TECHNOLOGY

MACHINE LEARNING

COURSE

MACHINE LEARNING UNPLUGGED

SESSION 1

WHAT IS MACHINE LEARNING?

Objectives

Apps for Good

CORE

- Understand what machine learning is
- Understand how machines learn

CHALLENGE

- Understand how machines learn to identify images
- Understand what neural networks are

Session activities

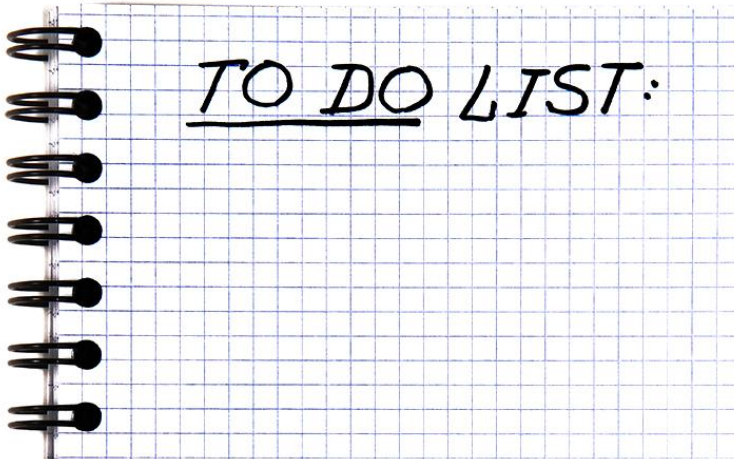
1.1 – What is machine learning?

1.2 - How do machines learn?

1.3 - Cats and dogs

1.4 - Neural networks

1.5 - Extension / Homework - What can go wrong?



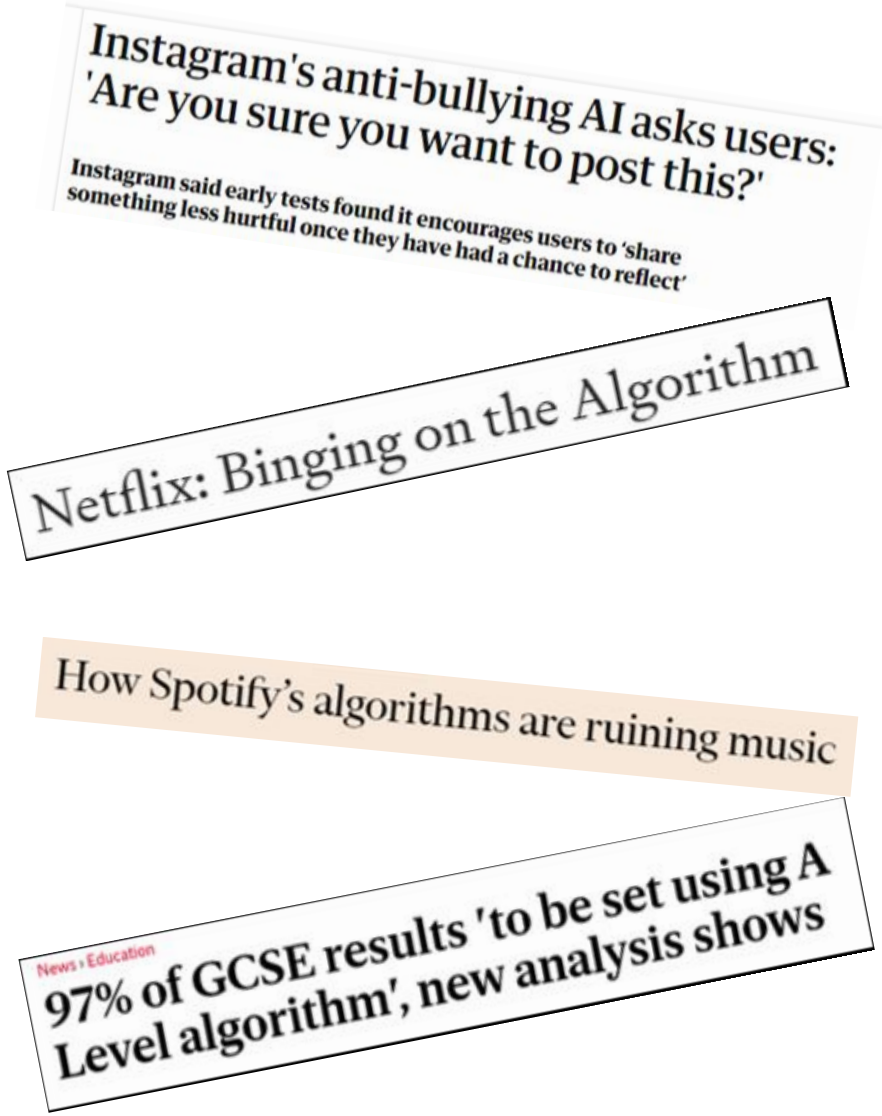
Introduction

Apps for Good

Machine learning is playing an increasingly important role in lots of different aspects of all our lives.

It's important that you understand what machine learning is and how it is being used - not just those of you who will go on to invent it or build with it (although that is important), but also those of you who will use it and be affected by it.

And that's everyone!



1 – What is machine learning

Activity

Go to Activity 1.1 in your Student Workbook and answer the questions in the top section:

- Have you heard of the term machine learning? YES / NO
- If yes what do you think it means?

When you have answered the questions watch the video on the following slide and then answer the remaining questions.

ACTIVITY 1.1

WHAT IS MACHINE LEARNING?

COURSE

MACHINE LEARNING UNPLUGGED

Questions to answer before you watch the video
Have you heard of the term machine learning? YES / NO If yes what do you think it means?
After you have watched the video
What is machine learning?
Why is the use of machine learning increasing rapidly?
Can you think of any any issues or problems caused by the increase in the use of machine learning?

Understanding what ML is and how it functions should help you recognise where you are interacting with computers in your everyday life and what this means for you (as a human?).

