An Introductory Approach to Appreciating the Essentials of Artificial Intelligence (AI)

by
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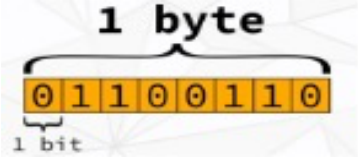
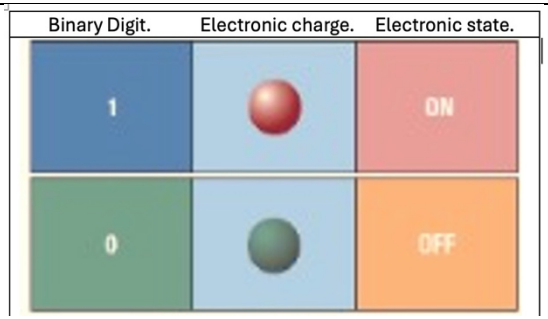
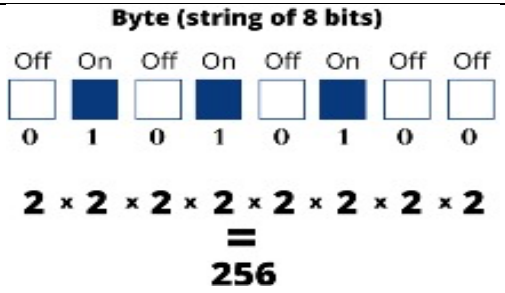
Introduction

- This is a ready-to-use resource **for Wilmslow u3a members who are not familiar with the basics of the 'ins and outs' of AI.**
- To support your 'AI appreciation journey', I have used sessions-based layout to create this document. Each session contains a written summary. It is then supported by short videos (my selection).
- To develop your familiarisation, I suggest that you take your time to go through one session at a time.
- In all, there are 11 sessions, each requiring about 6 to 10 minutes to complete (in most cases).

Session Numbers	Explanation	Figures
	Session 1	
1a. Bits and Bytes	• 'Bits and bytes' (see figure) are the fundamental units of computing, like 0 to 9 in decimal number system. • Bits and bytes are used for programming computers, (including AI based computers), and other modern digital electronic devices that we use daily.	
1b. Bit	• The term bit stands for 'binary digit', representing states either 0 or 1, (see figures). A binary digit can represent states like true/false, yes/no, and on/off. • It is like 'on' and 'off' states of a light switch. • A bit (0 or 1 state) is the smallest building unit in computer programming (instructions). • So, the binary system, (using 0 and 1) is fundamental to how computers process, store, and transmit data/information in digital form, for example, our names, photos, text messages, etc. • A bit can be stored/transmitted in different forms, such as electrical signal (e.g. volt), magnetic signal (e.g. magnetic tape), and light (e.g. CD).	

1c. Byte	• A byte is made up of 8 bits, e.g. '01010101'. • Using a string of 8-digits, a group of 256 patterns could be formed – e.g. 00110011, 00101100, 00111001, and so on. • A bit and combinations of bytes are used for creating computer programming, instructions like true/false, on/off, and, or etc, • For example, lower case 'a' is represented by 01100001 and upper-case 'A" is represented by 0100001. • Our data-to-day, natural language characters (a, b, c and so on) have binary digit representation based on international conventions and rules.	
1d. Short videos	**Bit vs. Byte - The Best Fast Explanation - The Core of Computing** (2 minutes) https://www.youtube.com/watch?v=S-L5E5UN8-k&t=51s This video provides an explanation of bits and bytes and how they are used to represent large amounts of digital data. **Decoding the Digital World: Bits and Bytes Made Simple** (6 minutes) https://www.youtube.com/watch?v=N4-E590_h04&t=39s This video explains the terms used for representing large amounts digital information, namely KB - Kilobytes, MB - Megabytes, GB – Gigabytes. **Binary Explained in Under 5 Minutes** (5 minutes) https://youtu.be/THSh85q7ZBY	**Notes:** To further appreciate my written explanation, video links are provided for visual appreciation. You have a choice of three videos in this session, watch at least one. If watching all, watch one, then take a break, and come back for the next. As soon as you get a grip of 'bits and bytes', you have mastered this session.
Session 2		
2a. Transistor	• A small electronic device that handles electrical signals. It can be a few cm high to tiny ones created by a complex photo-electric etching. These types are found in modern electronic printed circuit boards (PCBs) and Microprocessors (see details in Session 3).	

