Unit 21: Introduction to Artificial Intelligence (AI)

Delivery guidance

Approaching the unit

Artificial Intelligence (AI) and Machine Learning are rapidly emerging areas of the digital sector and skills in this area are highly sort after. In recent years as our reliance on digital systems has increased, so has the quantity of data that is produced. AI and Machine Learning leverage this wealth of data to solve problems, inform decisions and improve the performance of computer systems and individuals.

This unit provides an opportunity to explore different AI and Machine learning models in a practical manner in order to meet identified needs. While some appreciation of the underpinning mathematics will be helpful, this should not be the primary focus of the unit. The focus instead should be on understand which types of model can solve certain problems and then selecting and utilising the most appropriate models to meet the identified requirements. While some theory will be necessary, where possible learners should have practical experience and explore data and models in a hands-on fashion.

This delivery guide does not cover everything that needs to be delivered for completion of this unit but gives examples of delivery methods. You should refer to the specification for full details of all the content that needs to be covered.

Delivering the Learning aims

Learning aim A you could start with a class discussion to explore learners' current understating of what AI and Machine learning are. Use this opportunity to challenge any common misconceptions and define the differences, and similarities, between AI and Machine learning. Learner understanding is likely to be limited, but many may have experience of AI in action such as digital assistants, as well as well publicised uses of AI such as 'Deep Fake'. Use this time to also highlight the common uses (which they may not be aware of) such as how large companies use it to produce business forecasts and predict potential trends.

Delivery of this learning aim would benefit from the use of high quality, detailed case studies as well as talks and presentations from professionals in industry. You should provide learners with opportunities to explore the use of AI and Machine Learning in a range of contexts.

Encourage learners to explore and discuss the ethical considerations of AI and Machine learning, the use of detailed case studies and structured discussions will be of great benefit when exploring these concepts.

Learning aim B focuses on the data that drives AI systems. You could start by exploring key features of different types of data and how it is generated by different sources. You could provide the learners with different data sets and get them to explore the suitability of the data for different tasks. Explore different data processing activities and how they are utilised by AI systems to meet different needs.

Understanding the nature of data collection and creation is vital to this unit. Learner's will require an understanding of the factors that impact on the quality and reliability of data and how this in turn impacts on AI and Machine Learning. Learners will benefit from starting with provided data sets to examine their contents and assessing their suitability for a stated purpose, before progressing to collecting and preparing data in response to a brief.

Learning aim C focuses on the use and refinement of AI models to meet specific needs. You could start with a look at the some of the theoretical concepts ensuring learners are aware of the different types of classification and the types of problems they are used solve. Where possible the theory should be supported by practical activities. Seeing different models in action and exploring what they can do will better support learners' understanding of the key concepts. Learners do not need to explore the mathematical theories behind the models in depth, although an overview is helpful, instead this learning should focus on identifying the types of problem and output required, selecting and applying a suitable model and reviewing the outcomes to refine and optimise the solution.

Learning aims B and **C** are closely linked. While some parts will be taught separately initially, learners should be provided with practical activities that utilise learning from both learning aims. It is key that learners understand that the data and the models/solutions are intrinsically linked.

Assessment model

Learning aim	Key content areas	Recommended assessment approach
A Investigate uses and applications of AI	**A1** Uses and applications of AI **A2** Implications of A1	A written report exploring the how and why different industries utilise AI solutions, the benefits they can bring, and any associated risks and drawbacks.
B Plan and prepare an AI solution to meet identified needs	**B1** Data for AI **B2** Gathering and preparing data	A portfolio of evidence detailing the creation of an AI solution will include: • defining the objectives of the project/task • collection of data and preparation for appropriate data sets • coding an AI solution • testing and refining the solution • evaluation of the solution against objectives.
C Develop an AI solution to meet identified needs	**C1** AI models **C2** Tools for the development AI solutions	

Assessment guidance

This unit is internally assessed. There is a maximum number of two summative assignments for this unit. Tutors should refer to the assessment guidance in the specification for specific detail, particularly in relation to the requirements for Pass, Merit and Distinction grades.

The first assignment requires to evaluate how and why different industries utilise AI solutions, the benefits they can bring, and any associated risks and drawbacks. Learners could produce the evidence for this in different ways in including a written formal report or a presentation to the group. If a presentation is used then assessors could use video recording combined with an observation sheet to cite which assessment criteria the learner has met, with appropriate commentary supporting the reason for awarding a particular grade. A blog or some form of audio or visual evidence would also be acceptable and would allow learners to develop their creativity, provided the information is communicated in a clear and detailed manner using appropriate language.

