Task A – Natural Language Generation (NLG)

1. Match up these key terms with the correct definition.

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| 1. Natural Language Generation (NLG) |  | 1. The technology that turns your words (written or spoken) into data for the system to understand |
| 1. Natural Language Processing (NLP) |  | 1. This extracts the meaning of and relationships between words before being implemented into a workable system. |
| 1. Natural Language Understanding (NLU) |  | 1. A type of AI that generates natural language from structured data. |

1. Describe how the two NLG technologies listed below work.
2. Voice assistant

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| Major voice assistants like Apple's Siri and Amazon's Alexa rely on this to answer your questions and queries. |

1. Chatbots

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| Chatbots interpret what you type, then generate responses based on what you say. This may include customising language based on your query or tone or offering specific messaging depending on the topic. It may also include answering specific questions you ask by extracting content from areas of the website and packaging it into a response. |

1. Devices such as Amazon Alexa use speech recognition.
2. How does speech recognition work?

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| The computer takes input in the form of sound vibrations. This is done by making use of an analogue to digital converter that converts the sound waves into a digital format that the computer can understand. |

1. Identify some of the potential drawbacks associated with text to speech AI.

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| 95% accuracy which means a 5% error rate and this can be an issue if a voice is giving an important command which is misinterpreted. For example, a voice request on a satellite navigation might send someone in the wrong direction. Another example could be the use of a voice command in a smart home. The instructions for turning the lights off could be interpreted with turning the heating off. Despite the small error rate, it could lead to severe consequences. |

Task B – Smart devices

1. Using the table below, identify how these smart devices help improve the security of a household.

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| **Smart lock** | **Smoke alarm** | **Surveillance (e.g. security cameras)** |
| Use of biometric locks which can provide access to homes without the use of a key. This could be fingerprint or eye/retina recognition. | Smoke alarm can inform the owner the actual cause of smoke through the app. Other measurements can be taken such as carbon monoxide levels and battery life. | Surveillance systems can be used to predict break-ins and thefts before they occur.  More common devices such as ring door bell are used so occupants can see who is at their door or close to the house via the app which communicates with the integrated camera built into the doorbell. |

Task C – Machine learning

1. Match up these key terms with the correct definition.

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| 1. Deep learning |  | 1. Systems that have the ability to automatically learn and improve from experience without being explicitly programmed. |
| 1. Machine learning |  | 1. It’s a computing system made up of interconnected units that processes information by responding to external inputs, relaying information between each unit. |
| 1. Neural networks |  | 1. A system that closely tries to mimic how the human brain works. |

1. Machine learning will use something called ‘training data’

What is meant by ‘training data’?

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| The data you use to train an algorithm or machine learning model to predict the outcome you design your model to predict. The more data a machine/algorithm is provided with then the more intelligent it becomes. |

1. Complete the machine learning activity found on a separate worksheet.

Task D – Decision making

Volvo launched a fleet of electric vehicles with AI-driven super computers embedded in them.

1. Explain how Volvo is using AI to make vehicles safer and reduce the risk of an accident.

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| The machines are connected to sensors that will help detect and analyse driving conditions as well as monitor the car’s performance in real-time to flag any dangerous conditions. Volvo’s new tech will use AI to intervene immediately when it sees a risk, which it hopes will save lives and reduce injuries. |

Task E – Image recognition

1. AI uses classification and tagging for image recognition.

Match up the four key areas with the correct description.

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| 1. Classification |  | 1. This gives use the specific information (at pixel level) |
| 1. Detection |  | 1. Outputs the rectangle, or bounding box, on the image where the objects are. |
| 1. Segmentation |  | 1. Helps to determine what the object found in the image is most likely to be. |
| 1. Tagging |  | 1. Identify objects found in the image by labelling them. |

1. Use the screenshots below to identify which was demonstrates each area, justify your choice.

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|  | Select one box  Classification 🞏  Segmentation 🞏  Detection 🞏  Tagging 🞏  Why have you selected this option?  We are pretty sure there are only a dog and no cat. |  | Select one box  Classification 🞏  Segmentation 🞏  Detection 🞏  Tagging 🞏  Why have you selected this option?  There are both a dog and a duck. |
|  | Select one box  Classification 🞏  Segmentation 🞏  Detection 🞏  Tagging 🞏  Why have you selected this option?  We know in which box in the image duck and the dog are. |  | Select one box  Classification 🞏  Segmentation 🞏  Detection 🞏  Tagging 🞏  Why have you selected this option?  More detailed information based on their pixels. |

1. What happens if there are multiple objects in the same image?

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| If there is only one item at the same time, we call it classification (left). Otherwise, when several objects are in the same picture, it’s known as tagging (right). |