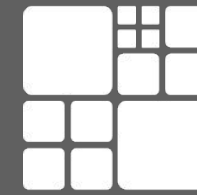


**TECHNOLOGY**

**MACHINE LEARNING**



**Apps  
for  
Good**

**COURSE**

**MACHINE  
LEARNING  
UNPLUGGED**

**SESSION 1**

**WHAT IS  
MACHINE  
LEARNING?**

# Objectives

## 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

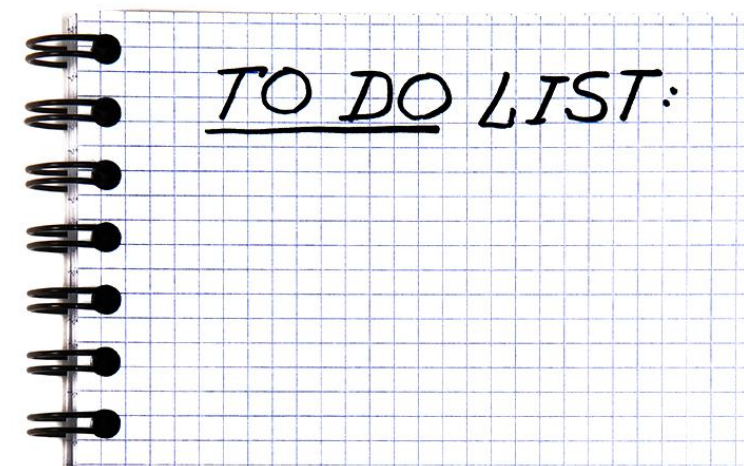
1.1 – What is machine learning?

1.2 - How do machines learn?

1.3 - Cats and dogs

1.4 - Neural networks

1.5 - Extension / Homework - What can go wrong?



# Introduction

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!

**Instagram's anti-bullying AI asks users: 'Are you sure you want to post this?'**  
*Instagram said early tests found it encourages users to 'share something less hurtful once they have had a chance to reflect'*

**Netflix: Binging on the Algorithm**

**How Spotify's algorithms are ruining music**

News • Education  
**97% of GCSE results 'to be set using A Level algorithm', new analysis shows**

# 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

# 1.1 – What is machine learning

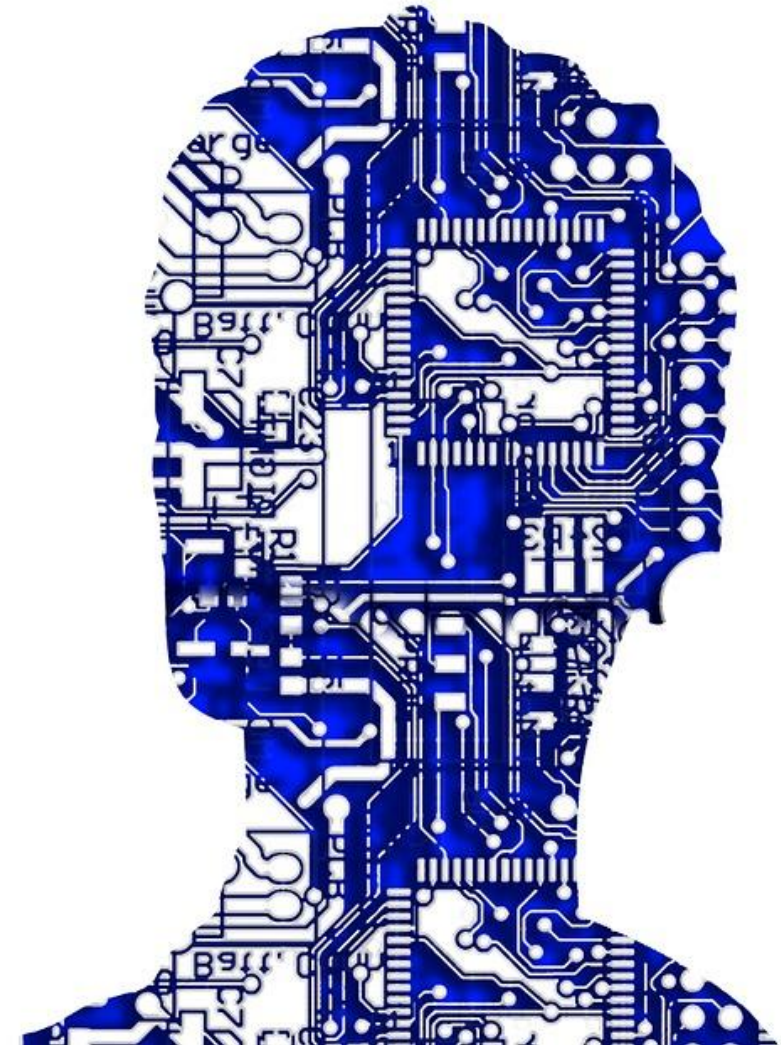
Watch this video: [What is Artificial Intelligence \(or Machine Learning\)?](#) (6 mins, 14s). Then complete the remaining questions in your workbook.





# 1.1 – What is machine learning

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?

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.

