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Module specification

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Module Code	COM572
Module Title	Machine Learning
Level	5
Credit value	20
Faculty	FACE
HECoS Code	100992
Cost Code	GACP

Programmes in which module to be offered

Programme title	Is the module core or option for this programme
BSc (Hons) Computer Science	Core
BSc (Hons) Computer Science with Industrial Placement	Core
Delivery as standalone module	Option

Pre-requisites

None

Breakdown of module hours

Learning and teaching hours	15 hrs
Placement tutor support	0 hrs
Supervised learning e.g. practical classes, workshops	15 hrs
Project supervision (level 6 projects and dissertation modules only)	0 hrs
Total active learning and teaching hours	**30** hrs
Placement / work based learning	0 hrs
Guided independent study	170 hrs
Module duration (total hours)	**200** hrs

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Initial approval date	08/11/2023
With effect from date	Sept 2025

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Date and details of revision	
Version number	1

Module aims

This module aims to equip students with the knowledge and skills necessary to apply and interpret common machine learning algorithms for regression, classification, clustering, and dimensionality reduction on complex datasets. Students will learn how to evaluate and optimize machine learning models using cross-validation, regularization, and feature selection. Additionally, they will learn how to develop and implement complete machine learning pipelines, including data pre-processing, feature engineering, model selection, and evaluation. By the end of the module, students will be able to communicate machine learning results effectively using appropriate visualizations and metrics and interpret the implications of these results for both technical and non-technical audiences.

Module Learning Outcomes - at the end of this module, students will be able to:

1	Apply and interpret common machine learning algorithms.
2	Evaluate and optimize machine learning models using industry-standard tools and techniques.
3	Develop and implement complete machine learning pipelines.
4	Communicate results effectively using appropriate visualizations and metrics for technical and non-technical audiences.

Assessment

Indicative Assessment Tasks:

This section outlines the type of assessment task the student will be expected to complete as part of the module. More details will be made available in the relevant academic year module handbook.

The students will demonstrate their skills by creating and applying a machine learning model to a given real-world problem. A development log will be used for formative assessment and a final presentation of findings and results will be the modules superlative assessment.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)
1	1,2,3,4	Coursework	100%

Derogations

None

Learning and Teaching Strategies

In line with the Active Learning Framework, this module will be blended digitally with both a VLE and online community. Content will be available for students to access synchronously and asynchronously and may indicatively include first and third-party tutorials and videos, supporting files, online activities any additional content that supports their learning.
As this module progresses, the strategies will change to best support a diverse learning environment. Initially, the module will start with a heavier reliance on engaging tutor-led lectures, demonstrations, and workshops to ensure that the students get the relevant threshold concepts. As the module continues experiential and peer learning strategies will be encouraged as the students' progress with their portfolio work.
Assessment will occur throughout the module to build student confidence and self-efficacy in relation to applied mathematical and technical concepts.

Indicative Syllabus Outline

- Introduction to Machine Learning
- Data Pre-processing
- Regression Analysis
    - Linear regression
    - Polynomial Regression
- Classification Analysis
    - Logistic regression
    - Decision trees,
    - Random forests
    - Naive Bayes
- Clustering Analysis
- Dimensionality Reduction
- Model Evaluation and Optimization
    - Cross-validation
    - Regularization
    - Feature selection
- Communicating Results (visualizations and metrics for technical and non-technical audiences)

Indicative Bibliography:

Please note the essential reads and other indicative reading are subject to annual review and update.

Essential Reads

A. Geron, *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow*, Oreilly, 2019.

Other indicative reading

G. James, *An Introduction to Statistical Learning*, Springer, 2021.
S. Raschka, V. Mirjalili, *Python Machine Learning* Pack Publishing, 2017.
C. M. Bishop, *Pattern Recognition and Machine Learning*, Springer, 2016.
J. Grus, *Data Science from Scratch*, Oreilly, 2019.
K. P. Murphy, *Machine Learning: A Probabilistic Perspective*, MIT Press, 2012.