INTERNATIONAL QUALIFICATIONS

AND ASSESSMENT CENTRE (IQAC)

«Approved»

2025 y. «16» _____

Programme	LEVEL EXTENDED DIPLOMA IN ARTIFICIAL INTELLIGENCE		
Unit Number/ Unit Title	UNIT 5 MACHINE LEARNING FUNDAMENTALS		
Cohort Code:	L04MLF-U5		
Unit Level	4		
Total GLH	Total qualification time 200/ Total Guided learning hours 90/ Self-guided learning hours 110		
Credits	20 CATS/ 10 ECTS		
Lecturer			
Start Date		**End Date**	

Unit Aims	The unit will cover key machine learning concepts such as supervised, unsupervised, and reinforcement learning, along with practical training on popular algorithms and frameworks. Students will develop skills in data preprocessing, model evaluation, and optimization to build effective and reliable machine learning solutions. This foundation will enable learners to apply machine learning techniques to real-world problems across various domains.
Differentiation Strategies *(e.g. planned activities or support for individual learners according to their needs)*	The total number of students to be in the lesson is approximately 20. This is a multicultural group of students predominantly between the ages of 24 – 45, with numerous ethnic, gender, and creed background. These are UK academic level 5 students; hence it is assumed that they have practical, theoretical, or technological knowledge and understanding of a subject or field of work to find ways forward in broadly defined, complex contexts. These students must be able to generate information, evaluate, synthesise the use information from a variety of sources. Various approaches to addressing the various identified students needs will be adopted throughout the lesson. Such will include:- 1. Progressive tasks 2. Digital resources 3. Verbal support 4. Variable outcomes

	5. Collaborative learning 6. Ongoing assessment 7. Flexible-pace learning
Equality & Diversity	Variety of teaching techniques will be employed to ensure that the needs of each individual learner are met.
Safeguarding & Prevent	Safeguarding policies and the Prevent duty are strictly observed to ensure the safety, well-being, and inclusivity of all students and staff.
Health & Safety	SIRM H&S policies will be maintained.
Learning Resources	**Teaching and Learning Materials** • "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron • "Machine Learning Yearning" by Andrew Ng • "Pattern Recognition and Machine Learning" by Christopher Bishop.

Learning Outcome	Assessment Criteria
LO1. Understand the basic concepts of machine learning	1.1. Define machine learning and its types (supervised, unsupervised, and reinforcement learning). 1.2. Explain key machine learning algorithms and their applications.
LO2. Implement supervised learning algorithms.	2.1. Develop regression models to predict continuous outcomes. 2.2. Implement classification algorithms to predict categorical outcomes.
LO3. Apply unsupervised learning techniques.	3.1. Perform clustering analysis to group similar data points. 3.2: Apply dimensionality reduction techniques to simplify data.
LO4. Evaluate machine learning models.	4.1: Use cross-validation techniques to assess model performance. 4.2: Interpret confusion matrices and other evaluation metrics.

No	Learning Outcome / Topic	Learning and Teaching Activities	Which assessment criteria does the session relate to?	Day/month/year/ signature
1.	**Introduction to Machine Learning (ML)**	**Introduction to Machine Learning (ML)** Definition, importance, and applications of ML.	LO1: Understand the Basic Concepts of Machine Learning	
2.	**Types of Machine Learning**	**Types of Machine Learning** Supervised, unsupervised, and reinforcement learning with examples.	LO1: Understand the Basic Concepts of Machine Learning	
3.	**Key Terminologies in ML**	**Key Terminologies in ML** Features, labels, training data, testing data, model, overfitting, underfitting.	LO1: Understand the Basic Concepts of Machine Learning	
4.	**Overview of Machine Learning Algorithms**	**Overview of Machine Learning Algorithms** Linear regression, decision trees, k-means, neural networks (brief).	LO1: Understand the Basic Concepts of Machine Learning	
5.	**Real-world Applications of ML**	**Real-world Applications of ML** Healthcare, finance, marketing, autonomous systems, etc.	LO1: Understand the Basic Concepts of Machine Learning	
6.	**Introduction to Supervised Learning**	**Introduction to Supervised Learning** Labeled data, regression vs. classification.	LO2: Implement Supervised Learning Algorithms	
7.	**Linear Regression**	**Linear Regression** Concept, cost function, gradient descent.	LO2: Implement Supervised Learning Algorithms	
8.	Half-Term Exam	- Review of LO1 and LO2 topics - Practice questions and mock assessment - **Half-term assessment** based on LO1 (theory)		
9.	**Building a Regression Model**	**Building a Regression Model** Hands-on implementation (e.g., predicting house prices).	LO2: Implement Supervised Learning Algorithms	