NAME

Apps for Good

1.1 – What is machine learning

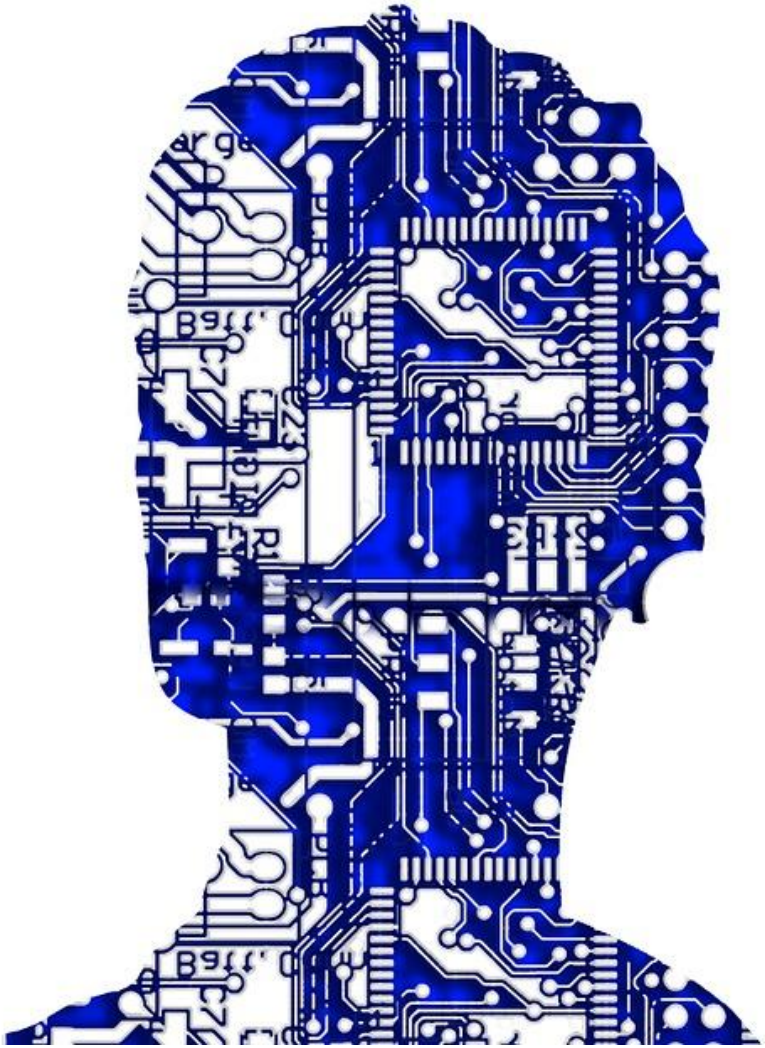
Apps for Good

Watch this video: What is Artificial Intelligence (or Machine Learning)? (6 mins, 14s). Then complete the remaining questions in your workbook.

1.1 – What is machine learning

Apps for Good

Machine learning is a system where - rather than a computer programmer deciding the best way to sort, organise, classify or use information – a computer program develops its own set of instructions based on information that users feed it.



1.2 – How do machines learn?

Apps for Good

You want a computer to perform a complex task…

With **computer programming**:

- You break down the complex activity into a set of simple instructions.
- You use these instructions to tell the machine how to perform the task.

With **machine learning**:

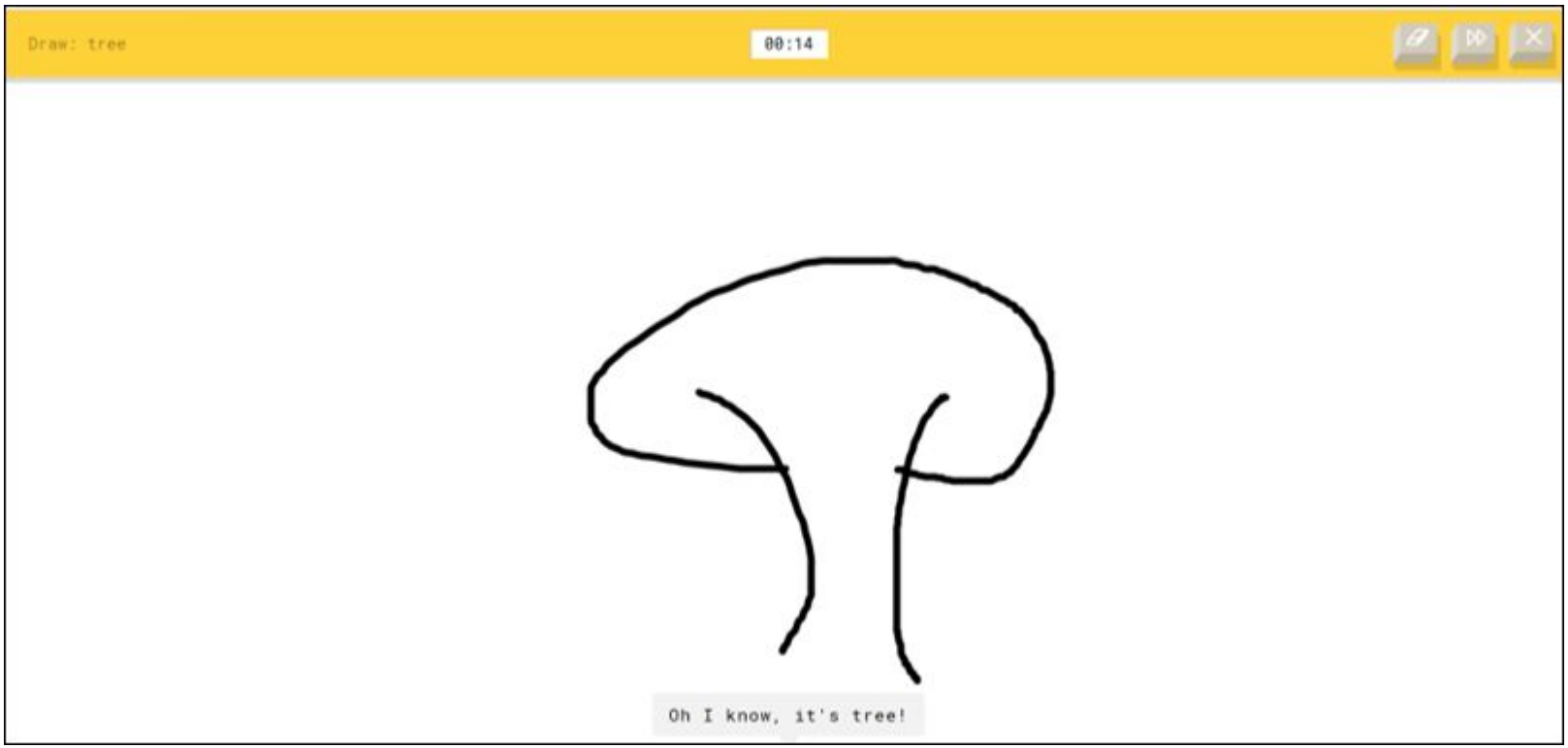
- You collect a set of examples of the task being done.
- The computer learns how to do the task from the examples you give it.