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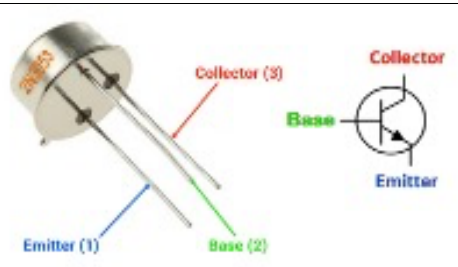
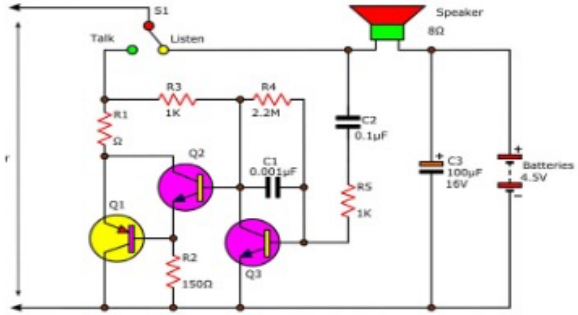
- Transistors are one of the fundamental budling components, (like sand in a bricks-built house), of modern digital devices (e.g. microchips, computers, phones, printers, alarms etc).
- They are used for controlling the flow of, as well as amplifying, electrical signals. A kind of switch in digital electronics.
- They are made mainly using semiconductor materials such as silicon, gallium, and germanium.
- Electrical conductivity of a semiconductor substance or material sits between that of a good conductor, (e.g. a copper wire) and an insulator (e.g. plastic sleeves that surrounds copper wires).
- Conductivity means how easily electric current can pass through.
- In a printed circuit board, a “chip” may contain many miniature transistors.

</td><td rowspan="2"> 

Transistors in a circuit for a speaker

(spot them)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<tr><td>**2b. Short video**</td><td>**How a transistor works:** a simple animated guide by explainer express (1 minute)
https://www.youtube.com/watch?v=BVou6JdiaOQ&t=1s

It explains the functions of a transistor, using the 0 (off) and 1 (on) states in a digital system.

Transistor Explained: Water Pipe Analogy for NPN Circuits (2 minutes)
https://www.youtube.com/watch?v=QAIQ-Iqq4bg&t=59s

In this video, water flowing through pipes is used as an analogy to provide a simple explanation.</td></tr>
<tr><td colspan="3">**Session 3**</td></tr>
<tr><td>**3a. Microprocessor (chip)**</td><td>

- A microprocessor is made of compact & complex electrical circuits containing electrical components including several tiny transistors.
- It supports the way digitally coded instructions and arithmetic calculations are carried out within a computer.

