Module Specification

BioComputation

Version: 2021-22, v2.0, 09 Oct 2019

Contents

Part 1: Information

Module title: BioComputation

Module code: UFCFY3-15-3

Level: Level 6

For implementation from: 2021-22

UWE credit rating: 15

ECTS credit rating: 7.5

Faculty: Faculty of Environment & Technology

Department: FET Dept of Computer Sci & Creative Tech

Partner institutions: None

Delivery locations: Frenchay Campus, Taylors University, Villa College

Field: Computer Science and Creative Technologies

Module type: Standard

Pre-requisites: None

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: Not applicable

Features: Not applicable

Educational aims: See Learning Outcomes

Outline syllabus: The syllabus includes:

Introduction:

Overview of the different learning algorithms and knowledge representations to be considered – intelligence at the level of populations/multiple agents, individuals/agents, and within agent components. Example applications and, as in all discussions of applications throughout the course, any potential wider societal implications will be highlighted and considered.

Population-level Intelligence:

Natural and simulated evolution. Knowledge representations (linear, trees, graphs) and search operators (recombination, mutation, inversion). Applications.

Natural and artificial swarms. Contrast examples, e.g., ants, flocks, bees, with related evolutionary computing topics (as above). Collective robotics (and subsumption architecture). Applications.

Multi-agent systems. Concept of agency and extension to problem solving through communication and cooperation. Communication languages (KIF, KQML, etc.). Interaction types (auctions, negotiations, etc.). Applications - highlighting use with evolutionary and/or swarm schemes.

Individual-level Intelligence:

Natural and artificial neural networks. Neuron representations (threshold, dynamic) and learning algorithms (gradient descent, population-based), including reinforcement learning (temporal difference learning). Applications.

Natural and artificial immune systems. Contrast clonal selection approaches with evolutionary computing and network approaches with neural computing. Applications.

Cell-level Intelligence:

Natural cells and genetic regulatory networks. Membrane computing. Learning algorithms (evo, swarm, etc.). Use of living cellular substrates in computing, including neuronal computing, physarum, bacteria. Applications.

And/or other suitable topics at the discretion of the module team.

Part 3: Teaching and learning methods

Teaching and learning methods: Scheduled learning includes lectures, seminars, tutorials, project supervision, demonstration, practical classes and workshops.

Independent learning includes hours engaged with essential reading, case study preparation, assignment preparation and completion, etc. These sessions constitute an average time per level. Scheduled sessions may vary slightly depending on the module choices you make.

This module will involve 6 hours contact time per fortnight. The time will be more or less equally divided between lecture sessions and laboratory sessions.

Activity:

Contact time: 36 hours

Assimilation and development of knowledge: 72 hours

Exam preparation: 21 hours

Coursework preparation: 21 hours

Total study time: 150 hours

Module Learning outcomes:

MO1 Identify the range and theory of modern Artificial Intelligence techniques

MO2 Compare and contrast such techniques, also with those traditionally associated with complex problems

MO3 Identify the issues associated with the application of modern Artificial Intelligence techniques, including any ethical issues

MO4 To apply an appropriate technique(s) to a given problem

MO5 Formulate a problem such that it is amenable to modern Artificial Intelligence techniques

MO6 Appraise the usefulness of various techniques for particular situations

Hours to be allocated: 150

Contact hours:

Independent study/self-guided study = 114 hours

Face-to-face learning = 36 hours

Total = 150

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://uwe.rl.talis.com/modules/ufcfy3-15-3.html

Part 4: Assessment

Assessment strategy: The assessment strategy for this module is a combination of in-class tests and coursework assignment.

The in-class test is of half an hours duration and comprises questions mapping to the module's learning outcomes. Questions examine cognate and practical skills via a range of short essay, multi-choice questions (MCQs), and appropriate problem solving exercises.

The coursework assignment involves one-to-one demonstrations of students' assignment software to tutors, enabling rich formative feedback in addition to the summative feedback element. The demonstration requires articulation and presentation skills appropriate for Level 3, and includes a critical evaluation of students' own contribution.

Assessment components:

In-class test - Component A (First Sit)

Description: Controlled conditions (0.5 hours)

Weighting: 25 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1, MO2, MO3

Practical Skills Assessment - Component B (First Sit)

Description: Practical Assignment requiring the production of program code.

Weighting: 75 %

Final assessment: No

Group work: No

Learning outcomes tested: MO4, MO5, MO6

In-class test - Component A (Resit)

Description: Controlled conditions (0.5 hours)

Weighting: 25 %

Final assessment: Yes

Group work: No

Learning outcomes tested:

Practical Skills Assessment - Component B (Resit)

Description: Practical Assignment requiring the production of program code.

Weighting: 75 %

Final assessment: No

Group work: No

Learning outcomes tested:

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Computing {Dual} [Aug][FT][Taylors][3yrs] BSc (Hons) 2019-20

Computing {Dual} [Mar][FT][Taylors][3yrs] BSc (Hons) 2019-20

Robotics [Sep][FT][Frenchay][3yrs] BEng (Hons) 2019-20

Computer Science [Jan][FT][Villa][3yrs] BSc (Hons) 2019-20

Computer Science [May][FT][Villa][3yrs] BSc (Hons) 2019-20

Computer Science [Sep][FT][Frenchay][3yrs] BSc (Hons) 2019-20

Computer Science [Sep][FT][Villa][3yrs] BSc (Hons) 2019-20

Computer Science [Sep][SW][Frenchay][4yrs] BSc (Hons) 2018-19

Robotics {Foundation} [Sep][FT][Frenchay][4yrs] BEng (Hons) 2018-19

Robotics [Sep][SW][Frenchay][4yrs] BEng (Hons) 2018-19

Computer Science {Foundation} [Sep][FT][Frenchay][4yrs] BSc (Hons) 2018-19

Computing {Dual} [Mar][SW][Taylors][4yrs] BSc (Hons) 2018-19

Computing {Dual} [Aug][SW][Taylors][4yrs] BSc (Hons) 2018-19