10.	**Logistic Regression for Classification**	**Logistic Regression for Classification** Sigmoid function, decision boundary.	LO2: Implement Supervised Learning Algorithms	
11.	**Decision Trees & Random Forests**	**Decision Trees & Random Forests** Splitting criteria (Gini, entropy), ensemble methods.	LO2: Implement Supervised Learning Algorithms	
12.	**Support Vector Machines (SVM)**	**Support Vector Machines (SVM)** Hyperplanes, kernel trick.	LO2: Implement Supervised Learning Algorithms	
13.	**Naive Bayes Classifier**	**Naive Bayes Classifier** Probabilistic approach for text classification.	LO2: Implement Supervised Learning Algorithms	
14.	Final Exam Preparation & Review	- Comprehensive review of all learning outcomes - Practice questions and revision of key topics		
15.	Final Exam	- **Final-term assessment** covering all learning outcomes (theory and practical elements)	LO1 LO2	
16.	Feedback & Reflection	- Review of final exam - Individual feedback on performance - Reflective discussion on key learning points		
17.	**Model Training & Testing**	**Model Training & Testing** Splitting data (train-test-validation sets).	LO2: Implement Supervised Learning Algorithms	
18.	**Introduction to Unsupervised Learning**	**Introduction to Unsupervised Learning** Clustering vs. dimensionality reduction.	LO3: Apply Unsupervised Learning Techniques	
19.	**K-Means Clustering**	**K-Means Clustering** Algorithm steps, choosing 'k' (elbow method).	LO3: Apply Unsupervised Learning Techniques	
20.	**Hierarchical Clustering**	**Hierarchical Clustering** Agglomerative vs. divisive approaches.	LO3: Apply Unsupervised Learning Techniques	

21.	**DBSCAN (Density-Based Clustering)**	**DBSCAN (Density-Based Clustering)** Core points, noise, and applications.	LO3: Apply Unsupervised Learning Techniques	
22.	**Principal Component Analysis (PCA)**	**Principal Component Analysis (PCA)** Variance, eigenvectors, reducing dimensions.	LO3: Apply Unsupervised Learning Techniques	
23.	Half-Term Exam	**Case Study: End-to-End ML Project** From data preprocessing to model deployment.	LO1 LO2 LO3	
24.	**t-SNE for Visualization**	**t-SNE for Visualization** Non-linear dimensionality reduction.	LO3: Apply Unsupervised Learning Techniques	
25.	**Model Evaluation Metrics**	**Model Evaluation Metrics** Accuracy, precision, recall, F1-score.	LO4: Evaluate Machine Learning Models	
26.	**Confusion Matrix**	**Confusion Matrix** TP, TN, FP, FN, ROC curves.	LO4: Evaluate Machine Learning Models	
27.	**Cross-Validation Techniques**	**Cross-Validation Techniques** k-fold, stratified k-fold, LOOCV.	LO4: Evaluate Machine Learning Models	
28.	**Bias-Variance Tradeoff and Hyperparameter Tuning**	**Bias-Variance Tradeoff** Overfitting vs. underfitting solutions. **Hyperparameter Tuning** Grid search, random search.	LO4: Evaluate Machine Learning Models	
29.	Final Exam Preparation & Review	LO1, LO2, LO3, LO4	LO1, LO2, LO3, LO4	
30.	Final Exam		LO1, LO2, LO3, LO4	