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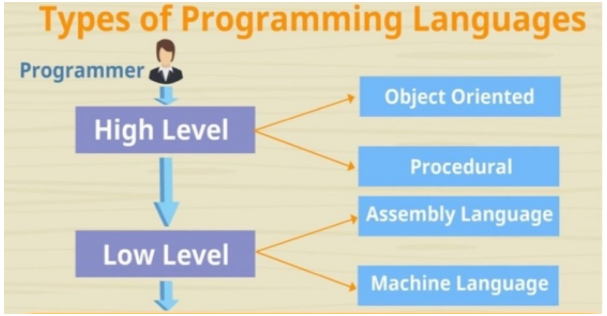
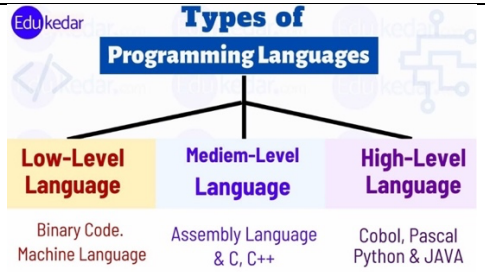
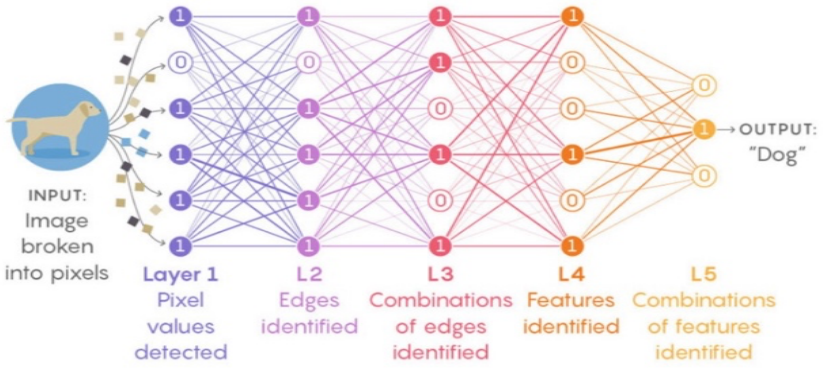
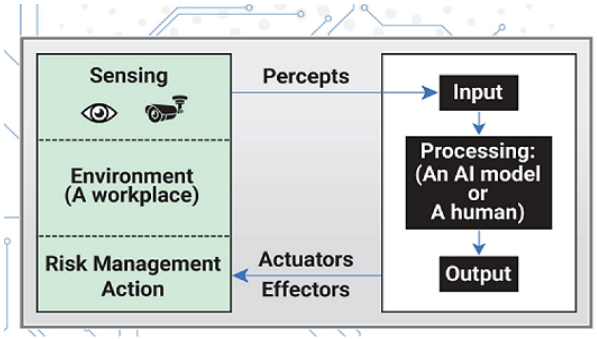
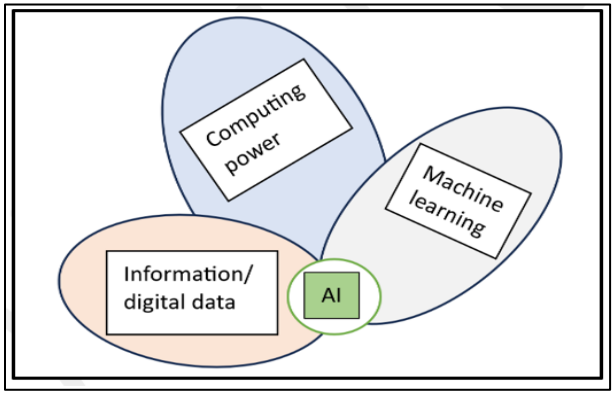
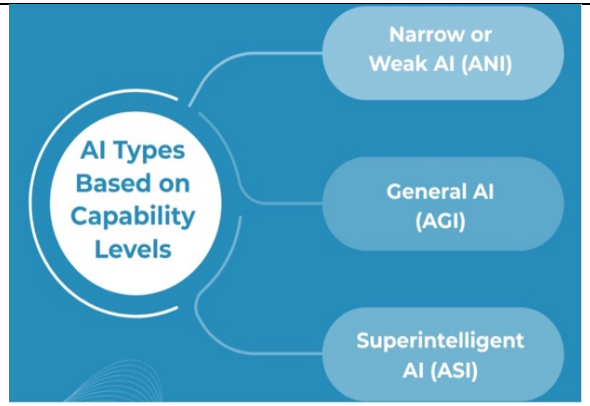
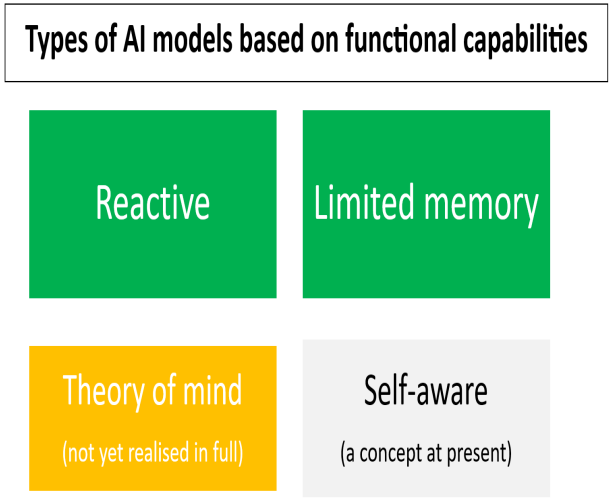
Other names such as Integrated circuit and computer chip	• A complex network that operates complex operations, commanded by computer programmes written to control the ways of working. • It supports the operations of a computer to produce outputs (results), such as sending a phone message created by you, including the paths and 'handshakes' to be taken to deliver the message to your intended recipient, monitoring the delivery process, and reporting back to you. • A transistor in a microprocessor uses digital data made up of combinations of bytes. A printed circuit board (PCB) will contain several chips and other components to do the work (see figures).	 A chip on a printed circuit board (PCB) A PCB with chips and other components 
3b. Short video	What is a microprocessor (3 minutes) https://www.youtube.com/watch?v=x0aGGeSOM8c This video provides a simple explanation of a microprocessor, the 'mother' of modern computers, and a black box that operates with codes programmed with bytes.	
Session 4		
4a. Computer programming languages and codes inside your computer	• We use, for example, English language to communicate our thoughts, ideas, views, emotions, etc. • The rules of English language grammar provide formality and structure for effective, colourful, emotional etc. communication. • Furthermore, we have many languages that use alphabets a to z. • Professions have their own language, like medical language and terminologies. Likewise, computer programming languages provide formality to computer communication, instructions and commands. All based on bits/bytes. • Programmers use different programming languages to do specific jobs in computing and to deliver the objectives and purposes of the job.	

