UNIVERSITY of BRADFORD

Module Descriptor

Module Details	
Module Title	Industrial Big Data Analysis and Mining
Module Code	COS7050-B
Academic Year	2021/2
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; such data can be used for enhanced benefits and impact to society 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 effective usage in industry. This module enables students to hands-on development of specialist knowledge in data analysis and mining using machine learning techniques, required to apply data science principles and to provide data-driven, innovative engineering solutions.

The module is intended to Engineering, Management, Data Analytics, Computer Science and similar subject graduates to gain hands-on development of advanced knowledge and skills in the application of 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, product quality management. The module will also address legal, social ethical and professional aspects of such projects.

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
1	Critically analyze solutions for big data processing and mining.
2	Critically analyse available data and produce results, or guide toward appropriate applications of Machine Learning for Big Data Analysis and Mining.
3	Implement and advocate the use of systematic methodology for Big Data Analysis and Mining.
4	Produce and evaluate solutions using machine learning algorithms.
5	Interpret the results and communicate the impact to both technical and non-technical audience, reflect and carry out a critical review of the issues related to legal, social, ethical and professional issues, including data management and data protection.
6	Use of practical software tools, with a focus on workflow design and experimentation.

Learning, Teaching and Assessment Strategy

The delivery is designed with a workshop approach having an approximate 50/50 split between technical sessions and hands-on exercises, designed to explain the concepts by leveraging relevant industrial case studies. Technical key-notes delivered by industry subject matter experts, or research and industry papers (nominally 5 sessions) will augment the technical content with important contextual application reference of knowledge in the workplace.

Utilising current research and case studies on the topic of machine learning applied to data analysis and mining, the students will participate in lectures, workshops, tutorials and independent study to explore concepts and solve real-world problems. The teaching and learning methods have been selected to engage students in developing their knowledge and understanding of analysis of data through formal learning opportunities such as lectures and tutorials, experiential learning through practical classes and lab sessions, and informal and social learning through team-working in projects. Embedding the strategic aims of the Universities Learning, Teaching and Student Experience Strategy (LTSES), case studies, practical demonstrations, provide lots of opportunities for students to design their own solutions. In addition to the modules, academic skills workshops will be organised during the year to provide further support in self-regulation, persistence, and the development of essential skills such as digital literacy.

To support accessibility, clarity and comprehension, teaching material is provided online in advance of the teaching sessions as well as training material (such as Python Programming tutorials at Introductory level) allowing students to customise the display of information and their learning experience as a whole. Throughout the programme, lots of opportunities are provided for students to design their own solutions and to express their own ideas, choosing from a variety of tools and methodologies. An emphasis is also placed on the importance of planning and goal setting, allowing students to forge a learning pathway that is suitable for their needs, while respecting the requirements of programme, and the needs of others, when working within a team.

The University recognises the importance of providing pastoral support, taking into consideration all aspects of our students? journeys and development. All students are allocated a personal academic tutor, with whom they meet regularly to discuss and receive guidance on their learning and development.

To prepare the students ready 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 - Written	Group mini project and presentation (10 mins)	20%
Summative	Coursework - Written	Individual Research Project (1500 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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