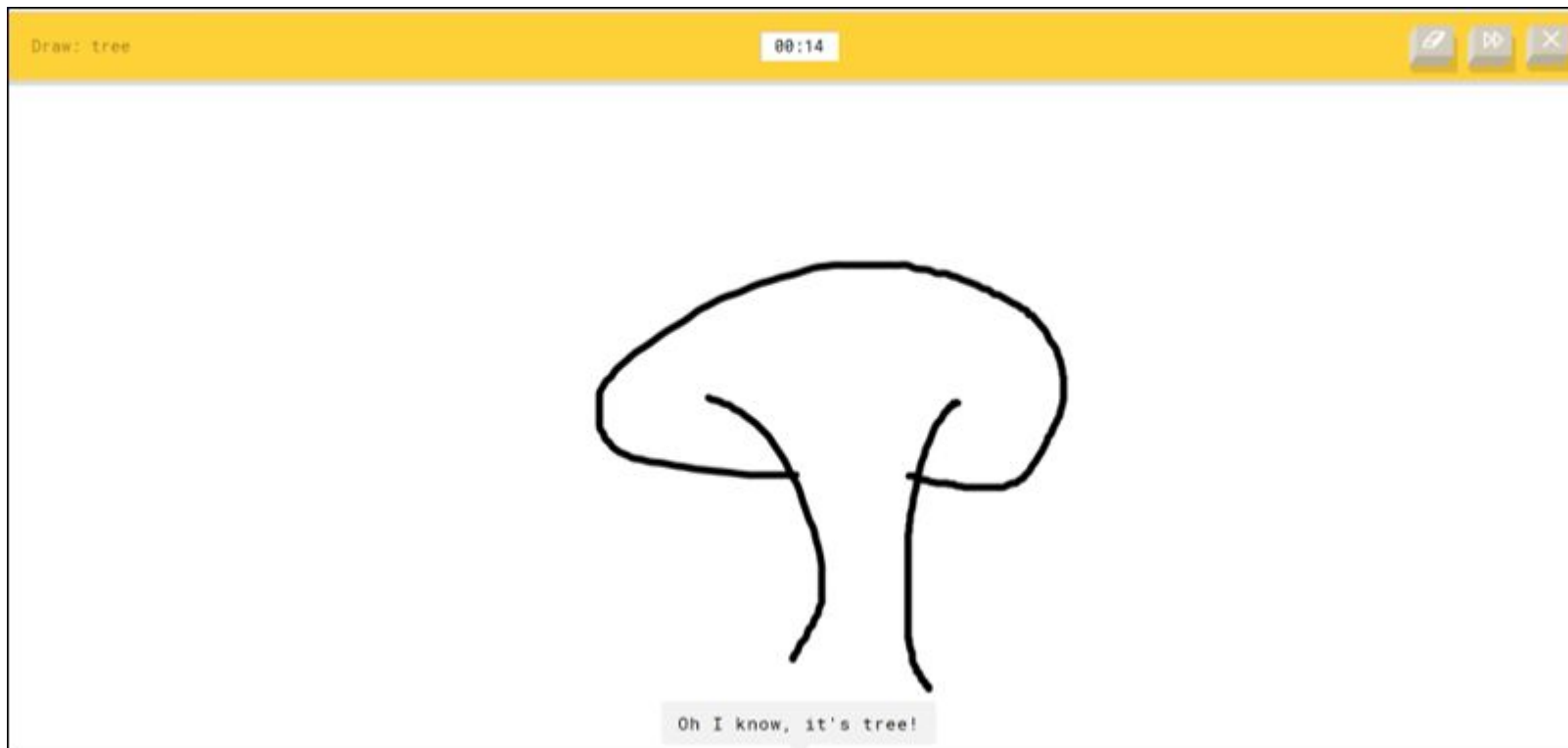
With **machine learning**:

- 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.

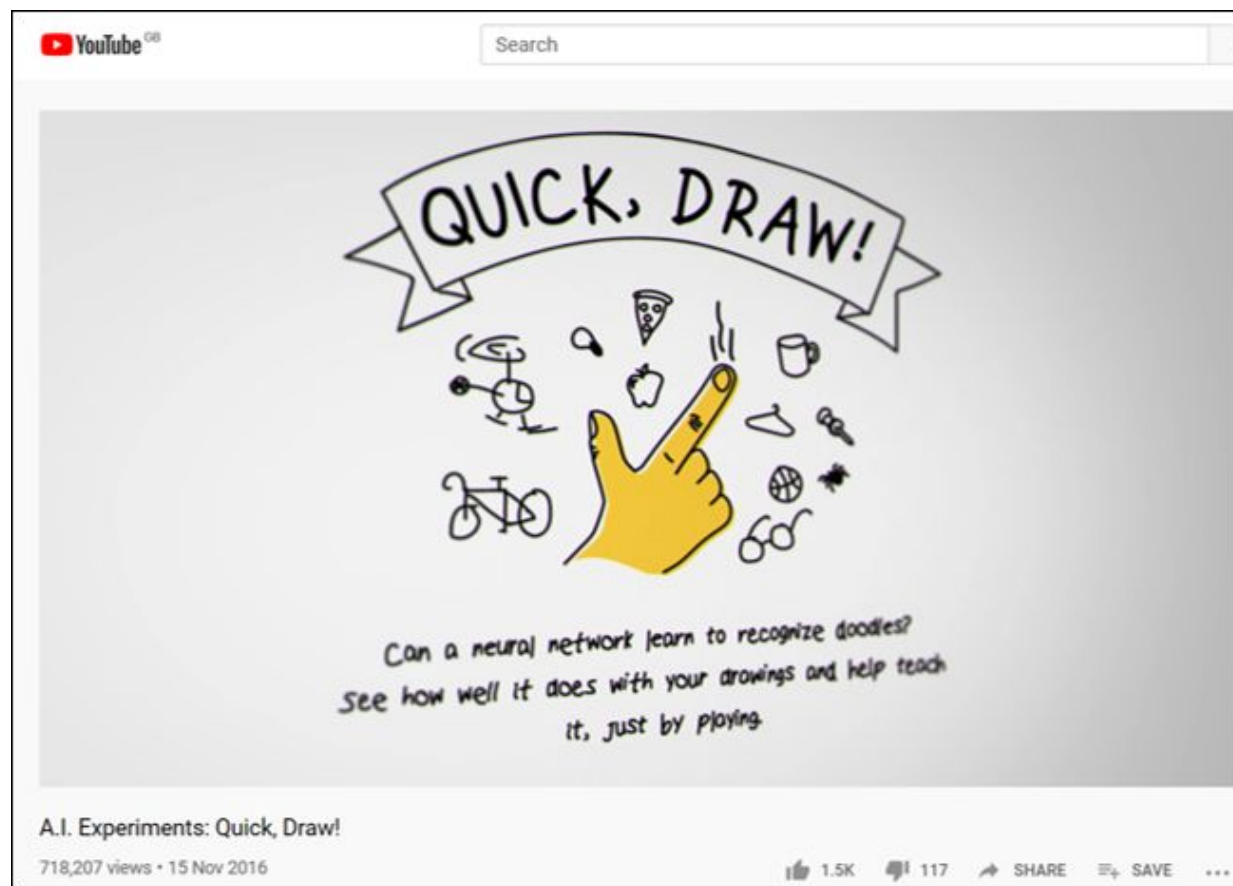
# Quick, Draw!

