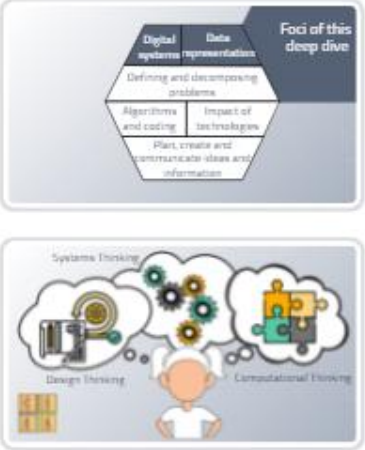# AI Professional Learning: Data representation and classification

PRIMARY DD2: Session overview

DT Curriculum focus	Relevant slides	Covered in the session	Resources
Impact and interactions		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	
Digital systems/Data representation		Curriculum connections • Digital Technologies: Focus on information systems the related key concepts include impacts, interactions and digital systems: **Data representation:** Deals with the way different types of data is represented (text, images, sound), stored and used in digital systems.	

AI Professional Learning: Data representation and classification

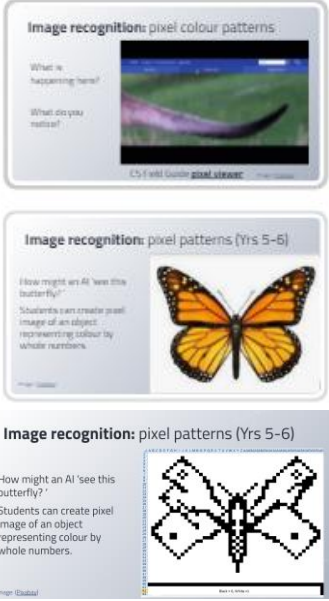|			
		Digital systems: we can explore the composition of digital systems and their use in all aspects of our lives. What are the key parts and functionality? While focussing on the impact of these information systems we can incorporate relevant general capabilities. - General capability: ICT capability - General capability: Critical and creative thinking	
Data representation		Data representation is a concept that flows through the DT curriculum. - F-2 Express data using pictures and symbols - Years 3-4 Represent same data in different ways depending on the purpose - Years 5-6 Represent data using whole numbers	

AI Professional Learning: Data representation and classification

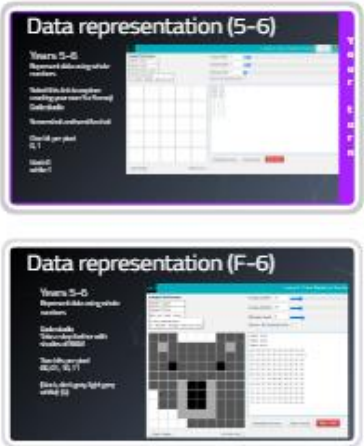|			
		We discuss examples of each.	
Data representation		Starting with F-2 example: Express data using pictures and symbols We use an example of creating a map for a zoo excursion. How would you express these on a map? • Zoo, Cafe, Playground, Train station, Public toilets What image could we use that people would recognise each of these? Teaching tips • Discuss Abstraction: What information do we need to include? What is not needed? • We end up extracting the important features that make it recognisable.	Lesson ideas • Can AI recognise what you are drawing? (Years F-4)

AI Professional Learning: Data representation and classification

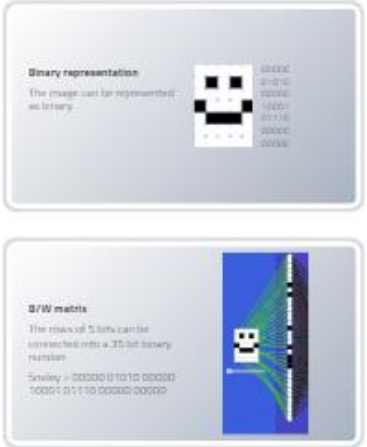|			
Data representation		We make the link between our representations of an object or idea and an AI tool that can recognise drawings. Can an AI recognise your drawing? Using an apple as an example we test to see if the AI can recognise our representation. Points covered: • abstraction (focus on important information only) • feature extraction, which features help people or the AI to recognise your idea being represented?	Downloadable resources/links Autodraw Quick draw Data showing people's represnen shark https://quickdraw.withgoogle.com/data/shark
Data representation /Digital systems		Years 3-4 Represent same data in different ways depending on the purpose We demonstrate ways the same data can be presented in different ways using the kangaroo as an example. We show how it can be represented: • as a symbol on a traffic sign • made up of shapes • As a word and image • As a list of its features • Identified by an AI (with a confidence level) When training an AI it is important for an accurate model that the same object is shown in different ways.	Downloadable resources/links **LESSON:** HOW CAN AN AI RECOGNISE WHAT IT SEES? (Years 3-4)

