# Curriculum Map – Computer Science – Year 9

Immanuel College
Church of England Academy

| | Half term 1 | Half term 2 | Half term 3 | Half term 4 | Half term 5 | Half term 6 |
|---|---|---|---|---|---|---|
| **Key focus** | Unit 13: AI | Unit 14: Animations | Unit 15: Micro:Bits | Unit 16: Data Science | Unit 17: Representations | Unit 18: Intro to Cyber |
| **Intent** | Students will experience a variety of real-world AI applications and be made aware of the ever-increasing range of AI-related careers. As well as considering the social and ethical implications of AI developments, students will have the opportunity to delve deeper and explore machine learning models and the engines that make them work. | Films, television, computer games, advertising, and architecture have been revolutionised by computer-based 3D modelling and animation. In this unit learners will discover how professionals create 3D animations using the industry-standard software package, Blender. By completing this unit learners will gain a greater understanding of how this important creative field is used to make the media products that we consume. Sessions will take learners through the basics of modelling, texturing, and animating; outputs will include 3D models, short videos, and VR. Links are made throughout to computer science, computational thinking, and the world of work. Tools and techniques learnt in this unit can also be used for 3D printing. | This unit applies and enhances the learners' programming skills in a new engaging context: physical computing, using the BBC micro:bit.<br>In the first half of the unit, learners will get acquainted with the host of components built into the micro:bit, and write simple programs that use these components to interact with the physical world. In the process, they will refresh their Python programming skills and encounter a range of programming patterns that arise frequently in physical computing applications.<br>In the second half, learners will work in pairs to build a physical computing project. They will be required to select and design their project purposefully, apply what they have learnt by building a prototype, and keep a structured diary throughout the process. | In this unit, learners will be introduced to data science, and by the end of the unit they will be empowered by knowing how to use data to investigate problems and make changes to the world around them. Learners will be exposed to both global and local data sets and gain an understanding of how visualising data can help with the process of identifying patterns and trends. Towards the end of the unit, the learners will go through the steps of the investigative cycle to try to solve a problem in the school using data | In this unit, learners will focus on digital media such as images and sounds and discover the binary digits that lie beneath these types of media.<br><br>Just like in the previous unit, where learners examined characters and numbers, the ideas that learners need to understand are not really new to them. You will draw on familiar examples of composing images out of individual elements, mixing elementary colours to produce new ones, and taking samples of analogue signals, to illustrate these ideas and bring them together in a coherent narrative.<br><br>This unit also has a significant practical aspect. Learners will use relevant software (GIMP and Audacity, in this case) to manipulate images and sounds and get an idea of how the underlying principles of digital representations are applied in real settings. | This unit takes the learners on an eye-opening journey of discovery about techniques used by cybercriminals to steal data, disrupt systems, and infiltrate networks. The learners will start by considering the value of their data to organisations and what they might use it for. They will then look at social engineering techniques used by cybercriminals to try to trick users into giving away their personal data. The unit will look at the more common cybercrimes such as hacking, DDoS attacks, and malware, as well as looking at methods to protect ourselves and our networks against these attacks. |
| **Key knowledge and skills** | • Describe the difference between 'data-driven' and 'rule-based' approaches to application development<br>• Name examples of AI applications<br>• Outline some benefits and issues of using AI applications | • Use Blender to:<br>• Add, delete, and move objects<br>• Scale and rotate objects<br>• Use a material to add colour to objects<br>• Add, move, and delete keyframes to make basic animations<br>• Play, pause, and move through the animation using the timeline | • Describe what the micro:bit is<br>• List the micro:bit's input and output devices<br>• Use a development environment to write, execute, and debug a Python program for the micro:bit<br>• Write programs that use the micro:bit's built-in input and output devices | • Select criteria and use data set to investigate predictions<br>• Evaluate findings to support arguments for or against a prediction<br>• Identify the steps of the investigative cycle<br>• Solve a problem by implementing steps of the investigative cycle on a data set | • Describe how digital images are composed of individual elements<br>• Define key terms such as 'pixels', 'resolution', and 'colour depth'<br>• Describe how an image can be represented as a sequence of bits<br>• Compute the representation size of a digital image, by | • Explain the difference between data and information<br>• Critique online services in relation to data privacy<br>• Identify what happens to data entered online<br>• Explain the need for the Data Protection Act<br>• Implement strategies to minimise the risk of data |