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?

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**

# 1.3 - Cat or Dog

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



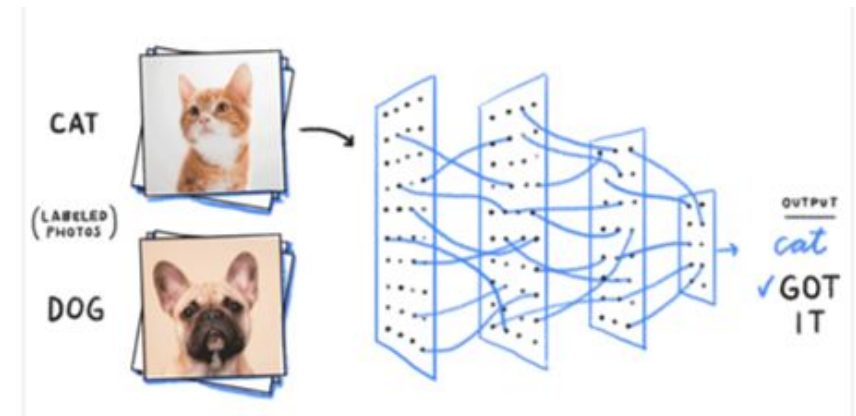
# 1.3 – Cat or dog?

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/>

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





# 1.4 – Neural networks

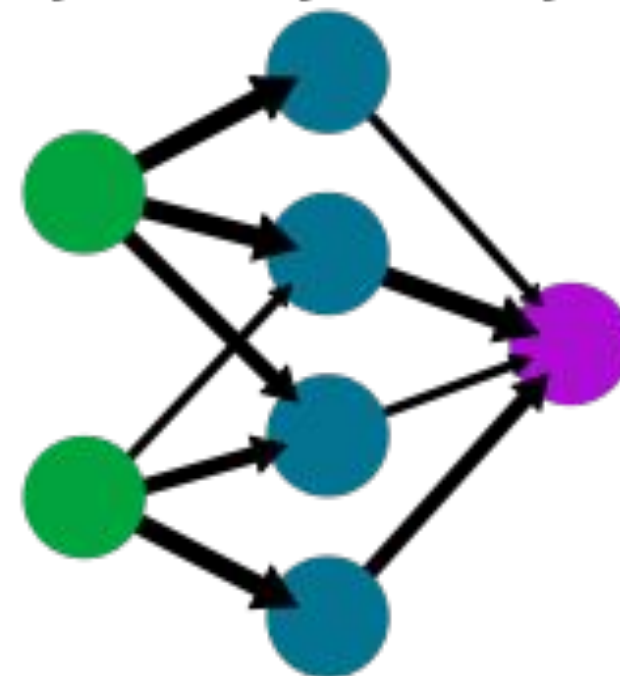
Quick,Draw uses neural networks to analyse your drawing and compare it with thousands of other drawings in its library.

