

Academic Year:	2023/24
Degree Awarding Body:	University of Bradford
Final and interim award(s):	Degree of Master of Science Postgraduate Diploma Postgraduate Certificate
Programme accredited by (if appropriate):	BCS, The Chartered Institute for IT (subject to approval)
Programme duration:	12 months full time 24 months part time
QAA Subject benchmark statement(s):	Computing Master's (2019)
Date last confirmed and/or minor modification approved by Faculty Board	

Introduction

The rise of Artificial Intelligence and its applications within society is gaining pace rapidly, with consumers, industry and governments driving its adoption into our everyday lives. Smarter systems, apps and insights gained from data-driven analytics and predictive modelling can enrich our lives and make the world around us a fairer, faster and more fun to live in. While this programme delivers advanced theoretical knowledge, it has a strong focus on applied practical skills using real world case studies from across the globe to equip graduates with the skills that industry need.

MSc Artificial Intelligence and Machine Learning delivers cutting edge and industrially in-demand knowledge of a wide range of advanced concepts, approaches and methodologies and will equip students with market ready practical and applied skills using powerful software tools and online solutions. The programme covers subjects ranging across digitally enabled and enhanced healthcare, applied predictive modelling, ethical and legal implications of AI systems, programming and software development, to data visualization as well as a wide variety of application focussed case studies. The programme includes a large-scale individual dissertation giving students the opportunity to work with leading research active staff within the School of Computer Science, AI and Electronics and across the University in collaborative projects. Optional subject choices within the programme allows students to tailor their degree towards their chosen career path or future aspirations.

The School of Computer Science, AI and Electronics has long-standing academic expertise in Artificial Intelligence in the AI Research group, the Advanced Automotive Analytics Research Lab in collaboration with the Automotive Research Centre, the contributions to the Digital Health Enterprise Zone, Digital Catapult Centre Yorkshire, the large number of relevant PhD theses and our funded research projects. The School has also established track record of developing AI systems with large industries and working with a variety of SMEs.

Programme Aims

The programme is intended to:

- Equip graduates with advanced knowledge and cutting-edge practical skills in Artificial Intelligence (AI), applied Machine Learning (ML) and Data Science
- Enhance students' critical analysis skills, their ability to discover, document and disseminate research findings, to present outputs of practical work, to understand the context within which data is used and to analyse, transform and process data in order to use it for data driven solutions.
- Provide market-ready graduates with experience in conceiving, designing, developing and evaluating solutions to real world problems using AI tools and techniques.

Programme Learning Outcomes

To be eligible for the award of Postgraduate Certificate at FHEQ level 7, students will be able to:

1. Demonstrate a systematic understanding and critical awareness of discipline knowledge in artificial intelligence.
2. Demonstrate an understanding of advanced techniques applicable to research and development projects for AI & ML applications.
3. Demonstrate originality in the collection and use of theoretical principles and knowledge for AI & ML, together with a practical understanding of how novel domain knowledge is created.
4. Demonstrate the ability to evaluate and compare existing methodologies from literature and propose new methodologies for addressing known challenges in AI.
5. Communicate outcomes of practical work, evaluation of results and conclusions within the field of AI clearly to specialist and non-specialist audiences.
6. Demonstrate transferable skills for decision-making in complex and unpredictable situations in AI and related projects.
7. Demonstrate the independent learning ability required for continuing professional development.
8. Additionally, to be eligible for the award of Postgraduate Diploma at FHEQ level 7, students will be able to:
9. Coordinate and resolve complexity in AI & ML projects including design, development, and documentation.

10. Demonstrate ability to work effectively within a team, including use of appropriate communication and planning approaches.
11. Demonstrate a depth and breadth of theoretical knowledge and applied practical skills across a range of AI & ML subjects, including legal, social, ethical and professional issues relevant to AI.

Additionally, to be eligible for the award of Degree of Master at FHEQ level 7, students will be able to:

12. Demonstrate skills to select, design, plan and manage a self-directed and managed research-informed original project, demonstrating a critical analysis and evaluation of relevant material and the ability to apply relevant skills and research methodologies in the production of an advanced report.

