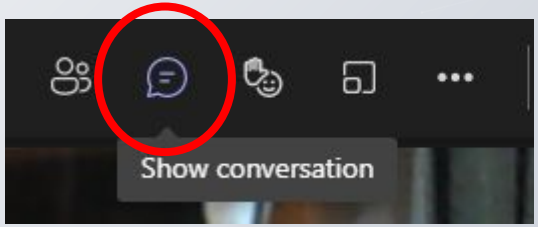
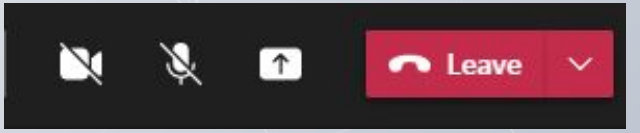
While we wait to get started ...

Open the chat



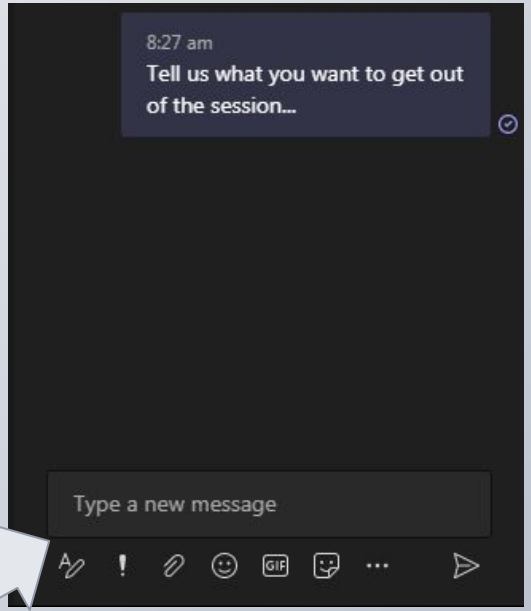


Your mic is on mute
... and camera disbaled

Tell us what you want to get out of the session.

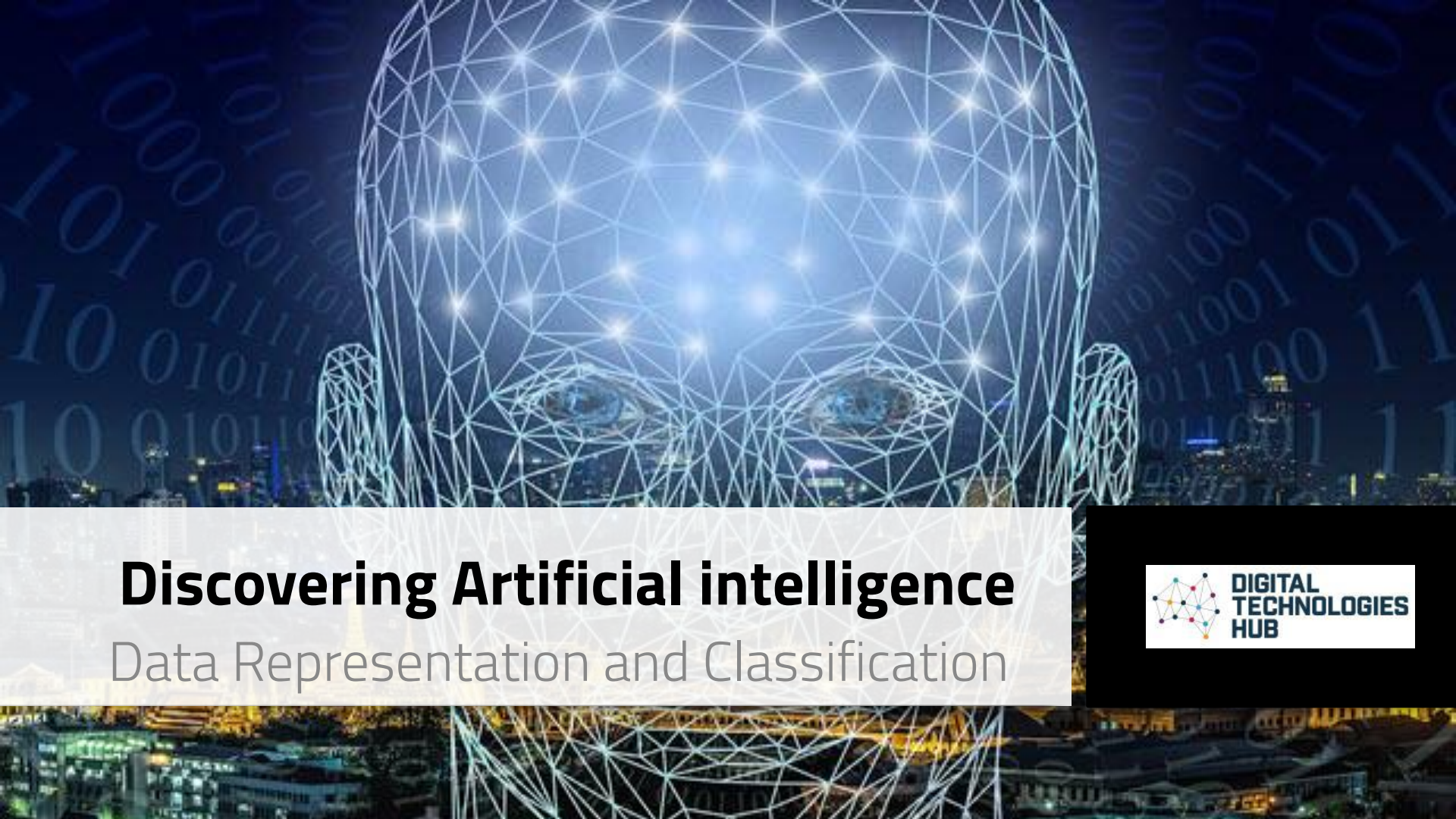
NOTE:
your name will appear with your comment.

The chat won't be part of the recorded version.



How do you teach about data in your classroom?

DIGITAL TECHNOLOGIES HUB



Discovering Artificial intelligence

Data Representation and Classification

DIGITAL TECHNOLOGIES HUB

Acknowledgement of Country

ESA acknowledges the Eastern Kulin Nation, Traditional Custodians of the land on which our head office stands, and pays our respects to Elders past and present.

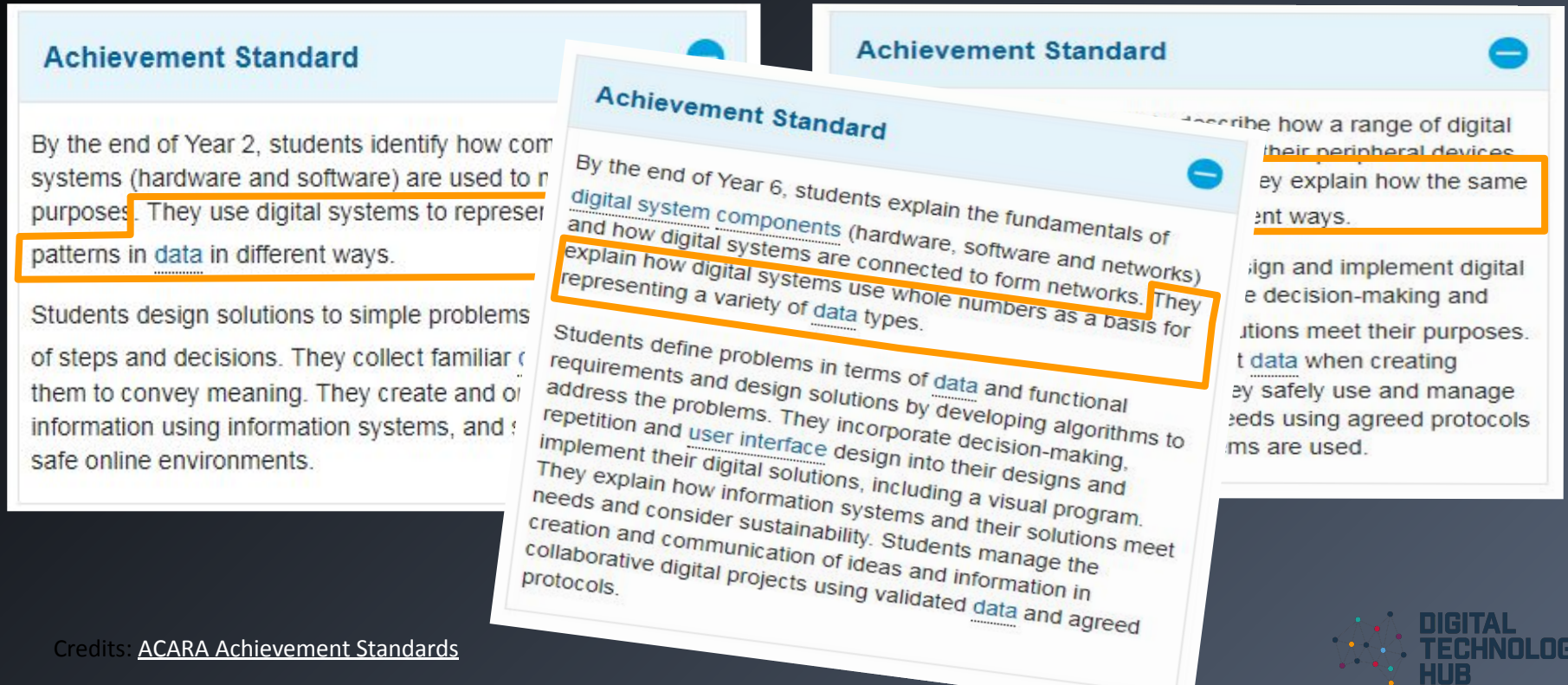
We recognise the Traditional Custodians of Country across Australia and their continuing connection and contribution to lands, waters, communities and learning

By the end of this session...

