

Journey to school

In this project you will train the computer to look for patterns in how your classmates get to school.

You'll test this training by getting the computer to predict how different people travel to school.

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Recognising **numbers** as **car, walk or cycle**

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age 6
distance 2
friends 1

age 10
distance 2.7
friends 0

age 6
distance 2.5
friends 0

age 8
distance 5
friends 4

age 6
distance 5
friends 4

age 8
distance 2.6
friends 1

age 8
distance 1.5
friends 4

age 5
distance 2.8
friends 1

age 6
distance 1.5
friends 0

age 7
distance 3
friends 1

age 6
distance 3
friends 1

age 14
distance 5
friends 1

age 15
distance 5
friends 1

+ Add example

age 12
distance 0.9
friends 4

age 13
distance 1
friends 0

age 12
distance 0.8
friends 3

age 9
distance 0.5
friends 1

age 10
distance 1.1
friends 2

age 12
distance 1
friends 3

age 15
distance 1.5
friends 0

age 12
distance 1.2
friends 3

age 10
distance 0.1
friends 6

age 11
distance 1.1
friends 4

age 13
distance 0.5
friends 5

age 9
distance 0.1
friends 0

age 13
distance 0.3
friends 5

age 15
distance 0.3
friends 3

age 12
distance 0.8
friends 4

+ Add example

age 12
distance 0.2
friends 8

age 10
distance 2
friends 1

age 11
distance 0.8
friends 1

age 10
distance 1.1
friends 0

age 13
distance 1
friends 1

+ Add example

+ Add new label

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1. For this project, you will need to do a survey with your classmates. The more people you can ask, the better!

2. Write 2 or 3 questions you could ask your classmates that could affect how they travel to school. You need questions that they can answer with a number.

For the rest of this worksheet, we'll use:

** Age (in years)*

** Distance (miles from home to school)*

** Number of siblings or school friends who live nearby*

But you can choose your own values. Make sure that they are numbers, and pick things that could possibly have something to do with their journey to school.

3. Draw up a table to collect the results, and then go do your survey. Remember to ask how they travel to school as well as your questions. The more children you ask, the better. If you can ask children from different classes and years, even better.

| Age | Distance | Nearby Siblings & Friends | Most common method to get to school (car / walk / cycle) |
|-----|----------|---------------------------------|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

4. Once you've collected answers from as many children as possible, it's time to use this to train the computer.

Go to <https://machinelearningforkids.co.uk/> in a web browser and click on **"Get started"**.

5. Click on **"Log In"** and type in your username and password. If you don't have a username, ask your teacher 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.

6. Click on **“Projects”** on the top menu bar
7. Click on the **“+ Add a new project”** button.
8. Name your project **“journey to school”** and set it to learn how to recognise **“numbers”**

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Start a new machine learning project

Project Name *
journey to school

Recognizing *
numbers

ADD A VALUE

Start to describe the values that you'll include with each example to train the computer with by clicking the 'Add a value' button.

CREATE CANCEL

9. Click **“Add a value”**, name it **“age”** and make the type **“number”**. Do this again for a **“number”** value called **“distance”**. Do it a third time for a **“number”** value called **“friends”**. Click **“Create”** when it looks like the picture below. *You should use the values you used in your survey, but don't include the actual journey to school method. We'll get to that next.*

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Start a new machine learning project

