

# Mailman Max

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.





This project worksheet is licensed under a Creative Commons Attribution Non-Commercial Share-Alike License http://creativecommons.org/licenses/by-nc-sa/4.0/

- **1.** Go to <u>https://machinelearningforkids.co.uk</u> in a web browser
- 2. Click on "Get started"
- **3.** 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 password, ask your teacher or group leader to reset it for you.
- **4.** Click on "**Projects**" on the top menu bar
- **5.** Click the **"+ Add a new project**" button.
- **6.** Name your project "Mailman Max" and set it to learn how to recognise "**images**".

	Start a new machine	learning project	
Project Name * Mailman Max			
Recognizing ' images	~	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"	
		CREATE CAN	CEL

- 7. Click the "Create" button
- 8. You should see "Mailman Max" in the list of your projects. Click it.

9.	Click the " <b>Tra</b>	i <b>n</b> " button		
	About Projects Worksheets News H	lelp Log Out		Language
		"Mailman Ma	х"	
	Train	' earn & Test	Make	
	Collect examples of what you want the computer to recognis	Use the examples to train the computer to recognise images.	Use the machine learning model you've trained to make a game or app, in Scratch or in Python	
	Train	Learn & Test	Make	

# **10.** Click the "Add new label" button, and create a label called "Oxford"

ml-for-kids	Welcome	About	Projects	Worksheets	News	Help	Log Out			
				Recog	nising	in	nages	as	Oxford	
< Back to project	pictures f	Oxf rom oti drop t	ord — her brow them her	rser windo re	ws					+ Add new label
	S www	v 🖸 we	bcam	draw						

### **11.** Click the "draw" button in the "Oxford" bucket

ml-for-kids Welcome About	Projects Worksheets News Help Log Out
	Recognising images as Oxford
< Back to project	Draw a new example of Oxford
Oxfo	Tools Draw Erase Reset
Drag pictures from oth and drop ti	
	ADD CANCEL
Ø www 🗅 web	cam 🖌 draw

**12.** 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.



# **13.** Click "ADD"

<b>4.</b> Click " <b>Draw</b> " again, and	draw another "OX"
ML About Projects Worksheets News Help Log Out	
Recognising	images as Oxford
Sack to project   Oxford   Image: Constraint of the second	Add new label

# **15.** Repeat until you've got **10** examples of "OX"



**17.** Use the "**Draw**" button in the "Guildford" bucket to draw 10 "GU" for postcodes in the Guildford area

About Projects Worksheets News Help Log Out	About Projects Worksheets News Help Log Out						
Recognising image	es as Oxford or Guildford						
< Back to project		Add new label					
Oxford	Guildford						
OX OX OX	GU GU GU						
OX OX OX	GU GU GU						
$\bigcirc X \land \bigcirc X$	GU GU GU						
$\bigcirc \times$	Gu						
Ø www ■ webcam ✓ draw	Ø www ■ webcam ✓ draw 10						

## **18.** Click "Add new label" again, and create one called "Southampton"



- **20.** Click on the "< **Back to project**" link
- **21.** Click the "Learn & Test" button
- **22.** Click the "Train new machine learning model" button It might take a few minutes for this to finish. You can carry on and get your Scratch project ready, but it won't work until the training finishes.



- **23.** Click the "< Back to project" link
- **24.** Click the "Make" button

### **25.** Click the "Scratch 3" button



**26.** Click on "Open in Scratch 3"

#### 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.

# 27. Click "Project templates"

(SatAt	📆 🌐 🔻 File Edit Project templates 🗄	Tutorials Scratch Project		🖉 Give Feedback	
Co	ode 🥒 Costumes 📢) Sounds		<b>N</b> •		
Motion	Motion				
Looks	move 10 steps				
Sound	turn C <sup>4</sup> 15 degrees				
Events	turn 🔊 15 degrees				
Control	ge to random position •				
				4 🦢	

#### **28.** Click on the "Mailman Max" project template



#### **29.** Find the "when green flag clicked" script on the "postcode" sprite



# **30.** Copy your town name blocks into the script

SCRAT	⊕ ▼ File Edit Project templates 🔅 Tutorials mailman-max Share 🕻
Co	ode 🖌 Costumes 📢 Sounds
	Mailman Max
Motion	recognise image costume image (
Looks	when 🛤 clicked
Sound	Guildford Set Oxford ▼ to □ Oxford
Events	□ □ Oxford set Guildford to □ Guildford to □
Control	Southampton v to Southampton v to Southampton
Sensing	add training data costume image

**31.** Add this script to recognise postcodes you'll write on the envelope *This is still on the "postcode" sprite* 

when I receive start sending	
set size to 7 %	
go to x: -30 y: 55 x x x x x x x x x x x x x x x x x x	
set answer - to recognise image costume image (label)	
broadcast sorted	

#### **32.** Save your project Click "File" -> "Save to your computer"

STAT	ً ⊕•	File	Edit Project tem	olates 🔅 Tutorials					Ø Give Feedback	
Co	de 🚽 d	New					<b>N</b>			
Motion Looks Sound Events	Events when space when this sp	Uploa Down • • kee	nd from your computer Iload to your computer y pressed	Ave start set answer • to broadcast sorted •	eerding •	me image (labe		Mr 123 Som	John Smith High Street æ town	
Control Sensing Operators	when backdr	op switch ness 👻	hes to backdrop •	when 🏴 clicked set Oxford 👻 to	Oxford		Oxford	Royal Mail	Guildford Royal Mail	Southampton Royal

# **33.** Click the Green Flag

SIL	📆 🌐 🕶 File Edit Project te	mplates 🔅 Tutorials Scratch Project	Share 5 See Communit	Give Feedback	🗂 😺 scratch-cat 🔻
<b>2</b> Co	ode 🕜 Costumes 📢 Sounds				
Motion Looks Sound	Events when is clicked when space key pressed	when I receive start sending • set size to 7 % po to x: -30		Mr John Smith 123 High Street Some town	K

#### **34.** Still on the "**postcode**" sprite, click on "**Costumes**"

<b>6514161 +</b> -	File Edit Project templates 🔅 Tutorials mailman-max	Share (5 See Community 🖉 Give Feedback 🗁 🧕 scratch-cat
📰 Code 🥑 Co	ostumes (I) Sounds	
1 costume 480 x 360	Costum tume	Mr Al Williamson 3 Classify Lane Some city
		Sprite postcode ↔ x -95 ‡ y 20   Show Ø Ø Size 23 Direction 90
	Convert to Vector	Image: Control of the second secon







**37.** 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. If it looks too big in the envelope, click the Green Flag again.* 



**38.** Click the full-screen button, and then click on the stamp 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.



#### **39.** Did it get it right?

*If not, you might need to add some more examples, and train a new machine learning model (steps 21-22) with them.* 

**40.** Repeat steps 35-38 to try it again with a different postcode



#### 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!