UNIVERSITY of BRADFORD

Module Descriptor

Module Details	
Module Title	Industrial Big Data Analysis and Mining
Module Code	COS7050-B
Academic Year	2023/4
Credits	20
School	Department of Computer Science
FHEQ Level	FHEQ Level 7

Contact Hours	
Type	Hours
Directed Study	164
Laboratories	12
Lectures	12
Tutorials	12

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

Module Aims

Nowadays, large amounts of data are collected from many different sources. This data can be used to enhance society's benefits and impact by evaluating its quality and relevance, integrating with existing information and digital resources, extracting patterns and creating new knowledge for decision support in engineering, healthcare and wellbeing, and society sustainable development. However, large amounts of data create continuous challenges for relevant and practical usage in the industry. This module enables students to develop specialist knowledge in data analysis and mining using machine learning techniques, which is required to apply data science principles and provide data-driven, innovative engineering solutions. The module is intended for Engineering, Management, Data Analytics, Computer Science and similar subject graduates to gain hands-on development of advanced knowledge and skills in applying data-driven machine learning techniques in support of robust big data-based decision-making. Students will explore how machine learning applied to industrial big data resources can support knowledge discovery for decision-making in domains such as industry 4.0, product design and development, and product quality management. The module will also address such projects' legal, social, ethical, and professional aspects.

Outline Syllabus

Fundamentals: exploration of data resources quality: cardinality; dimensionality; imbalance, feature selection, similarity; Theoretical and practical applications of machine learning techniques for Big Data mining: algorithms for clustering; regression and classification; also advanced classifiers and their performance evaluation; Review of special topics: Artificial Neural Networks, Deep Learning, Text mining; big data risk assessment and management, intellectual property, legal and ethical issues of big data analytics and mining processes. Engineering problem solving using Python with exercises built in a participative and interactive manner. Independent practice through application to a relevant Engineering Big Data individual project.

Learning Outcomes

Outcome Number	Description
LO1	Critically analyse solutions for big data processing and mining.
LO2	Critically analyse available data and produce results or guide toward appropriate applications of Machine Learning for Big Data Analysis and Mining.
LO3	Implement and advocate the use of the systematic methodology for Big Data Analysis and Mining
LO4	Produce and evaluate solutions using machine learning algorithms.
LO5	Interpret the results and communicate the impact to both technical and non-technical audiences, reflect and carry out a critical review of the issues related to legal, social, ethical and professional issues, including data management and data protection.
LO6	Use practical software tools, focusing on workflow design and experimentation.

Learning, Teaching and Assessment Strategy

Nowadays, large amounts of data are collected from many different sources. This data can be used to enhance society's benefits and impact by evaluating its quality and relevance, integrating with existing information and digital resources, extracting patterns and creating new knowledge for decision support in engineering, healthcare and wellbeing, and society sustainable development. However, large amounts of data create continuous challenges for relevant and practical usage in the industry. This module enables students to develop specialist knowledge in data analysis and mining using machine learning techniques, which is required to apply data science principles and provide data-driven, innovative engineering solutions. The module is intended for Engineering, Management, Data Analytics, Computer Science and similar subject graduates to gain hands-on development of advanced knowledge and skills in applying data-driven machine learning techniques in support of robust big data-based decision-making. Students will explore how machine learning applied to industrial big data resources can support knowledge discovery for decision-making in domains such as industry 4.0, product design and development, and product quality management. The module will also address such projects' legal, social, ethical, and professional aspects.

To prepare the students for world of work, assessments are designed to measure industry ready skills such as presentation skills, report writing skills, team-work skills (using group coursework to strengthened students ability to work effectively in teams) and peer evaluation. Throughout the module, students will be set formative assessment activities that will help develop confidence in tackling data analysis problems and in the use of the software tools that will support them. The timely constructive feedback from this formative assessment will support students develop the skills and knowledge required for the summative assessment. The module will be summatively assessed through a group presentation of a mini group project that requires students to identify correlation and construct statistical models from data resources and interpret the results from these models that can be explained to non-specialists. This will be followed by an individual research project that requires students to critically analyse big data solutions and applications, whilst demonstrating skills in using practical software tools.. If a student requires supplementary assessment for re-assessment, they will be set a range of tasks based on a supplementary scenario and data set to demonstrate evidence for the required learning outcomes.

Mode of Assessment			
Type	Method	Description	Weighting
Summative	Coursework	Group mini project and presentation (10 mins)	20%
Summative	Coursework	Individual Research Project (5000 words)	80%

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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