

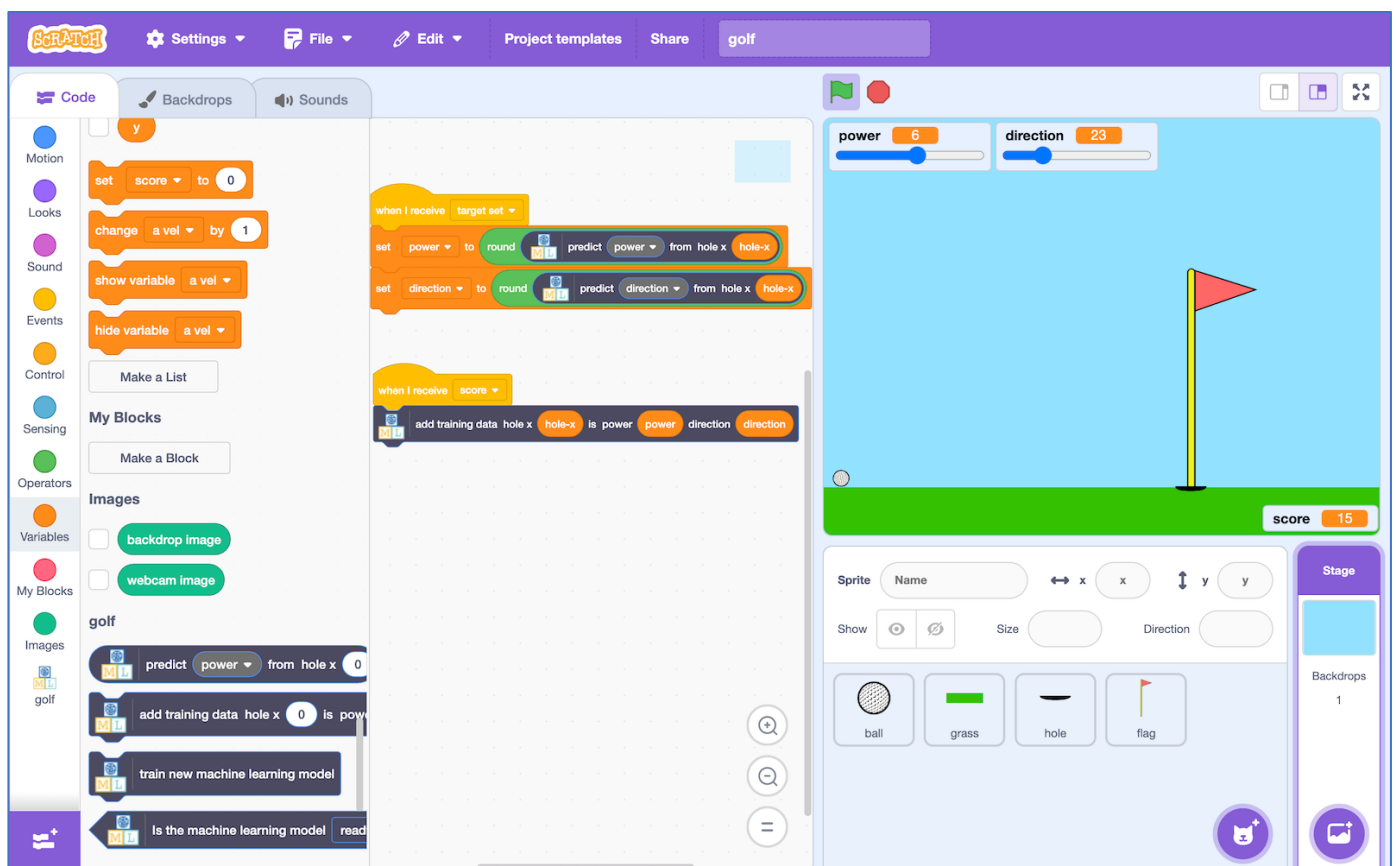


# Golf

In this project you will train a computer to play a simple arcade game.

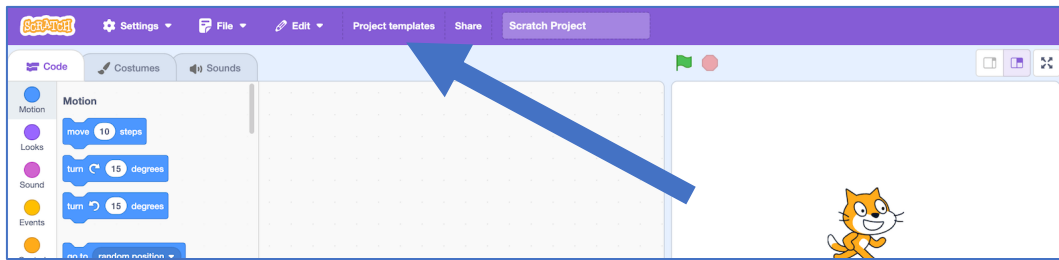
The game is based on golf putting.

You will teach the computer to be able to play this game by collecting examples of shots that score, so that it can learn to make predictions about the shot it should take.