You should be able to describe:

- How data representation and abstraction go hand in hand
- the progression from symbols via whole numbers to binary
- examples of data used by AIs
- the type of data an AI produces

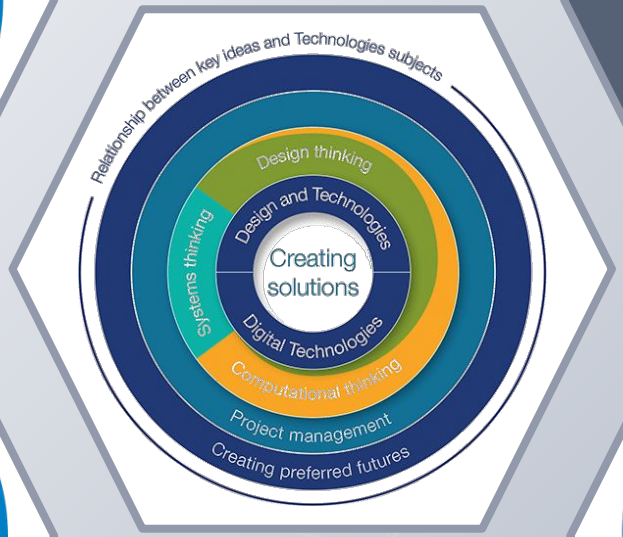
Achievement standards: starting point

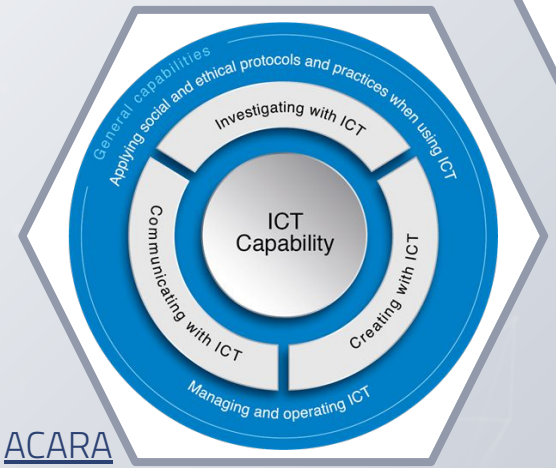


Credits: ACARA Achievement Standards

Australian CURRICULUM

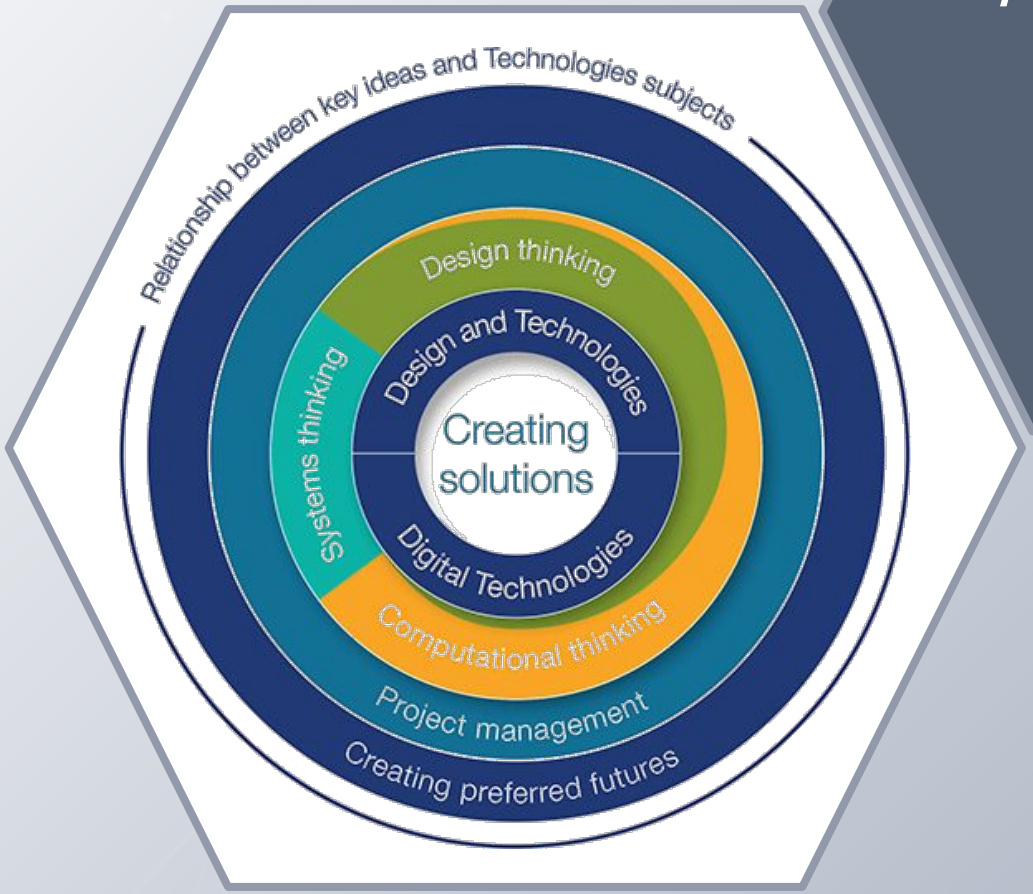
AI topics



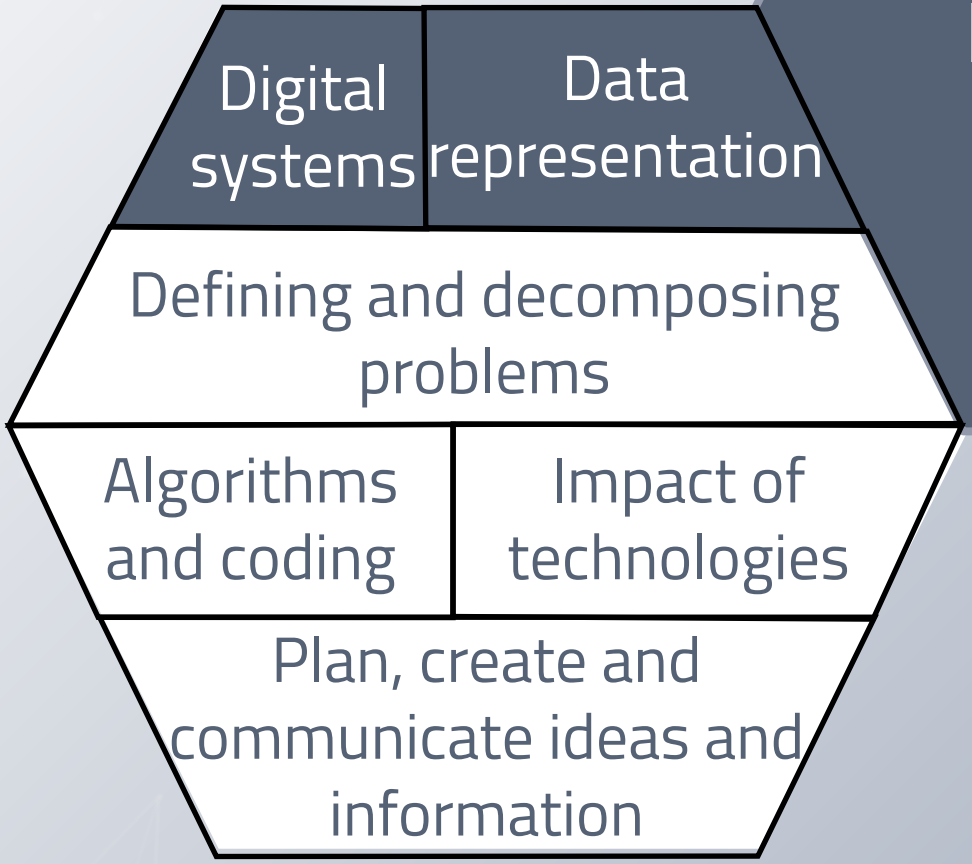


Source: ACARA

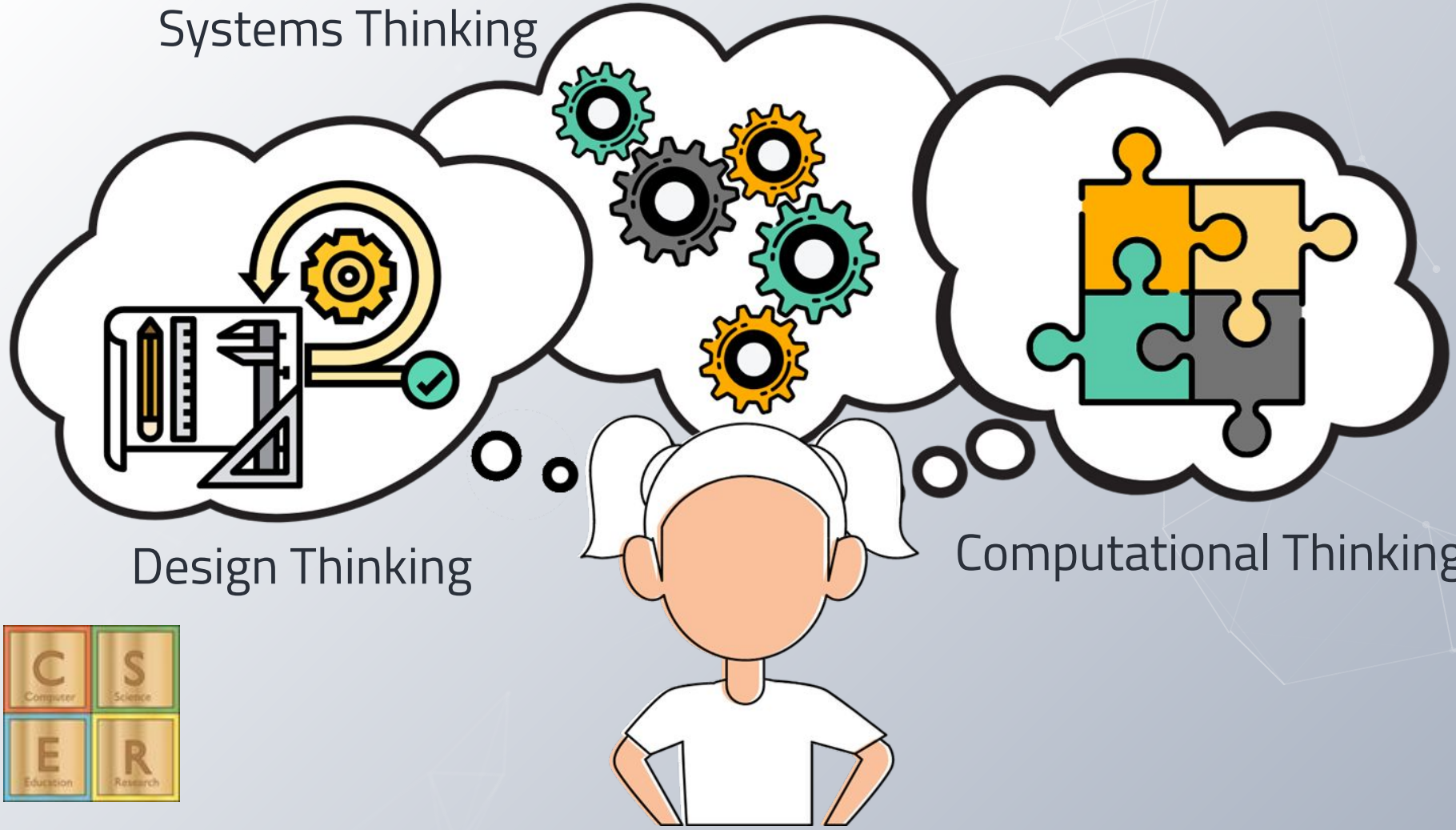
AI topics


Relationship between key ideas and Technologies subjects
Design thinking
Design and Technologies
Creating solutions
Digital Technologies
Systems thinking
Computational thinking
Project management
Creating preferred futures

Foci of this deep dive



Systems Thinking



Design Thinking

Computational Thinking

What data does an AI need?

