

University of the West of Scotland

Module Descriptor

Session: 2024/2025

Title of Module: Machine Learning Applications			
Code: COMP10XXX	SCQF Level: 10 (Scottish Credit and Qualifications Framework)	Credit Points: 20	ECTS: 10 (European Credit Transfer Scheme)
School:	School of Computing, Engineering and Physical Sciences		
Module Co-ordinator:	TBC		
Summary of Module			
<p>This module builds on the foundational knowledge acquired in previous data science modules. It focuses on the practical aspects of applying machine learning (ML) to real-world problems, with an emphasis on machine learning engineering. Students will cover ML project management methodologies, development workflows, model training, packaging, deployment, and scaling of solutions, gaining hands-on experience in building, and deploying production-ready ML systems using suitable technologies.</p> <p>Additionally, this module will also focus on environmental, ethical, and professional issues when applying ML.</p> <ul style="list-style-type: none"> • The syllabus will include the following: <ul style="list-style-type: none"> ○ ML applications ○ Application domains of ML ○ Application methods (cloud, edge, on-premise) • Ethics in ML systems <ul style="list-style-type: none"> ○ Bias: definition, measuring and monitoring ○ Interpretability of models • ML engineering <ul style="list-style-type: none"> ○ Definition ○ Roles within ML Teams ○ Challenges • Developing ML <ul style="list-style-type: none"> ○ Project methodologies: Scrum, Crips-DM ○ Processes and workflows ○ CI/CD • ML models <ul style="list-style-type: none"> ○ ML model definition ○ Model training ○ Model drift: detection and strategies ○ Feature engineering 			

- Automated training
- Training pipelines
- Model registries
- Deployment of ML
 - Challenges
 - Architectural considerations: microservices, serverless
 - Scalability: parallel and distributed computing
 - Packaging ML models
- Modern ML
 - Deep Learning
 - Generative AI
 - Large Language Models

Some example tasks undertaken by students throughout this module are: The deployment of an ML pipeline, the creation of an ML microservice and the critical examination of various real-life ML projects considering factors such as bias and interpretability.

This module will work to develop a number of the key 'I am UWS' Graduate Attributes to make those who complete this module:

- Universal: analytical; ethically-minded; and socially responsible
- Work Ready: enterprising; knowledgeable; and an effective communicator
- Successful: innovative; transformational; and resilient

Module Delivery Method

Face-To-Face	Blended	Fully Online	HybridC	Hybrid 0	Work-Based Learning
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If this module is delivered within the BSc (Hons) IT Software Development Programme the 'Blended' module delivery method applies.

See Guidance Note for details.

Campus(es) for Module Delivery

The module will **normally** be offered on the following campuses / or by Distance/Online Learning: (Provided viable student numbers permit) (tick as appropriate)

Paisley:	Ayr:	Dumfries:	Lanarkshire:	London:	Distance/Online Learning:	Other:
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Add name

Term(s) for Module Delivery

(Provided viable student numbers permit).					
Term 1	<input type="checkbox"/>	Term 2	<input checked="" type="checkbox"/>	Term 3	<input type="checkbox"/>

Learning Outcomes: (maximum of 5 statements) These should take cognisance of the SCQF level descriptors and be at the appropriate level for the module. At the end of this module the student will be able to:	
L1	Critically evaluate ethical considerations in machine learning applications
L2	Select and justify appropriate methods associated for the application and deployment of machine learning solutions, considering architectural considerations such as microservices and serverless architectures, as well as scalability
L3	Demonstrate a detailed understanding of the machine learning engineering process
L4	Develop and deploy a machine learning system using appropriate tools and practices, ensuring reliability, scalability, and ethical considerations.

Employability Skills and Personal Development Planning (PDP) Skills	
SCQF Headings	During completion of this module, there will be an opportunity to achieve core skills in:
Knowledge and Understanding (K and U)	<p>SCQF Level 10</p> <p>Detailed knowledge and understanding of the concepts and principles of the machine learning engineering process</p> <p>Understanding of the ethical issues that are apparent when developing machine learning applications</p>
Practice: Applied Knowledge and Understanding	<p>SCQF Level 10</p> <p>Execute a defined project of identifying the requirements and methods and completing an implementation and deployment of a machine learning solution using the specific technologies covered by the module.</p>
Generic Cognitive skills	<p>SCQF Level 10</p> <p>Demonstrate some originality and creativity in dealing with professional-level issues such as those presented by coursework.</p> <p>Make recommendations where data/information is limited or comes from a range of sources such as internal company documentation and/or data files.</p>

Communication, ICT and Numeracy Skills	SCQF Level 10 Present and convey information about machine learning engineering in the form of the coursework	
Autonomy, Accountability and Working with others	SCQF Level 10 Exercise autonomy and initiative when working with a range of tools that enable the development and deployment of machine learning solutions	
Pre-requisites:	Before undertaking this module the student should have undertaken the following:	
	Module Code:	Module Title:
	Other:	
Co-requisites	Module Code:	Module Title:

*Indicates that module descriptor is not published.