**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.

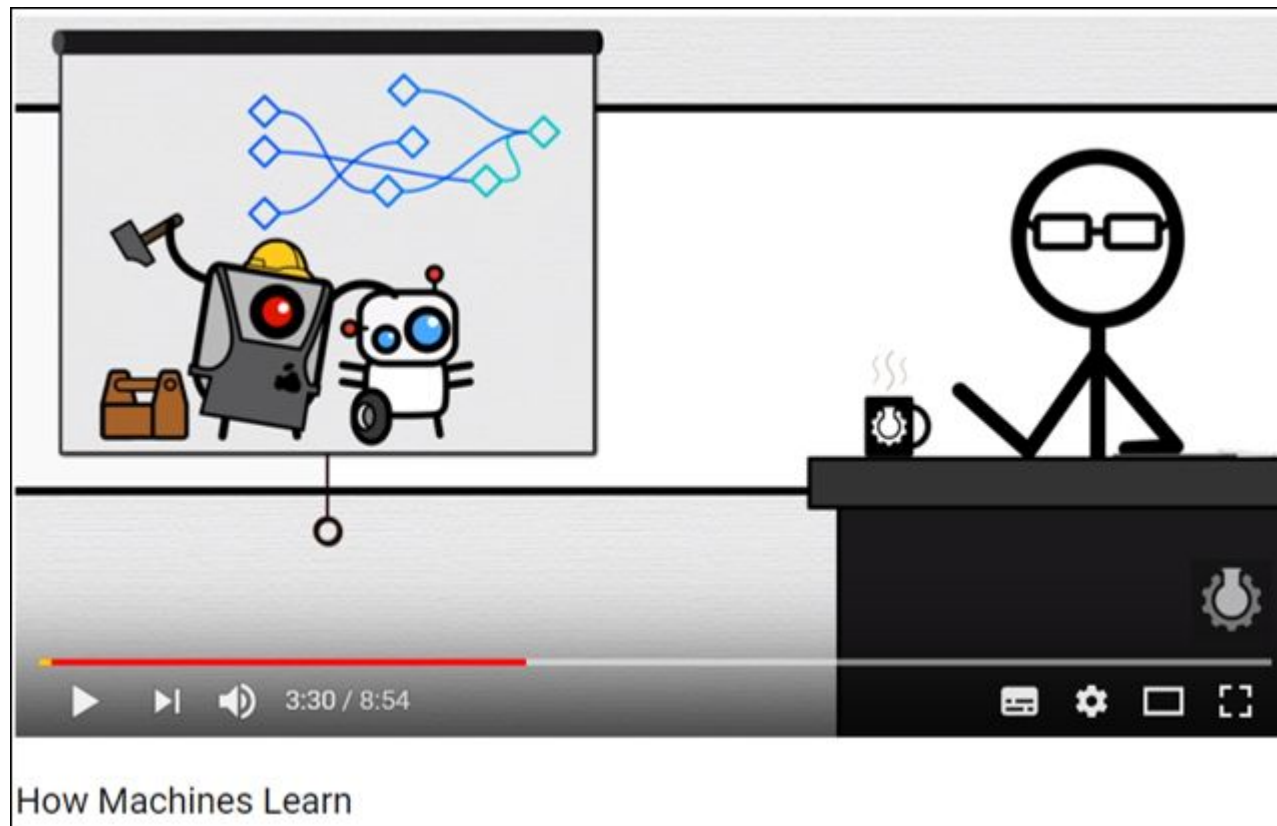
A simple neural network

input layer      hidden layer      output layer



# 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?

How do neural networks work?

**NAME**

# 1.5 - Extension / Homework - What can go wrong?

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



# This session

## 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

## 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**

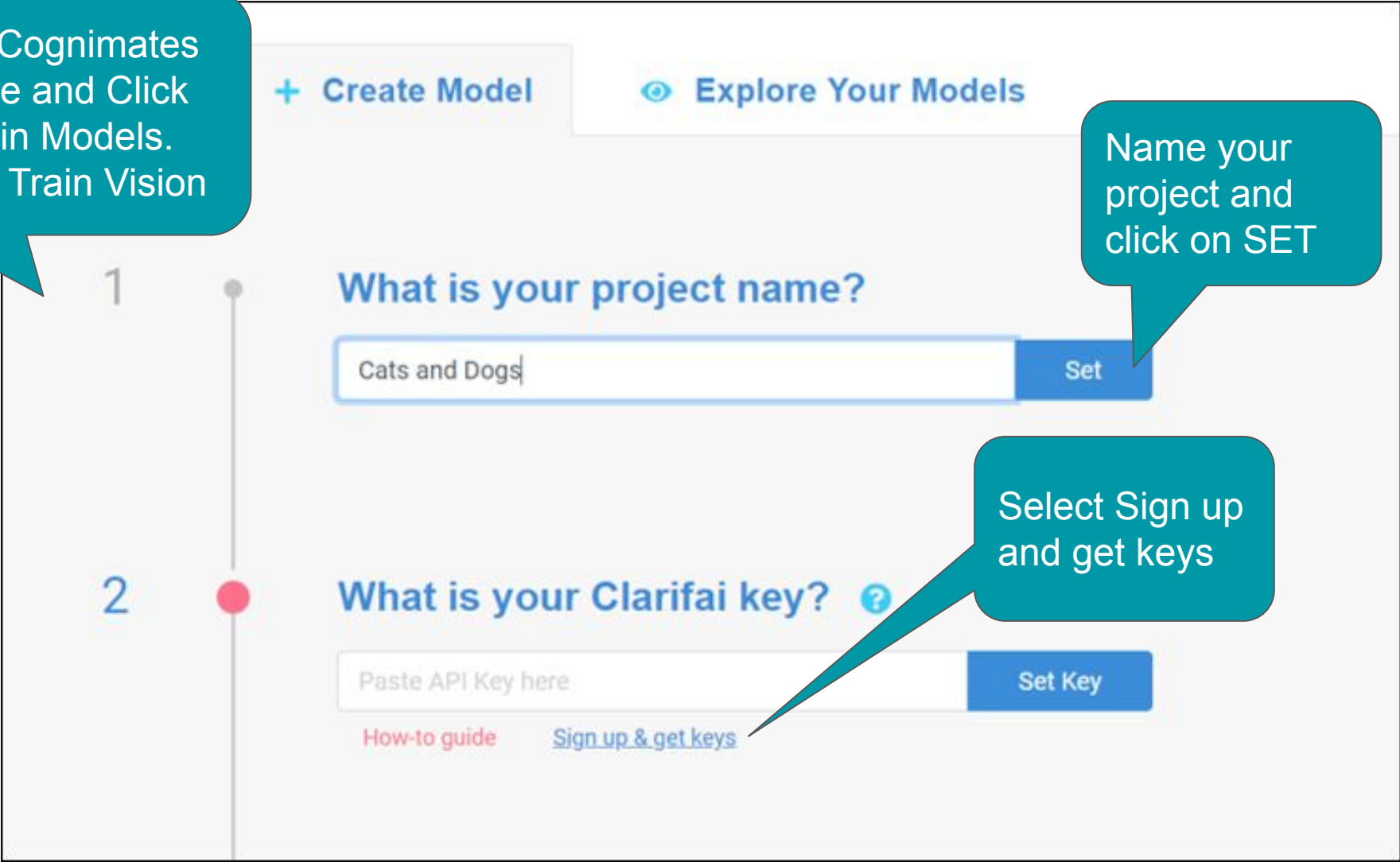
**MACHINE  
LEARNING  
UNPLUGGED**

**SESSION 2**

**FACIAL  
RECOGNITION**



# 1.3 – Building a model in Cognimates



The screenshot shows the 'Create Model' page in Cognimates. At the top, there are two tabs: '+ Create Model' (selected) and 'Explore Your Models'. Below the tabs, the main heading is 'What is your project name?'. There is a text input field containing 'Cats and Dogs' and a blue 'Set' button to its right. Below this, the heading is 'What is your Clarifai key?'. There is a text input field containing 'Paste API Key here' and a blue 'Set Key' button to its right. At the bottom, there are two links: 'How-to guide' and 'Sign up & get keys'. A vertical progress indicator on the left side of the page shows two steps: step 1 is marked with a grey dot and step 2 is marked with a red dot. Three teal callout boxes provide instructions: the first points to step 1, the second points to the 'Set' button, and the third points to the 'Sign up & get keys' link.

