

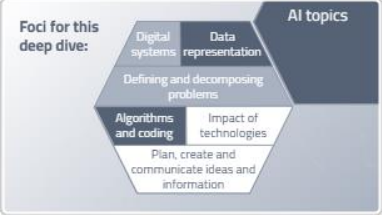


AI Professional Learning: Investigating training a machine learning model (Yrs 7-10)

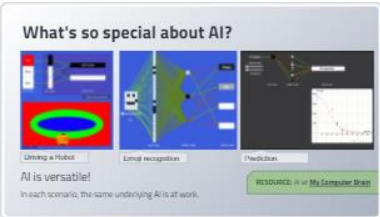
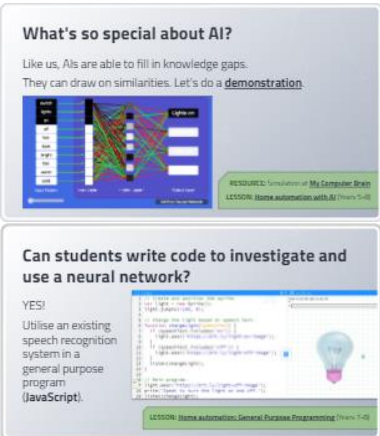
Session overview

DT Curriculum focus	Relevant slides	Covered in the session	Resources
		<p>During this session you will:</p> <ul style="list-style-type: none"> • Explore guiding students in how machine learning differs from traditional code, especially in terms of input data. • Try / observe a hands-on example of writing a conventional program and adding AI decisions to it. • Consider assessment and coding pedagogies, as well as concerns around IP and privacy. 	
<p>Defining and decomposing problems / Algorithms / Implementation</p>		<p>Curriculum connections</p> <ul style="list-style-type: none"> • Digital Technologies: Focus on defining and decomposing problems creating a digital solution that incorporates algorithms and implementation the related key concepts include: 	

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	 <p>Foci for this deep dive:</p> <p>Digital systems Data representation</p> <p>Defining and decomposing problems</p> <p>Algorithms and coding Impact of technologies</p> <p>Plan, create and communicate ideas and information</p> <p>AI topics</p>	<p>Defining and decomposing problems: the focus on the precise definition and communication of problems and their solutions.</p> <p>Implementation: the automation of an algorithm, typically by using appropriate software or writing a computer program.</p> <p>Algorithms: precise description of the steps and decisions needed to solve a problem.</p> <p>While focussing on implementation we can incorporate relevant general capabilities.</p> <ul style="list-style-type: none">• General capability: ICT capability	
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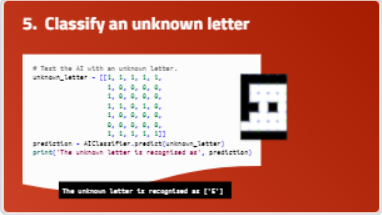
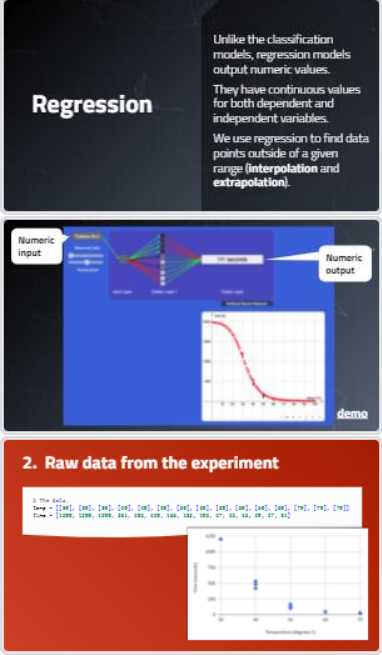
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		<ul style="list-style-type: none"> • General capability: Critical and creative thinking <p>We also include ways of thinking, particularly:</p> <ul style="list-style-type: none"> • Design Thinking • Computational Thinking 	
Implementation	 <p>What's so special about AI?</p> <p>AI is versatile! In each scenario, the same underlying AI is at work.</p>	<p>What's so special about AI?</p> <p>We use simulations to show how the same type of artificial neural network solves different problems.</p>	<p>Downloadable resources/links</p> <ul style="list-style-type: none"> • Simulations at My Computer Brain
Data representation	 <p>What's so special about AI?</p> <p>Like us, AIs are able to fill in knowledge gaps. They can draw on similarities. Let's do a demonstration.</p> <p>Can students write code to investigate and use a neural network?</p> <p>YES! Utilise an existing speech recognition system in a general purpose program (JavaScript).</p>	<p>We discuss why coding a neural network from scratch may be unsuitable as a classroom activity. Screenshot references this tutorial.</p> <p>However, students can write code to investigate and use a neural network:</p> <ul style="list-style-type: none"> • Utilise an existing speech recognition system in a general purpose program (JavaScript) • Utilise an existing sentiment analysis system in a general purpose program (Python) • Train their own AI model with an online tool. Then, bring the model 	<p>Downloadable resources/links</p> <ul style="list-style-type: none"> • Lesson idea: Home automation: General Purpose Programming (Years 7-8) • Lesson idea: Coding a sentimental chatbot (Years 7-10) • Lesson idea: Book analysis with AI techniques (Years 7-10) • Lesson idea: Rock,