Data representation (F-6)

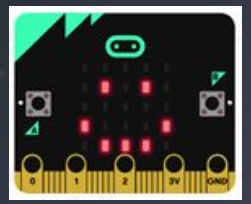
F-2

Express data using pictures and symbols

Years 3-4

Represent same data in different ways depending on the purpose

:) happy [redacted]

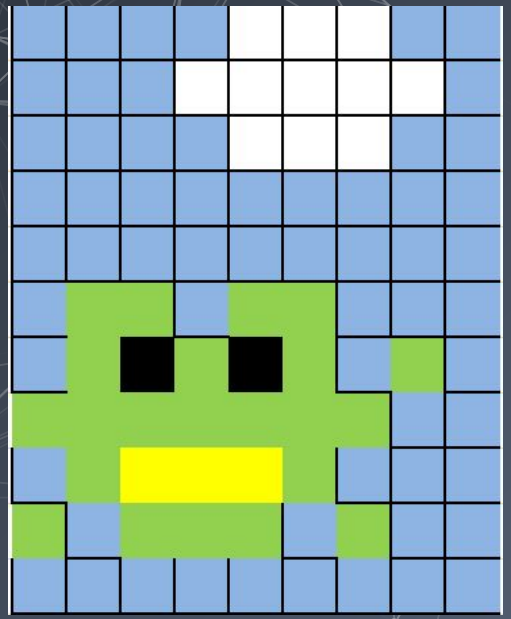


Happy ✓

Sad

Years 5-6

Represent data using whole numbers



Data representation (F-6)

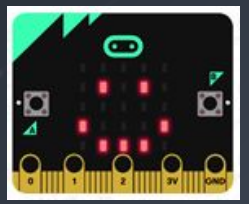
F-2

Express data using pictures and symbols

Years 3-4

Represent same data in different ways depending on the purpose

:) happy 

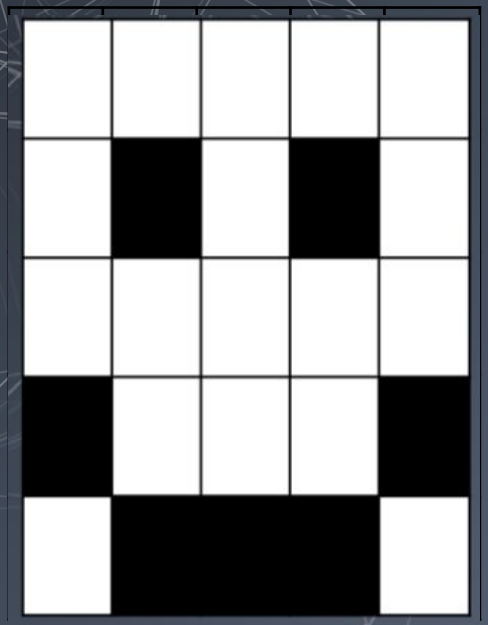


Happy ✓

Sad

Years 5-6

Represent data using whole numbers



Data representation (F-2)

F-2

Express data using pictures and symbols

How would you express these on a map?

1. Zoo
2. Cafe
3. Playground
4. Train station
5. Public toilets

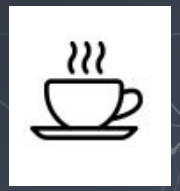
Icons: flaticon

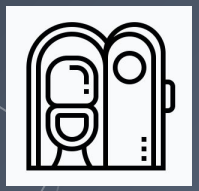
Teaching tips

What image could we use that people would recognise each of these?

Abstraction: What information do we need to include? What is not needed?

We end up extracting the important features that make it recognisable.

LESSON: Can AI recognise what you are drawing?

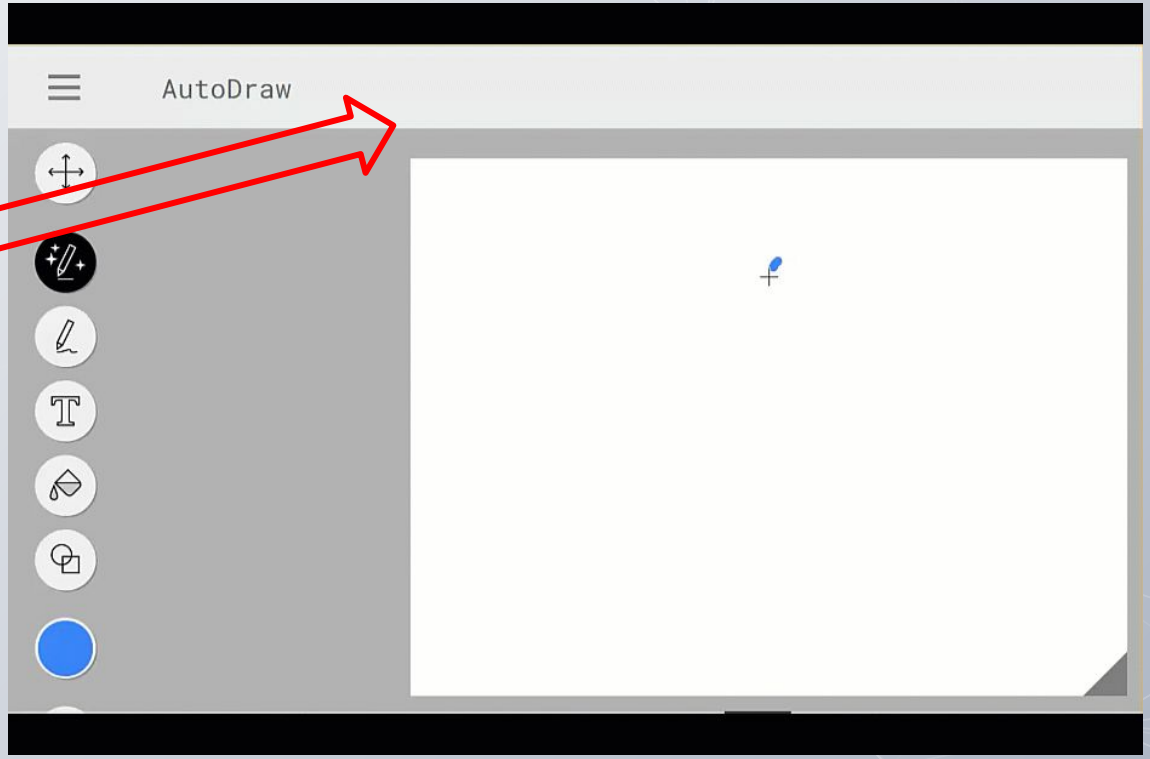
(Years F-4)

Can an AI recognise your drawing?

AutoDraw: An AI that recognises drawings

Look at how the AI predicts what the drawing might be.

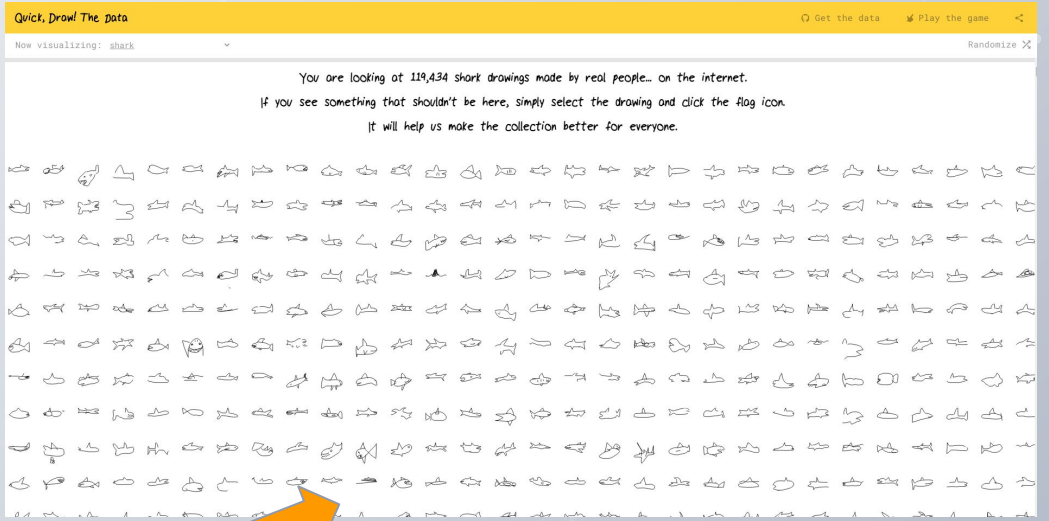
As it gets more information it recognises the drawing as a representation of an apple.



Autodraw

Quick, Draw!