Learning and Teaching	
In line with current learning and teaching principles, a 20-credit module includes 200 learning hours, normally including a minimum of 36 contact hours and maximum of 48 contact hours.	
Learning Activities During completion of this module, the learning activities undertaken to achieve the module learning outcomes are stated below:	Student Learning Hours (Normally totalling 200 hours): (Note: Learning hours include both contact hours and hours spent on other learning activities)
Lecture/Core Content Delivery	18
Tutorial/Synchronous Support Activity	6
Laboratory/Practical Demonstration/Workshop	24
Independent Study	152
	200 Hours Total
**Indicative Resources: (eg. Core text, journals, internet access)	

The following materials form essential underpinning for the module content and ultimately for the learning outcomes:

Duke, T. (2023) Building Responsible AI Algorithms A Framework for Transparency, Fairness, Safety, Privacy, and Robustness. Apress.

McMahon, A.P. (2023) Machine Learning Engineering with Python. Packt Publishing Ltd.

Staron, M. (2024) Machine Learning Infrastructure and Best Practices for Software Engineers. Packt Publishing

(*N.B. Although reading lists should include current publications, students are advised (particularly for material marked with an asterisk*) to wait until the start of session for confirmation of the most up-to-date material)

Attendance and Engagement Requirements

In line with the [Student Attendance and Engagement Procedure](#): Students are academically engaged if they are regularly attending and participating in timetabled on-campus and online teaching sessions, asynchronous online learning activities, course-related learning resources, and complete assessments and submit these on time.

For the purposes of this module, academic engagement equates to the following:

Attending all timetabled synchronous classes and engagement with asynchronous learning activities and resources.

Equality and Diversity

The University's Equality, Diversity and Human Rights Procedure can be accessed at the following link: [UWS Equality, Diversity and Human Rights Code](#).

Aligned with the overall commitment to equality and diversity stated in the Programme Specifications, the module supports equality of opportunity for students from all backgrounds and with different learning needs. Using our VLE, learning materials will be presented electronically in formats that allow flexible access and manipulation of content (part-time and distant learning students should check with their programme leader for any queries). The module complies with University regulations and guidance on inclusive learning and teaching practice. Specialist assistive equipment, support provision and adjustments to assessment practice will be made in accordance with UWS policy and regulations.

(N.B. Every effort will be made by the University to accommodate any equality and diversity issues brought to the attention of the School)

Supplemental Information

Divisional Programme Board	Computing
Assessment Results (Pass/Fail)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
School Assessment Board	Business & Applied Computing
Moderator	TBA
External Examiner	A Jindal
Accreditation Details	n/a
Changes/Version Number	1.0

Assessment: (also refer to Assessment Outcomes Grids below)

Assessment for this module consists of a report of student's practical work.

Assessment 1 – A Report of practical work that shows the student's approach to deploying a machine learning model to a given case-study-like problem including justifications and ethical considerations taken. (100%)

(N.B. (i) **Assessment Outcomes Grids** for the module (one for each component) can be found below which clearly demonstrate how the learning outcomes of the module will be assessed.

(ii) An **indicative schedule** listing approximate times within the academic calendar when assessment is likely to feature will be provided within the Student Module Handbook.)

Assessment Outcome Grids (See Guidance Note)

Component 1							
Assessment Type (Footnote B.)	Learning Outcome (1)	Learning Outcome (2)	Learning Outcome (3)	Learning Outcome (4)	Learning Outcome (5)	Weighting (%) of Assessment Element	Timetabled Contact Hours
Report of practical/field/	x	x	x	x		100	

clinical work							
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Combined Total for All Components	100%	- hours
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Change Control:

What	When	Who
Further guidance on aggregate regulation and application when completing template	16/01/2020	H McLean
Updated contact hours	14/09/21	H McLean
Updated Student Attendance and Engagement Procedure	19/10/2023	C Winter
Updated UWS Equality, Diversity and Human Rights Code	19/10/2023	C Winter
Guidance Note 23-24 provided	12/12/23	D Taylor
General housekeeping to text across sections.	12/12/23	D Taylor

Version Number: MD Template 1 (2023-24)