Project Name *
journey to school

Recognizing *
numbers

| Value 1 * | Type of value * |
|-----------|-----------------|
| age | number |

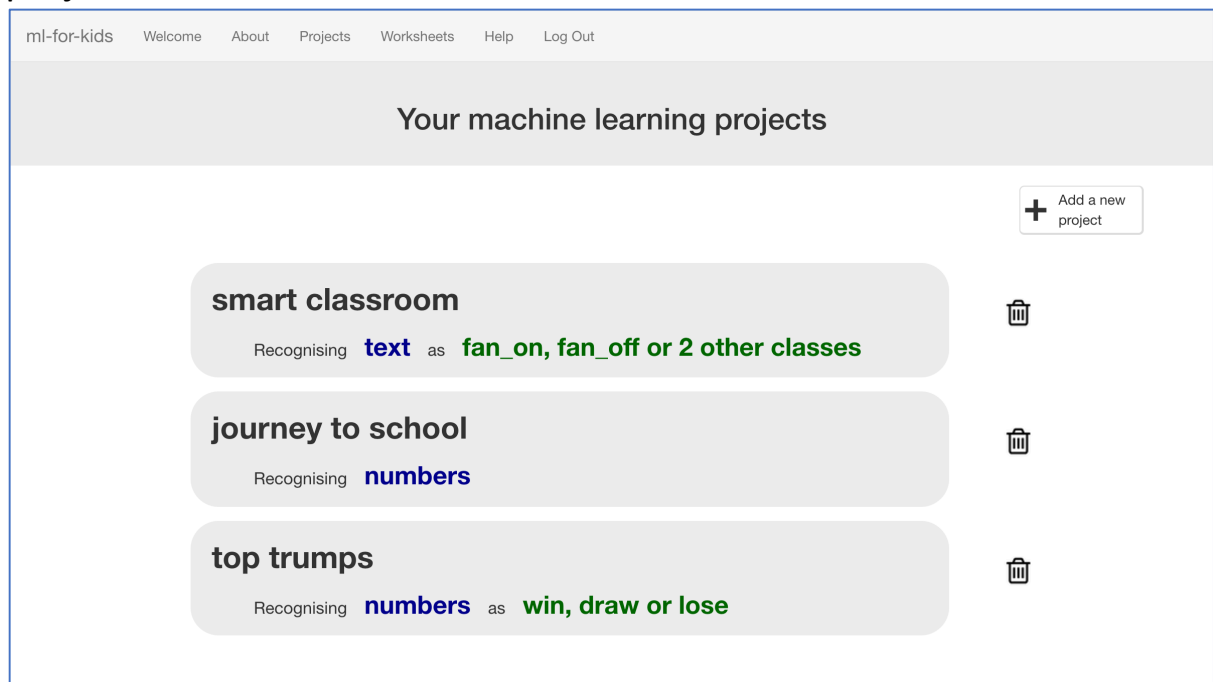
| Value 2 * | Type of value * |
|-----------|-----------------|
| distance | number |

| Value 3 * | Type of value * |
|-----------|-----------------|
| friends | number |

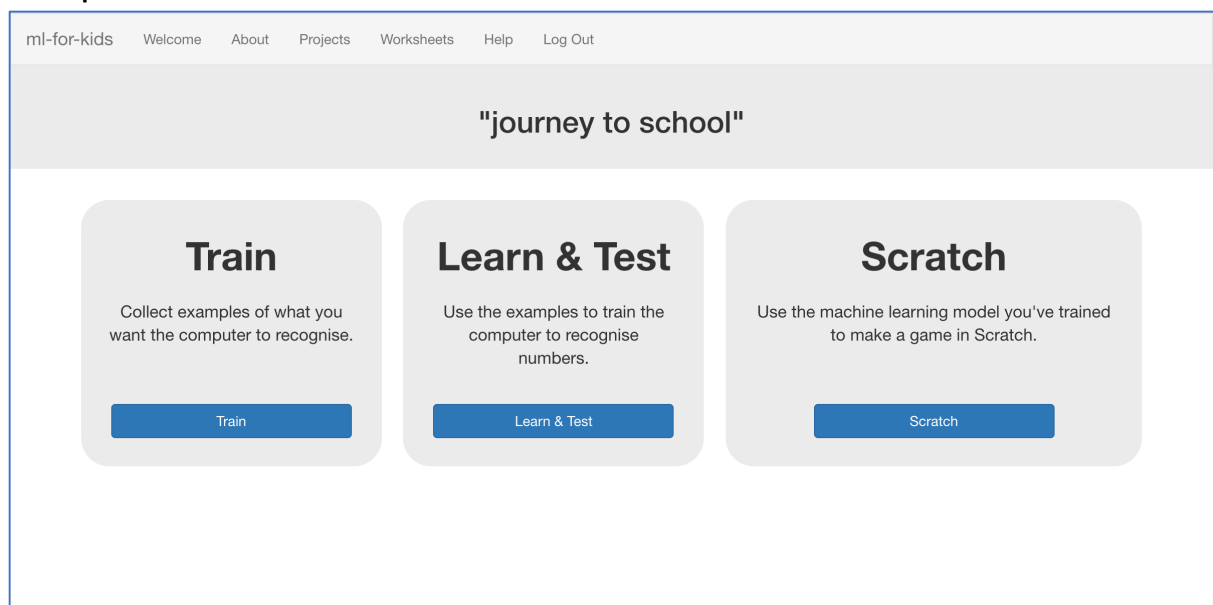
ADD ANOTHER VALUE

CREATE CANCEL

10. You should now see “journey to school” show up in the list of your projects. Click on it.



11. Click on the **Train** button to start giving your survey results to the computer.



- 12.** Click on **“Add new label”** and create a bucket called **“car”**. Do it again and create a bucket called **“walk”**. Do it again for **“cycle”**. *If you used different options in your survey, use those names instead.*

