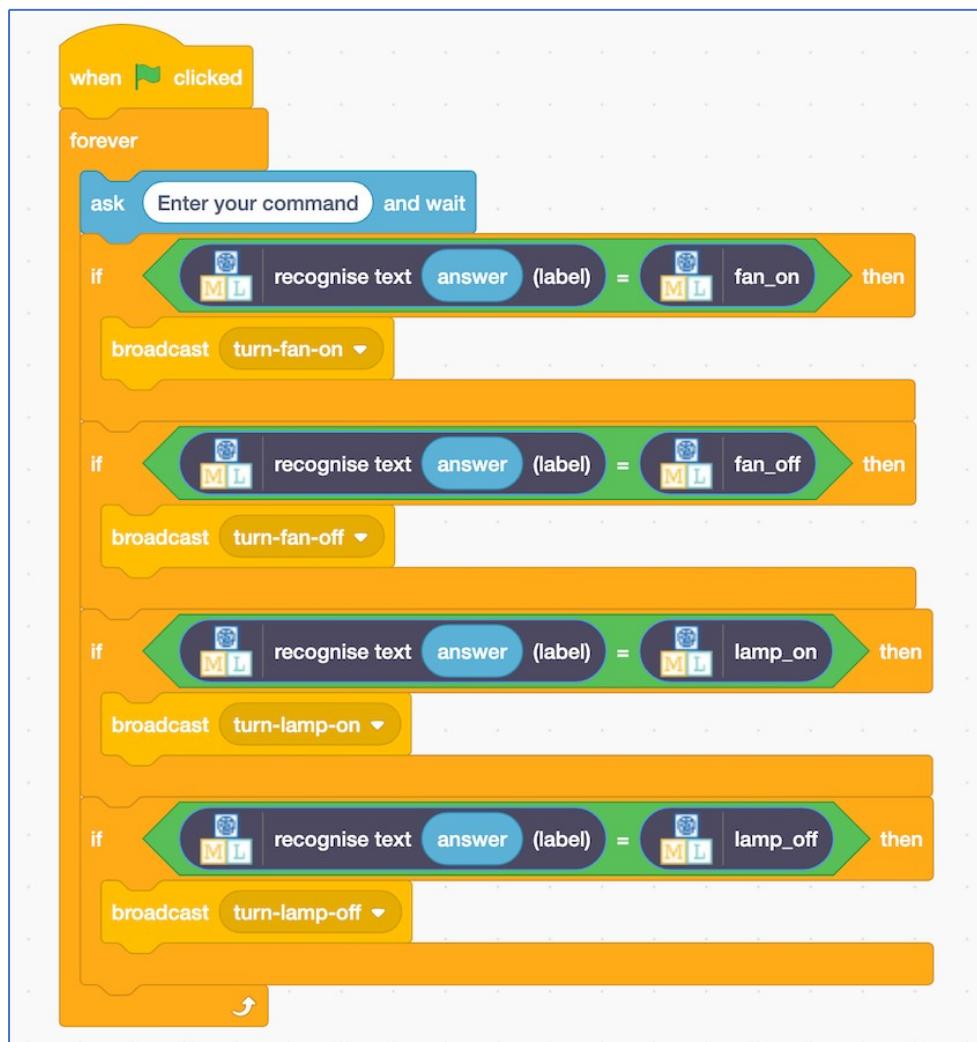
**Click on *Project templates***

**Click on *Smart Classroom (easy)***

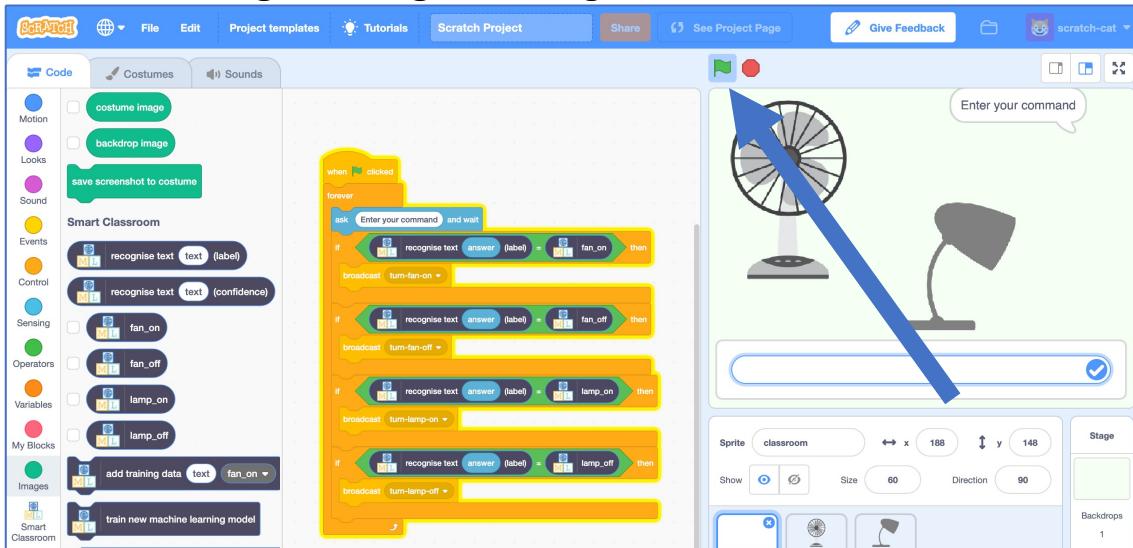
27. Click on “Unit 5” and drag and drop the rules from your machine learning model to the script.



28. Your script should look like this after you finish



## 29. Click the green flag to test again.



## 30. Test your project

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 so far?

You've modified your Scratch smart classroom assistant to use machine learning instead of your earlier rules-based approach.

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.

- 31.** Leave Scratch open (we'll come back in a moment) but go back to the **Learn & Test** page in the Training tool. Type something in the Test box that has nothing to do with lamps or fans. *For example, “make me a cheese sandwich”*

< Back to project

**What have you done?**

You have trained a machine learning model to recognise when text is fan\_on, fan\_off or 2 other classes.

You created the model on Saturday, April 13, 2019 9:44 PM.

You have collected:

- 11 examples of fan\_on,
- 12 examples of fan\_off,
- 12 examples of lamp\_on,
- 11 examples of lamp\_off

**What's next?**

Try testing the machine learning model below. Enter an example of text below, that you didn't include in the examples you used to train it. It will tell you what it recognises it as, and how confident it is in that.

If the computer seems to have learned to recognise things correctly, then you can go to Scratch and use what the computer has learned to make a game!

If the computer is getting too many things wrong, you might want to go back to the [Train](#) page and collect some more examples

Once you've done that, click on the button below to train the machine learning model and see what difference extra examples will make!

Try putting in some text to see how it is recognised based on your training.

