

SEVERN BUSINESS COLLEGE

Qualifi Level 5 Diploma in Artificial Intelligence

Course Handbook

Qualification
Qualifi Level 5 Diploma in Artificial Intelligence

Ofqual Number
610/3935/4

Level
5

Total Qualification Time
1200

Credit Value
120

Aim of the Course
The Level 5 Diploma in Artificial Intelligence (AI) builds upon the foundational knowledge and skills acquired in the Level 4 AI diploma, providing students with a deeper and more advanced understanding of AI technologies and applications. This program is designed to empower students with the expertise required to excel in the rapidly evolving field of AI. The Level 5 diploma extends the scope of AI education by delving into complex topics such as advanced machine learning techniques, natural language processing, computer vision, reinforcement learning, and AI for robotics. Students will explore cutting-edge AI emerging technologies, staying at the forefront of innovation in the field. In addition to technical knowledge, this diploma emphasizes critical thinking, problem-solving, and the ethical dimensions of AI. Students will engage in hands-on projects, applying their AI expertise to address real-world challenges and contribute to the advancement of AI solutions. The Level 5 AI diploma prepares graduates for a pathway for those seeking to pursue advanced studies in AI or related fields. Assessment methods include advanced projects, use-cases, and presentations, ensuring that students not only grasp advanced AI concepts but can also communicate and apply them effectively. By completing the Level 5 Diploma in AI, students will be equipped with the knowledge, skills, and ethical awareness necessary to be competent professionals in AI technology. This program provides a robust foundation for successful careers and continued academic pursuits in the exciting and dynamic field of Artificial Intelligence.

Assessment
Assessment is through practical assignments, with no exams - to more accurately reflect the real working environment.

Course Structure

Qualifi Level 5 Diploma in Artificial Intelligence			
Unit number	**Units**	**Unit level**	**Unit credit**
M/651/0605	Visualisation	5	20
R/651/0606	Reinforce Machine Learning	5	20
T/651/0607	Natural Language Processing	5	20
Y/651/0608	Human-AI Interaction	5	20
A/651/0609	Advanced Deep Machine Learning	5	20
H/651/0610	Introduction to Computer Vision	5	20

Assessment Grades

Grade	**Marking Criteria**
Pass	All learning outcomes are achieved. All assessment criteria are met.
Fail	All learning outcomes are not achieved. All assessment criteria are not met.
No Marks	Plagiarism

UNIT SPECIFICATIONS

Unit Title
Visualisation

Level
5

Learning Time Hours
200

Credit Value
20

Unit aim
This unit aims to provide students with fundamental knowledge of and hands-on practical skills in performing data visualization using graphic user-interface design and effective visual communication. Learners will cover the principles and theories of visualization and appreciate the purpose and benefits of the different types of data visualization and their respective tools and technologies. Students will practise applying user-experience design principles and communication skills using popular visualization tools and software to create interactive visualization on given datasets.

Learning outcomes and assessment criteria
In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit.

Learning Outcome	Assessment Criteria
1. Understand the importance of data visualisation in business intelligence.	1.1 Discuss data visualisation and its benefits in business intelligence. 1.2 Explain the different types of data visualization and when best to optimize them. 1.3 Compare the various tools and technologies used in data visualization..
2. Be able to carry out data preparation for visualization.	2.1 Organise data collection, cleansing and preprocessing for effective data visualization 2.2 Perform data quality validation and data preparation.
3. Be able to use different visual representations for decision-making.	3.1 Identify and select appropriate visualization tools to perform data visualization 3.2 Carry out visualization on a given dataset using appropriate visualization tools
4. Be able to present visualizations using appropriate visualization tools.	4.1 Perform data preparation for visualizations. 4.2 Present visualization on a given real-life business scenario. 4.3 Analyse visualization results to interpret business insights.

Suggested Resources
- Wilke, C.O., (2019) Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures, (O'Reilly)
- Pica, L. (2023) Present Beyond Measure: Design, Visualize, and Deliver Data Stories That Inspire Action (Wiley)
- Ryan, L., (2023) Visual Analytics Fundamentals: Creating Compelling Data Narratives with Tableau (Addison-Wesley)

UNIT SPECIFICATIONS

Unit Title
Reinforced Machine learning

Level
5

Learning Time Hours
200

Credit Value
20

Unit aim
This unit provides students with fundamental understanding of the principles, basic algorithms and practical usage of reinforced machine learning. Students will be introduced to various reinforcement machine learning algorithms, libraries and frameworks typically used to solve business problems. Students will work a with variety of datasets to produce simple designs and implement and evaluate reinforcement learning algorithms.

Learning outcomes and assessment criteria
In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit.