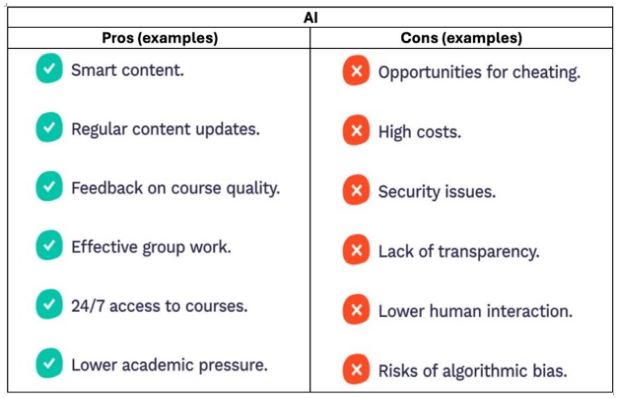
		
4b. Short Video	**Computer Science Basics: Programming Languages** (3 minutes) This video provides a summary on programming languages and what they could do. https://www.youtube.com/watch?v=Y_9t3eQFmU4	
Session 5		
5a. Advent of computers and computing power.	• The advent of modern computers represents a long evolution (like motor cars of yesteryears and of today) from simple brick sized calculators to compact programmable desktop computers, portable computers, cell phones, robots, etc. **First Generation (1940s-1950s):** based on vacuum tubes; very large and power hungry. **Second Generation (1950s-1960s):** based on transistors; much smaller than the first generation, much faster and more reliable. **Third Generation (1960s-1970s):** based on integrated circuits; further miniaturisation and improved performance' and less power requirements. **Fourth Generation (1970s-1990s):** based on faster microprocessors (chips), and widespread availability. **Fifth Generation (1990s - onwards):** based on advanced software programming (computer coding), much faster speed, less power hungry, and large memory chips, as well as using different types of AI. **Internet:** Sir Timothy John Berners-Lee, British and an eminent scientist invented the worldwide web, which transformed the digital communication of the digitally linked 'one-world.'	 
5b. Short videos	**Journey through time: The evolution of computers.** (3 minutes) https://www.youtube.com/watch?v=al757PyurCs&t=7s	