The second assignment requires the learner to create an AI solution that demonstrates one area of AI and meets a set of defined objectives. Learners will be expected to define a set of objectives for AI solution including functional and non-functional requirements. Learners will need to gather suitable data that can be used to train, validate and test the AI solution. Once the objectives are defined and data collected, the learners must develop an AI solution that utilises an appropriate model. They should train and test the model, review outcomes and refine the solution as required. Finally, learners will be required to evaluate the extent to which their solution meets the identified objectives.

Getting started

This gives you a starting place for one way of delivering the unit, based around the recommended assessment approach in the specification.

Introduction
Introduce this unit by discussing with learners how Artificial Intelligence (AI) and Machine Learning are rapidly emerging areas of the digital sector and skills in this area are highly sort after. Establishing the learners' baseline understanding of what AI and Machine learning are and considering what experiences they may have had with AI, even if they don't realise it, is a good starting point.
Learning aim A: Investigate uses and applications of AI
• Learning aim A should give learners an understating of what AI and machine learning are, how they are used an why. The learners should explore the "bigger picture" considering the impact AI has on different individuals and organisations. • For A1 learners need to explore the fundamental concepts of AI and its sub-disciplines and their use in different industries. Support teacher led input with case studies of AI and Machine learning in a range of contexts. Providing examples of AI in action will stimulate leaners engagement and provide a clear demonstration I it's capabilities. Encourage learners to do independent research about AI including the history and potential direction of AI. • For A2 need to consider the wider considerations of AI including legal and ethical factors. Use of case studies and news stories can be a good starting point for discussion amongst learners. • You could split learners into small groups and provide each group with a prompt in the form of a real, or theoretical, application of AI. The groups could then explore ethical, legal and wider factors of the use of AI. • If possible, organise educational visits to local organisations, to allow learners to see AI and Machine learning in real life situations. Where this may not be possible a guest speaker either in person or via video link can also provide a valuable experience for learners.
Learning aim B: Plan and prepare an AI solution to meet identified needs
• Learning aim B should provide learners with opportunities to explore a range of data and it's uses in conjunction with AI.

- For B1 learners could work in groups to explore different provided data sets to analyse the differences between different types of data (structured, unstructured, etc). Learners could investigate different sources of data to examine the types of data that is generated and how it is used by different stakeholders.

- Learners should be given opportunities to partake in practical activities to explore the use of Big Data and the application of data processing activities.

- For B2 learners should explore the importance of effective data collection and preparation to ensure accurate and meaningful outcomes form an AI solution. A combination of theoretical input, on topics such as the reasons why quality data is needed and legal and ethical considerations, along with practical data tasks to develop skills and understanding would be a good approach here.

- Where possible practical tasks should provide realistic, real world scenarios that allow learners to contextualise their learning.

Learning aim C: Develop an AI solution to meet identified needs

- This learning aim is best taught in conjunction with learning aim B. Once learners have an understanding of some of the basic skills of data collection and processing should start to introduce the practical AI tasks. It is important that learners appreciate the links between data and the AI models and solutions.

- For C1 and C2, provide learners with opportunities to explore different AI models. Start with well scaffolded activities where learners are provided with full solutions (including data) so that they can see working solutions in action. You should provide learners with opportunities to explore different types of problems (e.g. regression, classification, clustering) along with different solutions for each of the problems.

- As learners' familiarity with the problems and solutions increases, provide less scaffolded tasks. For example, you could provide a suggested solution, and allow the learner to source the data, or you could provide the data and get the learner to suggest and test a suitable solution.

- You will need to provide learners with opportunities to explore practical skills in the use of computer programming languages, and associated libraries and frame works. This can be achieved through a combination of tutor-led practical demonstrations, self-directed online learner and practical challenges.

Details of links to other BTEC units and qualifications, and to other relevant units/qualifications

This unit links to:

- Unit 4: Programming
- Unit10: Big Data and Business Analysis
- Unit 18: The Internet of Things
- Unit 22: Introduction to Robotics and Automation
- Unit 23: Emerging Trends and Technologies.

Resources

Textbooks

Stone, J – *Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning* (Sebtel Press, 2019) ISBN 0956372813

Taulli, T – *Artificial Intelligence Basics: A Non-Technical Introduction* (Apress, 2019) ISBN 1484250273

Websites

https://developer.ibm.com/technologies/artificial-intelligence/

IBM Developer resources – collection of AI learning resources

https://ai.google/education/

Google AI learning resources

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