UNIVERSITY of BRADFORD

Faculty of Management, Law & Social Sciences

MSc Applied AI and Data Analytics Programme Specification

https://www.brad.ac.uk/courses/pg/applied-artificial-intelligence-and-data-analytics

Academic Year:	2021/22
Degree Awarding Body:	The University of Bradford
Target Degree Award:	Master of Science in Applied Artificial Intelligence and Data Analytics
Interim Diploma Award:	Postgraduate Diploma in Applied Artificial Intelligence and Data Analytics
Interim Certificate Awards:	Postgraduate Certificate Safe Artificial Intelligence; PGCert Business Analytics and Safe Artificial Intelligence; PGCert Artificial Intelligence and Data Analytics
Programme Admissions:	September and January
Programme Duration:	12, 15 or 18 months full-time, 24 or 27 months part-time
QAA Subject Benchmark:	Masters degree in Business and Management
Programme Origination:	July 2020

Please note: This programme specification 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 changes may occur given the interval between publishing and commencement of teaching. Any change which impacts the terms and conditions of an applicant's offer will be communicated to them. Upon commencement of the programme, students will receive further detail about their course and any minor changes will be discussed and/or communicated at this point.

Minor Modification Schedule

1. December 2020: Adaptations for COVID, specification reformatted and made accessible. Added standard PG semester study abroad section.
2. June 2021: Return to campus delivery and annual changes.

Programme Aims

Today, the world is more data-driven than ever; and while specialist analytical, digital, data science, and artificial intelligence skills are in high demand, the supply is still very limited. There is a lack of experts in artificial intelligence, data science, and data analytics and this lack of expertise means that, currently, only few companies are actually able to exploit the full potential of their data sets and transform the same into competitive advantage.

The goal of this conversion course is to respond to the shortage of Artificial Intelligence (AI) and Data Science (DS) specialists in the UK, as evidenced by both market data Labour Market Report 2019 and by the Government's Digital Strategy, which states that "many jobs have a digital element, and it is predicted that within 20 years 90% of all jobs will require some element of digital skills".

In line with this market and business need, the Framework for Higher Education Qualifications (FHEQ) Level 7 Postgraduate conversion course leading to an MSc in Applied Artificial Intelligence and Data Analytics is a new, exciting, and focused programme that provides graduates with specialist and transferable knowledge and skill sets needed to enhance careers for applied AI and DS professionals, graduate analysts, technology consultants, or to start new tech-businesses. The course provides students with an applied understanding of AI and DS, with learners developing a critical understanding of relevant

analytical frameworks in the context of contemporary issues. The programme modules will seek to equip students with the right tools, techniques and skills necessary to gain up-to-date knowledge and transferrable skills to secure employment in this exciting and increasingly critical area.

Some of the indicative content and themes of this course will cover topics such as Machine Learning, Big Data, Visual Analytics, Government Data Analytics, Data Analytics in Healthcare, Digital Marketing, Safe AI, Project Management, Management Consulting, Entrepreneurship and Innovation, Developing Skills for Business Leadership, among others. Students develop both technical and non-technical skills.

Among the technical skills, students will be equipped with knowledge of Python, R, Weka, AWS, MS Azure, SAS, SPSS, and Excel, among others. Furthermore, for course work/dissertation implementation purposes, students can choose to use either programming languages (like Python/R) or software/cloud/platforms for machine learning (like Weka and MS Azure). This important differentiator allows far-STEM and near-STEM students to develop and implement technology on a par with STEM students.

Among the non-technical skills, the programme will prioritise the enhancement of business skills, such as project management skills, management consulting skills, entrepreneurship and innovation skills, and business leadership skills; and soft skills, such as data-driven decision-making and proactive problem-solving skills, critical thinking skills, situation-awareness skills, teamwork skills, effective communication skills, and presentation skills.

The programme will further make use of role models/mentorship opportunities, in the endeavour to expose students to role models across their student journey, introducing them to successful alumni, professionals and employers, to support student expectations.

Each module will have employability outcomes and the students will further be able to develop their intellectual and employability skills via the Faculty's own Career Booster professional development programme. Students will further be able to gain additional professional skills and certifications (micro-badges) through Amazon Web Services Academy and SAS (with a reduced examination fee to be borne by the student). The above will help to increase students' employability prospects.