Learning Outcome	Assessment Criteria
1. Understand key concepts in Reinforced machine Learning.	1.1 Define key concepts in reinforcement machine learning. 1.2 Compare supervised, unsupervised and reinforcement machine learning and their uses. 1.3 Compare the functional capabilities of different reinforcement machine learning algorithms

2. Be able to apply reinforcement machine learning algorithms, libraries, and frameworks.	2.1 Carry out reinforcement machine learning tasks on a given real-life business problem. 2.2 Review models and architectures used to solve real-life reinforcement machine learning problems 2.3 Apply reinforcement machine learning algorithms, libraries and frameworks to solve practical business problems
3. Be able to analyse results of reinforcement machine learning.	3.1 Present insights of given model on real life business reinforcement learning problems 3.2 Use appropriate evaluation metrics in reinforcement machine learning to analyse performance effectiveness for the given reallife problems 3.3 Use hyperparameter tuning and optimization to improve performance of reinforcement machine learning models.

Suggested Resources

- Winder, P., (2020) Reinforcement Learning: Industrial Applications of Intelligent Agents (O'Reilly)
- Sutton, R.S., Barto, A.G., (2018) Reinforcement Learning: An Introduction (MIT Press)
- Silver, D., (2023) Introduction to Reinforcement Learning
- Video Lectures https://www.youtube.com/playlist?list=PLbWDNovNB5mqFBgq7i3MY6Ui4zudcvNFJ, 27 Dec 2023

UNIT SPECIFICATIONS

Unit Title
Natural Language Processing

Level
5

Learning Time Hours
200

Credit Value
20

Unit aim
In this unit students will develop fundamental knowledge of skills in Natural Language Processing (NLP). Students will cover the fundamental concepts and algorithms commonly used for NLP. They will use Python libraries for NLP to build a search algorithm for extracting information from raw text. Students will have the opportunity to perform Sentiment Analysis to predict stakeholder sentiment.

Learning outcomes and assessment criteria
In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit.

Learning Outcome	Assessment Criteria
1. Understand fundamental concepts in Natural Language Processing (NLP)	1.1 Define key concepts and the various challenges associated with NLP. 1.2 Explain preprocessing of textual data and the tokenization techniques for NLP analysis. 1.3 Discuss various key NLP libraries, frameworks and other related tools.
2. Be able to use NLP libraries, frameworks, and other tools in text representations.	2.1 Implement NLP libraries, frameworks, and related tools on a sample text representation scenario 2.2 Review the application of Sentiment Analysis using machine learning and other appropriate NLP methods 2.3 Use appropriate NLP methods to analyse public sentiment within a given business scenario.
3. Be able to use NLP methods and techniques to carry out sentiment analysis.	3.1 Compare the strength and weakness of different NLP methods and applications 3.2 Use appropriate NLP techniques to analyse stakeholder sentiment within a chosen real-life business scenario. 3.3 Examine output produced by NLP against results from a conducted survey using sentiment analysis.

Suggested Resources

- Kochma, E., (2022) Getting Started with Natural Language Processing (Manning)

- Vajjala, S., Majumder, B. (et. al) (2020) Practical Natural Language Processing: A Comprehensive Guide to Building Real-World NLP Systems (O'Reilly)
- Lane, H., Hapke, H., Howard, C., (2024) Natural Language Processing in Action: Understanding, analyzing, and generating text with Python (2nd Eds - Manning)

UNIT SPECIFICATIONS

Unit Title
Human-AI Interaction

Level
5

Learning Time Hours
200

Credit Value
20

Unit aim
This unit aims to provide students with an understanding of the multidisciplinary areas involved in the field of Human-AI interactions. While the focus is on human interaction with AI, this unit covers the fundamental knowledge of and skills in designing an intuitive userfriendly human-machine interface. Students will consider human factors and basic elements in the psychology of human and AI interaction when using NLP interaction to influence conservational interface. Students will explore the fundamental concepts of explainable AI techniques to present transparent AI models.

Learning outcomes and assessment criteria
In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit.

Learning Outcome	Assessment Criteria
1. Understand key theories and concepts in human-AI interactions.	1.1 Explain the evolution and related concepts of Human-AI interaction 1.2 Analyse user-centred design principles used in developing AI systems. 1.3 Discuss how the design of an AI application uses principles of information architecture and intuitive user-friendly interaction.
2. Be able to carry out explainable AI techniques which take consideration of human factors and cognition.	2.1 Apply the various multimodal interaction techniques to analyse the effectiveness of various modalities for a given business scenario. 2.2 Apply explainable AI techniques to improve transparency and trust in developed AI applications. 2.3 Use human factors and cognitive load in designing the various interfaces within AI applications.
3. Understand design principles for collaborative human and AI systems.	3.1 Analyse user cognitive load to determine the processes and decision generated by AI application. 3.2 Examine principles in designing AI systems that ensure collaboration between humans and AI systems. 3.3 Investigate complexities in designing transparency for effective human and AI collaboration.

