In this project you will make a main postal sorting office. It will need to sort letters so that they can be put into vans going to the right local sorting offices.

The postcode is a great way to work out the next sorting office a letter should go to, so you’ll use that.

You’ll train the computer to recognise what the different codes at the start of a postcode look like when they are hand-written, and use that to sort letters.
To train the computer to recognise what the start of postcodes look like, we need to make some examples.

1. Go to https://ibm.biz/mlforkids-drawing in a web browser

2. Use your mouse to write “OX” in the empty box.
   _OX is the start for postcodes in the Oxford area._
   _Try to use all the space in the box, like in the picture below._

3. Click the _“Upload to imagebin”_ button
   _If it works, you should see a small version of your writing below._
4. Draw another “OX” and repeat until you’ve got 10 examples

5. Draw 10 “GU” for postcodes in the Guildford area.

6. Draw 10 “SO” for postcodes in the Southampton area.
7. Keep this web browser window open! 
*If you lose this page, you’ll have to draw the examples all over again.*

8. **In a separate web browser window, go to** [https://machinelearningforkids.co.uk/](https://machinelearningforkids.co.uk/)

9. Click on **“Get started”**

10. **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.*

11. Click on **“Projects”** on the top menu bar

12. Click the **“+ Add a new project”** button.
13. Name your project “Mailman Max” and set it to learn how to recognise “images”.
   Click the “Create” button

14. You should see “Mailman Max” in the list of your projects. Click it.

15. Click the “Train” button

16. Click the “Add new label” button, and create a label called “Oxford”

17. Click “Add new label” again, and create one called “Guildford”

18. Click “Add new label” again, and create one called “Southampton”
19. Drag the examples you drew in the first window into the correct training bucket in the machinelearningforkids.co.uk window. *If you get the windows side by side, this will be much easier. Try not to use the same example more than once!*

20. Click on the “< Back to project” link

21. Click the “Learn & Test” button

22. Click the “Train new machine learning model” button
23. Wait for the training to complete. This might take a few minutes.

24. Click the “< Back to project” link

25. Click the “Scratch” button

This page has instructions on how to use the new blocks in Scratch
Keep the page open if you need to check back on how to use them.
What have you done so far?

You’ve started to train a computer to recognise pictures of handwriting as being the start of postcodes for the Oxford, Guildford, or Southampton area. You are doing it by collecting examples of your handwriting. These examples are being used to train a machine learning “model”.

This is called “supervised learning” because of the way that you are supervising the computer’s training.

The computer will learn from patterns in the shapes of each of the examples you’ve drawn. This will be used to be able to recognise the postcodes we’ll write on the envelopes to be sorted.

26. You’ll need the mailman-max.sb file for this project. If you haven’t got this, ask your teacher or group leader.

27. Click the “Open in Scratch” button at the bottom to launch Scratch. You should see four new blocks in the “More blocks” section from your “Mailman Max” project.
28. Open the “mailman-max.sbx” project file.
   
   *Click File -> Load Project*
   
   *Click OK when it asks to replace the contents of the current project*

29. Click the “Data” tab

30. Click “Make a variable” and create a variable called “answer” which is available “For all sprites”

31. Untick the “answer” variable so it isn’t shown on the Stage

32. Click on the “letter” sprite
33. Enter the following script to choose a random letter to sort

![Random Letter Script]

34. Add the following script so that when we click on a letter it will get ready to be sorted.

![Click Script]

35. Add the following script so when the letter has been sorted, it goes to the post van to be taken to the correct regional sorting office.

![Sorted Letter Script]
36. Click on “postcode” sprite

37. Enter the following script to get the new envelope ready for you to write a postcode on

38. Add the following script to get the computer to try and recognise the postcode you write on the envelope.
39. Add the following script to get the handwritten postcode to go with the rest of the envelope, to the post van to be taken to the correct regional sorting office.

40. Save your project
*Click File -> Save Project*
It’s time to test!

41. Click the Green Flag

42. Still on the “postcode” sprite, click on “Costumes”

43. Use the line width slider so we can write a thick black line

44. Write the first two letters of a postcode using the paintbrush tool. *Fill the space, like you did with the training examples.* *You should also see it appear in the envelope in the right place.*
45. Click on the stamp in the envelope in the stage. You should see the letter shrink. Then the computer will try to recognise the postcode letters you’ve written. Once it thinks it has the answer, the envelope will move to the van for the correct sorting office.

46. Did it get it right?
If it’s not very good, you might need to add some more examples, and train a new machine learning model with them.

47. Repeat steps 41-46 to try it again with a different postcode
You’ll need to paint over your first postcode in white first. If you use the eraser, make sure you put a white background in again.
What have you done?

You’ve trained a machine learning model to be able to do handwriting recognition. This is called “optical character recognition” or “OCR” for short.

You did that by collecting examples of handwriting, to train the computer to be able to recognise it.

You built a small and simple example, using just the first two letters for just three postcode areas.

Imagine doing the same thing for every postcode area in the country. You’d have to create a lot more training buckets to cover the 120 postcode areas in the UK. And you’d need to collect thousands of training examples, with lots of different people’s handwriting, so that the computer could get really good at recognising them.

That is how large postal sorting offices sort our letters in real life.
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 someone else’s handwriting

You’ve trained the computer to recognise how you write the postcode letters, but would it be able to recognise someone else’s?

Ask a friend to test it and see if it works.

If it doesn’t, you’ll need to get some examples of their writing to add to your training data. The more people you can get training examples from, the better the computer will be at recognising a variety of handwriting styles.

Try more of the postcode

We made it easier for the computer by only giving it the first two letters.

But how can we get it to recognise something like “OX1 2JD” as being a postcode in the Oxford area?

If you collect a variety of different training examples of actual full postcodes (not just the first two letters) you should be able to train it to recognise them. That will probably need more than 10 examples!