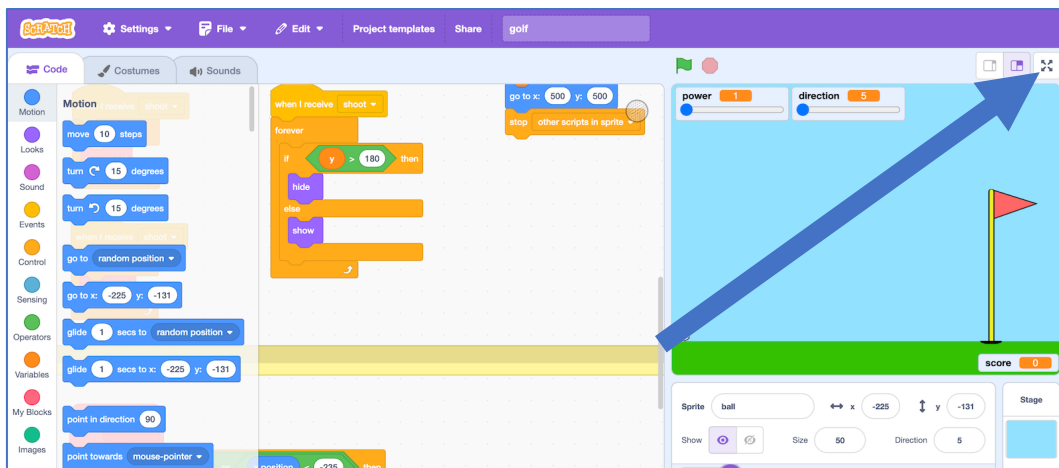


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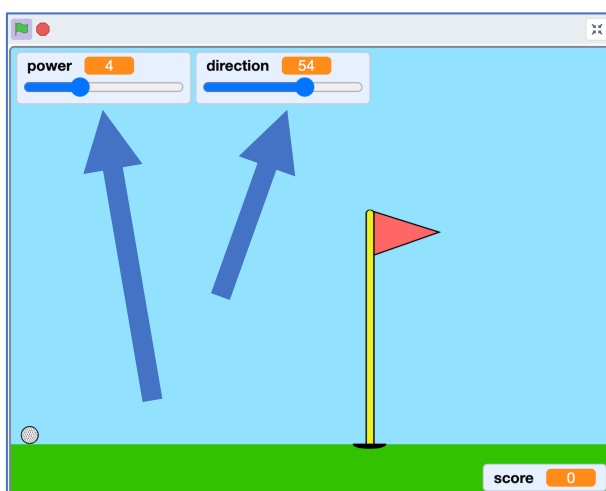
1. Go to <https://machinelearningforkids.co.uk/scratch>
2. Click on “Project templates”



3. Click on the “Golf” template
4. Click on the **full-screen** button



5. Click the **Green Flag** to move the hole to a new random location
6. Use the **power** and **direction** variable sliders to decide how you want to shoot the ball



7. When you are ready, press **S** to shoot
8. To try again and improve on your shot, press **R** to reset  
*This will put the ball back at the starting location, and let you change your decision about the power and direction*
9. When you think you've got it right, press **S** to shoot again  
*Did you score? If not, go to step 8 and try again until you get it in the hole*
10. Click on the **Green Flag** to try again with the hole in a new location  
*Remember:*

|                   |  |
|-------------------|--|
| <b>Green Flag</b> | Starts again, with the hole in a new location                      |
| <b>S</b>          | <b>Shoot</b> the ball  |
| <b>R</b>          | <b>Reset</b> with the ball in the same place, so you can try again |

## What have you done so far?

You played a game in Scratch. Each time you play, the hole appears at a random location. The aim of the game is to shoot the ball into the hole.

In this project, you are going to get the computer to predict what angle it should shoot at, and the power to use, based on the location of the hole.

You could do this by writing code to calculate the correct angle and power to launch at, based on the location. (If you have time, give this a try to compare!)

But, for this project, you're going to train the computer so that it learns for itself how to putt the ball.

You'll collect examples of the game being played and use that to train a machine learning "model" that can predict the correct angle to shoot the ball at.

11. Go to <https://machinelearningforkids.co.uk> in a web browser
12. Click on “Get started”
13. Click on “Try it now”
14. Click the “+ Add a new project” button.
15. Name your project “golf”. Set it to learn to **predict numbers**.

Start a new machine learning project

Project Name \*  
golf

Project Type \*  
predicting numbers

Storage \*  
In your web browser

What do you want to teach the computer to do?  
To recognise words, sentences or paragraphs, choose "recognising text"  
To recognise photos, diagrams or pictures, choose "recognising images"  
To recognise sets of numbers or multiple choices, choose "recognising numbers"  
To recognise voices or sounds, choose "recognising sounds"  
To predict numbers, choose "predicting numbers"  
To generate new text with a language model, choose "generating text"