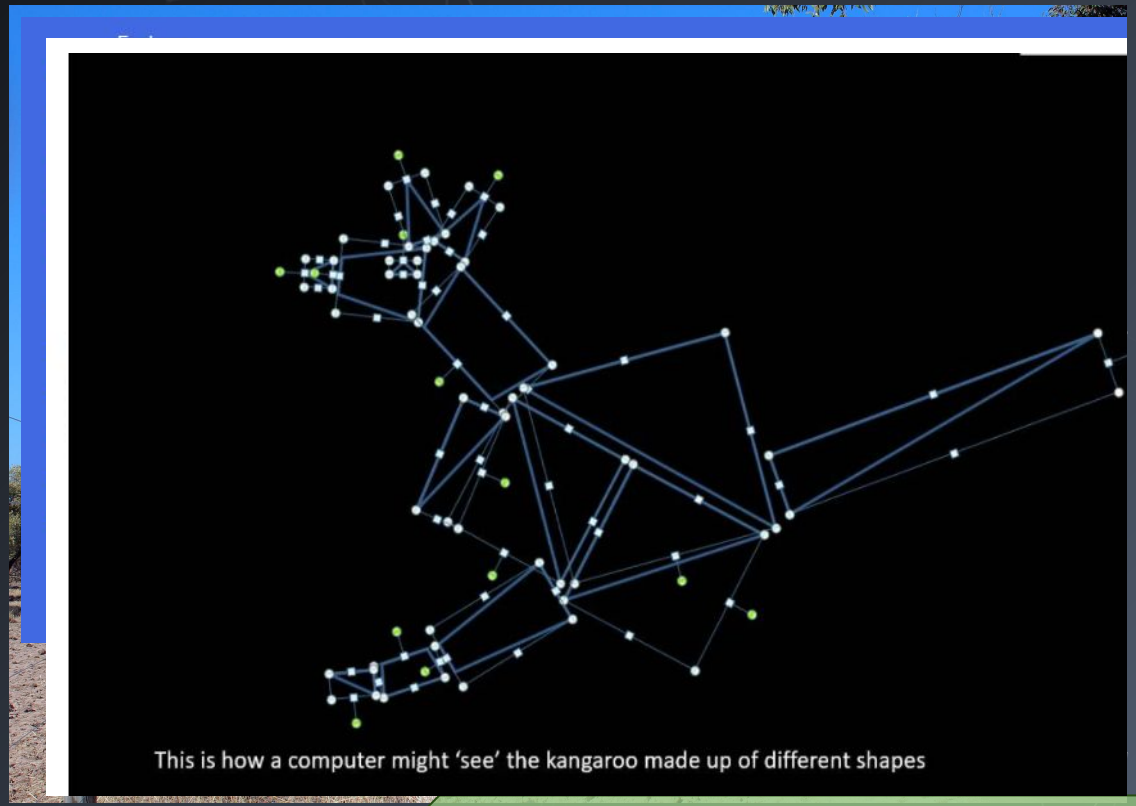

QUICK, DRAW!
Can a neural network learn to recognize doodling?
Help teach it by adding your drawings to the world's largest doodling data set, shared publicly to help with machine learning research.
Let's Draw!


Quick, Draw! The Data
Get the data
Play the game
Now visualizing: shark
Randomize
You are looking at 119,434 shark drawings made by real people... on the internet.
If you see something that shouldn't be here, simply select the drawing and click the flag icon.
It will help us make the collection better for everyone.

Data representation (Yr 3-4)

Years 3-4

Represent same data in different ways depending on the purpose



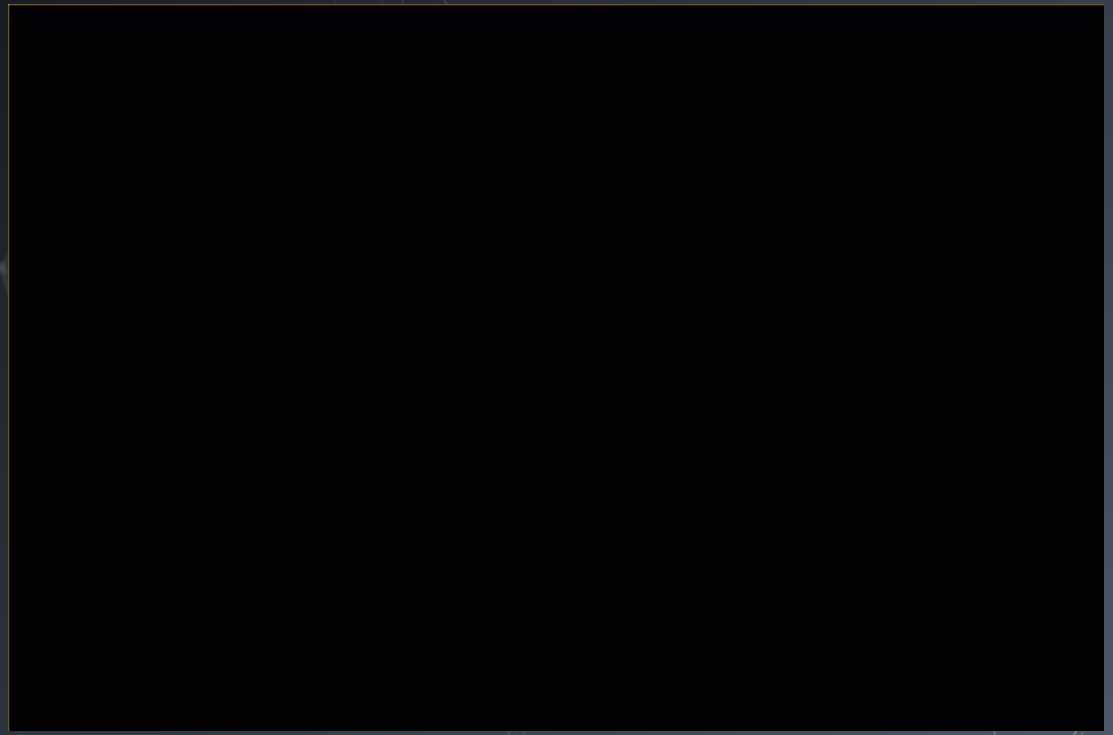
LESSON: HOW CAN AN AI RECOGNISE WHAT IT SEES?

(Years 3-4)

Data representation (Yr 3-4)

Years 3-4

Represent same data in different ways depending on the purpose



Animate an object using slide presentation software.

LESSON: HOW CAN AN AI RECOGNISE WHAT IT SEES?

(Years 3-4)

Data representation (Yr 3-4)

Years 3-4

Represent same data in different ways depending on the purpose

For an AI, the same data represented in different ways is critical.

Images: Pixabay

LESSON: HOW CAN AN AI RECOGNISE WHAT IT SEES?

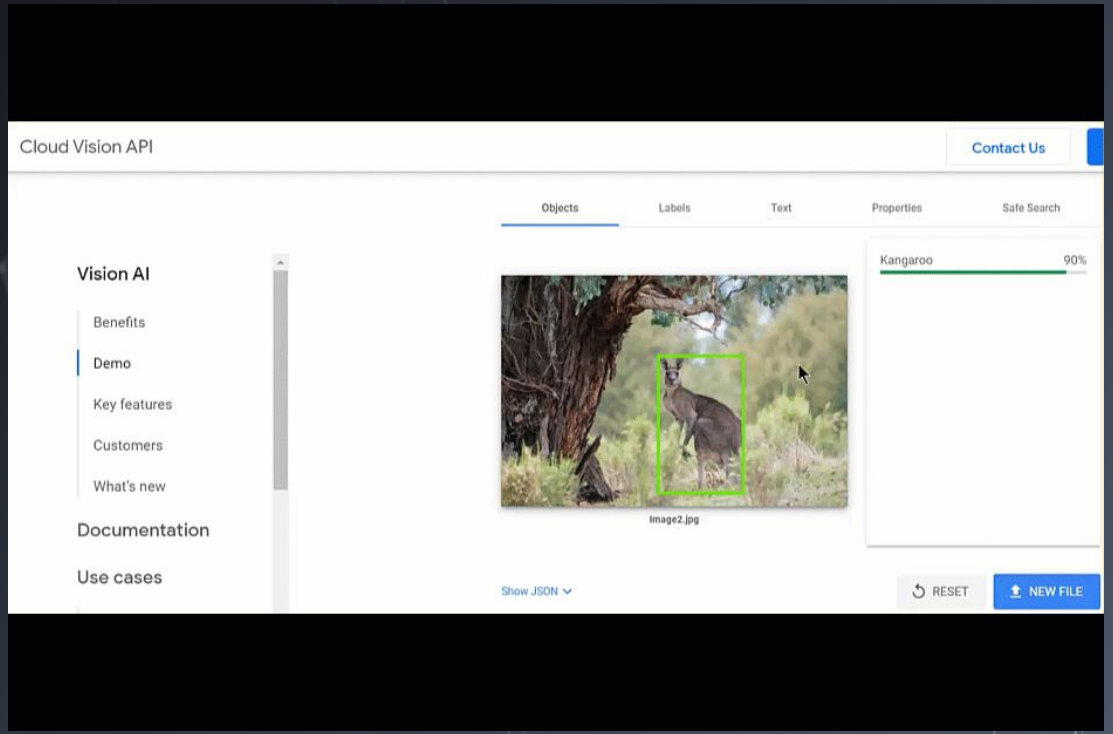
(Years 3-4)

Data representation (Yr 3-4)

Years 3-4

Represent same data in different ways depending on the purpose

Google Vision API



Images: Pixabay

LESSON: HOW CAN AN AI RECOGNISE WHAT IT SEES? (Years 3-4)

Image recognition: pixel colour patterns

What is happening here?

What do you notice?

CS Field Guide **pixel viewer**

Image: (Pixabay)

Image recognition: pixel patterns (Yrs 5-6)

How might an AI ‘see this butterfly? ‘

Students can create pixel image of an object representing colour by whole numbers.