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

1

+ Create Model    Explore Your Models

What is your project name?

Cats and Dogs    Set

2

What is your Clarifai key? ?

Paste API Key here    Set Key

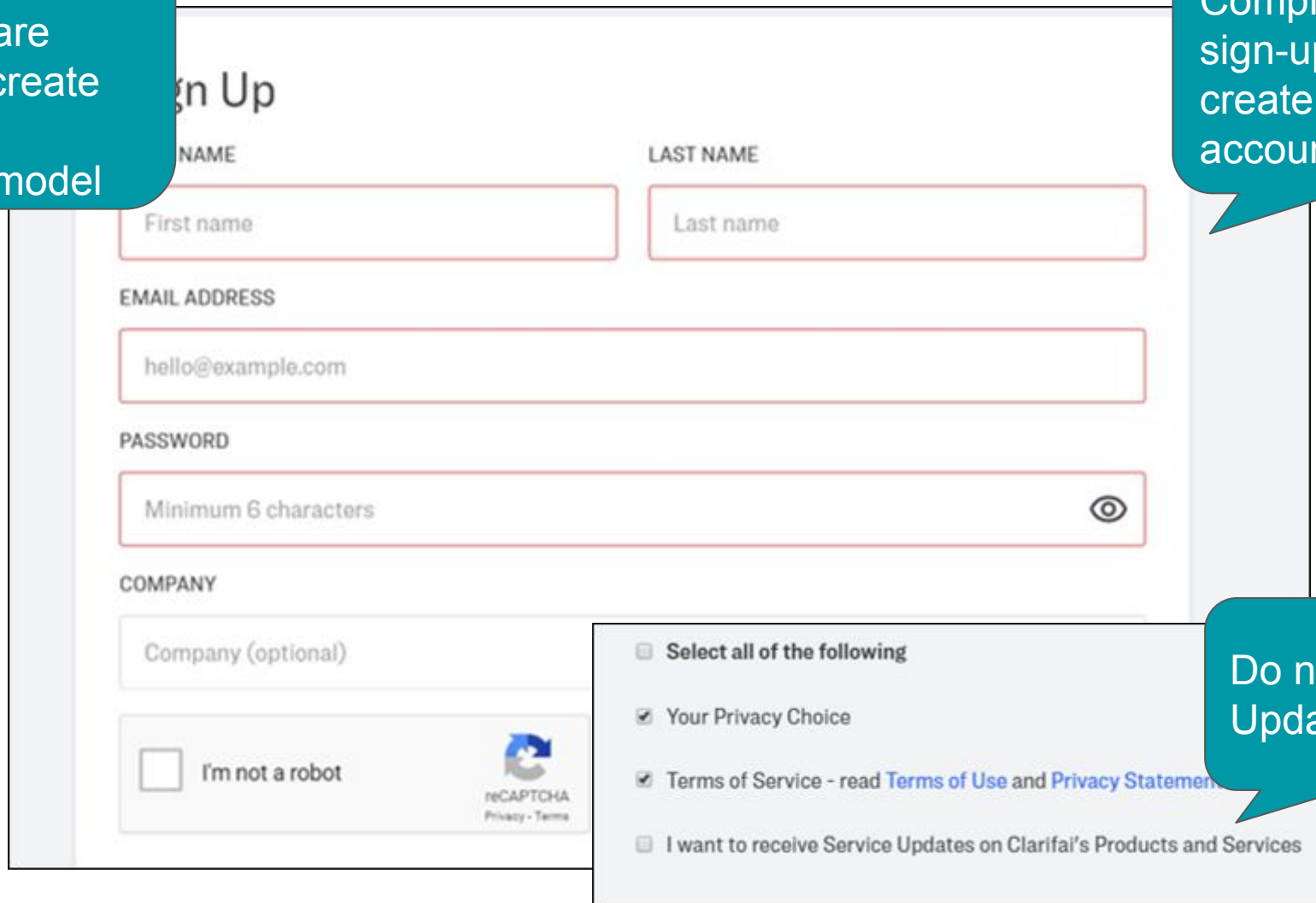
How-to guide    Sign up & get keys

Name your project and click on SET

Select Sign up and get keys

# 1.3 – Building a model in Cognimates

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



Sign Up

NAME

FIRST NAME LAST NAME

First name Last name

EMAIL ADDRESS


hello@example.com

PASSWORD

Minimum 6 characters

COMPANY

Company (optional)