CREATE CANCEL

16. Click on “Create”
17. “golf” will be added to your list of projects. Click on it.
18. Click the “Train” button

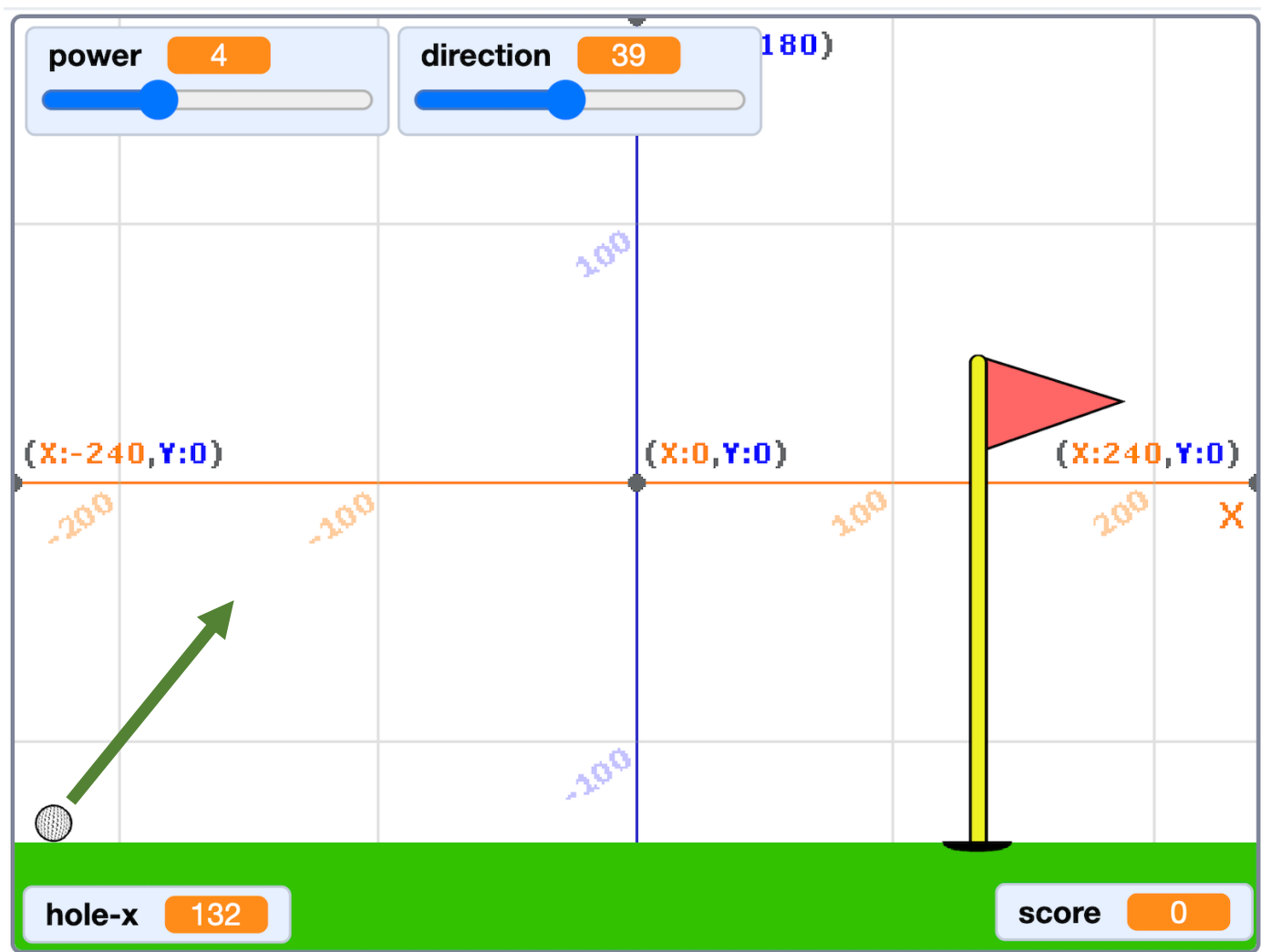
"golf"

**Train**  
Collect examples of what you want the computer to predict  
Train

**Learn & Test**  
Use the examples to train the computer to make predictions  
Learn & Test

**Make**  
Use the machine learning model you've trained to make a game or app in Scratch  
Make

The values that you will be using in this project are:



(input) Value the computer will use to make a prediction:

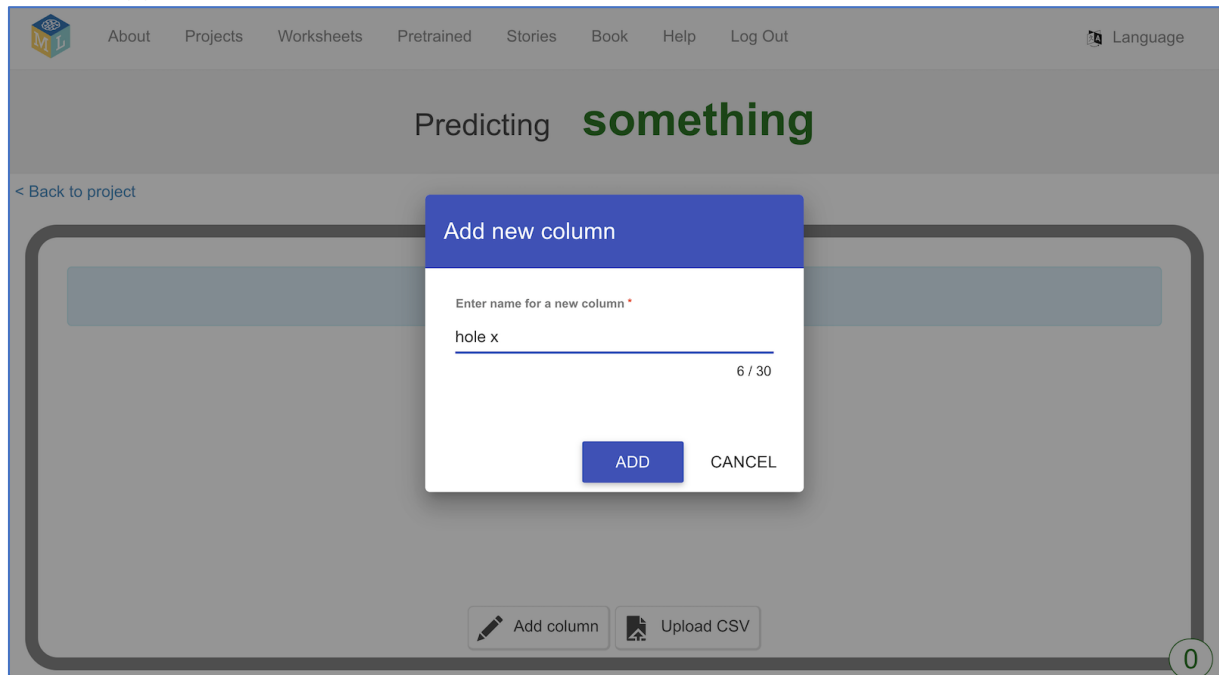
| Name   | What is it?                              | A positive number means...                 | A negative number means...                | Example in screenshot |
|--------|--|--|---|-----------------------|
| hole x | x-coordinate of the location of the hole | The hole is on the right side of the stage | The hole is on the left side of the stage | 132                   |