The screenshot shows the 'ml-for-kids' web interface. At the top, there's a navigation bar with links: 'ml-for-kids', 'Welcome', 'About', 'Projects', 'Worksheets', 'Help', and 'Log Out'. Below this, a header section says 'Recognising **numbers** as **car, walk or cycle**'. A '< Back to project' link is on the left. On the right, there's a '+ Add new label' button. The main area contains three large, empty rectangular buckets. The first bucket is labeled 'car' in green at the top. The second is labeled 'walk' in green at the top. The third is labeled 'cycle' in green at the top. Each bucket has a '+ Add example' button at the bottom.

- 13.** Click on the **“Add example”** button in the **“car”** bucket and then type in the first survey result for someone who travels by car.

This screenshot shows the same interface as the previous one, but with the 'Add new example' modal open for the 'car' bucket. The modal has a blue header 'Add new example' and a white body. Inside the body, it says 'Enter an example of 'car'' followed by three input fields: 'age' with the value '5', 'distance' with the value '2.8', and 'friends' with the value '1'. At the bottom of the modal are two buttons: 'ADD' (in blue) and 'CANCEL' (in grey). The background interface is dimmed.

14. Keep going until you've entered all the survey results.

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Recognising **numbers** as **car, walk or cycle**

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car **walk** **cycle** [+ Add new label](#)

| car | | | walk | | | cycle | | |
|------------------------------------|----------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-----------------------------------|-------------------------------------|-------------------------------------|
| age 5 distance 2.8 friends 1 | age 7 distance 3 friends 1 | age 6 distance 2.5 friends 0 | age 9 distance 0.7 friends 6 | age 12 distance 0.9 friends 4 | age 9 distance 1.5 friends 4 | age 10 distance 2 friends 1 | age 12 distance 0.2 friends 8 | age 11 distance 0.8 friends 1 |
| age 8 distance 5 friends 4 | age 6 distance 5 friends 4 | age 8 distance 1.5 friends 4 | age 12 distance 0.8 friends 3 | age 9 distance 0.5 friends 1 | age 15 distance 1.5 friends 0 | | | |
| age 6 distance 1.5 friends 0 | age 6 distance 3 friends 1 | age 14 distance 5 friends 1 | age 10 distance 0.1 friends 6 | age 13 distance 0.5 friends 5 | age 9 distance 0.1 friends 0 | | | |
| age 15 distance 5 friends 1 | age 6 distance 2 friends 1 | age 10 distance 2.7 friends 0 | age 13 distance 0.3 friends 5 | age 15 distance 0.3 friends 3 | age 12 distance 0.8 friends 4 | | | |
| | | | age 5 distance 0.8 friends 4 | age 6 distance 0.5 friends 8 | age 13 distance 1 friends 0 | | | |
| + Add example | | | + Add example | | | + Add example | | |

15. Click on the “< Back to project” link, and this time click on **Learn & Test** to use your examples.

16. Click on the **Train new machine learning model** button *It should only take a few seconds to train.*

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Machine learning models

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What have you done?

You've collected examples of numbers for a computer to use to recognise when numbers is car, walk or cycle.

You've collected:

- 13 examples of car,
- 5 examples of cycle,
- 19 examples of walk

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've collected so far.

(Or go back to the Train page if you want to collect some more examples first.)