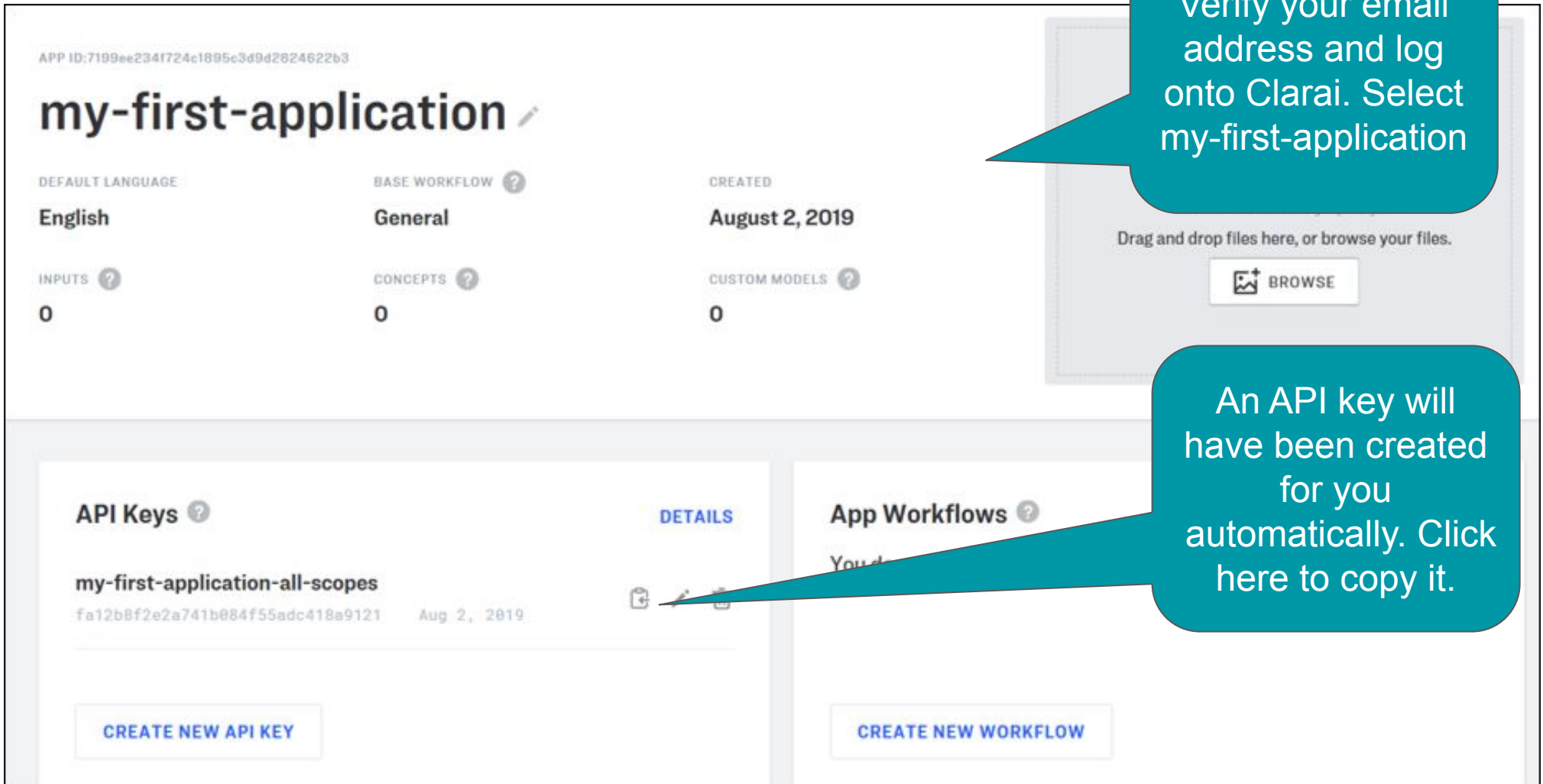
I'm not a robot  reCAPTCHA Privacy - Terms

- Select all of the following
- Your Privacy Choice
- Terms of Service - read [Terms of Use](#) and [Privacy Statement](#)
- I want to receive Service Updates on Clarifai's Products and Services

Complete the sign-up form to create your account

Do not select Updates

# 1.3 – Building a model in Cognimates



APP ID:7199ee2341724c1895c3d9d2824622b3




## my-first-application

DEFAULT LANGUAGE: English | BASE WORKFLOW: General | CREATED: August 2, 2019

INPUTS: 0 | CONCEPTS: 0 | CUSTOM MODELS: 0

Drag and drop files here, or browse your files. **BROWSE**

### API Keys

API Key Name	API Key Value	Created	Actions
my-first-application-all-scopes	fa12b8f2e2a741b084f55adc418a9121	Aug 2, 2019	<a href="#">DETAILS</a>   

**CREATE NEW API KEY**

### App Workflows

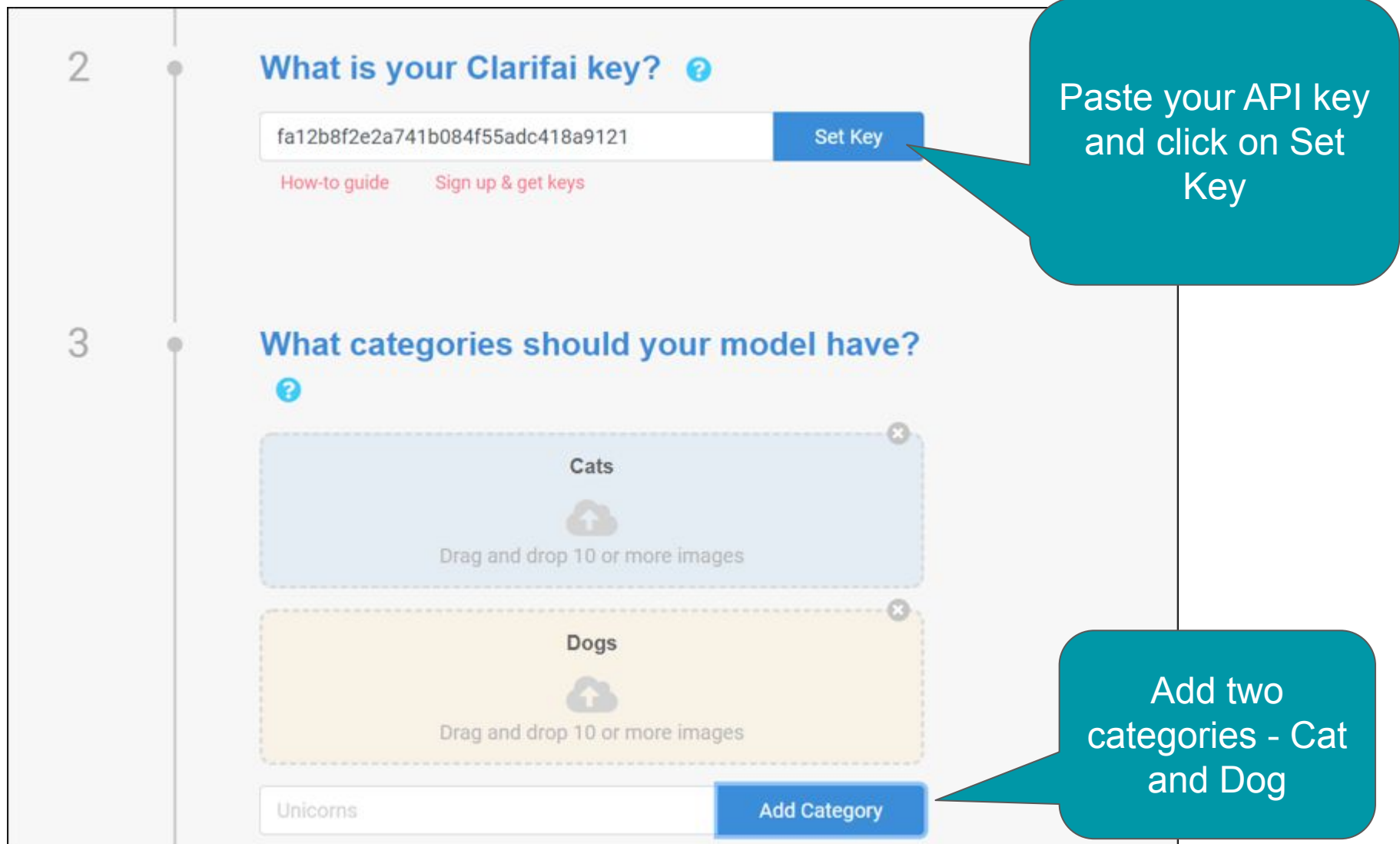
You d...