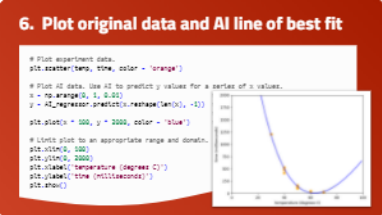
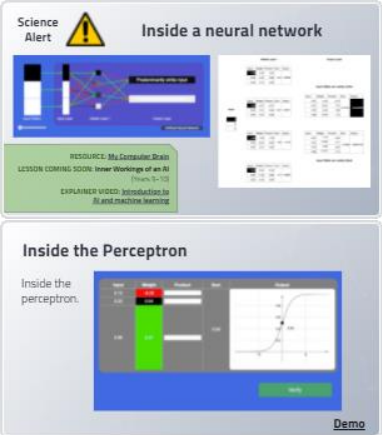
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		into a general purpose program (JavaScript) to make a decision.	Paper, Scissors, AI! (Years 7-8)								
	<p>Can students write code to investigate and use a neural network?</p> <p>YES!</p> <p>Train and test an AI model with general purpose code (Python).</p> <p>Perform classification and regression.</p>	<p>We introduce the main activity we'll be doing in this session, using Python to work with an AI model in order to perform</p> <ul style="list-style-type: none"> a classification (identify which class/bucket data fits into) a regression (line of best fit from numerical data) 									
Data representation	<p>First, let's talk about data.</p> <p>Years 7-8 Investigate how digital systems represent text, image and audio data in binary (ACTE4024)</p> <p>TEXT →</p> <table> <tr> <td>T = 84</td> <td>01010100</td> </tr> <tr> <td>E = 69</td> <td>01000101</td> </tr> <tr> <td>X = 88</td> <td>01011000</td> </tr> <tr> <td>T = 84</td> <td>01010100</td> </tr> </table> <p>Working with pixel values</p> <p>Colour Pixelation widget at code.org</p> <p>One bit per pixel 0 = black, 1 = white</p> <p>Two bits per pixel 00 = black, 01 = dark grey, 10 = light grey, 11 = white</p> <p>Binary representation</p> <p>The image can be represented as binary.</p>	T = 84	01010100	E = 69	01000101	X = 88	01011000	T = 84	01010100	<p>We explore how text, sounds and images are represented in binary.</p> <p>We break down simple black and white images into binary. These will be used in our coding examples later in the session.</p>	<p>Downloadable resources/links</p> <ul style="list-style-type: none"> Colour pixelation widget at code.org
T = 84	01010100										
E = 69	01000101										
X = 88	01011000										
T = 84	01010100										