The course is aligned to the university's strategy, which highlights a focus on excellence, internationalisation, sustainability, and equality and diversity. In this sense, the curriculum and delivery are de-colonised, inclusive and engaging, intellectually challenging and internationally relevant, with commitment to research-engaged learning, project-based assessment, and the opportunity to work on real-world briefs generated from project partners and the local community, thus ensuring impact. AIDA is the latest (modern) toolkit for taking many disciplines forward and retaining future market relevance.

Admissions Requirements

The University of Bradford welcomes applications from all prospective 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 programme.

We take into consideration a number of factors when assessing your application. It's not just about your grades; we take the time to understand your personal circumstances and make decisions based on your potential to thrive at university and beyond.

Academic Entry Requirements

Applicants should have at least a lower second class (2:2) degree or equivalent from an accredited higher education institution. The programme is aimed at existing graduates interested in acquiring specialist and transferable knowledge and skill sets needed to enhance careers for applied Artificial Intelligence and Data Science professionals, graduate analysts, technology consultants, or to start new tech-businesses.

Language Entry Requirements

As the programme is delivered entirely in English, applicants must be able to demonstrate proficiency in the English language; thus, UK educated students must have a GCSE grade 4 (C) or above. International students must have a 6.0 overall score on IELTS test of English (with no sub-test less than 5.5) or an equivalent score on another recognised test. Exceptionally, holders of a UK degree awarded within 2 years prior to entry to the University of Bradford programme may be exempt from these English test requirements.

Please note: The information above relates to the contemporary recruitment cycle at time of publication and therefore may now be out of date. The current tariff and accepted qualifications for entry onto the programme, is published at www.bradford.ac.uk/courses/pg/applied-artificial-intelligence-and-data-analytics.

Recognition of Prior Learning

Applications are welcome from mature students returning to study (aged 25 or over upon entry) or students with non-standard qualifications. For more details about our Recognition of Prior Learning procedures visit the website www.brad.ac.uk/teaching-quality/prior-learning.

Students without formal qualifications who have relevant work experience (minimum 3 years' full time of professional problem solving experience) are welcome to apply with evidence of their interests and work experience (likely take the form of a Work Certificate). Applicants will be assessed on an interview basis.

Programme Learning Outcomes

Upon successful completion of this programme, students will be able to demonstrate achievement of the following FHEQ Level 7 learning outcomes:

Subject Knowledge and Skills

1. Explain and critically apply a range of state-of-the-art principles, concepts, methods, tools, and technologies in AI and DS, and discuss their current and potential application and impact in a variety of applied fields.
2. Define and apply machine learning techniques and big data technology, analytics, and associated business strategies which underpin the understanding and application of AI solutions in a range of applied fields.

3. Develop coding analytics skills and coding-free analytics skills relevant to the students' own applied fields.
4. Recognise and critically examine the legal, ethical, social, and moral considerations involved in the design, development, and implementation of AI methods, tools, and technologies in different fields.
5. Research, design, develop, and evaluate an AI solution or AI artefact in view of a practical problem, using relevant AI tools and techniques.

Practical and Transferable Skills

6. Demonstrate initiative and personal responsibility.
7. Demonstrate decision-making competence in complex and unpredictable situations.
8. Demonstrate independent learning ability required for continuing professional development.
9. Communicate complex ideas/ information and field-specific terminology clearly to a variety of specialist and non-specialist audiences.

Professional Behaviours

10. Exhibit data analytics, research, and enquiry skills using library-based and online data sets, corporate sources and reports and produce an original, substantial, and complex project (with appropriate ethical approval) within a specified timeframe.
11. Develop and pitch creative/innovative ideas to given problems.
12. Consider and articulate issues of accessibility, inclusivity, and diversity in defining problems and proposing solutions.

Learning and Teaching Strategy

The programme aligns with the University's Access and Participation Plan (APP), which forms a key element of the University's overall strategy to position it as a sector-leader in creating and sustaining the conditions for holistic, inclusive learning that enables social mobility and progression into graduate employment. This alignment is demonstrated through the conversion course adopting the key principles of Active and Collaborative Learning.