AI Professional Learning: Data representation and classification

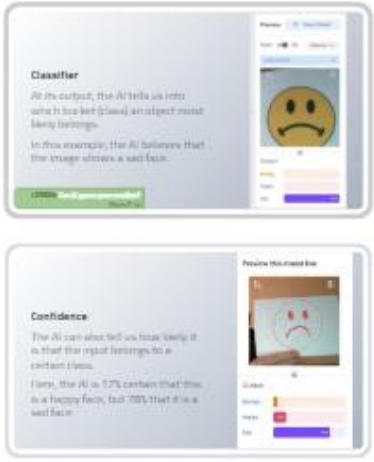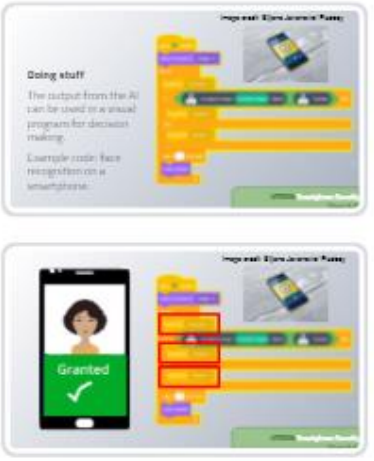|			
Data representation /Digital systems/ ICT Capabilities	Data representation (Yr 3-4)	Years 3-4 Represent same data in different ways depending on the purpose We demonstrate aN AI tool that classifies images and indicates its level of confidence. We cover ICT Capabilities locating and storing files and also recognise intellectual property	Downloadable resources/links AN AI tool that classifies images and indicates its level of confidence Google Vision API
Data representation /Digital systems	Image recognition: pixel colour patterns Image recognition: pixel patterns (Yrs 5-6) Image recognition: pixel patterns (Yrs 5-6)	Years 5-6 Represent data using whole numbers We demonstrate how images are made up of picture elements known as pixels. This leads us in to binary numbers made up of only 0 and 1 We explore the use of whole numbers to represent number using Pixel art We undertake a task using a shared Google sheet to explore conditional formatting We provide an example of a Google sheet that uses conditional formatting to represent colour using numbers.	Conditional format Pixel art: butterfly example

AI Professional Learning: Data representation and classification

Data representation		From whole numbers to Binary numbers We provide a link to Code.org pixel puzzle resource. Teachers can use this to show how 1 and 0 are used to code a grid to create a representation of a smiling emoji for example. We explain that using this code.org tool teachers can go a step further and show how a picture can be represented with a combination of two binary numbers per pixel giving the shades of white, light grey, dark grey, black. 00 Black 01 Dark grey 10 Light grey 11 White	Downloadable resources/links Pixelation: Colour Pixelation tutorial: [Code studio](#)
Data representation /Digital systems		AI systems 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	

AI Professional Learning: Data representation and classification

Data representation /Digital systems		Binary representation The image can be represented as binary We show how a simple AI recognises the image	
Data representation /Digital systems		Using home automation we demonstrate words in binary. Note that in Years 5-6 we don't want to convert each individual character into its Unicode representation We are demonstrating how an AI can be trained to classify words based on a pattern of pixels	

AI Professional Learning: Data representation and classification

Data representation /Digital systems		**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. **Confidence issues** We discuss reasons why an AI can be confident, but still be wrong. Here, the AI is 93% confident that it sees a happy face, yet it is wrong. We discuss bias in simple terms.	Downloadable resources/links **LESSON: Can AI guess your emotion?** (Years F-4)
Data representation /Digital systems		We show an example of an AI code that recognises images of faces. The model is trained to recognise one face as the only one to allow access to a phone. All others are denied access. When clicked the program switches to a phone screen with an image It scans the image … If it recognises access granted else denied	Downloadable resources/links **LESSON: Smartphone Security** (Years 5-6)

AI Professional Learning: Data representation and classification

Data representation /Digital systems		You can use teachable machine to discuss digital systems ICT protocols using ICT safely (webcam and privacy) avoid screen capturing your face and using it in the model	
Data representation /Digital systems		We demonstrate Assessment examples	