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| **Lesson Title** |
| Lesson 3 – Midge Season Game – Train and Test an AI Model to Recognise Sounds |
| **Introduction** |
| In this lesson, students will train a machine learning model to recognise voice commands ‘up’, ‘down’, ‘left’, and ‘right’, and use them to control a biting midge in a fun game.  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:**  Midge Season - Starter – Slow Reveal Chart  **Handouts:**  Midge Season Tutorial.pdf (1 copy per pair/group)  **Scratch Game File:**  midgeseason.sb3  **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).   **Teacher Laptop with mic**  **Student Laptops/PCs** (1 mic per pair/group) |
| **Learning Intentions/Success Criteria** |
| **Learning Intentions**   1. **Understand Machine Learning Basics**:    * Students will learn how machine learning can be applied to recognise voice commands. 2. **Set Up a Machine Learning Project**:    * Students will learn how to set up a machine learning project using the provided tools and resources. 3. **Collect and Label Data**:    * Students will understand the importance of collecting and labelling data accurately for training a machine learning model. 4. **Train a Machine Learning Model**:    * Students will learn the steps involved in training a machine learning model to recognise specific voice commands. 5. **Test and Evaluate the Model**:    * Students will learn how to test the trained model and evaluate its performance in recognising voice commands. 6. **Integrate Machine Learning with Scratch**:    * Students will learn how to integrate the trained machine learning model with a Scratch project to control game elements using voice commands. 7. **Enhance the Game with Additional Features**:    * Students will explore ways to enhance the game by adding new features, such as extra points for collecting items or creating a two-player mode.   **Success Criteria**   1. **Accurate Data Collection**:    * Students collect and label at least 8 examples of background noise and each voice command ('up', 'down', 'left', 'right'). 2. **Effective Model Training**:    * Students successfully train the machine learning model using the collected data. 3. **Model Recognition Accuracy**:    * The trained model accurately recognises the voice commands during testing. 4. **Integration with Scratch**:    * Students integrate the machine learning model with the Scratch project and control the game elements using voice commands. 5. **Game Functionality**:    * The game functions correctly with voice commands, and students can move the midge in the expected directions. 6. **Creative Enhancements**:    * Students add creative enhancements to the game, such as random items for extra points or a two-player mode and test their functionality. |
| **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:** Slow reveal chart  **Slow Reveal Chart (Slides 1 to 7)**  Teacher displays each slide and invites students to predict and reason about what the chart might show.  Each slide from 2 to 6 will reveal another part of the chart to promote discussion and predictions word.  After slide 7 and entire chart is revealed, how does this relate to students’ own behaviour? |
| 5 mins | **Intro to Lesson**  Voice activation in games **(Slide 8)**  (NB These points are revisited during plenary quiz) |
| 30+ mins (or multiple periods for extension as required) | \*\*Issue Midge Season Tutorial.pdf\*\* (**Slide 9, 10**)  Students require copy of Scratch file: midgeseason.sb3  Students will work through the Midge Season Tutorial in small groups. |
| 5-10 mins | **Closing Discussion:**  Plenary/Summary of learning across lesson (periods)  Summary quiz and discussion points **(Slides 11 to 18)** |

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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> |