

trash sorting the right wAI

Emma Baker Reynolds
Raphael Weidemann



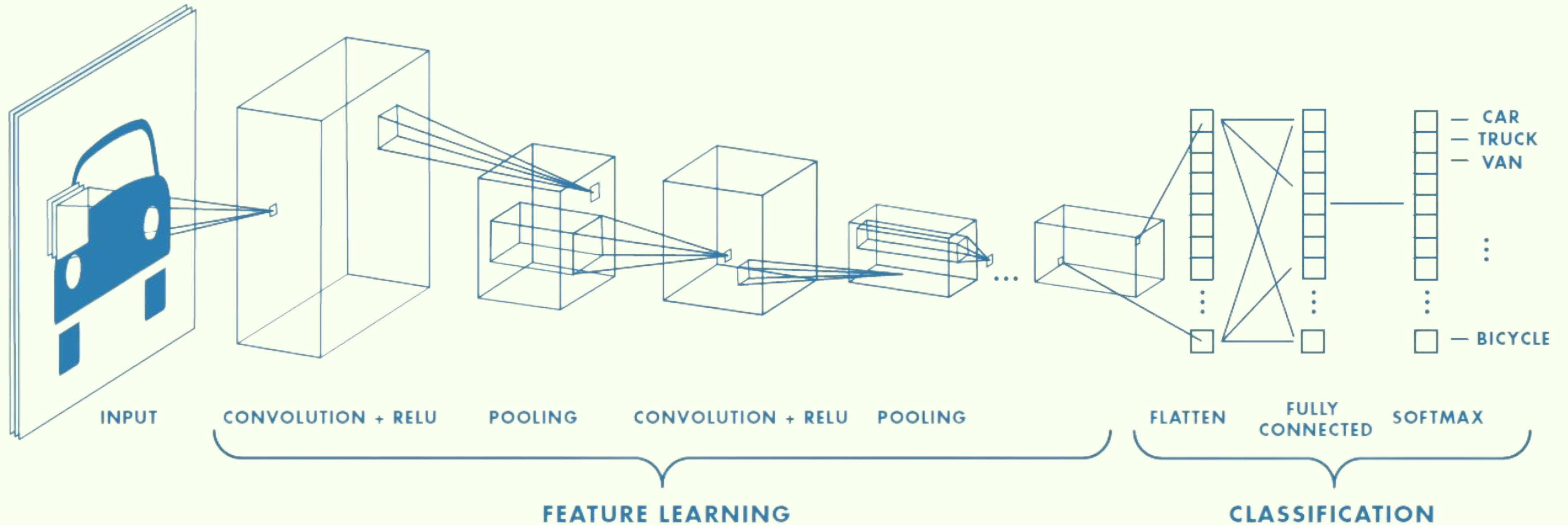
MOTIVATION

- Garbage sorting is a major issue and people often don't know how to correctly separate their recycling
- Make it easier to sort trash into the correct bin
- Use machine learning to create an image recogniser function