(outputs) Values the computer will learn to predict:

| Name      | What is it?            |                                      |   | Example in screenshot |
|-----------|------------------------|--------------------------------------|---|-----------------------|
| power     | speed to fire the ball | 1 means the ball will be very slow   | 10 means the ball will be very fast             | 4                     |
| direction | angle to fire the ball | 0 means the ball will go directly up | 90 means the ball will go directly to the right | 39                    |

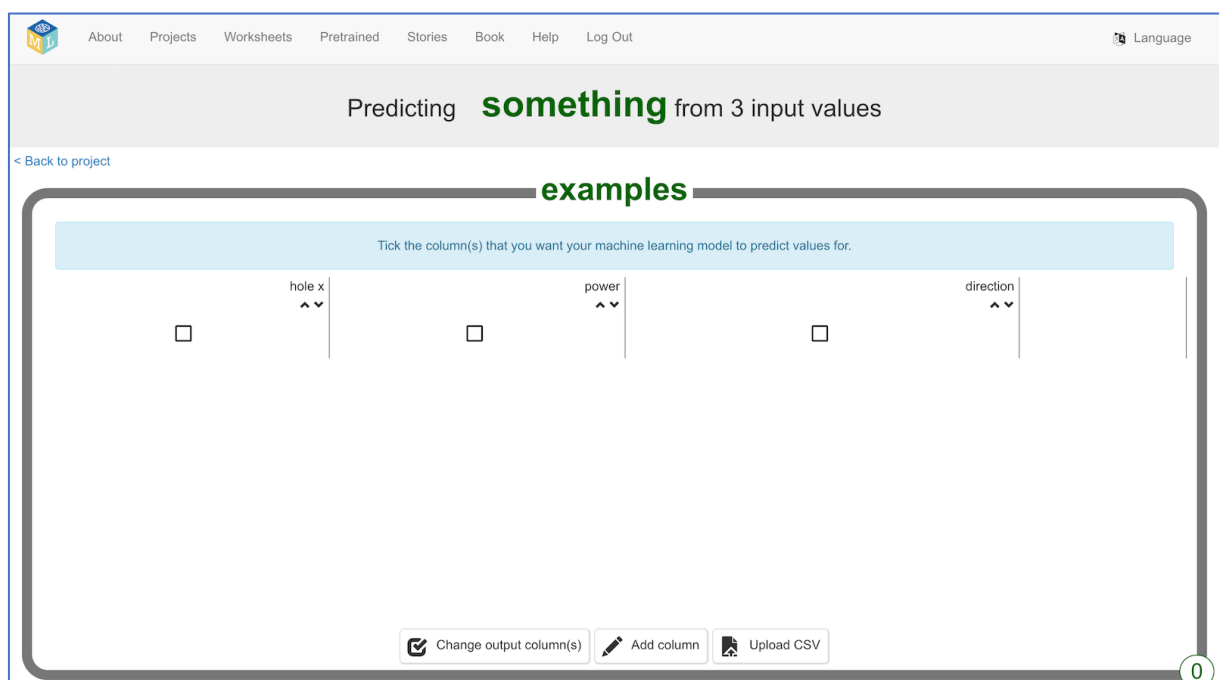
19. Click on **“Add column”**

20. Type **“hole x”** and click **“Add”**



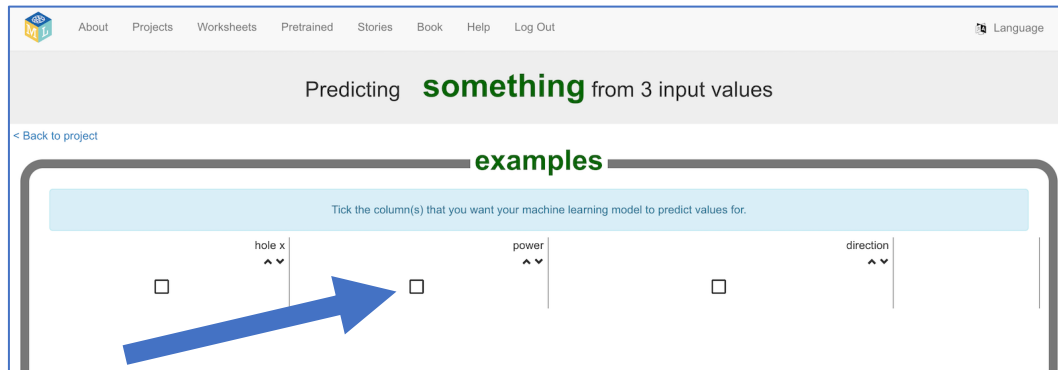
21. Click on **“Add column”**, type **“power”**, and click **“Add”**