The next two activities will show how this works in practice. In each case the machine is being taught to recognise images.

Quick, Draw!

Apps for Good

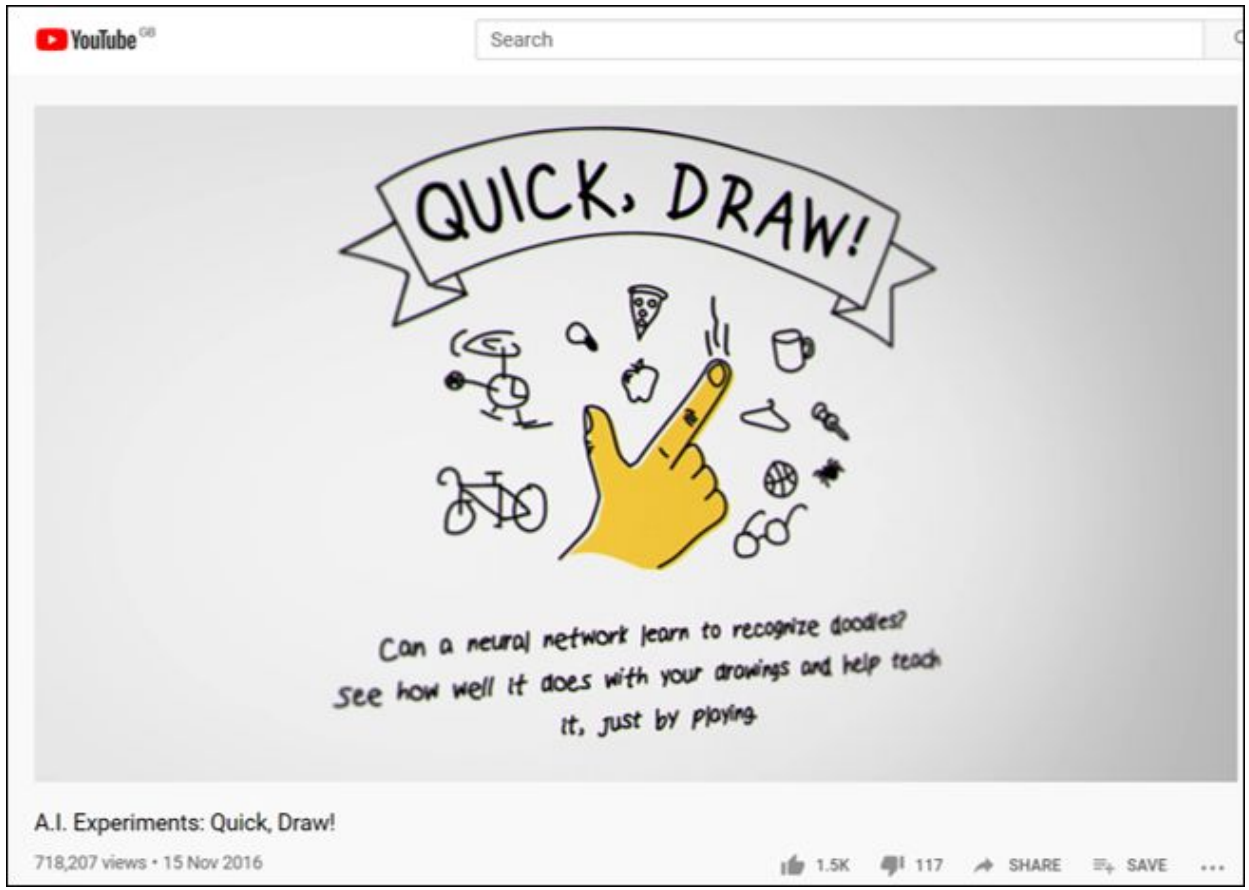
This is a game built with machine learning. You draw, and a neural network tries to guess what you're drawing. Play the game here: https://quickdraw.withgoogle.com/



Quick, Draw! - how does it work?

Apps for Good

This video (1 min, 40) explains how machine learning is used to identify the drawings.



1.3 - Cat or Dog?

How do humans identify images? Look at these two images and try to think of some rules that will identify the difference between these two images. Make a note of them on worksheet 1.3.

ACTIVITY SHEET 1.3

CAT OR DOG

COURSE

MACHINE LEARNING UNPLUGGED

What are your rules for identifying the difference between the two images?

Image 1	Image 2	Image 3	Image 4

Revised rules for identifying images of cats and dogs

Can you tell the difference between cats and dogs?

NAME

Apps for Good

1.3 - Cat or Dog

Apps for Good

Test your rules on these four images. Do they work? If not why not? Can you improve your rules so they work for these images? Record your answers on worksheet 1.3.

1

2

3

4

1.3 – Cat or dog?

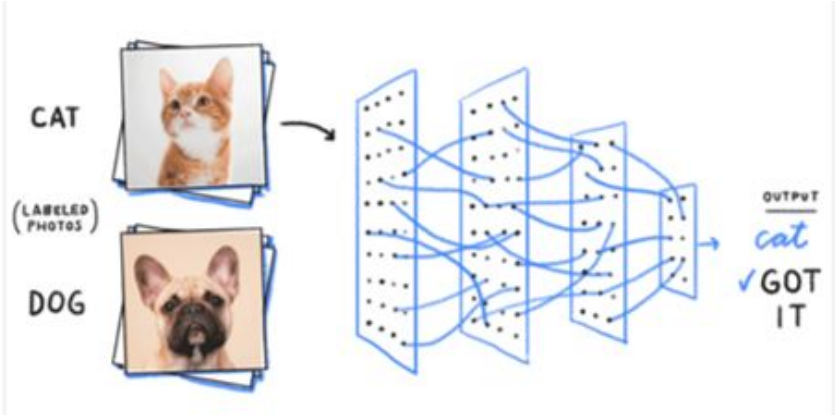
Apps for Good

In this project you will explore a machine learning model that learns to sort photos of cats and dogs.