**CREATE NEW WORKFLOW**

Verify your email address and log onto Clarai. Select my-first-application

An API key will have been created for you automatically. Click here to copy it.

# 1.3 – Building a model in Cognimates



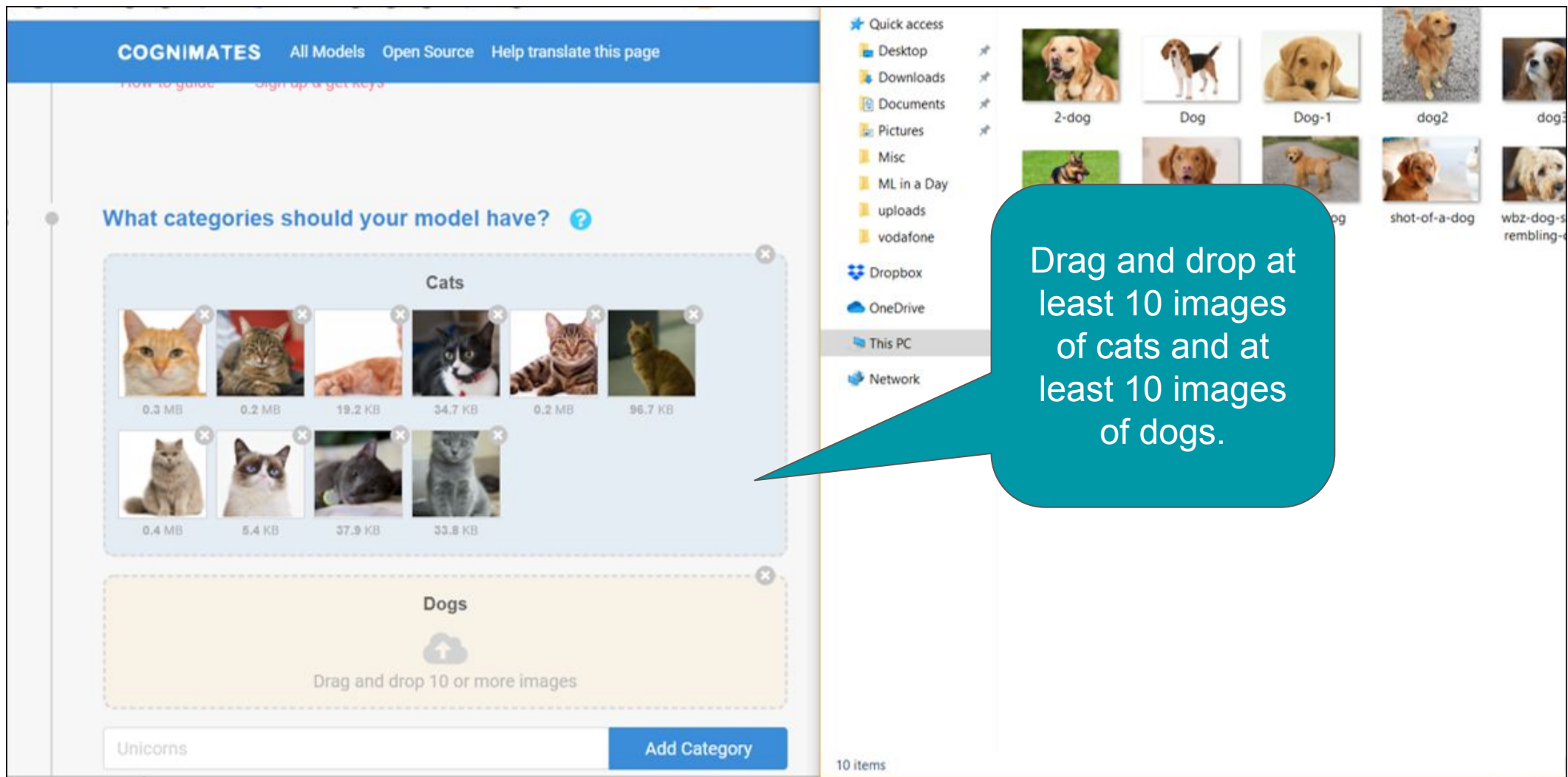
The screenshot displays two steps in a vertical timeline on the left:

- Step 2:** "What is your Clarifai key?" with a question mark icon. A text input field contains the key "fa12b8f2e2a741b084f55adc418a9121". To the right is a blue "Set Key" button. Below the input field are links for "How-to guide" and "Sign up & get keys".
- Step 3:** "What categories should your model have?" with a question mark icon. There are two category boxes: "Cats" (light blue) and "Dogs" (light yellow). Each box contains an upload icon and the text "Drag and drop 10 or more images". Below these boxes is an input field with "Unicorns" and a blue "Add Category" button.