Learning will be directed, supported, and reinforced through a combination of lectures, tutorials, seminars, labs, demonstration, project supervision, as well as through personal research and directed and self-directed study. These activities will all be further supported through face-to-face and online learning environment, within a blended-learning framework.

The programme will aim to integrate applied and theoretical knowledge with assessment processes that test both knowledge of the discipline and understanding of its application and limitations. To facilitate learning, lectures, tutorials, and seminars will be grounded in active and collaborative learning and will typically utilise case studies and problem-solving exercises. Sessions may be delivered weekly or in blocks. Small group sessions will use

case studies and problem-solving exercises, with oral feedback given in class. Lab sessions will complement formal lectures and tutorials and will be an opportunity for students to do some hands-on-system work and focus on developing and practising both coding analytics skills and coding-free analytics skills.

Students will be guided to suitable primary and secondary (open access) data sources and be required to conduct research, analysis, and presentation exercises. Resources to support the teaching and learning activity will be provided on the University's virtual learning environment.

Assessment Strategy

The programme is formatively and summatively assessed by a mixture of assessed coursework, case studies, group projects and multimedia presentations. Assessment is integrated with learning and teaching to support and demonstrate achievement of the learning outcomes for individual modules and the programme as a whole. Emphasis is placed on the feedback function of formative assessment as part of the learning, teaching and assessment strategy as a whole. Overall, modules will seek to strike a balance between formative and summative assessments, all of which will be designed with the aim of developing a range of skills in students. Assessments will consist of a variety of tasks and will take different formats, and students will have an opportunity to demonstrate the achievement of a defined set of learning outcomes by having the option to choose the format in which they can present their learning. This will ensure that the assessments reflect the diversity of students and optimise inclusivity.

Learning outcomes 1 to 5 are focused on knowledge and subject-specific skills, needed to enhance careers for applied AI and DS professionals, graduate analysts, technology consultants, or to start new tech-businesses. They are assessed by a mixture of individual pieces of coursework and group work, including multimedia presentations.

Learning outcomes 6 to 12 are focused on practical and transferable skills, as well as professional behaviours which are so important to employability. They are assessed by a mixture of individual pieces of coursework and group work, including multimedia presentations.

The dissertation is a capstone module assessing all learning outcomes.

Programme Structure

Stage 1: Taught Element

In this stage, students will be introduced to a range of principles, methods, tools, and technologies in AI and DS, from fundamental to advanced, and how these can provide real-time support to relevant stakeholders in a variety of applied fields. Students will develop both coding analytics skills (using Python/R) and coding-free analytics skills (using platforms such as Microsoft Azure, AWS Machine Learning, and Weka). Students will explore use cases and applications of AI and DS and will work collaboratively with peers on guided group projects to put their newly acquired subject-specific knowledge and skills

into practice. Additionally, students will be equipped with a variety of non-technical skills and a strong business understanding in the context of industrial applications.

Students will take 4 core 20-credit taught modules:

1. Business Data Analytics
2. Safe AI: Ethics, Law and Governance
3. Artificial Intelligence and Data Science
4. Applied Machine Learning and Big Data Strategy

Through modules 1 and 2, students will gain knowledge of the role of data analytics for a modern business/organisation and the legal, social, moral, and ethical implications of AI.

The module “Artificial Intelligence and Data Science” will provide knowledge surrounding artificial intelligence & data science and be delivered intensively during the first six weeks of Semester 2. The module “Applied Machine Learning and Big Data Strategy” will cover machine learning and big data strategy, exploring use cases and applications for a range of applied fields, and start in week 7 of Semester 2 running for 12 weeks.

Students will take 2 core 10-credit taught modules, which will equip students with knowledge of business leadership, entrepreneurship, and innovation skills:

5. Developing Skills for Business Leadership
6. Entrepreneurship and Innovation

Module Code	Module Title	Module Type	Credit	Study Period
OIM7502-B	Business Data Analytics	Core	20	Sem 1
OIM7506-B	Safe AI: Ethics, Law and Governance	Core	20	Sem 1
OIM7507-B	Artificial Intelligence and Data Science	Core	20	Sem 2
OIM7508-B	Applied Machine Learning and Big Data Strategy	Core	20	Sem 2
HRM7503-A	Developing Skills for Business Leadership	Core	10	Sem 1
EAE7501-A	Entrepreneurship & Innovation	Core	10	Sem 2