	The evolution of computers in 3 minutes. (3minutes) https://www.youtube.com/watch?v=9A2joXt2sD4&t=1s	
	Session 6	
6a. A brief history of AI. A technological innovation.	• The thought of intelligent machines goes back to before the beginning of the Christian Era. The groundwork for modern computing was laid by Professor Alan Turing, (father of the modern computing and of the Manchester University), in the 1940s. • He also formulated the "Turing Test," the first ever benchmark for evaluating a computer's ability to exhibit 'human-like' intelligence. • AI means the ability of computer-based systems to do tasks normally associated with human intelligence and thinking, learning, and reasoning, problem solving, a bit of lateral thinking, and decision making. • But currently AI lacks things (characteristics) like common sense and emotional intelligence matched to human capacity. • AI of today can be biased because of the training data used. • AI can lack transparency and vulnerable to cyberattacks.	
6b. Short videos	The videos listed below provide varied explanation about the history of modern computing and AI. **A brief history of AI** (7 minutes) **https://www.youtube.com/watch?v=eSj80Zr6TEE** **The Complete History of AI: 1950 to 2025 Explained** (7 minutes) **https://www.youtube.com/watch?v=0YRKoSOdP-M** **A Brief History of AI by IBM: From Machine Learning to Gen AI to Agentic AI (**13 minutes)	**Notes:** Watch as many videos as you like. 1950s to 2025.

	IBM is one of the leaders in developing AI tools. They are giving a storyline from 1950s to 2025 and beyond. https://www.youtube.com/watch?v=ZHCB09O6zUk	
Session 7		
7a. A guide to understanding AI or machine learning	• AI is a technology based on engineering, science, biology, mathematics, statistics, computing, and pattern recognition. • AI enables computers, machines, and tools to simulate human intelligence, and with robots, they try to replicate the human physical body in whole or parts (e.g. a robotic arm). • As a non-expert user of AI, I do not need to understand the intricacies of an AI model and how it is created. • Basically, a large majority of today's AI systems, available to the public, learn the tricks by **using data, machine, learning and pattern recognition** to perform the allocated job(s). • So, the quality data and its availability in abundance is the king of AI. Without quality data, we could not have quality AI. This BBC News demonstrate the critical importance of quality data for training AI models and correct pattern recognition – a car camera that mistook a woman's jumper https://www.bbc.co.uk/news/uk-england-somerset-58959930  Machine learning using neural networks (see above), similar to human decision making using the biological neural network (containing millions of neurons) in our	 

	body and the brain (e.g. a dog, brown eyes, brown hair, bushy tail, playful, loving, cheeky and face looks like a Cocker Spaniel, but it has some Irish Red Setter features too. So, it is a Cooker Spaniel with some inter breading with Irish Red Setter and based on other information, it can be prune to ear infections. I used so many weighting factors to arrive at my decision; it can be further tuned to make a better decision – means more quality data and more learning). So, data teaches computer algorithms to learn, create computer models and make decisions.	
7b. Short videos and News items	This video explains the importance of quality data in AI. (2 minutes) Title https://www.bbc.co.uk/teach/articles/z97cs82#z66cfdm **What is machine learning** (3 minutes) https://youtu.be/f_uwKZIAeM0 **What is machine learning?** (3 minutes) https://youtu.be/ob_p9qARjJo **Simplest Explanation of How Artificial Intelligence Works? No Jargon | What is AI? How AI works?** https://www.youtube.com/watch?v=m8o2GrbR3d8 (26 minutes) – an optional video to watch	**News Items** (see below) 1. What is AI? A simple guide to help you understand artificial intelligence - BBC News https://www.bbc.co.uk/news/resources/idt-74697280-e684-43c5-a782-29e9d11fecf3 2. AI introduction by Microsoft https://cdn-dynmedia-1.microsoft.com/is/content/microsoftcorp/microsoft/final/en-us/microsoft-brand/documents/2024-wttc-introduction-to-ai.pdf
Session 8		
8a. Types of AI	AI is classified in many ways using their capabilities, functionalities, and learning methods (as in humanity). **AI Based on Capabilities:** 1. **Narrow AI (Weak AI):** This type is designed for specific tasks or jobs. So, it performs well at predefined tasks (e.g. identifying cats amongst dogs, identifying a particular cancer using an x-ray pictures). Siri, Alexa, Bing, etc. to perform specified tasks such as text-based information search and their outputs. 2. **General AI (Strong AI):** A type of AI capable of performing intellectual tasks like a human i.e.: features like learning and adopting to contextual situations without the help of human	