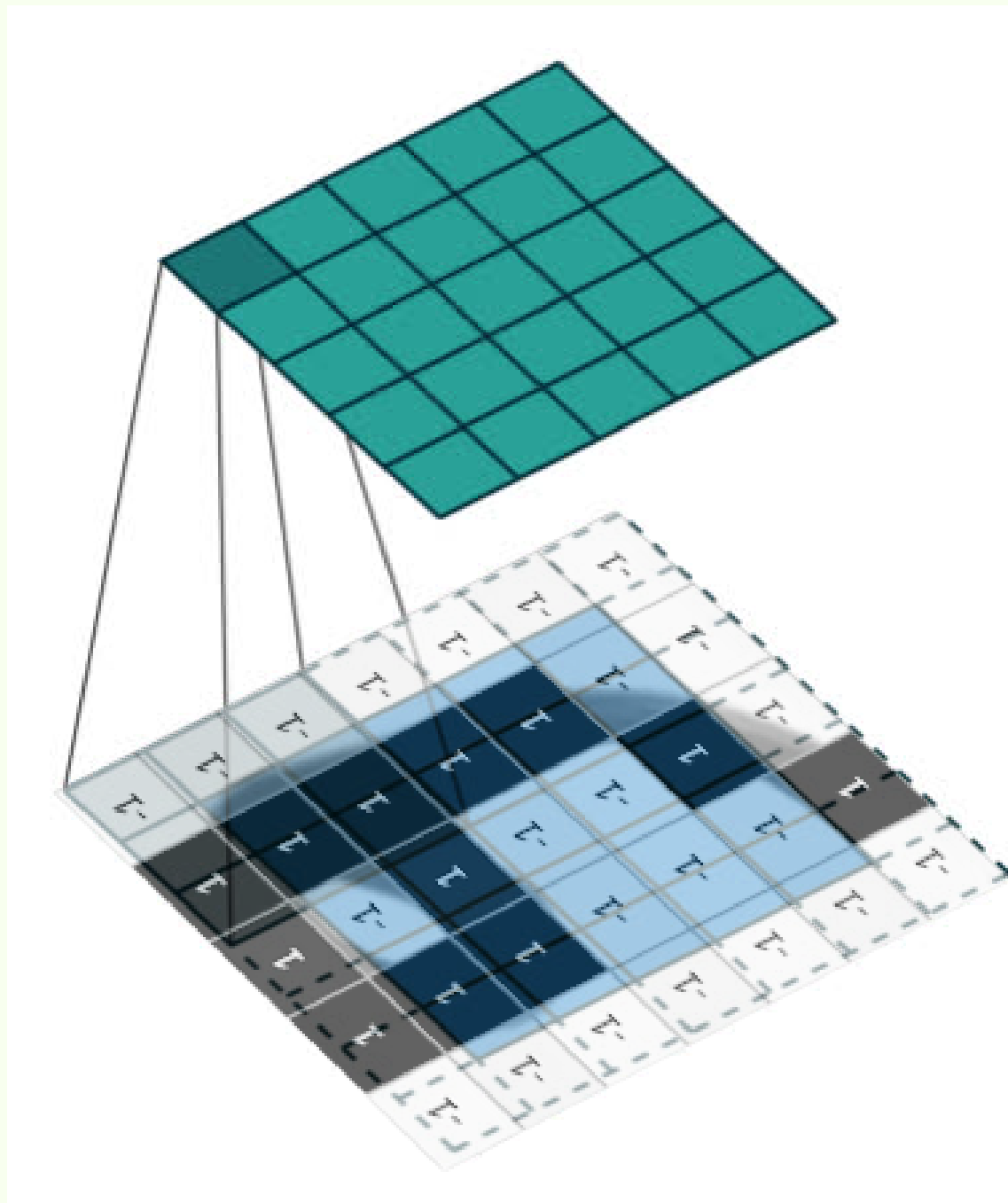


MACHINE LEARNING

WITH CONVOLUTIONAL NEURAL NETWORKS (CNN)



FEATURE DETECTION



-1	1	1	1	-1
-1	1	-1	1	-1
-1	1	1	1	-1
-1	-1	-1	1	-1
-1	-1	-1	1	-1
-1	-1	1	-1	-1
-1	1	-1	-1	-1

-1	1	1	1	-1
-1	1	-1	1	-1
-1	1	1	1	-1
-1	-1	-1	1	-1
-1	-1	-1	1	-1
-1	-1	1	-1	-1
-1	1	-1	-1	-1

Loopy pattern filter

-1	1	1	1	-1
-1	1	-1	1	-1
-1	1	1	1	-1
-1	-1	-1	1	-1
-1	-1	-1	1	-1
-1	-1	1	-1	-1
-1	1	-1	-1	-1

IMAGE FROM CODEBASICS YOUTUBE CHANNEL

-1	1	1	1	-1
-1	1	-1	1	-1
-1	1	1	1	-1
-1	-1	-1	1	-1
-1	-1	-1	1	-1
-1	-1	1	-1	-1
-1	1	-1	-1	-1

Vertical line filter

-1	1	1	1	-1
-1	1	-1	1	-1
-1	1	1	1	-1
-1	-1	-1	1	-1
-1	-1	-1	1	-1
-1	-1	1	-1	-1
-1	1	-1	-1	-1