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	 <p>5. Classify an unknown letter</p> <pre># Test the AI with an unknown letter. unknown_letter = ['C', 'I', 'L', 'O', 'U', 'X', 'Z'] unknown_letter = ['C', 'I', 'L', 'O', 'U', 'X', 'Z'] unknown_letter = ['C', 'I', 'L', 'O', 'U', 'X', 'Z'] unknown_letter = ['C', 'I', 'L', 'O', 'U', 'X', 'Z'] unknown_letter = ['C', 'I', 'L', 'O', 'U', 'X', 'Z'] unknown_letter = ['C', 'I', 'L', 'O', 'U', 'X', 'Z'] unknown_letter = ['C', 'I', 'L', 'O', 'U', 'X', 'Z'] unknown_letter = ['C', 'I', 'L', 'O', 'U', 'X', 'Z'] unknown_letter = ['C', 'I', 'L', 'O', 'U', 'X', 'Z'] unknown_letter = ['C', 'I', 'L', 'O', 'U', 'X', 'Z'] prediction = AIClassifier.predict(unknown_letter) print("The unknown letter is recognized as: ", prediction)</pre> <p>The unknown letter is recognized as ['C']</p>		
<p>Data representation / Algorithms / Implementation/ Computational Thinking</p>	 <p>Regression</p> <p>Unlike the classification models, regression models output numeric values. They have continuous values for both dependent and independent variables. We use regression to find data points outside of a given range (interpolation and extrapolation).</p> <p>2. Raw data from the experiment</p> <pre># The data. data = [[100, 1000], [200, 1000], [300, 1000], [400, 1000], [500, 1000], [600, 1000], [700, 1000], [800, 1000], [900, 1000], [1000, 1000], [1100, 1000], [1200, 1000], [1300, 1000], [1400, 1000], [1500, 1000], [1600, 1000], [1700, 1000], [1800, 1000], [1900, 1000], [2000, 1000], [2100, 1000], [2200, 1000], [2300, 1000], [2400, 1000], [2500, 1000], [2600, 1000], [2700, 1000], [2800, 1000], [2900, 1000], [3000, 1000], [3100, 1000], [3200, 1000], [3300, 1000], [3400, 1000], [3500, 1000], [3600, 1000], [3700, 1000], [3800, 1000], [3900, 1000], [4000, 1000], [4100, 1000], [4200, 1000], [4300, 1000], [4400, 1000], [4500, 1000], [4600, 1000], [4700, 1000], [4800, 1000], [4900, 1000], [5000, 1000], [5100, 1000], [5200, 1000], [5300, 1000], [5400, 1000], [5500, 1000], [5600, 1000], [5700, 1000], [5800, 1000], [5900, 1000], [6000, 1000], [6100, 1000], [6200, 1000], [6300, 1000], [6400, 1000], [6500, 1000], [6600, 1000], [6700, 1000], [6800, 1000], [6900, 1000], [7000, 1000], [7100, 1000], [7200, 1000], [7300, 1000], [7400, 1000], [7500, 1000], [7600, 1000], [7700, 1000], [7800, 1000], [7900, 1000], [8000, 1000], [8100, 1000], [8200, 1000], [8300, 1000], [8400, 1000], [8500, 1000], [8600, 1000], [8700, 1000], [8800, 1000], [8900, 1000], [9000, 1000], [9100, 1000], [9200, 1000], [9300, 1000], [9400, 1000], [9500, 1000], [9600, 1000], [9700, 1000], [9800, 1000], [9900, 1000], [10000, 1000]]</pre>	<p>We begin our second coding example: a regression (line of best fit) for a small set of experimental data.</p> <p>The example is first illustrated with a visualisation.</p> <p>Then, the code is done in Python, using the replit.com online environment. This is a more complex program than the classifier, due to the need to normalise the data.</p> <p>Again, the functions and objects for the AI neural network and modelling is provided by the sci-kit library.</p>	<p>Downloadable resources/links</p> <ul style="list-style-type: none"> • The replit.com online environment • The sci-kit library • Starting point for our program • The finished program

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<p>Data representation / Algorithms / Computational Thinking</p>		<p>In the time remaining, we dive a little more into the internal workings of a neural net, exploring how the Perceptron (the equivalent of a biological neuron) works.</p>	<p>Downloadable resources/links</p> <ul style="list-style-type: none"> • Simulations at My Computer Brain • Artificial Intelligence Explainers: Video 1: Introduction to AI & machine learning