Image: (Wanderer butterfly greenadelaide.sa.gov.au)

Data representation (F-6)

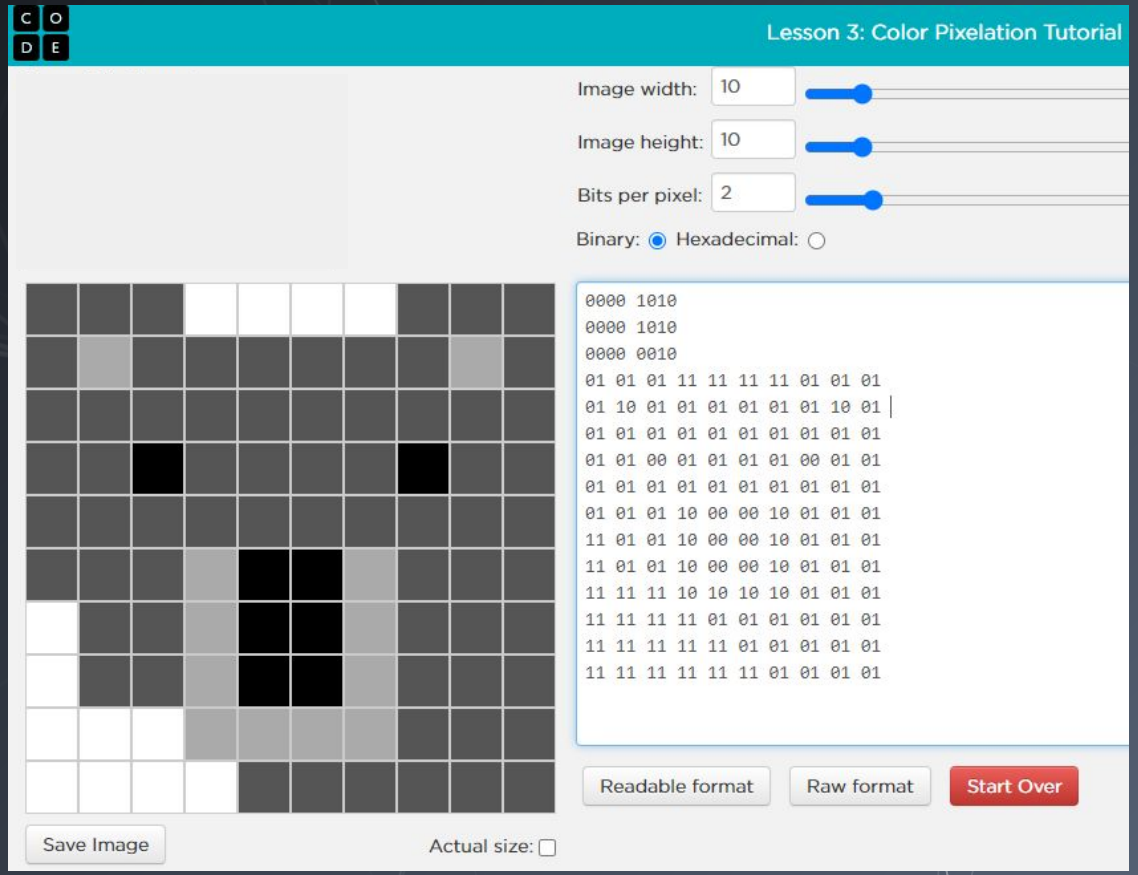
Years 5-6

Represent data using whole numbers

Code studio
Take a step further with shades of B&W

Two bits per pixel
00, 01, 10, 11

(black, dark grey, light grey white) (4)



How does an AI represent data?

Input

- Generally binary input data

Output

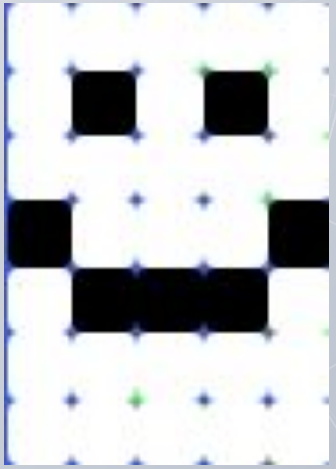
- Generally one or more floating point outputs in the range of 0 to 1
- Confidence values
- These can be rounded to the nearest 1 or 0, which leads to a classifier

Input

B/W matrix

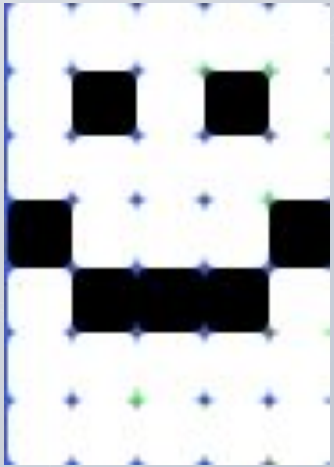
This image is a 7x5 matrix of black and white pixels

Each pixel represents a bit: 0 or 1



Binary representation

The image can be represented as binary

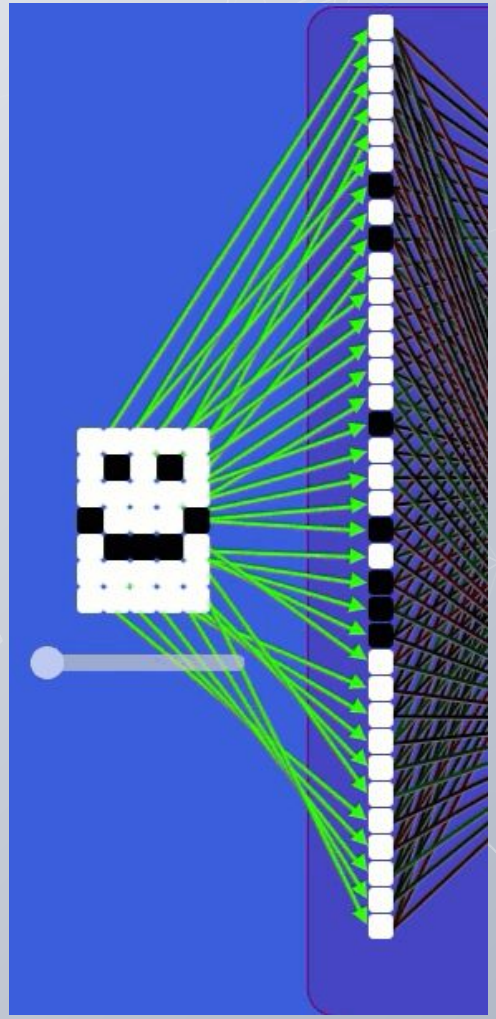


00000
01010
00000
10001
01110
00000
00000

B/W matrix

The rows of 5 bits can be connected into a 35 bit binary number

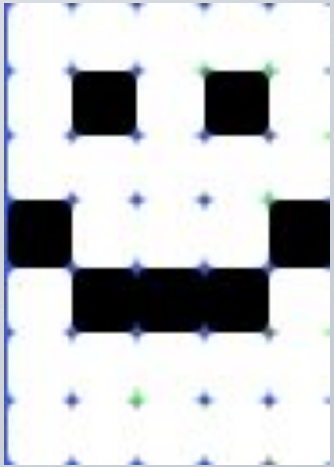
Smiley = 00000 01010 00000 10001 01110 00000 00000



Binary representation

The binary representation is preferred over a decimal representation, as binary more closely resembles the image.

By looking at the binary number, we can actually see the picture

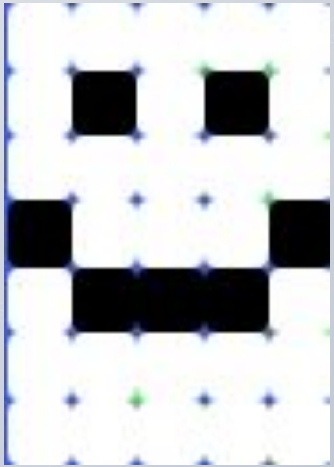


00000
01010
00000
10001
01110
00000
00000

Decimal representation

The decimal representation is fairly disconnected from the original image.

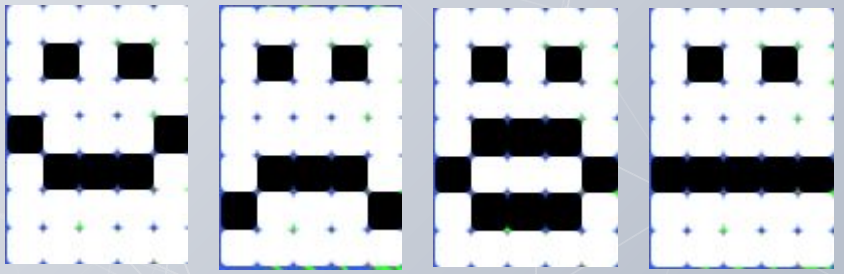
Leading zeroes are lost.



336115712

Binary Representation

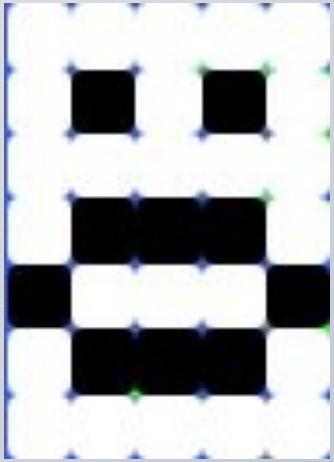
With this approach, we can represent any B/W picture as binary numbers



Happy Sad Surprised Angry

Binary representation Activity

What is the binary representation of the ‘Surprised’ emoji?



00000
01010
00000
01110
10001
01110
00000

00000 01010 00000 01110 10001 01110 00000

This approach is not limited to pixel graphics. We can also represent words in binary.

Let’s explore home automation

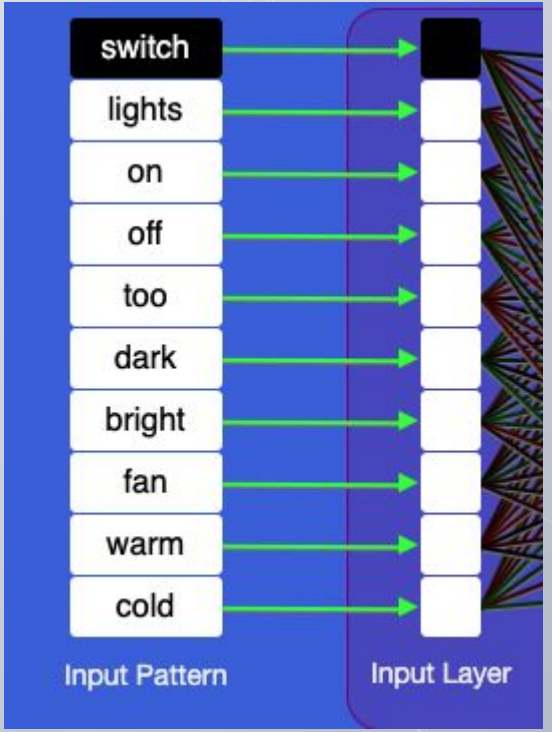
Image CC-BY-SA NDB Photos (Wikimedia Commons)

Home automation

Entire words can be represented in binary

In this AI ...

