Module Specification

Fundamentals of Machine Learning

Version: 2026-27, v1.0, Approved

Contents

Part 1: Information

Module title: Fundamentals of Machine Learning

Module code: UFCEK4-30-2

Level: Level 5

For implementation from: 2026-27

UWE credit rating: 30

ECTS credit rating: 15

College: College of Arts, Technology and Environment

School: CATE School of Computing and Creative Technologies

Partner institutions: None

Field: Computer Science and Creative Technologies

Module type: Module

Pre-requisites: None

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: In this module, we will expand the data handling skills developed in the first year, including greater awareness of different data sources, formats, and applications. We will explore tools used to analyse real problems involving data. We will delve into advanced statistical techniques and machine learning methodologies, focusing on the analysis of complex data sets and the application of sophisticated models. Various machine learning algorithms will be applied, and their relative

strengths and weaknesses will be addressed. As part of problem-solving, we will critically evaluate and apply appropriate statistical software.

Features: Not applicable

Educational aims: This module aims to provide students with an in-depth understanding of advanced statistical techniques and machine learning methodologies to ensure students develop critical and analytic thinking using quantitative research methodology.

Outline syllabus: An indicative content is as follows:

Review of Fundamental Concepts and Introduction to Advanced Topics

Regression Analysis

Binary Logistic Regression

Bayesian Statistics

Ensemble Methods in Machine Learning

Support Vector Machines (SVM) and Kernel Methods

Basics of Neural Networks and Deep Learning

Introduction to Deep Learning Architectures

Unsupervised Learning and Dimensionality Reduction

Part 3: Teaching and learning methods

Teaching and learning methods: The delivery is designed to promote active learning, comprising interactive lectures, problem-based computer practicals, and lectorials.

The delivery has an emphasis on the use of statistical software, including that seen at level 4, and software introduced in this module. Continued use of software expands data handling skills, awareness of different data, and tools to analyse 'messy' data. Therefore, as concepts are introduced during lectures, they will be illustrated by examples that demonstrate the use and interpretation of software. To complement this, computer practicals will involve students completing actual data analysis using software. Lectorials provide flexible opportunities for combining the two above approaches.

Lectures also provide space for critical and analytic thinking that does not require software. Therefore lectures will introduce theoretical statistical concepts and provide active learning through engaging with solving examples.

Students develop skills in formal report writing and data visualisation through assessment, and also through a continued emphasis on output and communication throughout the delivery. All examples (both in course notes and computer practicals) show a complete data analysis, so that all examples demonstrate the features of a statistical analysis and how these may be critiqued in a formal report. All computer practicals are based around preparing computer output for a formal report, so that feedback and feed-forward on the summative report-writing is strengthened by feedback and feed-forward during computer practicals.

Module Learning outcomes: On successful completion of this module students will achieve the following learning outcomes.

MO1 Perform and interpret advanced statistical analyses and apply nonparametric equivalents for situations where traditional parametric assumptions are violated.

MO2 Apply various machine learning algorithms to complex data problems and evaluate and interpret the performance of different machine learning models using appropriate metrics.

MO3 Critically assess the assumptions, validity, and robustness of statistical and machine learning models.

MO4 Communicate findings effectively, highlighting insights, limitations, and recommendations for data-driven decision-making.

Hours to be allocated: 300

Contact hours:

Independent study/self-guided study = 228 hours

Face-to-face learning = 72 hours

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://rl.talis.com/3/uwe/lists/58A26F5E-61E8-CBEA-4BEA-F70EB05DE7F1.html

Part 4: Assessment

Assessment strategy: The coursework assessment requires students to communicate data analyses in a formal report. Students will also demonstrate that they can identify appropriate techniques for the report, and apply appropriate software.

There is also an examination at the end of the module. The partially-seen format allows for exam preparation, in which students identify appropriate tools and techniques for the exam questions, and apply appropriate software.

The resit assessment strategy retains the the same examination and coursework format.

Assessment tasks:

Report (First Sit)
Description: Individual report (2000 - 3000 words)
Weighting: 50 %
Final assessment: No
Group work: No
Learning outcomes tested: MO2, MO3, MO4

Examination (Online) (First Sit)

Description: Online examination with partially seen or partially redacted questions (24 hours)

Weighting: 50 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1

Report (Resit)

Description: Individual written report (2000 - 3000 words)

Weighting: 50 %

Final assessment: No

Group work: No

Learning outcomes tested: MO2, MO3, MO4

Examination (Online) (Resit)

Description: Online examination with partially seen or partially redacted questions (24 hours)

Weighting: 50 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Data Science [Frenchay] BSc (Hons) 2025-26