Curriculum

The course is comprised of three distinct stages; Autumn and Spring semesters where three taught modules will be completed, and the dissertation stage commencing in the summer following semester two. Part time students will take modules over two years, splitting the module load for each semester across each year.

The taught module stages build knowledge, skills and research techniques within the subject, supporting students with their dissertation as a capstone to their degree.

FHEQ Level	Module Title	Core/ Option/ Elective	Credits	Study Period	Module Code
7	Software Development	C	20	Autumn (Sem 1)	COS7009-B
7	Cloud AI	C	20	Autumn (Sem 1)	COS7054-B
7	Responsible AI: Ethics, Law and Governance	O	20	Autumn (Sem 1)	OIM7510-B
7	Big Data Visualisation	O	20	Autumn (Sem 1)	COS7046-B
7	MSc Group Project	C	20	Spring (Sem 2)	COS7048-B
7	Advanced Machine Learning	C	20	Spring (Sem 2)	COS7045-B
7	Advanced Topics in AI and Digital Healthcare	C	20	Spring (Sem 2)	COS7053-B
7	Dissertation	C	60	Summer (Sem 3)	COS7004-E

Students will be eligible to exit with the award of Postgraduate Certificate if they have successfully completed 60 credits and achieved the award learning outcomes.

Students will be eligible to exit with the award of Postgraduate Diploma if they have successfully completed at least 120 credits and achieved the award learning outcomes.

Students will be eligible for the award of Degree of Master if they have successfully completed at least 180 credits and achieved the award learning outcomes.

Learning and Teaching Strategy

The programme uses a variety of teaching approaches to support student learning through face to face sessions as well as a virtual learning environment for directed independent study and developing practical skills. In addition to the advanced knowledge and technical skills students will develop during their studies, there is also a strong focus on developing transferrable skills and independent research/study skills that will provide a foundation for future career progression and professional growth through strong lifelong learning approaches and techniques. Embedding the strategic aims of the Universities Learning, Teaching and Student Experience Strategy (LTSES), alongside Universal Design for Learning (UDL), the programme is designed to achieve a balance between subject knowledge and transferable skills. The student journey has been considered at programme-level and the core modules will provide students with skills and knowledge that are deemed to be fundamental to the AI discipline, whereas optional modules are also included to promote and increase interest and offer students more choices and to meet their own personal career goals. 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. Critical future-facing subjects such as the ethical and societal impact of increasing use of AI systems are embedded within many core modules in the course such as Advanced Topics in AI and Digital Healthcare, MSc Group Project and the Dissertation, with the option to study at increased depth in optional modules such as Responsible AI: Ethics, Law and Governance. These subjects aim to address the increasing importance of societal impact and related governance frameworks, designed to ensure the impact of AI systems and tools benefits humanity and considers diverse populations around the world.

Learning and teaching activities include lectures that introduce and explore theory, concepts and case studies illustrating how practical outcomes are derived from theoretical principles. Laboratory sessions demonstrate hands on and applied use of industry standard tools to support development of subject relevant practical skills, and facilitate individual and small group feedback to students. Seminars and tutorials help to build communication, teamwork and strengthen the connections between theory and practice.

The programme will demonstrate an advanced industry standard tool, Amazon Web Services, across modules including dissertation and project work in the course, as well as the module “Cloud AI” that complements the Amazon AWS Academy “Cloud Practitioner” learning path principles and concepts, but will not directly lead to certification with the AWS Academy scheme.

There will be a substantial focus on Digital Health topics and applications layered on fundamental theoretical learning across several AI topics, bringing subjects that are both of

increasing international focus and a major University research theme into the heart of the student learning experience. Collaboration with local NHS bodies such as the Bradford Institute for Health Research (BIHR) and Bradford Teaching Hospitals NHS Foundation Trust allows for the integration of real-world data and project topics within the course, instilling demonstrable transferable skills within students exemplified through a growing area of international focus; public health.

Students on the course will undertake a dissertation as part of their studies, involving the selection or creation of a research project requiring development of an application, system prototype or experimentally tested theoretical hypothesis. Under the supervision of a School staff member with relevant research expertise, the process will further strengthen independent research and implementation skills as well as professional communication through an assessed viva presenting the work, key outputs and conclusions.