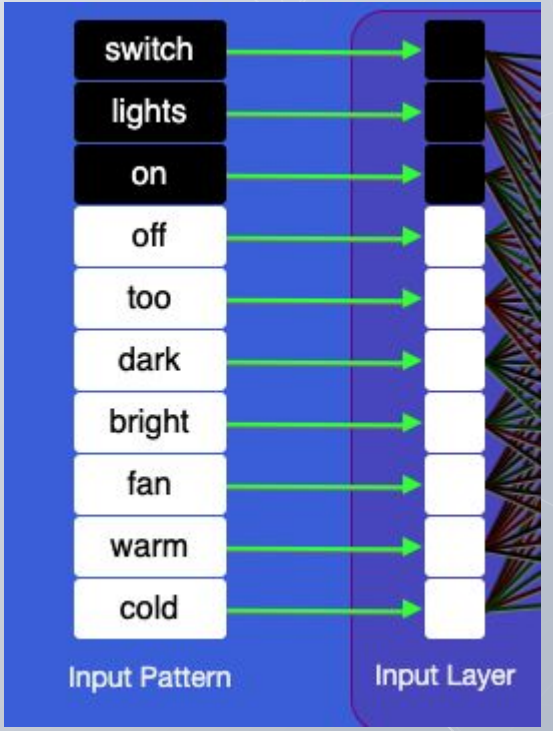
‘Switch’ is 10000 00000



LESSON: Home automation
(Years 5-6)

In this AI …

‘Switch lights on ’ is 1110 00000

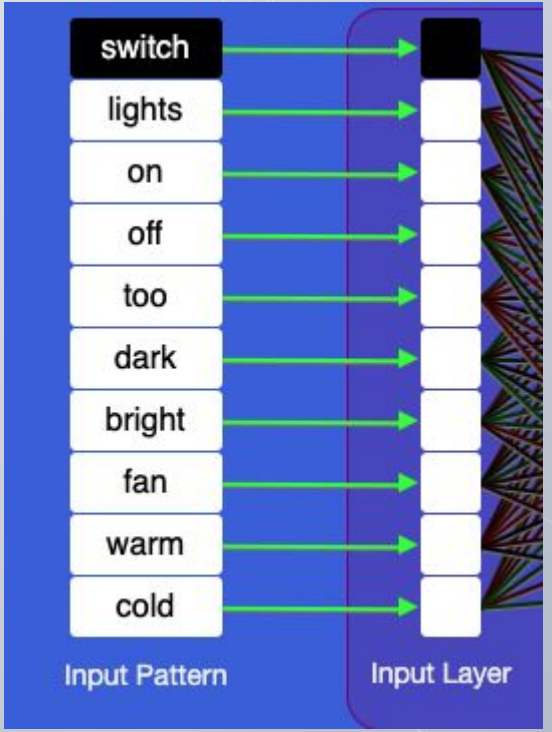


1
1
1
0
0
0
0
0
0
0

Note that in a primary environment we **don't** want to convert each individual character into its Unicode representation

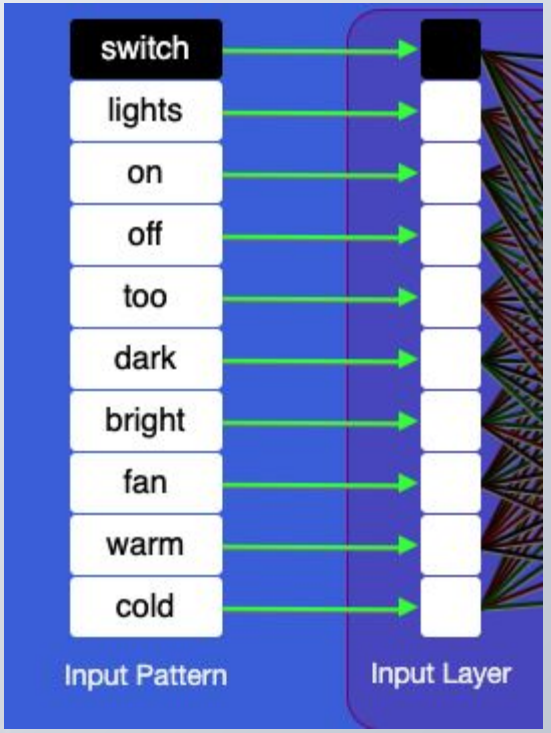
switch= 0073 0077 0069 0074 0063 0068

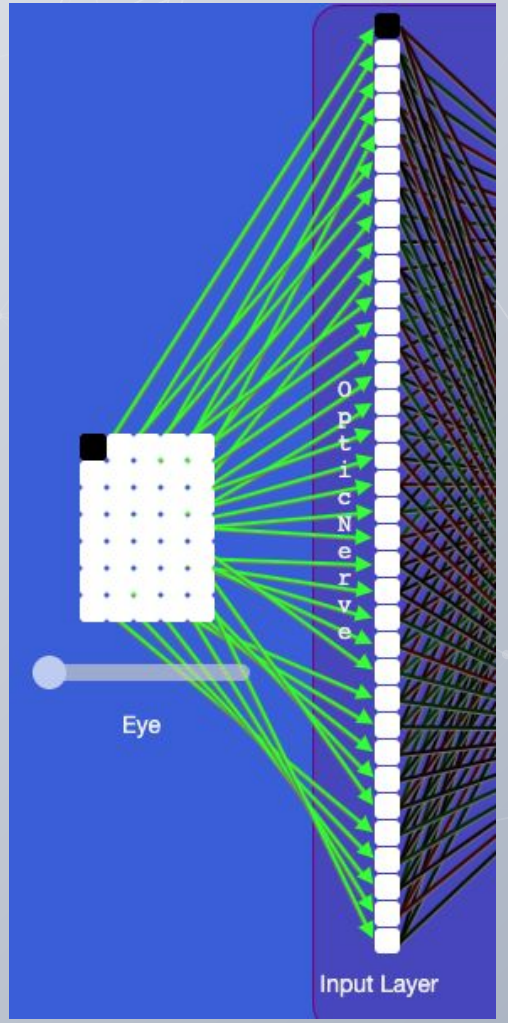
YIKES !



Ultimate Equality !

It does not matter for the AI whether a bit represents a word or a pixel



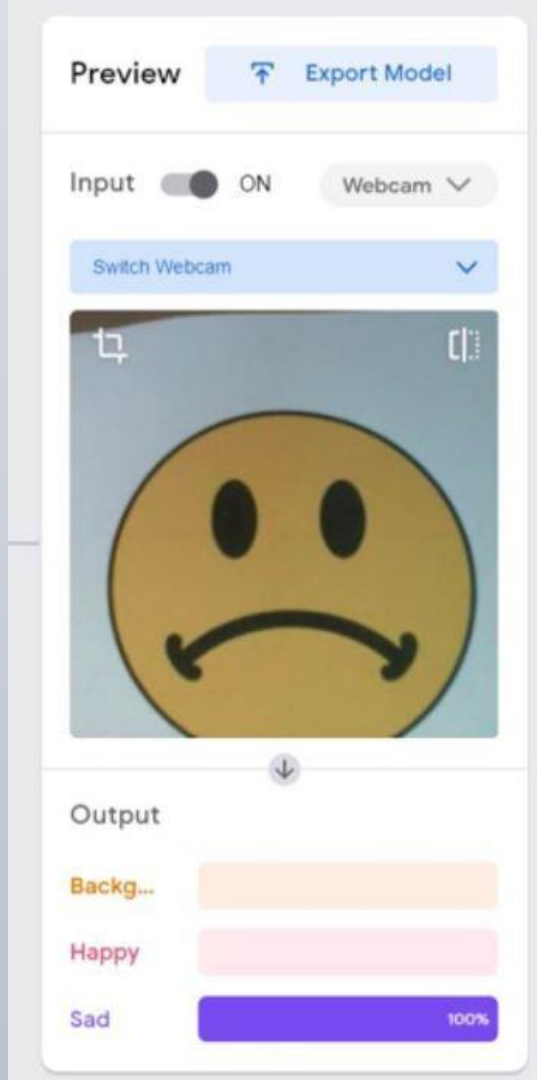


Output

Classifier

At its output, the AI tells us into which bucket (class) an object most likely belongs.

In this example, the AI believes that the image shows a sad face.

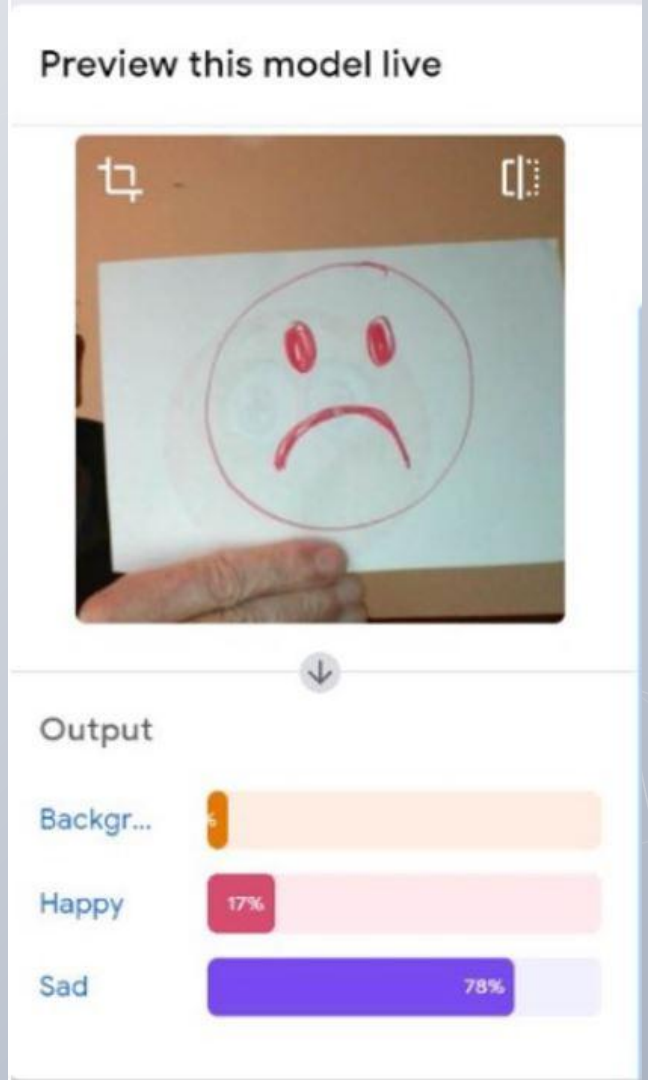


LESSON: Can AI guess your emotion?
(Years F-4)

Confidence

The AI can also tell us how likely it is that the input belongs to a certain class.