22. Click on **“Add column”**, type **“direction”**, and click **“Add”**



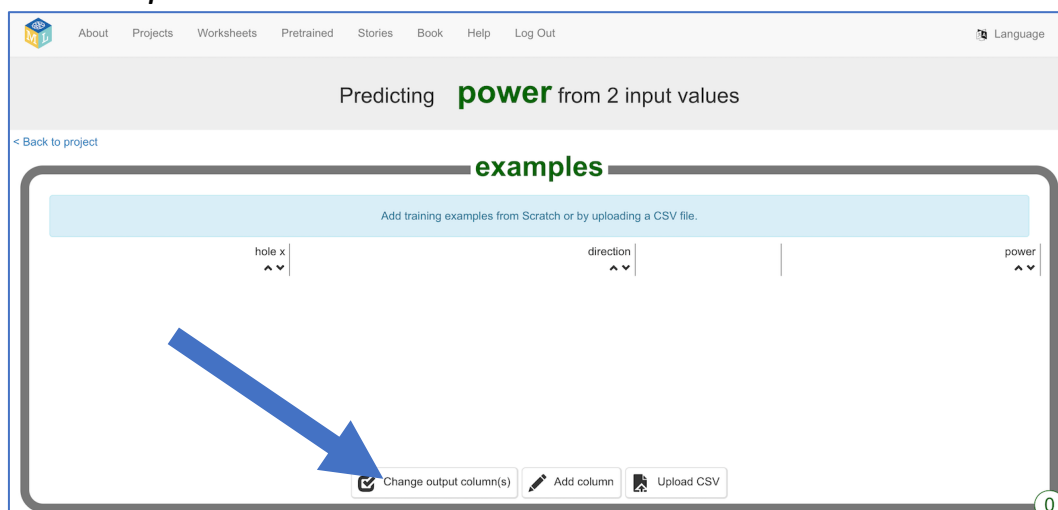
### 23. Click the tick box under “power”

*This is to choose that the “power” value is one of the values that you want the computer to learn to predict*



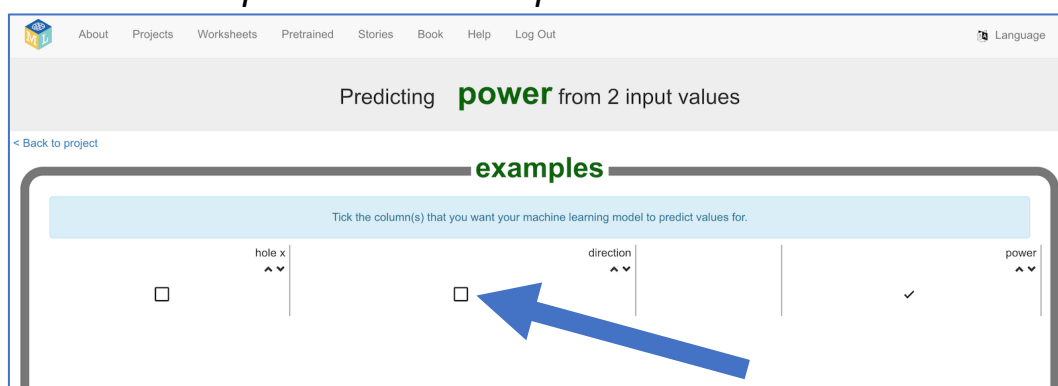
### 24. Click the **Change output columns** button

*This is to let you add another value to the ones you want the computer to learn to predict*



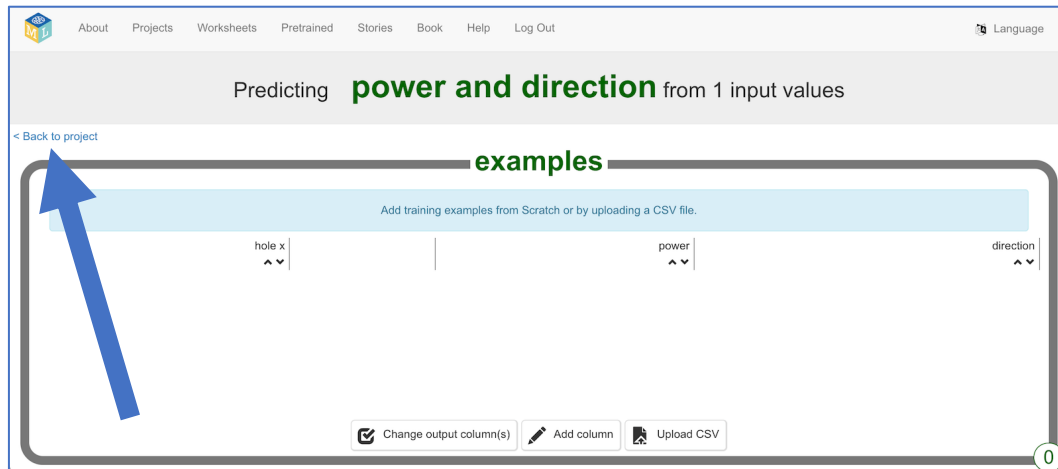
### 25. Click the tick box under “direction”

*This is to choose that the “direction” value is the other value that you want the computer to learn to predict*