	intervention. At present, this is a theoretical concept for the public. 3. **Super AI (artificial superintelligence):** Today, it is a hypothetical concept, but it could be achieved in the future. Its capabilities would surpass human intelligence in various aspects (self-taught learning, independent reasoning, decision-making, problem-solving, lateral thinking, and hopefully emotional intelligent too). **AI Based in Functionalities** 1. **Reactive AI:** Has no memory to recall; responds to current inputs based on the rules created by the programmer. For example, the IBM Deep Blue computer programme that beat the world chess player (you came across this in Section 6, above). 2. **Limited Memory AI:** Use time-limited historical data for decision making. Can use current available data to improve performance. For example, a self-driving taxi using satellite signals (GPS) as well as past data stored in its memory for making driving instant decisions. 3. **Theory of Mind AI:** It should understand the thoughts and emotions of other intelligent entities. Not yet realised in full. You may have seen robots smiling at a guest or winking at a person because of the answers given by the human interacting with the robot. 4. **Self-Aware AI:** Human-like feelings, understanding, and self-awareness. A futuristic concept, probably has the potential for beating humans in the types of functional capabilities described.	 
8b. Short video	**Types of AI.** https://youtu.be/XFZ-rQ8eeR8	
Session 9		

9a. Pros and Cons of AI	Like any technology (e.g. cars), AI comes with its own advantages and disadvantages. **Examples of advantages:** improved lifestyle for us, better work methods, productivity, communication, travel, transport, health, health care for unwell and disabled people, wellbeing, safety, decision making etc. **Examples of disadvantages:** jobs being displaced; modern slavery; privacy risks; bias including discrimination; misinformation and manipulation of data; and causing unwanted stress and disadvantages to individuals and groups of people.	 **In education and training**
9b. Short videos	**Pros and cons of Artificial Intelligence** (6 minutes) https://youtu.be/1EOwP-OHPFk **Five things you need to know about AI** (5 minutes) https://youtu.be/-J3YJxNnzDc	
Session 10		

10a. Experts warning of AI and its development	Several concerns were professed by experts. 1. **Potential for human extinction:** hundreds of experts have signed a statement that urgent preventive actions should be taken to avoid potential problems, as well as prevent nuclear wars and pandemics that may be caused by the contributions of uncontrolled AI systems. 2. **Potential for loss of human control:** Rapid advancements in capabilities and functionalities could create scenarios where loss of human controls can result in catastrophic outcomes (see examples above). 3. **Social consequences:** Unchecked and/or ineffectively regulated AI systems/tools could lead to serious consequences such as scams, political modelling, terrorism, and mass unemployment as well as causing damage to wellbeing and reputation. 4. **Lack of necessary safety measures:** Because of lack of international/national cooperation, polices, and other suitable preventive measures. They can lead to an 'open field day' for AI-related harms. We may be ill-prepared to deal with harms that are brewing as well as not being able to control those taking place now.	
10b. Short videos	**Stephen Hawking: 'AI could spell the end of the human race'** (5 minutes) https://youtu.be/fFLVyWBDTfo **'Godfather of AI' has a plan for humanity to survive AI** https://www.youtube.com/shorts/Wd8RzZ3xn7w?feature=share **Is Bill Gates worried about AI destroying the world?** (2 minutes) https://youtu.be/EzQXZi1xXh8 **Godfather of AI WARNS: "You Have No Idea What's Coming"** (20 minutes) (Nobel Laurate Professor Hinton) https://youtu.be/5KmopXwjXik	**Notes:** watch as many videos as you wish.

	Is Bill Gates worried about AI destroying the world? https://youtu.be/EzQXZi1xXh8	
Section 11		
11a. AI Ethics	• AI-associated ethics address issues such as responsible design, deployment, use, and governance mechanisms. • They are needed to prevent harm to humans, animals, and the environment. To support and uphold fairness when AI-led decisions are made. Protect individual privacy and uphold human rights.	○ **Accountability** (e.g.An AI product's end-to-end answerability) ○ **Fairness** (e.g. preventing discrimination, and biases) ○ **Explainability** (of the processes involved and justification of the process) ○ **Sustainability** (e.g. does it take account of sensitivities involved, and real-world impacts) ○ **Data stewardship** (e.g. assuring quality, integrity, protection, and privacy) ○ **Safety** (e.g. technical accuracy, reliability during operation, and secure operation)
11b. Sort videos	**What is AI ethics** (7 minutes) https://youtu.be/aGwYtUzMQUk	