The project will be built using

http://cognimates.me/home/

Congimates is an AI education platform for building games, programming robots & training AI models



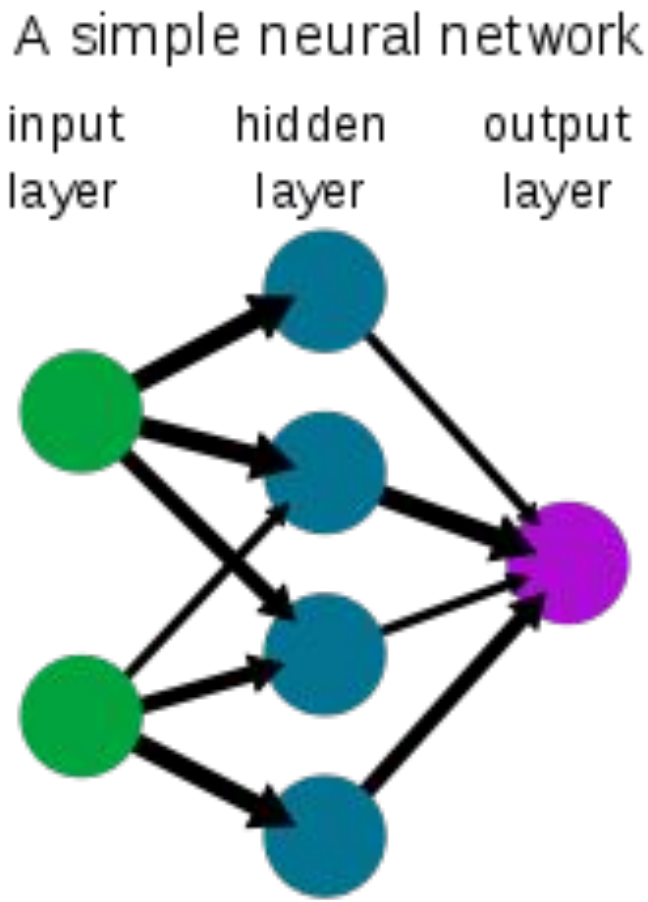
1.4 – Neural networks

Apps for Good

Quick,Draw uses neural networks to analyse your drawing and compare it with thousands of other drawings in its library.

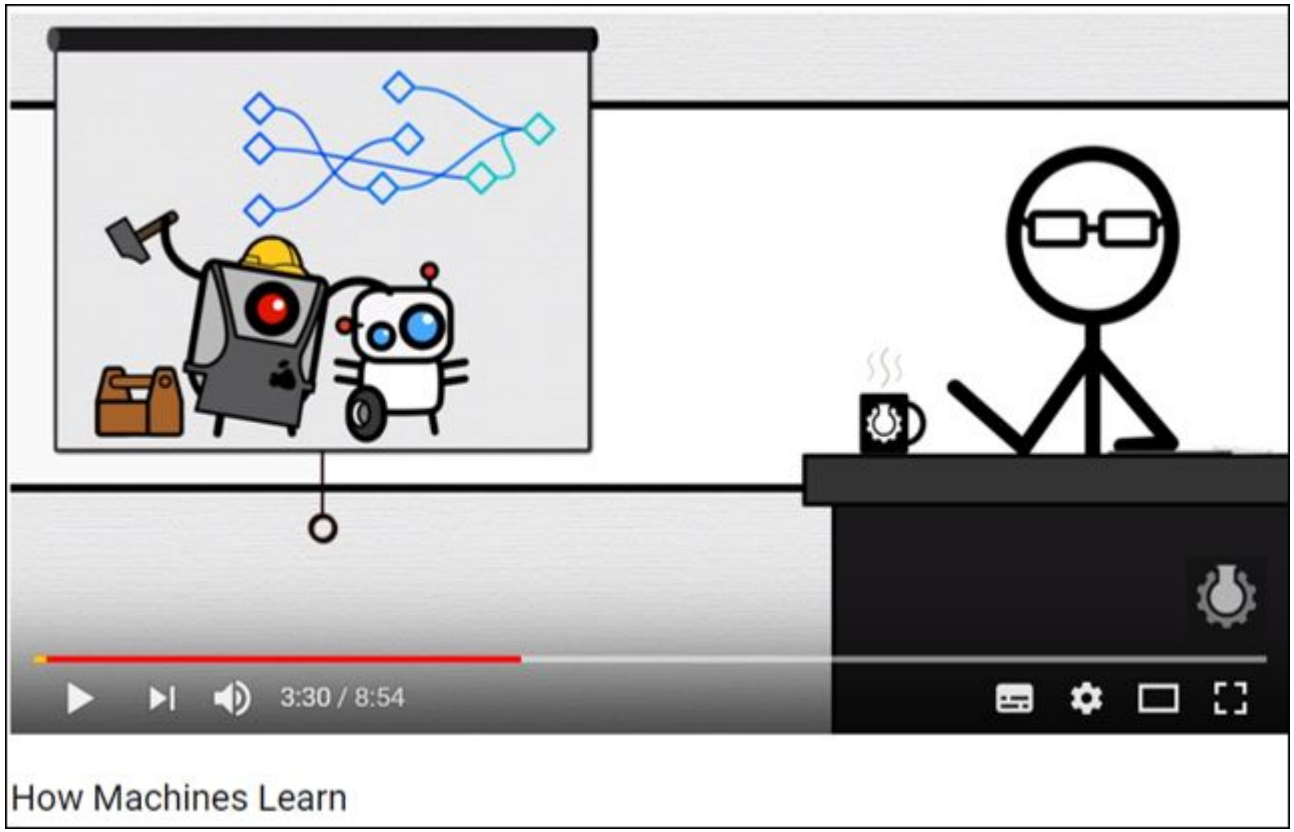
Neural networks are modelled loosely on the human brain and enable computers to learn from being fed data.

The typical neural network consists of thousands of interconnected artificial **neurons**, which are stacked in rows that are known as **layers**, forming millions of connections.



1.4 – Neural networks

This video, How Machines Learn (8 mins, 54s), explains how **neural networks** are used to train machine learning models. When you have watched it answer the questions on worksheet 1.4



ACTIVITY SHEET 1.4

NEURAL NETWORKS

COURSE

MACHINE LEARNING UNPLUGGED

What is an algorithm?