Two teal callout boxes provide instructions:

- The first callout points to the "Set Key" button and contains the text: "Paste your API key and click on Set Key".
- The second callout points to the "Add Category" button and contains the text: "Add two categories - Cat and Dog".







# 1.3 – Building a model in Cognimates



**COGNIMATES** All Models Open Source Help translate this page

What categories should your model have? ?

**Cats**

					
0.3 MB	0.2 MB	19.2 KB	34.7 KB	0.2 MB	96.7 KB

**Dogs**

Drag and drop 10 or more images

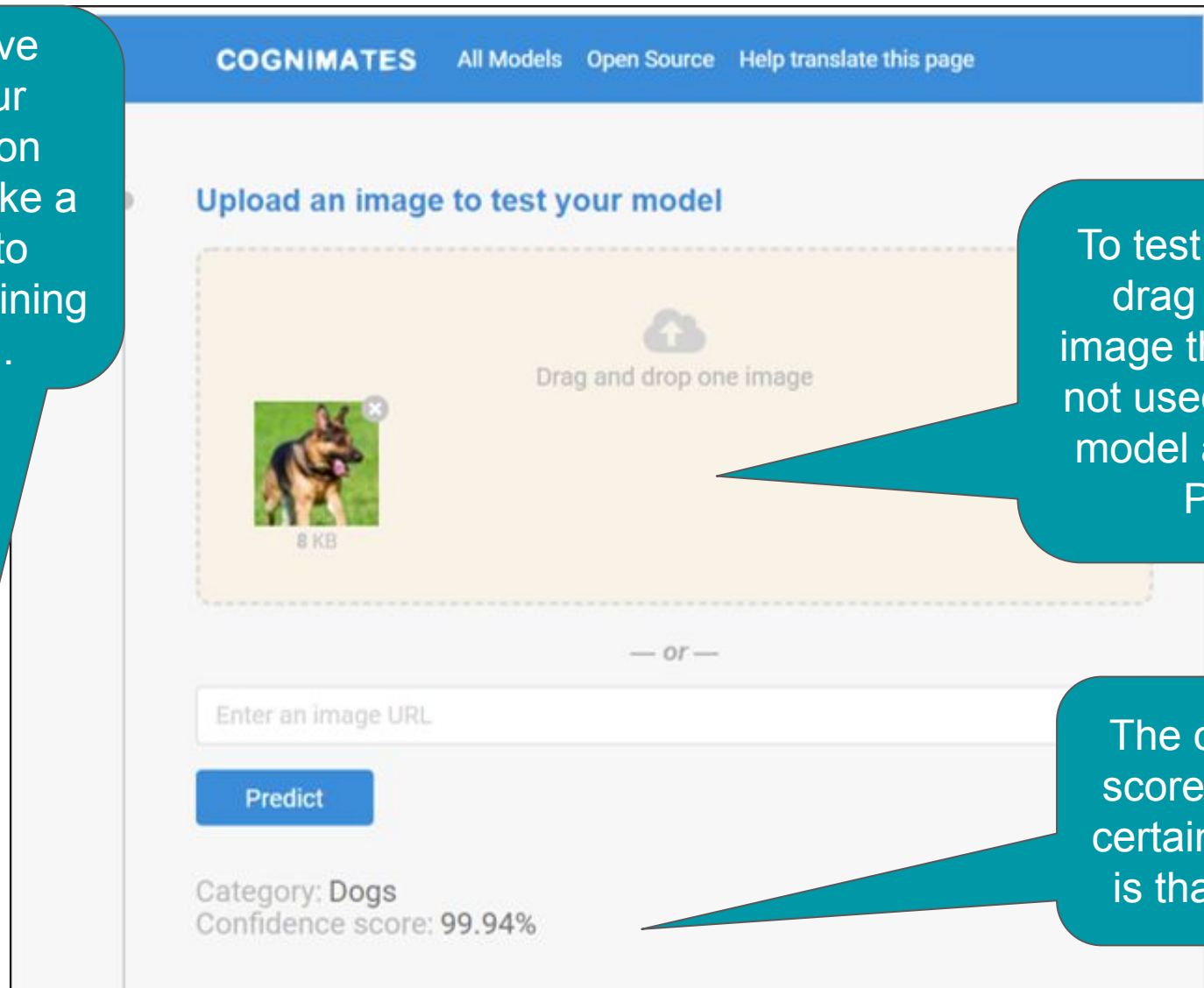
Unicorns **Add Category**

10 items

Drag and drop at least 10 images of cats and at least 10 images of dogs.

# 1.3 – Building a model in Cognimates

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



The screenshot shows the Cognimates web interface. At the top, there is a blue navigation bar with the text "COGNIMATES" and links for "All Models", "Open Source", and "Help translate this page". Below the navigation bar, the main heading is "Upload an image to test your model". There is a large dashed box containing a cloud icon with an upward arrow and the text "Drag and drop one image". To the left of this box, a small image of a dog is shown with a close button (X) and the text "8 KB". Below the dashed box, there is a separator "— or —". Underneath, there is a text input field labeled "Enter an image URL" and a blue "Predict" button. At the bottom of the interface, the prediction results are displayed: "Category: Dogs" and "Confidence score: 99.94%".

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



**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 recognise 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

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