Module Specification

Coding for Machine Learning and Data Science

Version: 2025-26, v1.0, 19 Sep 2023

Contents

Part 1: Information

Module title: Coding for Machine Learning and Data Science

Module code: UFCE56-30-3

Level: Level 6

For implementation from: 2025-26

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:

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: Data science and machine learning are exciting rapidly evolving disciplines that offer enormous potential for the future of computer science. To keep up with the rapidly evolving field of a modern data scientist requires fundamental data wrangling and Machine Learning skills. This module is designed to introduce students to programming and statistical concepts frequently used within Machine Learning and Data Science.

Features: Not applicable

Educational aims: Students will acquire the ability to understand and interpret statistical data output and apply modern data analysis methods for gaining new business insights.

This module will boost your Python coding skills to the required level to conduct research and complete projects within data science and machine learning. We will introduce students to the complexity of working with real-world data, cover common data wrangling techniques and solutions, and introduce key machine learning concepts in supervised learning.

Outline syllabus: Throughout this module teaching will cover:

Basic data analysis tasks and techniques review.

Legal, ethical and responsible data management.

Fundamentals of coding within Python to the PEP8 standard

Critically appraise data science problems and evaluate the tools needed to solve them

An introduction to JupyterLab or Jupyter Notebooks for data science and machine learning

Advanced data wrangling in Python, using NumPy and Pandas

Object-Oriented programming

Data Visualisation using seaborn and matplotlib

Statistical classification: overview, classifiers (linear discriminant and logistic regression) and applications of classification, for example using SciPy.

Forecasting: Overview, stationary data, models (ARIMA and Prophet).

Part 3: Teaching and learning methods

Teaching and learning methods: Learning and teaching will be provided to students in two forms: lectures and computer labs.

During lectures, theoretical aspects of the module will be provided to students by the teaching staff. Lectures will be supported by presentation published and available to the students on Teams as well as additional materials (publications, videos, etc.).

Computer labs are devoted to practical data analysis using modern software. Jupyter will be used for illustration of techniques and output analysis; students are allowed to use other software packages (Python) by a prior agreement with the module instructor. Computer lab classes are reserved for requirement clarifications, problem discussion, and assessment.; students are expected to carry out the work independently outside the classes.

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

MO1 Demonstrate competence in the fundamentals of programming for data science

MO2 Analyse and manipulate complex datasets and demonstrate competence in building statistical and computational models to work with them in Python.

MO3 Apply a range of advanced forecasting techniques to model outcomes in time-series datasets and obtain well-grounded business insights. Students will conduct the work individually and independently.

MO4 Use a range of Python tools to wrangle data into a usable format, for use in exploratory data analysis.

Hours to be allocated: 300

Contact hours:

Independent study/self-guided study = 228 hours

Face-to-face learning = 72 hours

Total = 300

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link

Part 4: Assessment

Assessment strategy: This module compromises of two assessments, a practical portfolio and a 2000 word Laboratory Report:

PRACTICAL PORTFOLIO
The practical portfolio will require students to apply their knowledge of advanced level programming concepts and object-oriented techniques to develop and test a software solution. The portfolio is usually comprised of several smaller deliverables, emphasising well-structured and efficient code design. The completed software solution should adhere to industry best practices and include extensive testing.

Students are expected to demonstrate their knowledge and ability to program in Python, eg. utilising PEP8 compliant code, and the usage of data structures within NumPy and Pandas libraries.

LABORATORY REPORT
In the 2000 word Laboratory Report, students will explain the methodology used for the analysis, the results, and draw conclusions based upon those results. The analysis consists of an exploratory analysis and the application of one forecasting technique on a time-series dataset.

Students should conduct the computer labs independently. This entails analysis of a time-series dataset of the student's choice, and application of at least one forecasting technique to gain insights from this data set. The report will contain a summary of methodologies used, justification of analysis, and conclusions on results.

The module resit opportunity will follow the same format as the first take. Where appropriate, a reworking of datasets/code may be considered given the size and complexity.

Assessment tasks:

Portfolio (First Sit)
Description: A practical portfolio of a Python program.
Weighting: 40 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO4

Laboratory Report (First Sit)
Description: Individual report on computer labs (forecasting).
Weighting: 60 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO2, MO3

Portfolio (Resit)
Description: A practical portfolio of a Python program.
Weighting: 40 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO4

Laboratory Report (Resit)
Description: Individual report on computer labs (forecasting).
Weighting: 60 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO2, MO3

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Digital and Technology Solutions (Software Engineer) {Apprenticeship-UCW} [UCW] BSc (Hons) 2023-24

Digital and Technology Solutions (Data Analyst) {Apprenticeship-UCW} [UCW] BSc (Hons) 2023-24

Digital and Technology Solutions (Software Engineer) {Apprenticeship-GlosColl} [GlosColl] BSc (Hons) 2023-24