Module Specification

Machine Learning and Predictive Analytics [TSI]

Version: 2023-24, v2.0, 06 Dec 2023

Contents

Part 1: Information

Module title: Machine Learning and Predictive Analytics [TSI]

Module code: UFCED1-12-M

Level: Level 7

For implementation from: 2023-24

UWE credit rating: 12

ECTS credit rating: 6

College: College of Arts, Technology and Environment

School: CATE School of Computing and Creative Technologies

Partner institutions: Transport and Telecommunication Institute

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: This course will equip students with knowledge and understanding of tools and techniques commonly utilised within the field of Machine Learning. The course will set the context of the machine learning and predictive analytics utilisation in business intelligence. The courses discusses a range of applications for predictive analytics. A wide range of machine learning techniques will be considered in the course: Decision tree learning, Artificial neural networks, Naive Bayes classifier, Genetic algorithms etc.

Features: Not applicable

Educational aims: This module will provide students with knowledge and understanding of tools and techniques commonly utilised within the field of Machine Learning to solve complex problems.

Outline syllabus: This module will cover:

Introduction to predictive analytics:
Defining predictive analytics - introduction

Business Relevance of PA - Business intelligence and applications:
Relevance of pattern recognition, classification, optimisation

Predictive analytics and big data
Case study: a business application using predictive analytics approaches

Predictive analytics in business - applications:
Sources of data and value of knowledge

Identify a wide range of applications for predictive analytics:
Marketing and recommender systems, fraud detection, business process analytics, credit risk modelling, web analytics and others
Social media and human behaviour analytics

Case study: email targeting - which message will a customer answer? - (tutorial)

Analytics models and techniques:
Introduction to analytics modelling
Types of analytics models:
Predictive models
Survival models
Descriptive models

Define pattern recognition, inferring data and data visualisation

Briefing learning and regression approaches

Comparison of approaches - use and goals - (tutorial)

Introduction to machine learning:

Introduction: Basic principles:

Basic notions of learning

Introduction to learning problems (classification, clustering and reinforcement) and literature

Identifying different learning approaches - supervised, unsupervised and reinforcement

Case study on different types of learning - (tutorial)

Machine learning for predictive analytics (1):

Review of types of problems

Machine Learning techniques:

Decision tree learning

Artificial neural networks

Clustering

Naive Bayes classifier

k-nearest neighbours

Genetic algorithms

Case study on problem - a "suitable" predictive modelling technique - (tutorial)

Regression techniques for predictive analytics:

Review of types of problems (application)

Linear regression models

Survival or duration analysis (time to event analysis)

Ensemble learning and random forest

Case study on problem - a "suitable" predictive modelling technique - (tutorial)

Advanced topics and Software tools:

Analytics in the context of big data

Predictive analytics as art and science

Software tools; the R project and Python

Trends and challenges in predictive analytics - where are we going?

Part 3: Teaching and learning methods

Teaching and learning methods: This module is made up from one item - coursework. Coursework involves solving a business related problem based on given requirements and data, proposing a solution and preparing a pilot predictive model. This brings together module material on the context, data and requirements for implementing a predictive module and in the course of completion students will gain experience in model building, presenting results and evaluating accuracy. During the module practical classes, will be combined with lectures. During lectures the particularities of each predictive analytics methods will be discussed, with special attention to limitation, input data, parameters to tune predictive models etc. During practical classes, teaching staff will provide tutorials on each predictive analytics methods usage for developing predictive models. All materials regarding the module, will published on e.tsi.lv platform, which includes presentations, tutorials, self-reading materials, assessment specification.

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

MO1 Synthesise evidence on the value of data as an asset for businesses to "mine" knowledge and "predict" trends.

MO2 Identify learning problems including classification, clustering and reinforcement; distinguish their scope and outline suitable solutions.

MO3 Develop and evaluate predictive analytics approaches and techniques.

MO4 Visualise and present the results of predictive and descriptive models alongside an evaluation of performance and recommendations for improvement.

MO5 Illustrate proficiency with software tools used in predictive analytics in the context of predictive analytics trends and challenge.

Hours to be allocated: 120

Contact hours:

Independent study/self-guided study = 112 hours

Face-to-face learning = 48 hours

Total = 160

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/170DB3CA-83CA-C04E-9391-ACBBFEA9BD8F.html?lang=en-gb&login=1

Part 4: Assessment

Assessment strategy: This module is assessed through a single assessment. Students are required to produce a written report, using appropriate case studies and models to support their decisions. The assessments is a subject of individual completion. The written report in frame of this module is used, as it allows to demonstrate the skills of application of application of predictive analytics methods, discuss its applicability in the frame of the tasks, critically evaluate the performance and results.

During resit students need to rework/improve written report.

Assessment tasks:

Report (First Sit)
Description: Written report, including any models (2000 words)
Weighting: 100 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO3, MO4, MO5

Report (Resit)

Description: Written report, including any models (2000 words)

Weighting: 100 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1, MO2, MO3, MO4, MO5

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Computer Science (Data Analytics and Artificial Intelligence) {Double Degree} [TSI] MSc 2023-24