Programme links to the Artificial Intelligence Research (AIRe) group offers an opportunity to promote the research active aspect of our School and the links to cutting edge research that inform the teaching on our courses. Examples of funded projects and demonstrable research outcomes can be marketed, and the expertise of both staff and PhD students within the group promoted as an opportunity to learn from genuine subject experts.

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. The University also operates a wide range of support services covering areas such as disability, counselling, faith advisors and careers.

The University of Bradford is well known for attracting students from a wide variety of backgrounds, experiences and countries. The University of Bradford encourages and supports women in information technology and engineering, celebrating events such as International Women in Engineering Day and International Women and Girls in Science Day. Some of the staff in the Faculty of Engineering and Digital Technologies are also STEM ambassadors, who actively promote science and engineering subjects to wider audiences. Female staff and students are an integral part to the University of Bradford's Faculty of Engineering and Digital Technologies. The University has held Bronze Athena Swan accreditation on an institutional level since 2015, demonstrating our commitment to striving for gender equality and actively engages with the Women in STEM initiative and activities within the University. The University of Bradford's *modus operandi*, Making Knowledge Work, is embedded in the philosophy of this programme.

The programme will promote and encourage enrolments from individuals from non-traditional backgrounds across a range of educational and cultural metrics through engagement with local and national admissions recognition schemes for those with non-standard or without any academic qualifications, recognising prior learning in all its forms through rigorous mapping processes. Dissemination of ideas and concepts related to AI to non-standard audiences will also contribute to widening participation, through opportunities such as events organised by the Bradford Metropolitan Council Computing, Science and Environmental Technology (CSET) Industrial Centre of Excellence, such as the Bradford Skills Month. In addition to this the programme has been designed to include, wherever possible, opportunities for students to incorporate topics, applications and assessment or project content that reflects their individuality and personal cultural

background. Modules such as Advanced Machine Learning, Advanced Topics in AI and Digital Healthcare, and the Dissertation include assessment components with strong elements of personalised choice in topics, datasets and research aims. This commitment to inclusive learning and assessment is also reflected in the commitment to “decolonise” the curriculum and reading materials, wherever possible utilising and promoting research papers, textbooks and other content from non-western backgrounds and authors.

Assessment Strategy

Assessment of learning outcomes is achieved through module specific assignments and examinations. Most modules in this course assess student attainment through practical coursework exercises, reflecting the emphasis on demonstrable applied skills that support future career paths and progression. Assessments using real world problems and limited scope case studies increase engagement, creating stronger links between the academic subject, the assessment of learning outcomes and the career-ready and transferrable skills modules aim to embed within students. Written or computer-based examinations are also used to measure specific theoretical and knowledge aims, which are also assessed in written reports for many coursework assignments. The dissertation module assesses skills for research, critical analysis, design and implementation through a major written report and an oral examination.

Assessment Regulations

This Programme conforms to the standard University Regulations which are available at the following link:

<http://www.bradford.ac.uk/agpo/ordinances-and-regulations/>

Admission Requirements

The University welcomes applications from all potential students and most important in the decision to offer a place is our assessment of a candidate’s potential to benefit from their studies and of their ability to succeed on this particular programme. Consideration of applications will be based on a combination of formal academic qualifications and other relevant experience.

The standard entry requirements for the programme are an undergraduate degree in computer science, artificial intelligence, computer engineering or closely related subjects from an accredited degree awarding body with a result classification of 2:2 or above.

The University of Bradford has always welcomed applications from disabled students, and these will be considered on the same academic grounds as are applied to all applicants. If applicants have some form of disability, they may wish to contact the Disability Service before they apply at www.bradford.ac.uk/disability/before.

Recognition of Prior Learning

If applicants have prior certificated learning or professional experience which may be equivalent to parts of this programme, the University has procedures to evaluate and recognise this learning in order to provide applicants with exemptions from specified modules or parts of the programme.

Applications are welcome from students with non-standard qualifications or mature students (those over 21 years of age on entry) with significant relevant industrial experience, in addition to GCSE English at grade 4 (formerly grade C) or above. International written and spoken English tests passed at grade 6.0 for IELTS or 550 for TOEFL (or 250 for the computer-based test) are accepted for overseas applications.

Minor Modification Schedule

Version Number	Brief description of Modification	Date of Approval (Faculty Board)