| | | | | | | |
|---|---|---|---|---|---|---|
| | • Describe the impact of data on the accuracy of a machine learning (ML) model<br>• Explain the need for both training and test data<br>• Explain how bias can influence the predictions generated by an ML model<br>• Describe how decision trees are used to build a classification ML model<br>• Use a machine learning tool to import data and train a model | • Create useful names for objects<br>• Join multiple objects together using parenting<br>• Use edit mode and extrude<br>• Use loop cut and face editing<br>• Apply different colours to different parts of the same model<br>• Use proportional editing<br>• Use the knife tool<br>• Use subdivision<br>• Add and edit set lighting<br>• Set up the camera<br>• Compare different render modes<br>• Create a 3–10 second animation<br>• Render out the animation | • Write programs that use GPIO pins to generate output and receive input<br>• Write programs that communicate with other devices by sending and receiving messages wirelessly<br>• Design a physical computing artifact purposefully, keeping in mind the problem at hand, the needs of the audience involved, and the available resources<br>• Decompose the functionality of a physical computing system into simpler features<br>• Implement a physical computing project, while following, revising, and refining the project plan | • Use findings to support a recommendation<br>• Describe the need for data cleansing<br>• Apply data cleansing techniques to a data set<br>• Visualise a data set | multiplying resolution (number of pixels) with colour depth (number of bits used to represent the colour of individual pixels)<br>• Perform basic image editing tasks using appropriate software and combine them in order to solve more complex problems requiring image manipulation<br>• Explain the function of microphones and speakers as components that capture and generate sound<br>• Calculate representation size for a given digital sound, given its attributes<br>• Perform basic sound editing tasks using appropriate software and combine them in order to solve more complex problems requiring sound manipulation | being compromised through human error<br>• Define hacking in the context of cyber security<br>• Explain how a DDoS attack can impact users of online services<br>• Identify strategies to reduce the chance of a brute force attack being successful<br>• Explain the need for the Computer Misuse Act<br>• List the common malware threats<br>• Examine how different types of malware causes problems for computer systems<br>• Question how malicious bots can have an impact on societal issues<br>• Compare security threats against probability and the potential impact to organisations<br>• Explain how networks can be protected from common security threats<br>• Identify the most effective methods to prevent cyberattacks |
| **Key words/ vocabulary** | ML accuracy, Artificial intelligence, AI literacy, AI project lifecycle, Bias, ML class, ML classification, Computer vision, ML confidence, ML confidence threshold, Data Data-driven, Data bias, Data cleaning, ML decision tree, ML decision tree node, ML explainability, ML feature, Generative AI, ML label, Machine learning, ML model, ML model card, ML prediction, Reinforcement learning, Rule-based, ML test data, ML training, ML | Object, sphere, cone, add, move, rotate, scale, colour (material), Keyframe, tweening, stop motion, object, animation, location, rotate, scale, timeline, parenting, Edit mode, scale, extrude, loop cut, face, edge, vertex, Proportional editing, knife tool, organic, subdivision, Render, lights, camera, focus, ray tracing | Input, output, sensors, hardware components, selection, iteration expressions, lists, pins, circuits, wireless, Project, design, problem, audience, prototype, decomposition, processing, audience, prototype | Data science, visualisation, insight, infographic, Data, prediction, criteria, outliers, Correlation, PPDAC, investigative cycle, data capture, data source, analysis, data cleansing, conclusion, visualisation | Digital image, Binary image representation, Picture elements, Pixels Resolution, Colour depth, Bitmap or raster images, RGB colour, Representation size, Compression, Sound, Waves, Microphone, Speaker, Analogue, Digital, Digital sound representation, Sampling rate, Sample size, Digitisation, Symbolic representations, Vector graphics | Data, Information, Cybersecurity, Cybercriminals, Profiling, User behaviour, Privacy policies, Data protection, Data subject, Data portability, Malware, Social engineering, Phishing, Blagging, Shouldering, Name generator attacks, Scam, Cyberthreats, Hacking, Ethical hacking, Penetration testing, Brute force attacks, Script kiddies, DoS (denial of service), DDoS (distributed denial of service), Computer Misuse Act (1990), |

| | | | | | | |
|---|---|---|---|---|---|---|
| | training data, Societal bias, Supervised learning, Unsupervised learning | | | | | Ransomware, Malware, Viruses, Trojans, Worms, Adware, Spyware, Bots, Botnet, Anti-malware, Firewall, End-user authentication, Folder permissions/privileges, Botnet, Trojans, Biometrics, Two-factor authentication (2FA), CAPTCHA, Internet Service Provider (ISP), Auto-updates |
| **Assessment method** | Summative Assessment | Create a 3-10 second animation demonstrating skills learnt | A project assessment rubric is provided for evaluating different aspects of the physical computing projects, along with a summative assessment quiz for assessing individual learning at the end of the unit. | Summative assessment creating a visualisation and then analysing the data. | Summative assessment | Summative assessment |
| **Wider links** | Using AI to solve problems. Analysing and using data. Ethics | Storytelling, design, art, 3D modelling | Maths, Design Technology, Engineering | Maths, Geography, History, Science | Maths, Art, Music | Maths, English |
| **Enrichment opportunities** | Bebras | Blender competition | Micro:Bit programming Olympics | GoIT | Digital Media Design | Cyber competitions |
| **Careers links** | AI in industry. Programmer, Machine Learning | Animator, Film, Artist, 3D designer, Architect | Programmer, Robotics, Engineering, Designer | Data analyst, business manager, accountant | Web Developer, Content creator, Graphic Designer, Sound engineer | Cyber security, Network manager |