Here, the AI is 17% certain that this is a happy face, but 78% that it is a sad face.



Confidence issues

The AI can be confident, but still be wrong.

Here, the AI is 93% confident that it sees a happy face, yet it is wrong.

Our AI model has a problem.

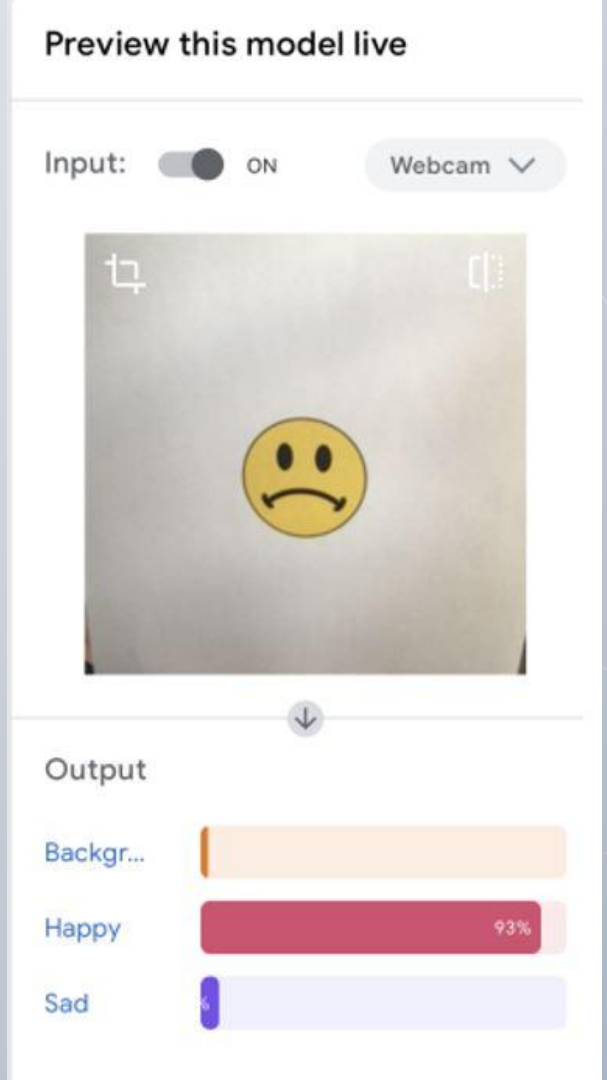


Image credit: Biljana Jovanovic/ Pixabay

Doing stuff

The output from the AI can be used in a visual program for decision making.

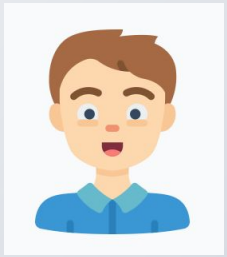
Example code: face recognition on a smartphone.

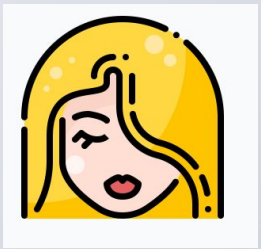
LESSON: [Smartphone Security](#)
(Years 5-6)

Buckets (classifying the data)

Denied

These faces will not be granted access to the phone

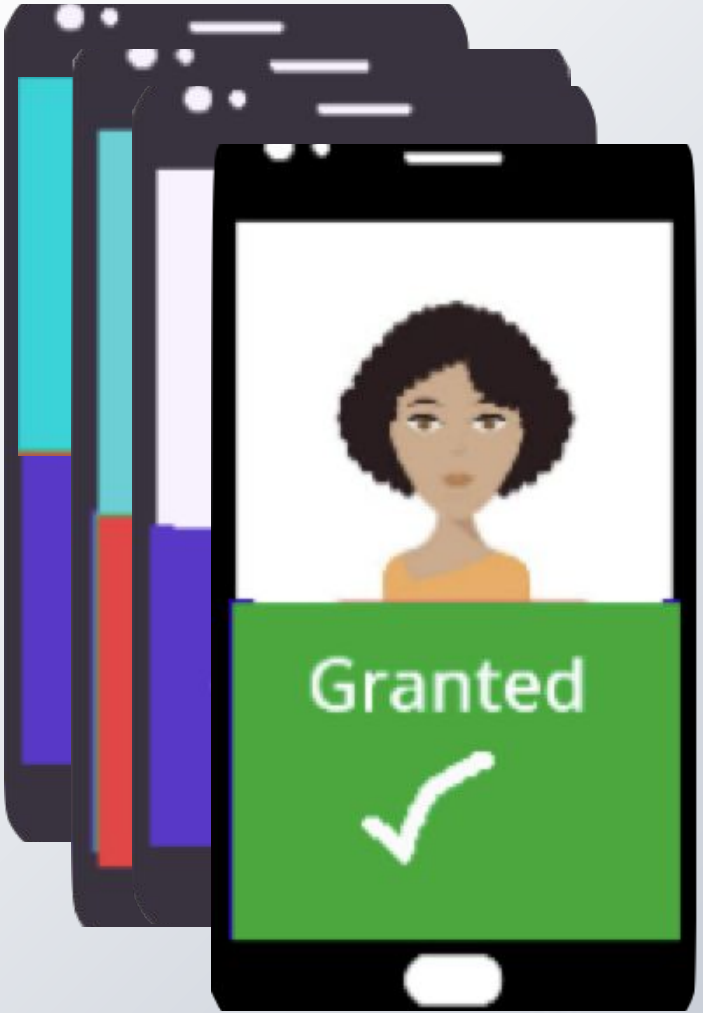

Source: Flaticon

Granted

This face only will be granted access to the phone

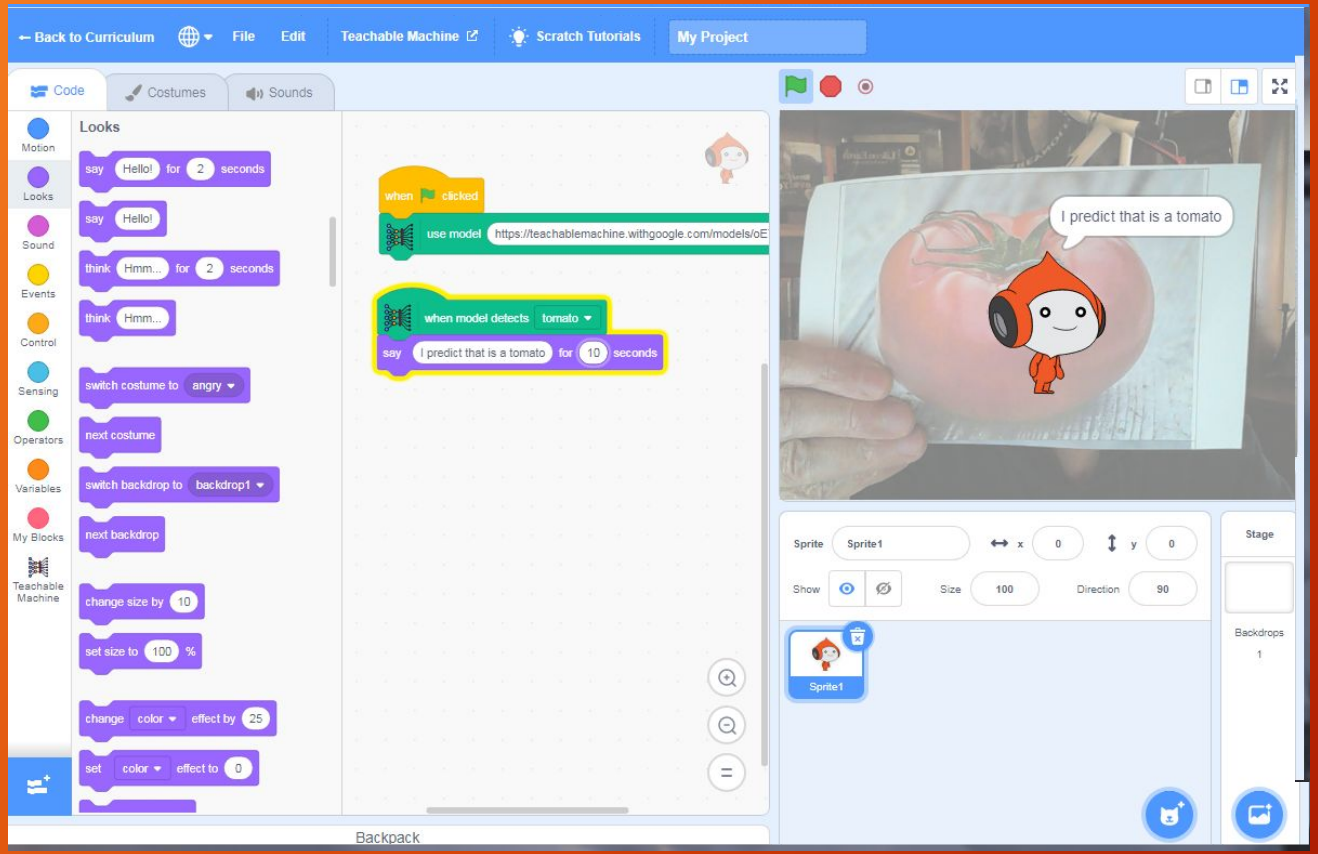
LESSON: Smartphone Security
(Years 5-6)

Image credit: Biljana Jovanovic/ Pixabay



LESSON: Smartphone Security
(Years 5-6)

A new version of Scratch that is AI compatible!



