Module Specification

AI Challenges and Research [TSI]

Version: 2023-24, v3.0, 09 Aug 2023

Contents

Part 1: Information

Module title: AI Challenges and Research [TSI]

Module code: UFCFQX-12-3

Level: Level 6

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: 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: This module will introduce you to the latest thinking in addressing key concerns that frequently occur when creating AI-based solutions to real-world problems.

Features: Not applicable

Educational aims: This module aims at consolidating all knowledge on Artificial Intelligence acquired during the previous two years of study. Emphasis will be on the

assessment of the most suitable technics and methodologies to be utilised in achieving appropriate applications that will provide effective and efficient solutions to complex problem situations. The selected methodologies will then be applied to demonstrate the accuracy of the assessment and design of the solutions and allow for further analysis and evaluation of the strengths of the tools utilised.

Outline syllabus: Optimisation:
Search spaces and problem types (NP, non-stationary, multi-objective, etc), and local search therein, eg, random hill-climbing, simulated annealing, tabu search.
Population-based search - simulated evolution (EAs):
Knowledge representations in EAs (linear, trees, graphs) and associated search operators (recombination, mutation, inversion).
Other population-based search techniques - artificial swarms. Comparing and contrasting examples such as ant colony and particle swarm with evolutionary algorithms both in terms of search mechanisms and appropriate application domains.
Hybridising local and population-based search.

Modelling:
Training and testing – stopping, imbalance, missing variables, bias in data sets, features, pre-processing, etc. That is, the realities of handling data and formulating questions from it.
Supervised Learning:
Instance-based learning – kNN,
Decision Trees – C4.5
Probabilistic Methods – Bayes/ Fuzzy
Neural Networks - MLPs and backprop
Deep networks – autoencoding and convolutional
Reinforcement Learning - Tabular Q learning
Unsupervised Learning – K means, including some aspects of visualisation

Part 3: Teaching and learning methods

Teaching and learning methods: Each topic will be introduced by lectures and guided reading, illustrated by examples, expanding to show how we have tackled the issues in real-world collaborative research projects. Where appropriate this will be supplemented by talks from industry speakers.
Interwoven throughout each of these topics and their learning opportunities are three assumptions:
(i) Most real-world systems will be hybrid in form, blending optimisation, machine learning and (possibly) symbolic reasoning (esp. wrt interactive AI).
(ii) Most domains require documentation of critically informed design decisions and algorithm selection based on relating strengths/weaknesses of different approaches to problem characteristics.
(iii) All real-world applications of AI require the designer to be fully aware of ethical and security implications, and to be able to document their risk analysis and use of appropriate mitigating strategies.

A series of tutorial/lab tasks will provide students with the opportunity to work in groups, designing, implementing evaluating, and documenting solutions to complex problems. These will also form the basis of the module assessment

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

MO1 Compare and contrast modern Artificial Intelligence techniques, and with those traditionally associated with complex problems.

MO2 Identify the issues associated with the application of modern Artificial Intelligence techniques, including any ethical issues, and evaluate challenges presented.

MO3 Demonstrate the ability to select appropriate paradigms and solve one or more problems with Artificial Intelligence techniques.

Hours to be allocated: 120

Contact hours:

Independent study/self-guided study = 96 hours

Face-to-face learning = 64 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/B1EC8AE0-B161-9736-D1D7-068DBDC877E9.html?lang=en-gb&login=1

Part 4: Assessment

Assessment strategy: The assessment strategy for this module is a combination of an in-class test and a coursework assignment.
The in-class test will be of half an hours duration and comprises questions mapping to the module's learning outcomes. Questions will examine cognate and practical skills from a subset of a range of possible means, including short essays, multi-choice questions (MCQs), and appropriate problem solving exercises.
The written coursework assignment requires the production of a report, and program code. Tutorials will include the opportunity for one-to-one demonstrations of students' assignment software to tutors, enabling rich formative feedback in addition to the summative feedback element.

The resit will follow the same format, with different tasks used for the practical assignment.

Assessment tasks:

In-class test (First Sit)
Description: Controlled conditions (30 mins)
Weighting: 25 %
Final assessment: Yes
Group work: Yes
Learning outcomes tested: MO1, MO2

Written Assignment (First Sit)

Description: Report (max 3000 words) - Technical documentation and critically review of the developed solution.
Weighting: 75 %
Final assessment: No
Group work: Yes
Learning outcomes tested: MO1, MO3

In-class test (Resit)
Description: Controlled conditions (30 mins)
Weighting: 25 %
Final assessment: Yes
Group work: Yes
Learning outcomes tested: MO1, MO2

Written Assignment (Resit)
Description: Report (3000 words) - Technical documentation and critically review of the developed solution.
Weighting: 75 %
Final assessment: No
Group work: Yes
Learning outcomes tested: MO1, MO3

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Computer Science and Software Development {Double Degree} [Oct][FT][TSI][4yrs] BSc (Hons) 2020-21

Computer Science and Software Development {Double Degree} [Feb][FT][TSI][4yrs] BSc (Hons) 2020-21