UNIVERSITY of BRADFORD

Module Descriptor

| Module Details | |
|---|---|
| Module Title | Advanced Machine Learning |
| Module Code | COS7045-B |
| Academic Year | 2022/3 |
| Credits | 20 |
| School | Department of Computer Science |
| FHEQ Level | FHEQ Level 7 |

| Contact Hours | |
|---|---|
| Type | Hours |
| Laboratories | 24 |
| Lectures | 20 |
| Directed Study | 156 |

| Availability | |
|---|---|
| Occurrence | Location / Period |
| BDA | University of Bradford / Semester 2 |

## Module Aims

The application of Artificial Intelligence to real world problems often requires the use of complex machine learning algorithms chosen from a broad and deep range of possible tools. Understanding the context within which predictive modelling, data clustering and other techniques operate, and how to appropriately select and use them for a defined purpose, requires an understanding of both theoretical contexts and practical computer software.

This module aims to develop an understanding of current theoretical and practical approaches, algorithms and techniques used to enable Machine Learning, and to develop practical skills in applying Machine Learning techniques in specific contexts so that students will have the necessary domain knowledge and applied skills to understand a problem's requirements and select/use a range of appropriate techniques to produce a suitable solution.

## Outline Syllabus

The module will introduce a variety of machine learning and data mining approaches from both a theoretical and practical perspective, including:
- background and history of Machine Learning
- current approaches and sub-fields
- data mining
- supervised and unsupervised learning algorithms
- deep learning
- data preparation and processing;
- software and tools for machine learning including R, KNIME and Weka.

The curriculum is regularly updated to reflect changes in industry and academic focus and up to date examples and case studies for practical lab sessions.

## Learning Outcomes

| Outcome Number | Description |
|---|---|
| 1 | Demonstrate mastery of applying relevant machine learning techniques to suitable data and/or software environments. |
| 2 | Demonstrate practical skills using suitable software tools for data mining and machine learning. |
| 3 | Critically analyse and select appropriate techniques and algorithms depending on the context and problem. |

## Learning, Teaching and Assessment Strategy

A combination of lectures and laboratory sessions make up the contact time for this module. Theoretical concepts delivered in lectures will have strong links to practical skills developed in associated lab sessions. Verbal feedback during practical lab exercises and online support using Technology Enhanced Learning tools will support student learning throughout the module. The Canvas Virtual Learning Environment is the primary mechanism for providing student with access to learning materials and for the submission of coursework, and other TEL tools such as MS Teams can facilitate short one-to-one discussions with students outside of contact hours.

The module content and assessment are primarily designed around the introduction of advanced theoretical knowledge which is then reinforced in a practical setting during labs through the use of software tools and real world and/or benchmark datasets to demonstrate the connection between theory and practice. The module aims to embed case studies, practical demonstrations, and provide opportunities for students to design their own solutions for case studies (both informal and assessed) and practical exercises by specifying the context of a problem, stating objectives and researching/selecting techniques to produce an appropriate solution.

Assessment is in the form of a coursework exercise that requires students to select and solve problems in the fields of data mining and machine learning using both the knowledge gained in the module as well as independent research conducted during the completion of the coursework.

## Mode of Assessment

| Type | Method | Description | Weighting |
|---|---|---|---|
| Summative | Coursework - Written | Practical machine learning and/or data mining exercise: Report (4000 words) & code/scripts demonstrating practical work. | 100% |

| Reading List |
| --- |
| To access the reading list for this module, please visit https://bradford.rl.talis.com/index.html |

*Please note:*
*This module descriptor has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but minor changes may occur given the interval between publishing and commencement of teaching. Upon commencement of the module, students will receive a handbook with further detail about the module and any changes will be discussed and/or communicated at this point.*

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