Paste the model's unique URL.

Add some code blocks and you are away.

It is that simple!

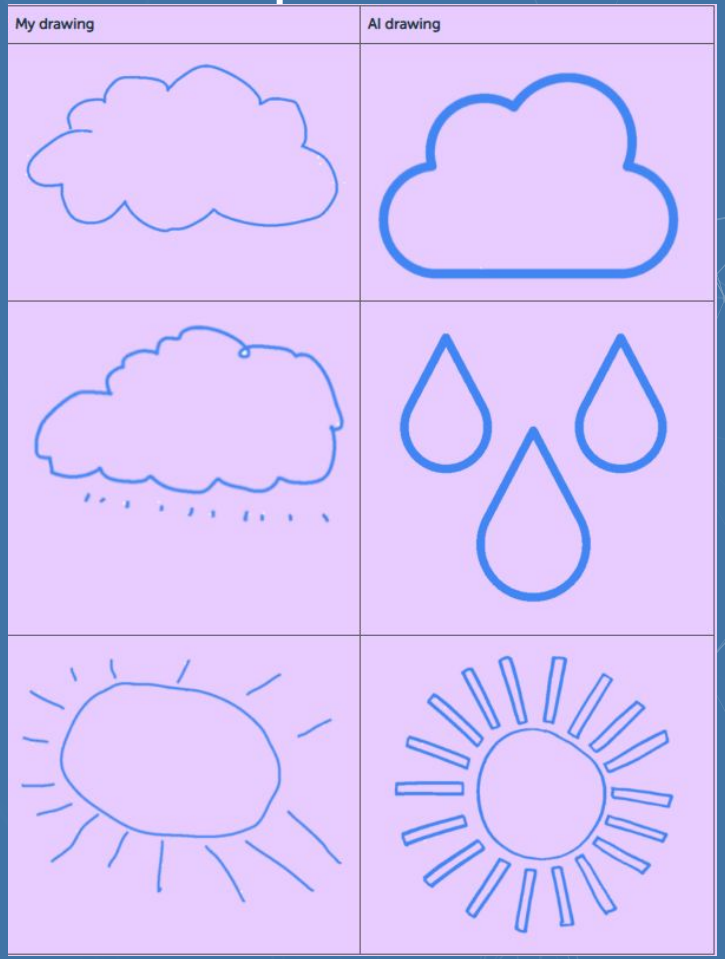
https://mitmedialab.github.io/prg-extension-boilerplate/create/

DIGITAL TECHNOLOGIES HUB

Assessment

Artificial Intelligence is a rich field for assessment opportunities.
Here are a few examples in the core concept areas of data, algorithms and implementation

Data representation (F-2)



They use digital systems to represent simple patterns in data in different ways.

Draws symbols to represent weather

Compares to AI drawing

Describes main features of their representation.

DIGITAL TECHNOLOGIES HUB

Data representation (3-4)

TASK: Create an AI model that can be used to solve a problem

Represent same data in different ways depending on the purpose

Collects data; does the data include same data presented in different ways? How have they classified the data?

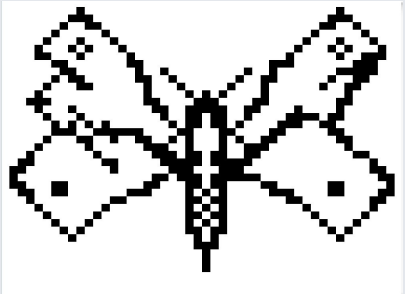
Explains their selection of data and why they chose it.

Describes how well the model works and gives reasons.

DIGITAL TECHNOLOGIES HUB

Data representation (5-6)

TASK: Demonstrate what an AI might see an object using whole numbers to represent patterns.



They represent data using whole numbers

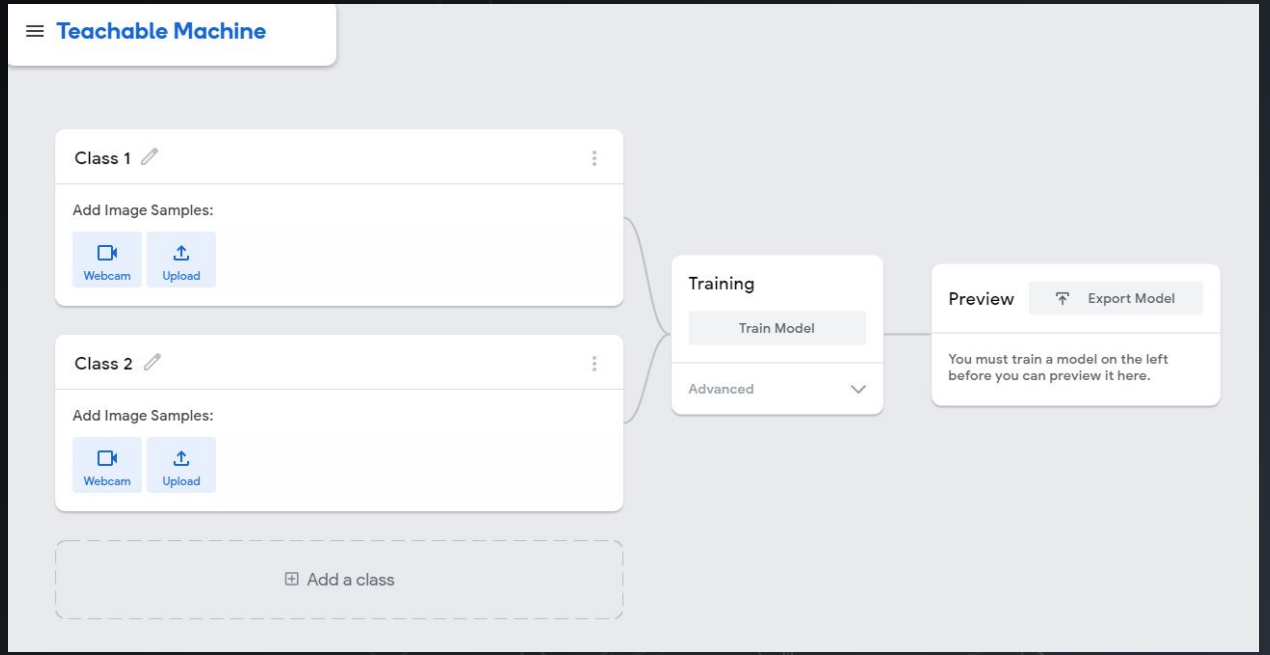
Uses 1 and 0 to represent black and white in pixel drawing.

Automates process using spreadsheet and conditional formatting.

Creates a recognisable representation of an object.

DIGITAL TECHNOLOGIES HUB

You can use teachable machine to discuss digital systems



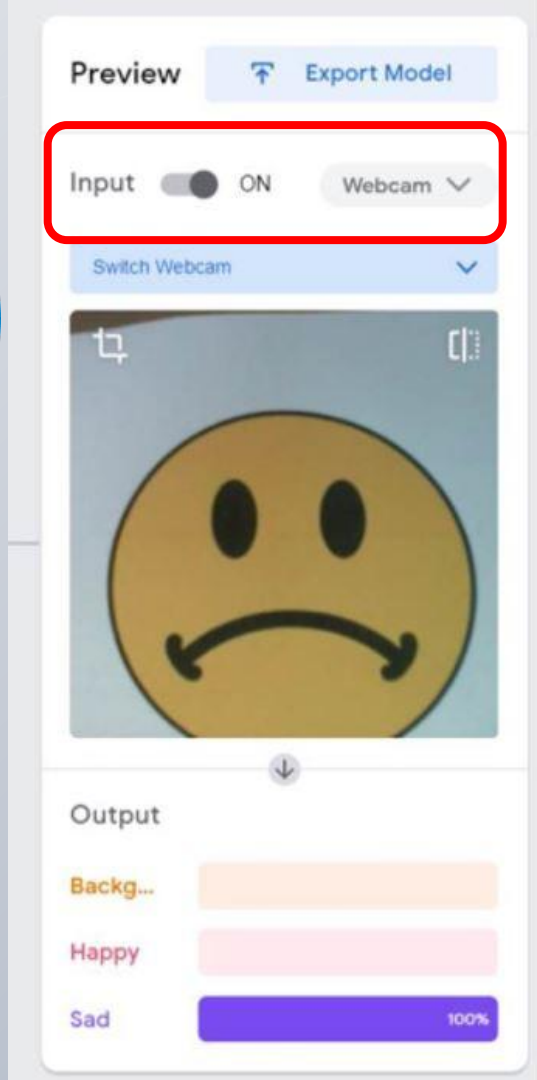
Digital systems

Interact with digital systems

Input: Webcam (peripheral)/inbuilt camera

Process: Teachable machine (Software/application)

Output: Screen display

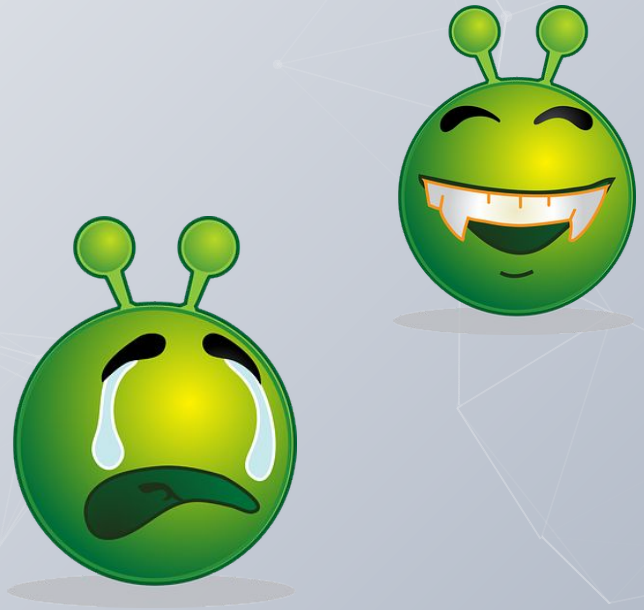


LESSON: Can AI guess your emotion?
(Years F-4)

Cliffhanger ...

Join us next week, when Martin and Karsten make machine learning models and get stuck into bias and all sorts of emojis from Mars ...

POLL pls let us know how we did in meeting your needs



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