What are some of the uses of machine learning mentioned in the video?

How do the bots get trained?

NAME

1.5 - Extension / Homework - What can go wrong?

Apps for Good

Watch this video The dangers of AI are weirder than you think (10 mins, 29s). Why does AI sometimes get things wrong?

This session

Apps for Good

You have:

- Explored machine learning and some its uses
- Gained an understanding of how neural networks are used in machine learning
- Started to explore how machine learning can be used to identify images

Next session

Apps for Good

You will:

- Explore how machine learning can be used for facial recognition
- Understand some of the issues surrounding the implementation of facial recognition

NEXT SESSION…

COURSE

MACHINE LEARNING UNPLUGGED

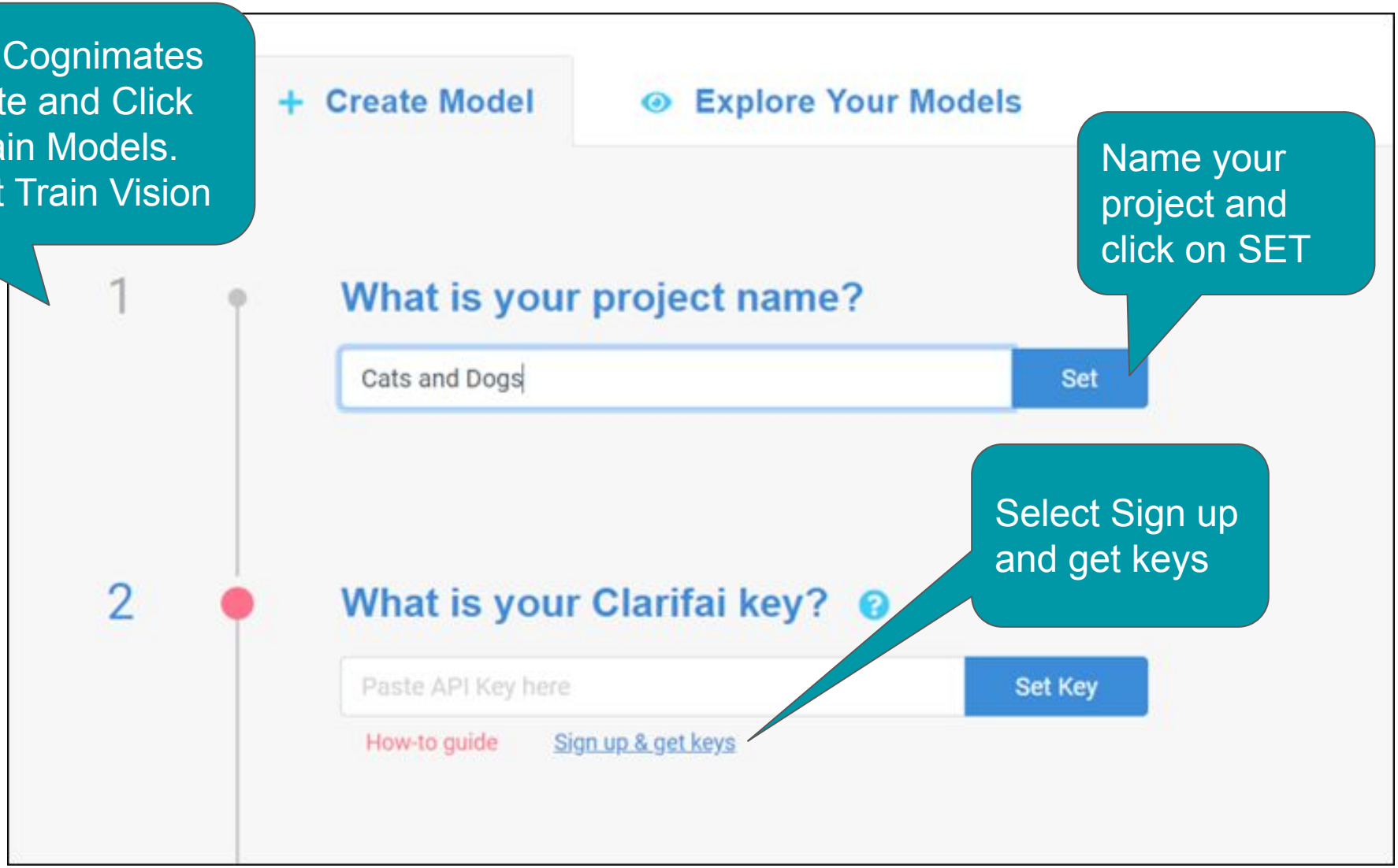
SESSION 2

FACIAL RECOGNITION

1.3 – Building a model in Cognimates

Apps for Good

Go to Cognimates website and Click on Train Models. Select Train Vision



Name your project and click on SET

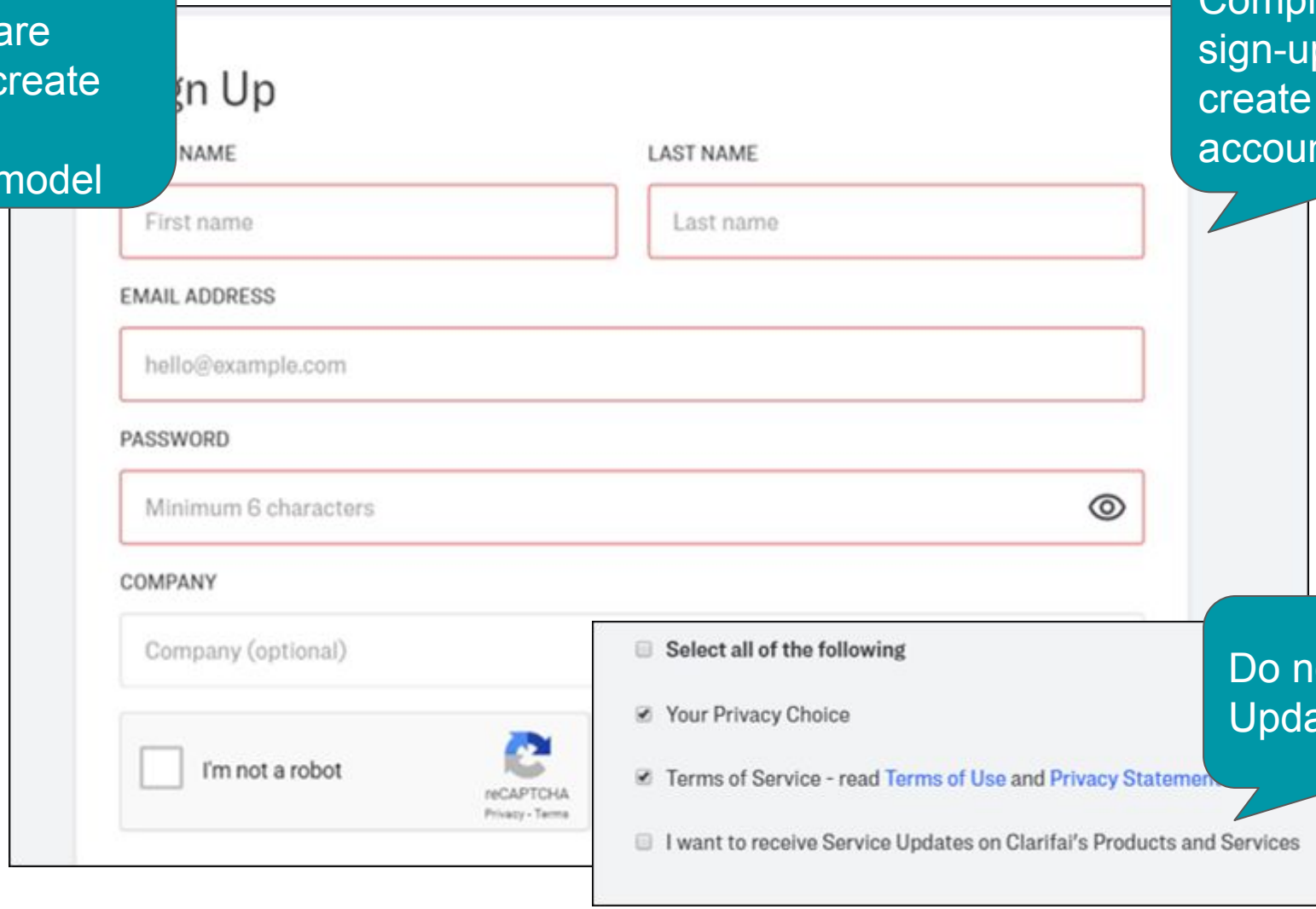
Select Sign up and get keys

1.3 – Building a model in Cognimates

Apps for Good

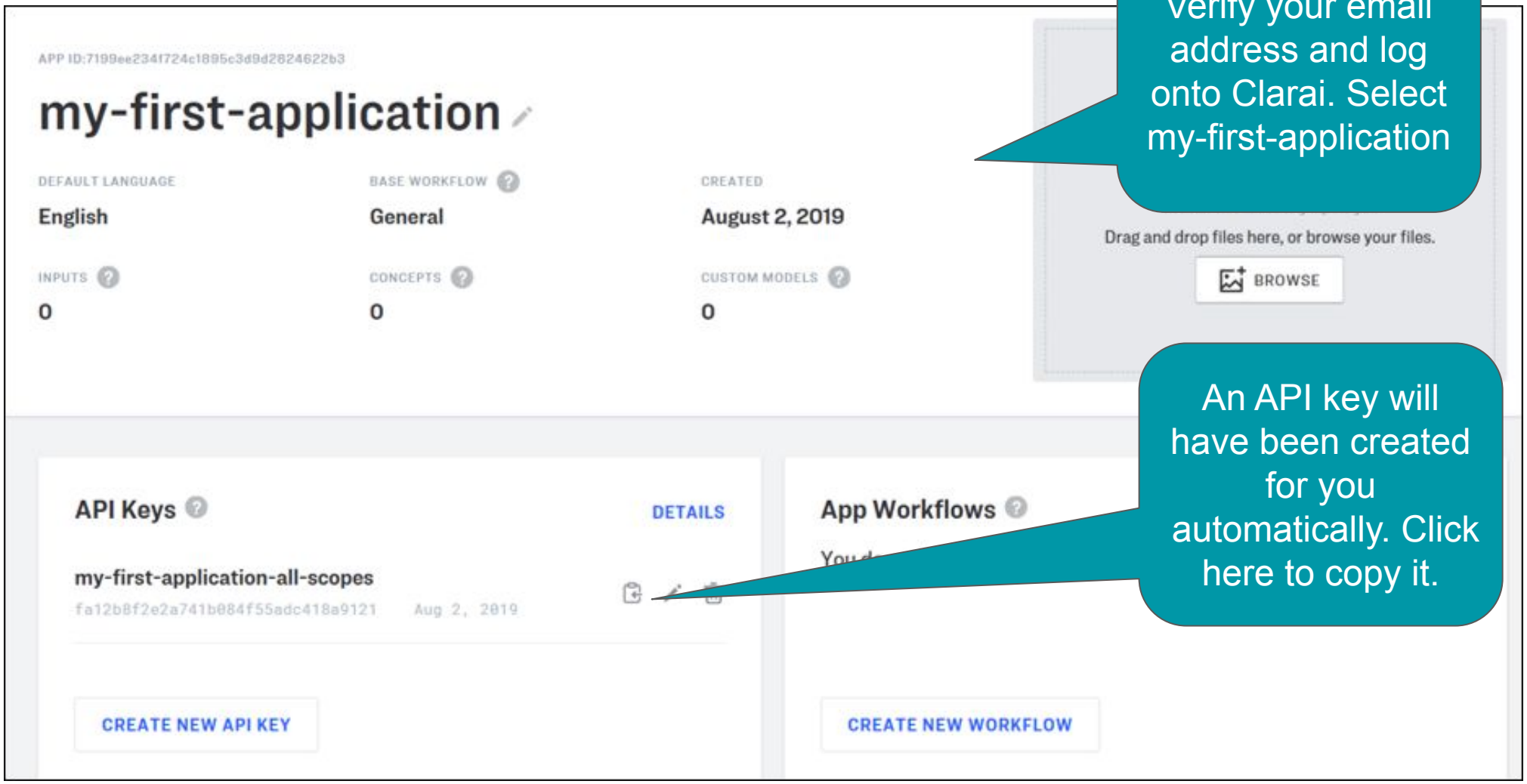
Clarifai allows you to create free API keys which are required to create your visual recognition model