make me a cheese sandwich

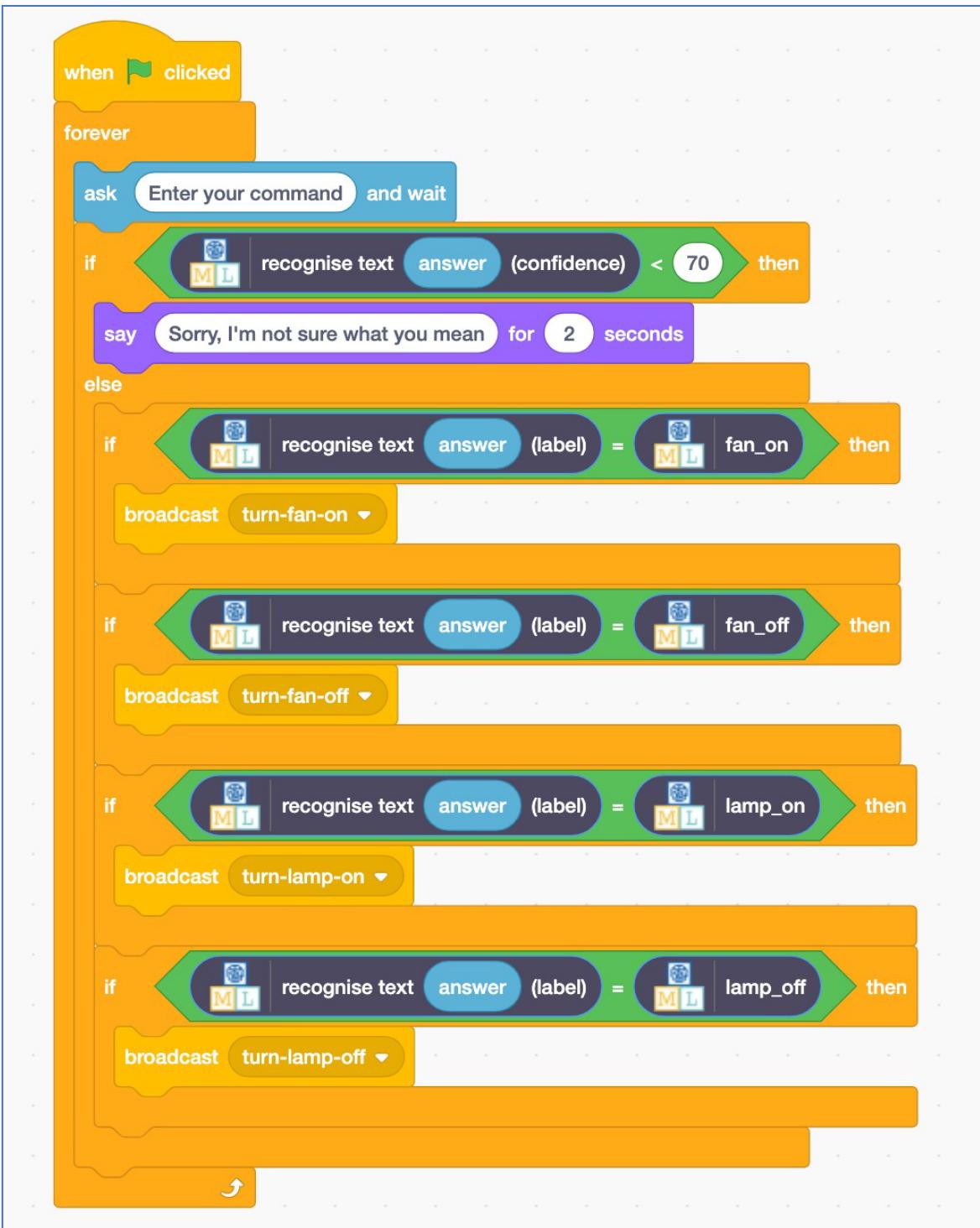
Test

Recognised as lamp\_off  
with 21% confidence

- 32.** Look at the confidence score, and check that it's very low. Compare this with the score you get from commands like “turn on the lamp”. *This is the computer’s way of telling you that it’s not very certain it understands your command, because it doesn’t look like what it learned from your examples.*

- 33.** Go back to Scratch.  
*You can open your saved project from before if you closed the window.*

**34.** Modify the script for the “classroom” sprite so that it uses this confidence score.



**35.** Click the green flag and test again

*Try typing commands that have nothing to do with the fan or lamp.*

*Try asking for something to be turned on or off.*

*Check that your classroom reacts in the right way.*

## What have you done?

You've trained a smart assistant – like a simple version of the 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).

You've used it to create a smart classroom assistant in Scratch, using machine learning instead of your earlier rules-based approach.

Training the computer to be able to recognise instructions was hopefully much easier than trying to make a list of every possible command. And the more examples you give it, the better it gets at recognising instructions and the more confident it gets in doing that.

And now, if it's not sure what you mean, it will ask you to try again.