Diagonal line filter

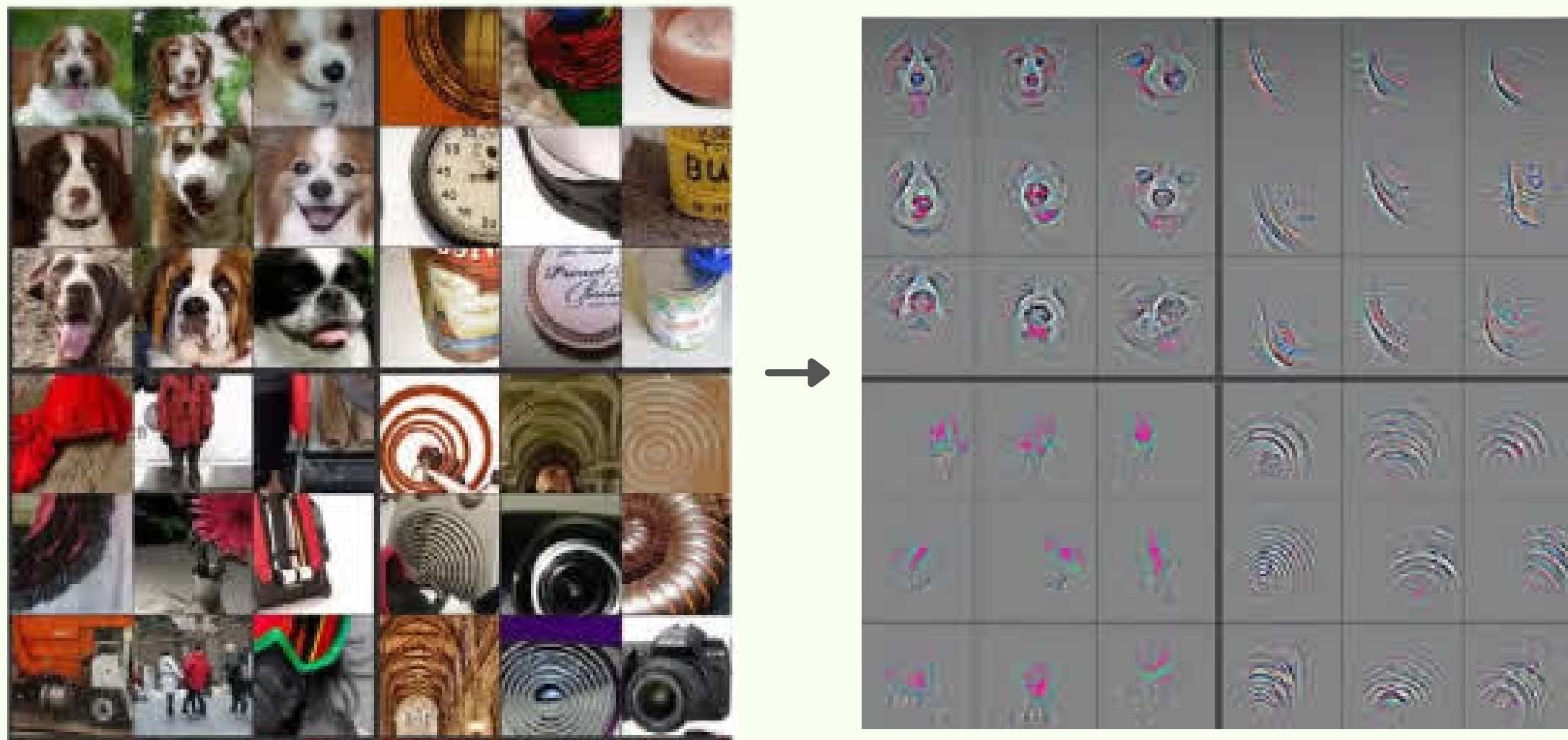
Convolutional layers use different kinds of filters to detect features/patterns like:

- lines
- shapes

Or to support layers to detect by:

- sharpening
- edge detection

FEATURE DETECTION



By using different filters we can detect different elements

Through stacking the filtering layers we can detect complex structures like faces.

The CNN then combines these elements to make a classification.

BUILDING THE MODEL

Epoch	Training loss	Validation loss
1	9.830496	10.178691
5	7.177356	7.297019
10	4.249138	4.321951
15	2.557806	2.499118
20	1.715660	1.646037
25	0.633111	0.504662
30	0.328433	0.227507
35	0.211715	0.124314
40	0.225033	0.317374
45	0.179736	0.231164
50	0.168561	0.220994

Dataset consists of 2527 images of garbage against a plain background split into six categories

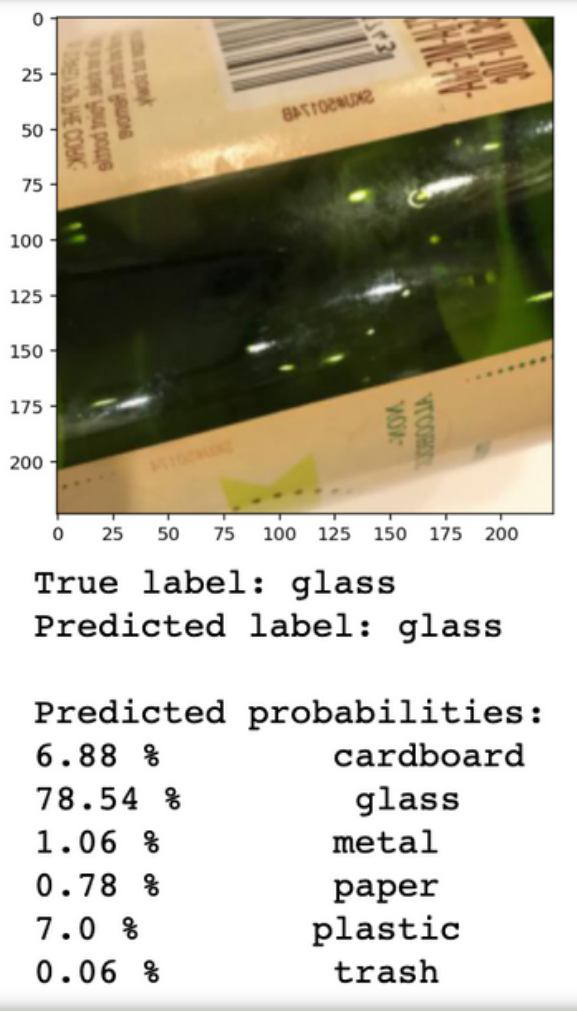
Used resnet18 (pre-trained model using pytorch framework) to perform transfer learning with our images