## 26. Click “Back to project”

*Check your project looks like the screenshot before you continue.  
The title should say that your project will be predicting **power and direction** from 1 input value.*



## 27. Click the “Make” button

## 28. Click on “Scratch 3”

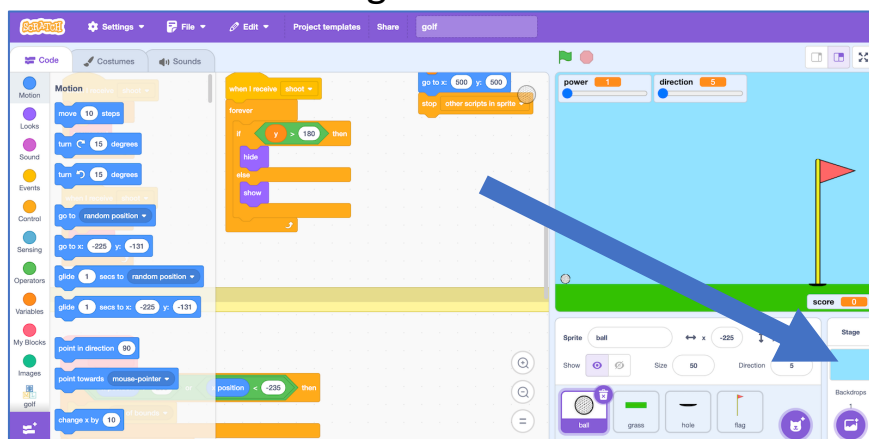
## 29. Click the “straight into Scratch” button

*The page will warn that you don’t have a machine learning model. You will use Scratch to collect training examples to train a model.*

## 30. In the Scratch window that opens, click on “Project templates”

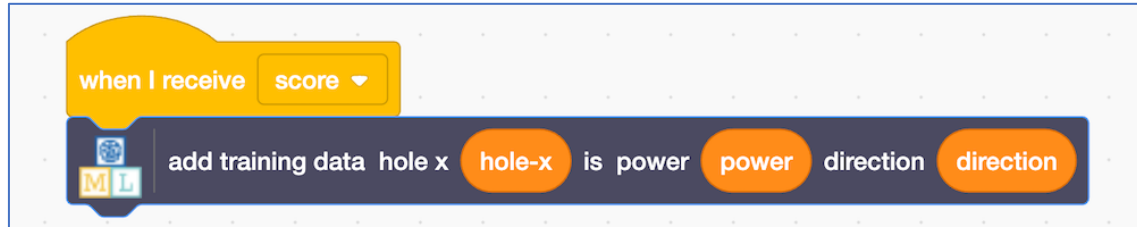
## 31. Open the “Golf” template again

## 32. Click on the Stage





- 33.** Add the following code to the Stage
- This means every time you putt the ball, the decision you made for power and decision will be added to your training data.*
- The computer will learn from all of the good shots you take.*
- Make sure you use the correct variables as shown below.*



- 34.** Click on the **full-screen** button

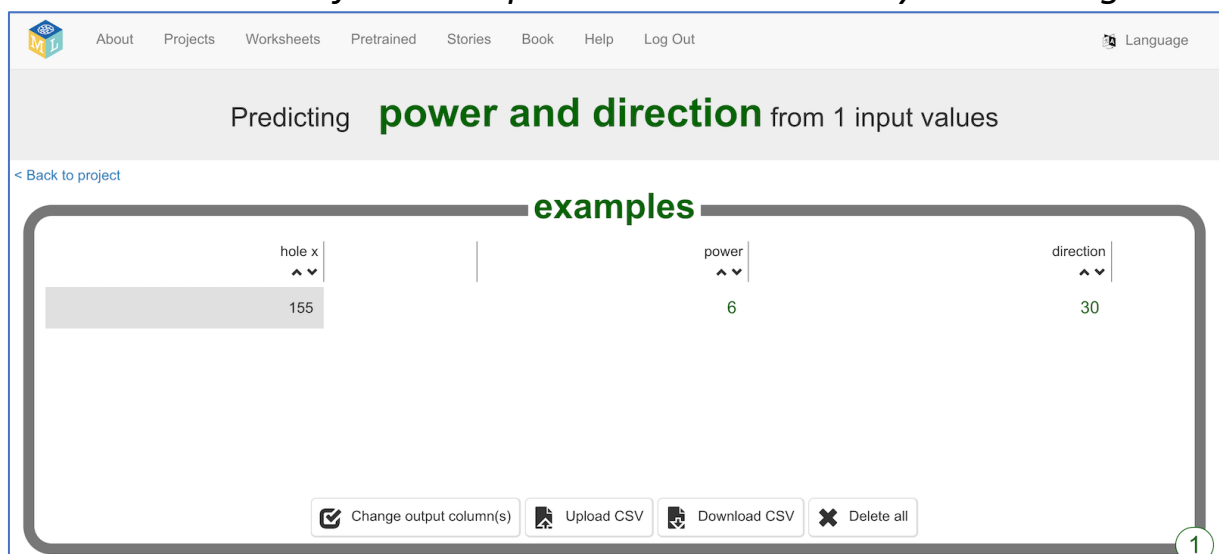
- 35.** Click on the **Green Flag**

- 36.** Play the game until you putt the ball

*Remember:*

|                   |  |
|-------------------|--|
| <b>Green Flag</b> | Starts again, with the hole in a new location                      |
| <b>S</b>          | <b>Shoot</b> the ball  |
| <b>R</b>          | <b>Reset</b> with the ball in the same place, so you can try again |