Suggested Resources
- Shneiderman, B., (2022) Human-Centered AI (Oxford Press)
- Eckroth, J., (2018) AI Blueprints: How to build and deploy AI business projects (Packt)
- Munn, M., Pitman, D., (2022) Explainable AI for Practitioners: Designing and Implementing Explainable ML Solutions (O'Reilly)
- Bartneck, C., Belpaeme, T., et al. (2020) Human-Robot Interaction: An Introduction (Cambridge University Press)
- Nielson, J. (2023) 10 Usability Heuristics for User Interface Design at https://developer.apple.com/design/human-interface-guidelines/machine-learning, 27 Dec 2023
- Google PAIR (2023) People + AI Guidebook at https://pair.withgoogle.com/guidebook/ , 27 Dec 2023

UNIT SPECIFICATIONS

Unit Title

Advanced Deep Learning

Level
5

Learning Time Hours
200

Credit Value
20

Unit aim
This unit builds on the fundamentals of deep learning, data sciences, machine learning and Neural networks covered in the Level 4-unit Introduction to Deep Learning (AID405). Students will explore advanced Neural network architecture and techniques and their use in improving the performance of deep learning models. Students will have the opportunity to use deep learning models within NLP and Reinforcement Learning on given real-life business scenarios.

Learning outcomes and assessment criteria
In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit.

Learning Outcome	Assessment Criteria
1. Be able to review contemporary theories and concepts of deep machine learning.	1.1 Summarize contemporary theories, concepts and models of deep machine learning. 1.2 Analyse the effectiveness of various deep machine learning models in addressing different business scenarios.
2. Understand advance Neural network architecture.	2.1 Investigate the use of advance Neural network architectures 2.2 Explain the principles governing transfer learning. 2.3 Explain the principles of improving trainedmodels
3. Be able to use different techniques to improve performance of deep machine learning models.	3.1 Investigate the hyperparameter tuning and generative models to improve performance. 3.2 Use hyperparameter tuning to review impacts from different parameters on model. 3.3 Use generative models to review effects on image generations and data synthesis.
4. Use deep machine learning models on Natural Language Processing (NLP) and Reinforced Machine Learning (RML).	4.1 Apply deep learning techniques in NLP tasks and examine the results. 4.2 Integrate deep learning techniques within RML algorithms to solve complex problems.

Suggested Resources
- Sewak, M., Karim, M.R, (2018) Practical Convolutional Neural Networks: Implement advanced deep learning models using Python (Packt)
- Michelucci, U., (2019) Advanced Applied Deep Learning: Convolutional Neural Networks and Object Detection (APress)
- Vasilev, I., (2019) Advanced Deep Learning with Python (Packt)

UNIT SPECIFICATIONS

Unit Title
Introduction to Computer Vision

Level
5

Learning Time Hours
200

Credit Value
20

Unit aim

This unit focuses on the fundamentals of computer vision principles and techniques and their applications. In addition to understanding the theoretical concepts, students will have the opportunity to use common computer vision algorithms and systems. Students will explore techniques for image processing, feature extraction and representation as well as use algorithms to detect and classify objects within a given image.

Learning outcomes and assessment criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit.

Learning Outcome	Assessment Criteria
1. Understand key concepts and principles of computer vision.	1.1 Define the key concepts and principles of computer vision. 1.2 Explain the evolution of computer vision and its application in AI. 1.3 Apply basic image processing techniques to analyse results from enhanced visual data.
2. Be able to perform object recognition and image segmentation.	2.1 Use basic feature extraction and representation techniques to discover representation from raw data. 2.2 Apply object detection algorithms as part of developing recognition system to classify objects in a given image.
3. Be able to apply deep learning models in computer vision.	3.1 Use image segmentation techniques to isolate images into specific segments. 3.2 Use convolution Neural networks to classify images for the purpose of features learning. 3.3 Assess the application of deep learning models and framework within computer vision

Suggested Resources

- Bhuyan, M.K. (2019) Computer Vision and Image Processing: Fundamentals and Applications (CRC)
- Davies, E. R. (2017) Computer Vision: Principles, Algorithms, Applications, Learning (APress)
- Lakshmanan, Görner, V.M., Gillard, R. (2021) Practical Machine Learning for Computer Vision (O'Reilly)

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