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| **Lesson Title** |
| Lesson 2 – Midge by Numbers – Recognising Patterns in Numerical Data |
| **Introduction** |
| In this lesson, students will train an AI model to **recognise patterns in numerical data**.  Delivery over multiple periods of learning may be advisable depending on prior learning.  **This lesson is designed for Computing Science students, S4 to S6 to support learning and teaching of AI concepts and practical skills for learners undertaking SQA Artificial Intelligence Unit(s) (Level 4 - J8E0 44, Level 5 - J8E0 45, Level 6 - J8E0 46).** |
| **Materials required** |
| **Slides:**  2) Train and Test an AI Model – Recognise Patterns in Numerical Data  **Handouts:** *(NB designed to be printed black and white to save printing costs)*  biting midge.pdf (1 copy per pair/group)  non-biting midge.pdf (1 copy per pair/group)  test-midge – large.pdf (1 copy per pair/group)  Midge Project – Recognising Patterns in Numerical Data - Template.pdf  **Online Tools:**  Machine Learning for Kids (<https://machinelearningforkids.co.uk/>)   * This project does not require you to create an account or log in. For this project, the examples you use to make the model are only stored temporarily in your browser (only on your machine).   **Digital Copies of Files:** *(via local shared drive or hosted in GDrive)*  biting.csv  non-biting.csv  **Teacher Laptop**  **Student Laptops/PCs** (1 per pair/group) |
| **Learning Intentions/Success Criteria** |
| 1. **Understand the Basics of AI and Machine Learning**:    * Students will learn that artificial intelligence (AI) and machine learning (ML) can be used in real-world applications. 2. **Introduction to Pattern Matching and AI Prediction**:    * Students will understand the concept of pattern matching and predicting missing values 3. **AI Model Number Recognition**:    * Students will learn how AI models can be trained to recognise patterns in numerical data. 4. **Data Collection and Labelling**:    * Students will explore the importance of collecting and labelling data accurately for training AI models. 5. **Training the Model**:    * Students will learn the steps involved in training an AI model, including feeding it labelled datasets 6. **Evaluating Model Performance**:    * Students will understand how to test and evaluate the performance of an AI model. 7. **Hands-On Practice**:    * Students will get hands-on experience by working with a simple AI model to recognise patterns in numerical data reinforcing their understanding of the concepts introduced in lesson 1. |
| **Curriculum Links** |
| SQA Artificial Intelligence Unit(s) (Level 4 - J8E0 44, Level 5 - J8E0 45, Level 6 - J8E0 46) |

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| **Lesson Outline** | |
| 5 mins | **Starter Activity:** Predicting Missing Values (Human Brain)  **Missing Words (Slides 2 to 5)**  Teacher displays each slide and students predict the most likely missing word.  NB Slide 2, students’ predictions might be evenly split between answers pizza, pancakes, toast  How do students’ predictions vary when additional connect is provided (butter and jam negates pizza, but not the others, Time of day? Country?)  Further class discussion opportunity around ‘**Certainty Factor**’ from lesson 1 and LLM text generation.  *(NB If students won’t recognise Andy Murray swap image or create additional slides with famous people, places, objects etc)* |
| 5 mins | **AI Predictions: Filling in the Blanks**  Missing book genres **(Slide 6)**  Invite students to predict the missing genres?  What criteria can students use to help predict missing values?  Reveal solution on **(Slide 7)** |
| 10 mins\* -  30 mins | **Midge by Numbers: Recognise Patterns in Numerical Data (Slides 8 to 13)**  \*\*Re-issue Lesson 1 Handouts\*\*  biting midge.pdf (1 copy per pair/group)  non-biting midge.pdf (1 copy per pair/group)  test-midge – large.pdf (1 copy per pair/group)  \*Note: Depending on time, level of study (4/5/6) prior learning or ability, students can either be provided with completed csv files or taught process of categorising features of midge using slides (**Slide 9**) and handout Midge Project – Recognising Patterns in Numerical Data - Template.pdf |
| 30 mins | **Train and Test an AI Model – Recognising Numbers​**  **Machine Learning for Kids Scratch Project**  Machine Learning for Kids (<https://machinelearningforkids.co.uk/>)  \*\*Issue ML for Kids - Midge Project - Recognising Numbers Tutorial.pdf\*\*  \*\*Re-issue students’ decision trees from lesson 1\*\*  **Students follow tutorial instructions to create ML Scratch Project**  Remind students to pay close attention to value names. They must type them exactly as they see them, with correct spellings, lower case and underscore.  **When students are ready they should click “Describe your model”.**  Students should be encouraged to experiment with their machine learning model using the test images and see how it uses the decision tree to make predictions.  **They will be presented with a decision tree representing their model** |
| 5 mins | **Closing Discussion:**  Plenary/Summary of learning across lesson (periods)  Human brain helps us recognise patterns and predict missing values.  AI models can be trained to recognise patterns in numerical data.  AI models can generate decision trees (should match that designed by students in Lesson 1)  Decision trees can be used to classify data, predict outcomes, and assist in decision-making processes. |

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| **References/Notes (optional!)** |
| SQA Artificial Intelligence Units  Level 4 - J8E0 44, Level 5 - J8E0 45, Level 6 - J8E0 46  Outcome 4 – students will acquire the skills required to develop their own AI systems.  Students will be able to:   * Apply a model to solve a problem * Prepare training data for the model * Use the model to solve a defined problem * Develop and execute test plans for the model * Identify improvements and modify the model * Compare and evaluate the models   <https://www.sqa.org.uk/files/nq/J8E044.pdf>  <https://www.sqa.org.uk/files/nq/J8E045.pdf>  <https://www.sqa.org.uk/files/nq/J8E046.pdf> |