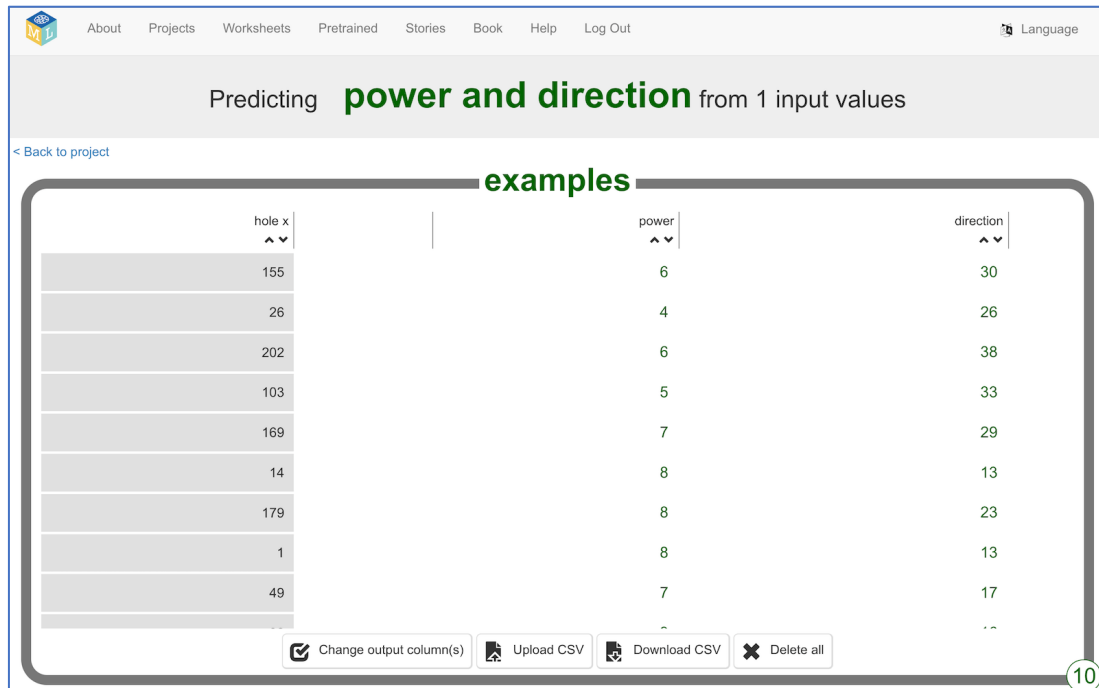
- 37.** In the training window, go back to the “**Train**” page
- You should see the first example has been added to your training data*



**38.** Go back to the Scratch window, and click on the **Green Flag** again

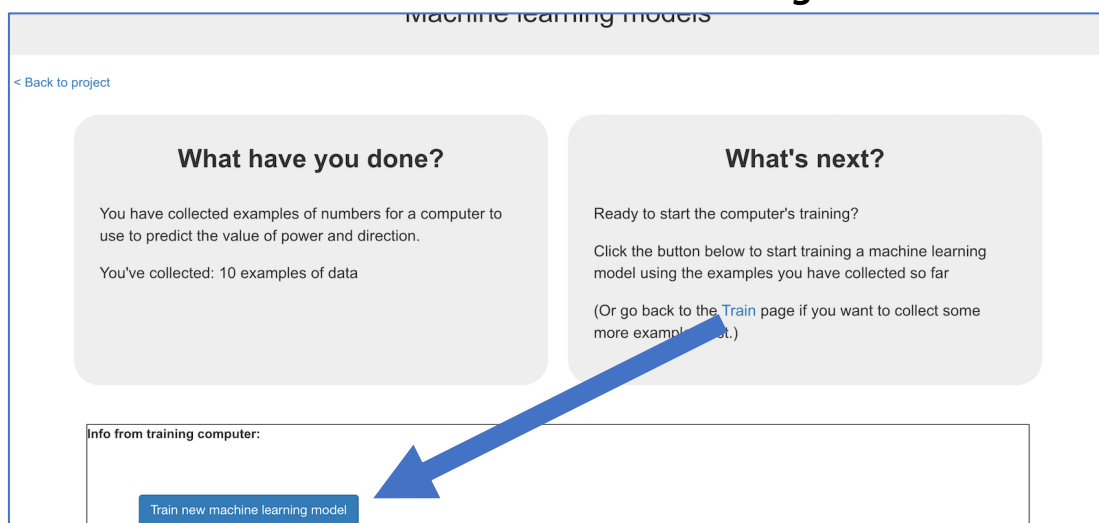
**39.** Repeat this to collect more training examples  
*The more examples you collect, the better your machine learning model should perform. Try to collect **at least ten** examples.*

**40.** Go back to the training window and refresh the Train page to review the examples you have collected



| hole x | power | direction |
|--------|-------|-----------|
| 155    | 6     | 30        |
| 26     | 4     | 26        |
| 202    | 6     | 38        |
| 103    | 5     | 33        |
| 169    | 7     | 29        |
| 14     | 8     | 13        |
| 179    | 8     | 23        |
| 1      | 8     | 13        |
| 49     | 7     | 17        |
|        |       |           |

**41.** Train a machine learning model using your examples  
*Click on “**Back to project**”, then click the “**Learn & Test**” button. Then click on the “**Train new machine learning model**” button*



**What have you done?**

You have collected examples of numbers for a computer to use to predict the value of power and direction.