Complete the sign-up form to create your account

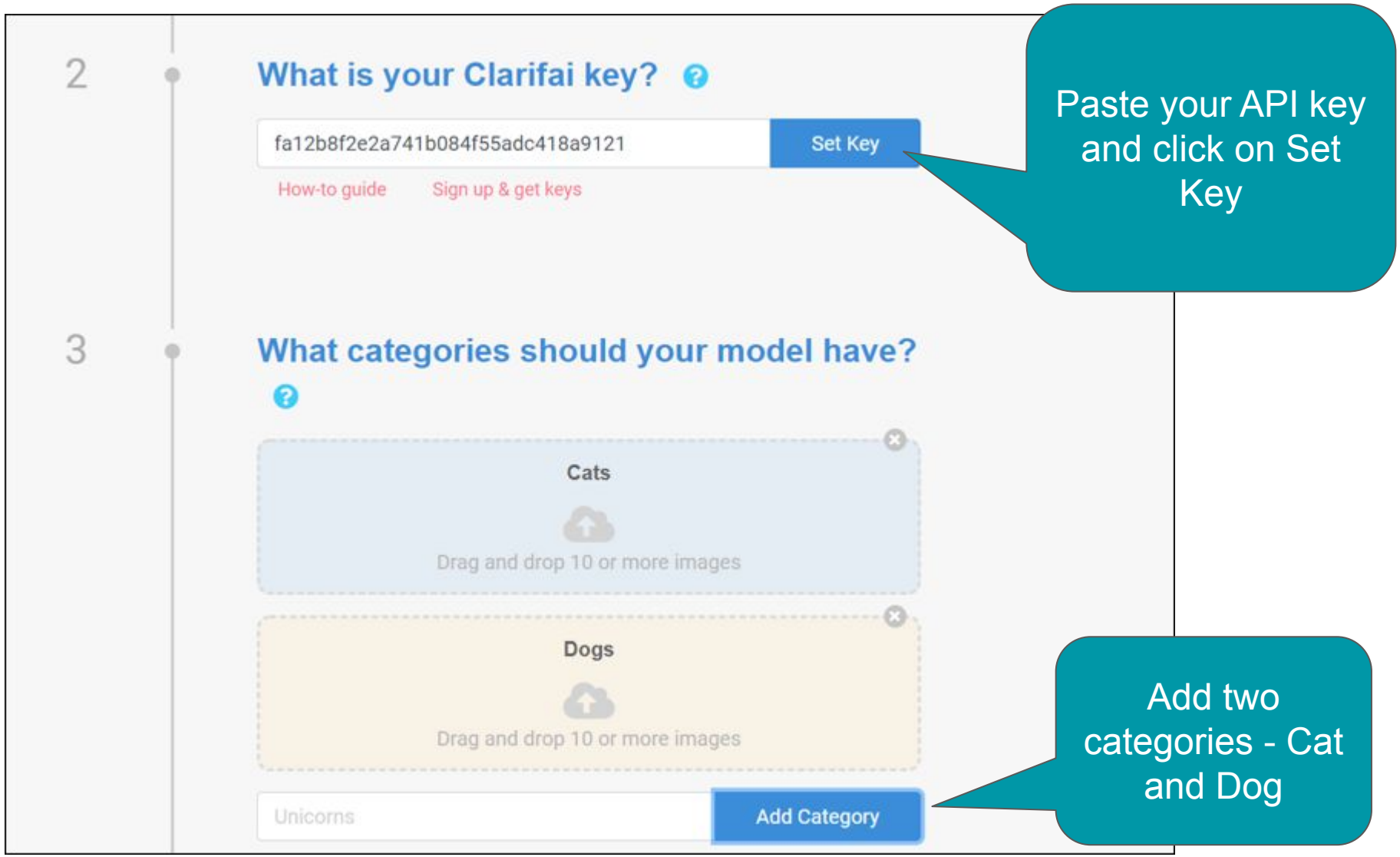


Do not select Updates

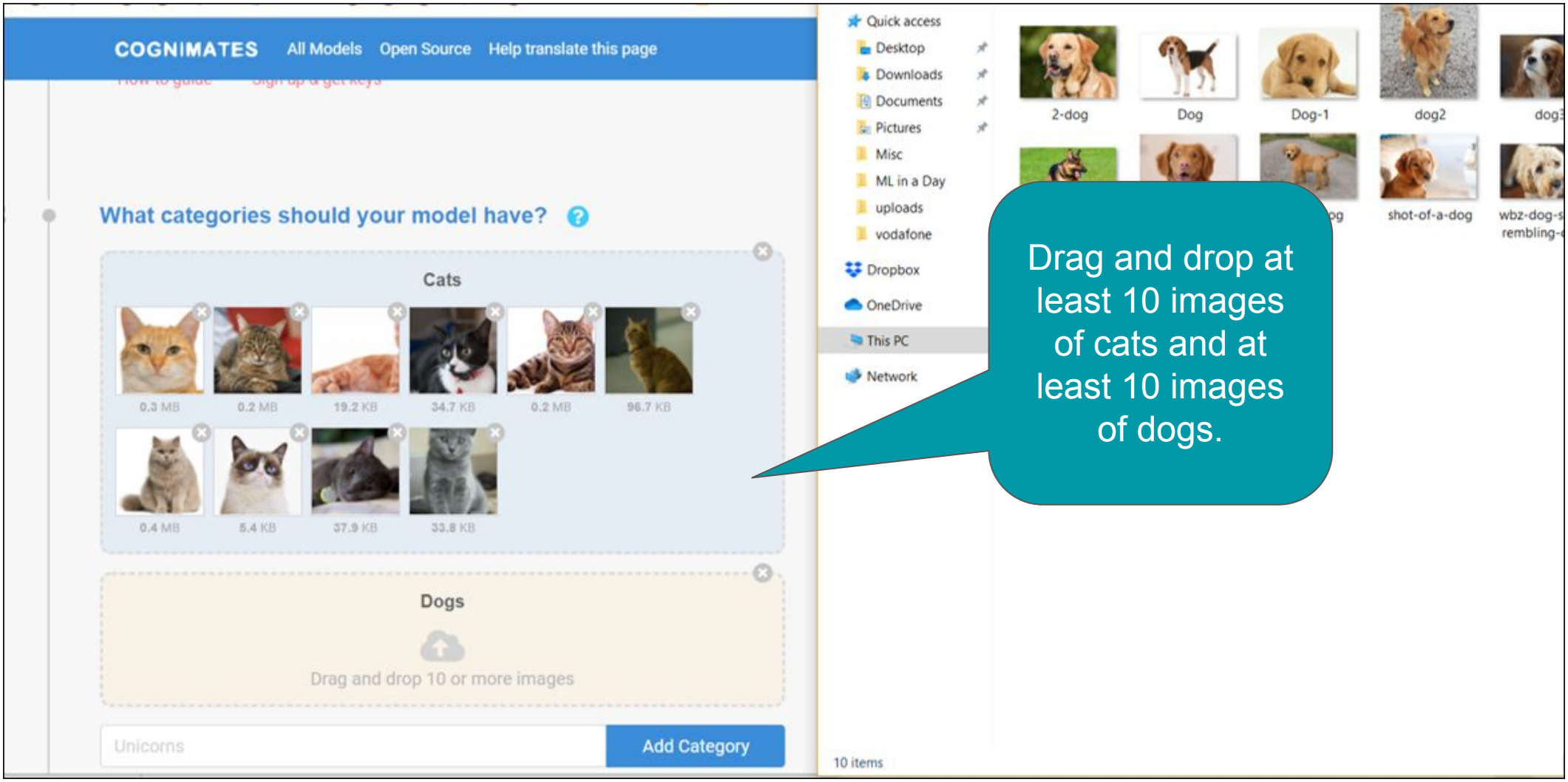
1.3 – Building a model in Cognimates



1.3 – Building a model in Cognimates



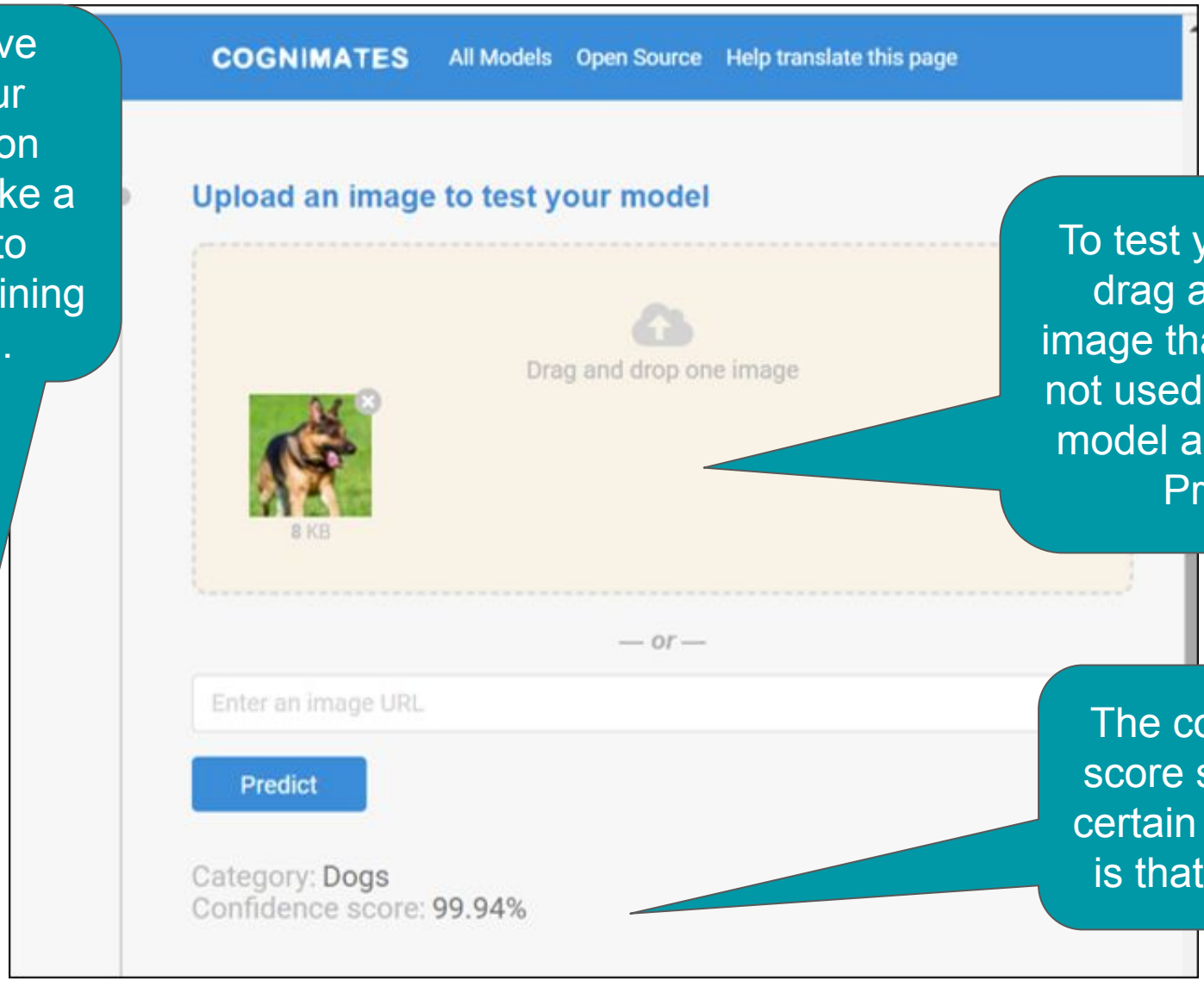
1.3 – Building a model in Cognimates



1.3 – Building a model in Cognimates

Apps for Good

When you have uploaded your images Click on Train - it may take a few minutes to complete the training of the model.



To test your model drag a drop an image that you have not used to train the model and click on Predict

The confidence score show how certain the model is that it is right

1.3 - Refining and adapting your model

Apps for Good

Experiment to find out how the computer learns, and how it behaves.

Try adding a third type of image to your model or building a new model to sort different images.

Try confusing the computer - Train the computer using ten photos of a dog on a grass background and ten photos of a cat on a plain white background. Can the computer recognises a dog on a plain white background or a cat on a grass background?

Does the computer get confused? Did it learn to recognise the dog and cat? Or was it more influenced by the background?

Using these materials

Apps for Good