Info from training server:

[Train new machine learning model](#)

- 17.** Once training has finished, a Test box should appear.
Use this to test your model.
*Enter the values into the Test text boxes and press **Test***

The screenshot shows a web interface for training and testing a machine learning model. It is divided into two main sections: 'What have you done?' and 'What's next?'. The 'What have you done?' section contains text about training a model to recognize car, walk, or cycle based on age, distance, and friends. It lists collected examples: 24 for car, 6 for cycle, and 38 for walk. The 'What's next?' section explains how to test the model by entering new values and how to retrain it if needed. Below these sections is a 'Test' form with input fields for 'age' (9), 'distance' (1.1), and 'friends' (0). A 'Test' button is present. Below the button, it says 'Recognised as walk with 67% confidence'. A large blue arrow points from the 'Test' button to the recognition result.

What have you done?

You've trained a machine learning model to recognise when numbers is car, walk or cycle.

You created the model on .

You've collected:

- 24 examples of car,
- 6 examples of cycle,
- 38 examples of walk

What's next?

Try testing the machine learning model below. Enter an example of numbers 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 different the extra examples will make!

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

| | |
|----------|-----|
| age | 9 |
| distance | 1.1 |
| friends | 0 |

Test

Recognised as **walk**
with 67% confidence

- 18.** Keep testing to try and work out the patterns that the computer has seen in your survey data.
As you make the age higher, does the computer think walking becomes more likely than going by car?
If so, what's the age where the computer seems to have seen the change?

What have we done so far?

You've trained a simple machine learning model using numbers from a travel survey.

You've created a "predictive model" – called that because we use models like this to make predictions.

You could use this model to make predictions for how likely someone is to walk to school if you know their age and how far they live from school.

But how accurate are the predictions?

19. Click on the “< Back to project” link and then go back into the **Train** page.

20. Choose **one** of the survey responses you entered earlier, and delete it.

Make sure you write down all of the values for the example you are deleting before you delete it. We’ll need the values in a minute.

Hover the mouse pointer over it, until the red cross appears. Click on that red cross to delete the example.

| | | |
|----|------------|------------|
| 0 | friends 4 | friends |
| 13 | age 9 | age 1 |
| 1 | distance 1 | distance 1 |
| 0 | friends 0 | friends 3 |

21. Click on the “< Back to project” link and then go back into the **Learn & Test** page.

22. Click on **Train new machine learning model** again.

You might need to scroll down – the button is at the bottom of the page.

23. Once the new model has trained, enter the values that you deleted into the **Test** boxes.

You know what the right answer for this is – it’s the bucket that you deleted this example from.

Compare the computer’s prediction with the right answer.

Did the computer get it right?

What have we done so far?

You've tested your predictive machine learning model to see how accurate it is.

By deleting the example from the computer's training first, it means you tested it by asking it for the answer to a question it hadn't seen before.

(If you test it on an example that it has seen before – that it has had to learn from in its training – then you can't really tell if the computer has learned how to work out the answer for itself.)

But how fair a test was it?

Did you choose a really easy example? (Like a student who lives a really really long way from school!)

Or did you choose a really hard example?

How could you have chosen an example to make it fair?

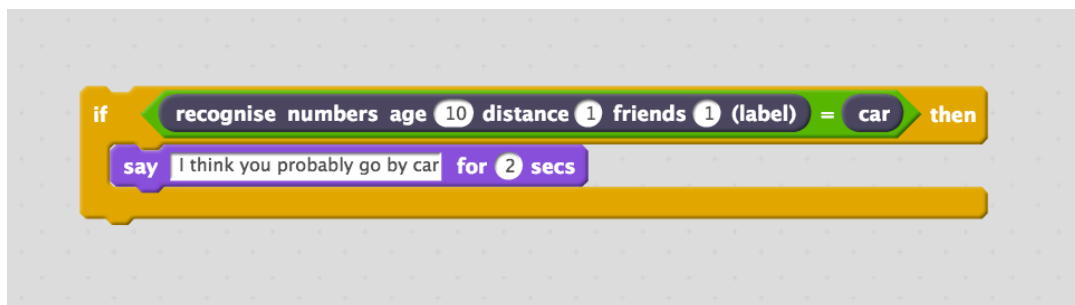
Ideas and Extensions

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

Or come up with one of your own?

Try using this in Scratch

Can you think of a way to use the computer's ability to predict how people travel to school in a game?



Try bigger tests

Instead of just deleting one example from the training data and using that to test, try using more examples.

How many do you think you should use for testing?

If you use too few to test, you can't be sure how good the computer is.

If you use too many to test, you're reducing how many examples the computer has to actually learn from.

Example survey results

Not able to run a survey?