IMAGES COLLECTED MANUALLY BY GARY CHUNG AND MINDY YANG - [GITHUB/GARYTHUNG/TRASHNET](https://github.com/GARYTHUNG/TRASHNET)

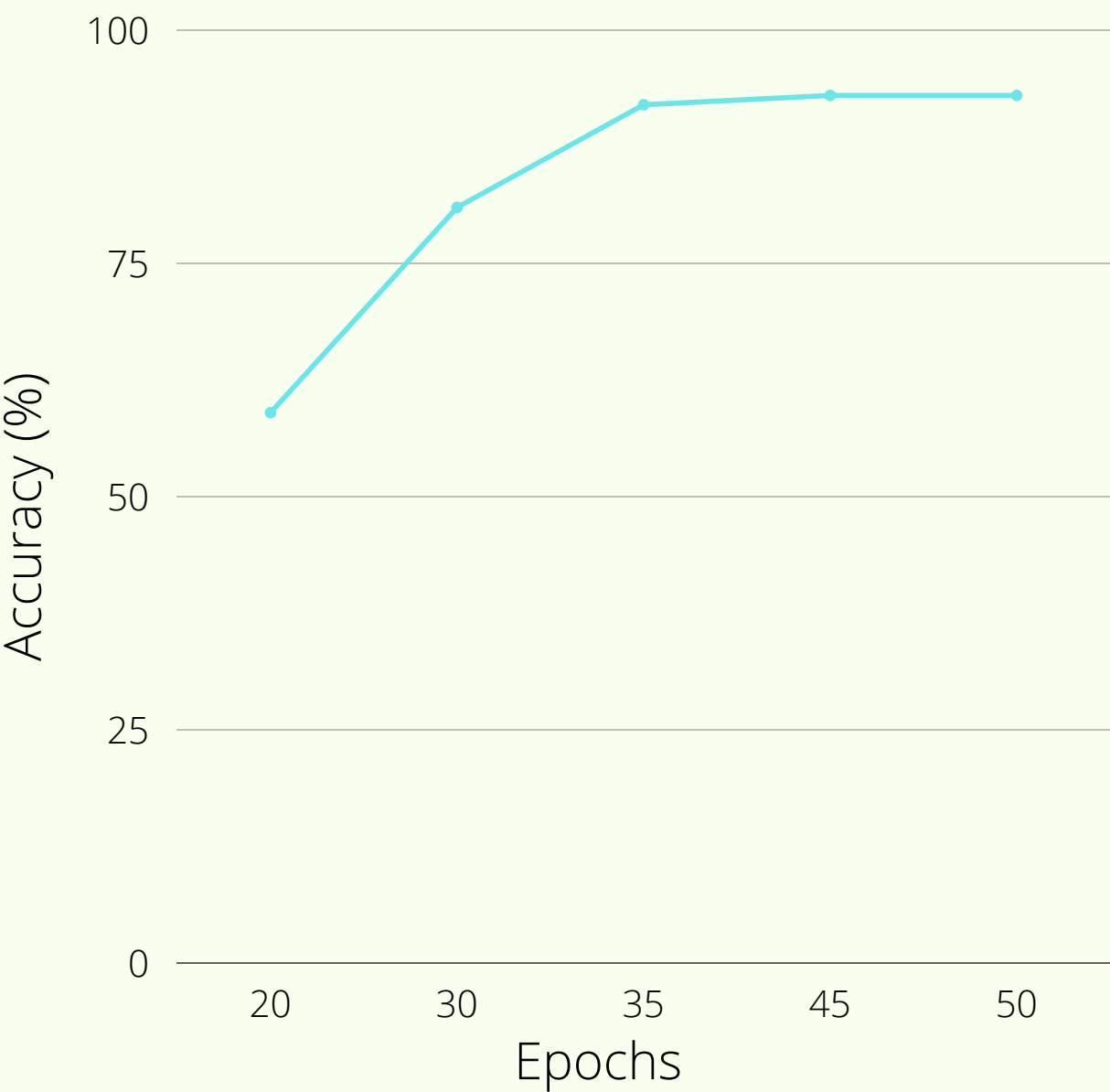


RESULTS



Achieved an accuracy of 93% after 50 epochs and we see the improvement start to plateau

Percentages are shown of each category and the image gets sorted into the label with the highest value



DEMO