You've collected: 10 examples of data

**What's next?**

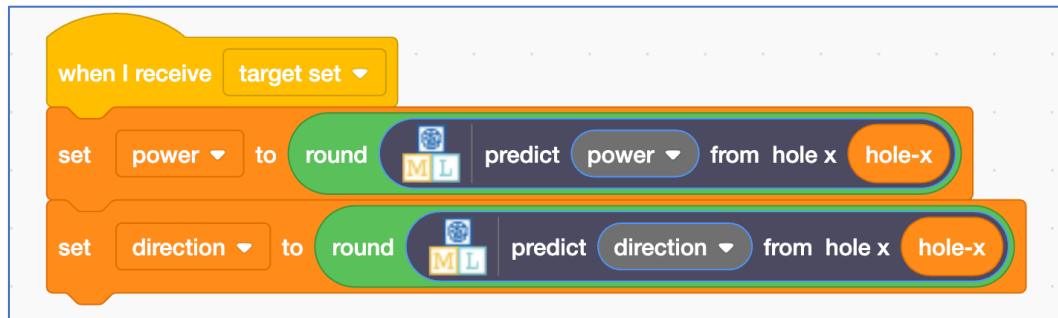
Ready to start the computer's training?

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.)

**Train new machine learning model**

- 42.** In the Scratch window, return to the Code for the Stage and add this  
*You will need to exit full-screen mode to modify your code.*  
*This means that the power and direction will be set for you using the prediction from your machine learning model*



- 43.** Click on the **full-screen** button to go back into full-screen mode

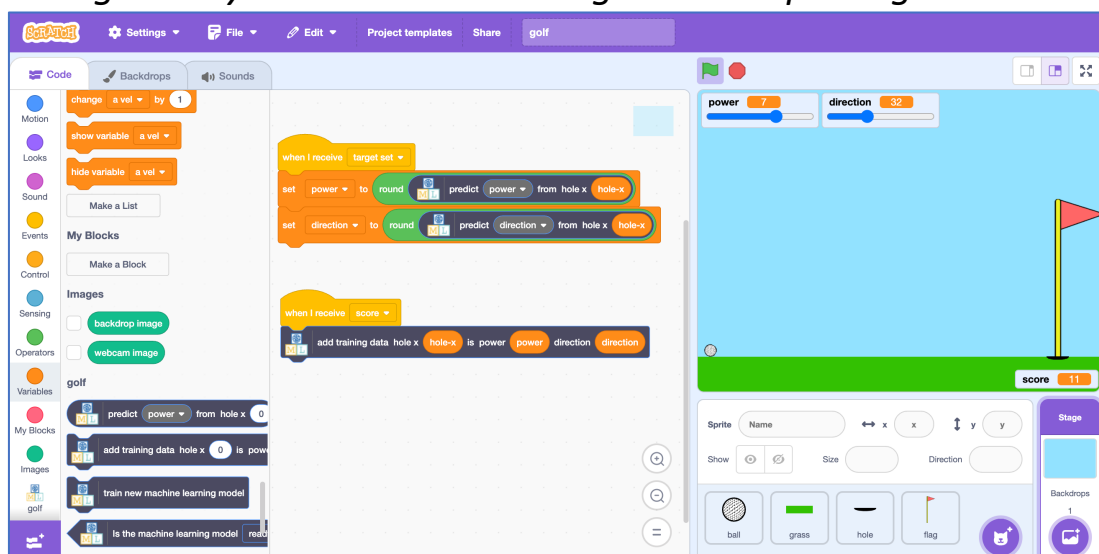
- 44.** Click on the **Green Flag**

- 45.** Try playing the game with help from your machine learning model  
*Remember:*

|                   |  |
|-------------------|--|
| <b>Green Flag</b> | Starts again, with the hole in a new location                      |
| <b>S</b>          | <b>Shoot</b> the ball  |
| <b>R</b>          | <b>Reset</b> with the ball in the same place, so you can try again |

*If the machine learning model doesn't putt the ball,  
 press **R**, change the values to what you think is right, then  
 press **S** to shoot again.*

*How good is your machine learning model at putting the ball?*



## What have you done so far?

You've trained a computer to play a game. Instead of working out the equation to fire the ball, you did it by collecting examples. These examples were used to train a machine learning model.

The computer learned from patterns in the examples. It used these to make predictions. The more examples it had to learn from, the better it will probably be.

**46.** You can go back to the **Learn & Test** page and click the **Train new machine learning model** button again  
*You still have the “add training data” blocks in your code, so you were collecting more training examples while you were testing your project. Training a new model now will hopefully be better at playing the game because it has more examples to learn from.*

**47.** Go back to the Scratch window and play again with help from your machine learning model  
*Have the recommendations improved?*

## Is this a good use of machine learning?

We use machine learning when we want computers to do things that would be complicated for us to write instructions for it to follow.

We avoid machine learning if the time it takes to collect training examples would be longer than just writing the instructions for how to do the task.

Compare the effort to collect the training examples to train the computer to play this game, with the effort it would've taken you to calculate the angle to fire at. Do you think this game is a good use of machine learning?

In this project, you were always in control of the shot that was taken. The machine learning model didn't replace you, but it was available to help you with recommendations. Do you think it's safer to use machine learning like this?

## 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?

### **Import examples from other players**

Training examples can be downloaded to a CSV file.

Sharing training examples with others can help a machine learning model to learn from the experiences of many players.