No problem! Here are the results from a small survey that we ran.

| Age (years) | Distance (miles) | Friends & Siblings nearby | Normal journey to school |
|----------------|---------------------|---------------------------------|--------------------------------|
| 9 | 0.8 | 0 | car |
| 8 | 0.9 | 0 | car |
| 6 | 1.5 | 12 | car |
| 6 | 2 | 1 | car |
| 11 | 3 | 0 | car |
| 15 | 7 | 0 | car |
| 10 | 2 | 0 | car |
| 14 | 7 | 0 | car |
| 10 | 2.7 | 0 | car |
| 10 | 3.5 | 2 | car |
| 7 | 3.5 | 1 | car |
| 6 | 2.5 | 0 | car |
| 11 | 2.6 | 1 | car |
| 8 | 5 | 4 | car |
| 9 | 1.2 | 0 | car |
| 6 | 5 | 4 | car |
| 9 | 2.3 | 0 | car |
| 8 | 2.6 | 1 | car |
| 8 | 1.5 | 4 | car |
| 5 | 2.8 | 1 | car |
| 6 | 1.5 | 0 | car |
| 7 | 3 | 1 | car |
| 5 | 1 | 0 | car |
| 6 | 3 | 1 | car |
| 9 | 1 | 0 | car |

| Age (years) | Distance (miles) | Friends & Siblings nearby | Normal journey to school |
|----------------|---------------------|---------------------------------|--------------------------------|
| 6 | 1.1 | 0 | car |
| 5 | 1 | 4 | car |
| 5 | 10 | 0 | car |
| 14 | 5 | 1 | car |
| 14 | 7 | 0 | car |
| 15 | 5 | 1 | car |
| 9 | 1 | 0 | car |
| 9 | 1.1 | 0 | walk |
| 12 | 0.9 | 4 | walk |
| 6 | 0.5 | 5 | walk |
| 7 | 1 | 1 | walk |
| 8 | 0.9 | 0 | walk |
| 13 | 1 | 0 | walk |
| 9 | 1 | 0 | walk |
| 11 | 1.4 | 3 | walk |
| 11 | 1.5 | 2 | walk |
| 9 | 0.9 | 0 | walk |
| 9 | 1.1 | 0 | walk |
| 9 | 1 | 1 | walk |
| 8 | 1.3 | 0 | walk |
| 9 | 1 | 0 | walk |
| 10 | 0.9 | 1 | walk |
| 9 | 1.2 | 0 | walk |
| 9 | 1 | 3 | walk |
| 11 | 1 | 0 | walk |

| Age (years) | Distance (miles) | Friends & Siblings nearby | Normal journey to school |
|----------------|---------------------|---------------------------------|--------------------------------|
| 12 | 0.8 | 3 | walk |
| 9 | 0.5 | 1 | walk |
| 10 | 1.1 | 2 | walk |
| 12 | 1 | 3 | walk |
| 15 | 1.5 | 0 | walk |
| 12 | 1.2 | 3 | walk |
| 9 | 1.3 | 0 | walk |
| 10 | 0.1 | 6 | walk |
| 11 | 1.1 | 4 | walk |
| 9 | 1.25 | 1 | walk |
| 13 | 0.5 | 5 | walk |
| 7 | 1.25 | 1 | walk |
| 9 | 0.1 | 0 | walk |
| 9 | 1.4 | 1 | walk |
| 13 | 0.3 | 5 | walk |
| 15 | 0.3 | 3 | walk |

| Age (years) | Distance (miles) | Friends & Siblings nearby | Normal journey to school |
|----------------|---------------------|---------------------------------|--------------------------------|
| 12 | 0.8 | 4 | walk |
| 5 | 0.8 | 4 | walk |
| 9 | 1.1 | 1 | walk |
| 9 | 1.5 | 4 | walk |
| 9 | 0.7 | 6 | walk |
| 8 | 0.6 | 4 | walk |
| 6 | 0.5 | 8 | walk |
| 16 | 1 | 10 | walk |
| 9 | 1 | 2 | walk |
| 12 | 0.2 | 8 | cycle |
| 10 | 2 | 1 | cycle |
| 11 | 0.8 | 1 | cycle |
| 10 | 1.1 | 0 | cycle |
| 13 | 1 | 1 | cycle |
| 9 | 1.1 | 0 | cycle |