Two 10-credit modules will be taken from the School’s range of optional modules. Students not taking SIB7506-A will also be able to attend the Summer School. This choice allows the students to customise their master’s programme in line with their career interests and aspirations, while aiming to enhance their business and soft skills:

Module Code	Module Title	Module Type	Credit	Study Period
MAR7509-A	Digital Marketing Metrics	Option	10	Sem 1
OIM7503-A	Operations Management	Option	10	Sem 1
SIB7505-A	Corporate and Social Responsibility	Option	10	Sem 2
SIB7504-A	Cross-Cultural Management	Option	10	Sem 2
SIB7506-A	International Masters Summer School	Option	10	Sem 3
SIB7507-Z	International Masters Summer School (Attendance) non credit	Option	0	Sem 3

Stage 2: Capstone Dissertation

This stage aims to bring together the professional skills and knowledge developed and/or acquired by the students in the previous stage of taught components and focus on the development of students as AI as DS professionals in industry. Alongside this capstone dissertation, students will hone a variety of non-technical skills and a strong business understanding in the context of industrial applications.

The students must select relevant tools and techniques acquired throughout the course and design and develop an AI solution or AI artefact in view of a practical problem or challenge by using either

(1) a real-world data set, or

(2) a generated hypothetical data set.

Module Code	Module Title	Module Type	Credit	Study Period
MAL7504-E	Applied Artificial Intelligence and Data Analytics Capstone Dissertation	Core	60	Full Year

The curriculum may change, subject to the University's programme approval, monitoring, and review procedures.

Programme Regulations

This Programme conforms to the standard University Postgraduate Assessment Regulations which are available at the following link: www.bradford.ac.uk/regulations.

However, there is one variation to these regulations: On completion of the taught element of the programme and at the Interim Exam Board, a student who has 50 credits or more requiring supplementary assessment will not be permitted to proceed to the dissertation stage of the programme. The decision to allow progression will only be reconsidered at the Supplementary Exam Board.

Academic Student Journey

Full-time September Start (12 months)

Study Period	Programme Structure
Semester 1 (Autumn) October – December	Semester 1 Modules
	Coursework submission
Semester 2 (Spring) January – April	Semester 2 Modules Supervisor allocated and start work on Dissertation
	Coursework submission & Exam period
Semester 3 (Summer) June – September	International Master's Summer School (10-credit option module or attendance only) Continuation of Dissertation
	Submission of Dissertation September 2022

Full-time January Start (15 months)

Study Period	Programme Structure
Semester 2 (Spring) January – April	Semester 2 Modules
	Coursework submission
Semester 3 (Summer) June – September	International Master's Summer School (10-credit option module or attendance only) Supervisor allocated and start work on Dissertation
Semester 1 (Autumn) October – December	Semester 1 Modules
	Coursework submission & Exam period
Semester 2 (Spring) January – April	Continuation of Dissertation
	Submission of Dissertation March 2023

Part-time Delivery

The model part-time student journey is based on a half-day attendance per week per module over 2 years, with the following planned sequence (depending on timetabling and subject to the University's programme approval, monitoring, and review procedures):

Study Period	Programme Structure
Year 1, Semester 1	Two Core Modules
Year 1, Semester 2	One Core Module + One Option Module
Year 2, Semester 1	Two Core Modules
Year 2, Semester 2	One Core Module + One Option Module
Year 2, full year	Artificial Intelligence and Data Analytics Capstone Dissertation

Achievable Awards

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, with the following possible titles:

- **PgCert Applied Artificial Intelligence and Data Analytics:** Completing 60 credits including OIM7507-B **AND/OR** OIM7508-B.
- **PgCert Business Analytics and Safe Artificial Intelligence:** Completing 60 credits including both OIM7502-B **AND** OIM7506-B.
- **PgCert Safe Artificial Intelligence**: Completing 60 credits including OIM7506-B.
- **PgCert Business Analytics:** Completing 60 credits including OIM7502-B.

Students will be eligible to exit with the award of **Postgraduate Diploma in Applied Artificial Intelligence and Data Analytics** if they have successfully completed 120 credits (with or without dissertation) and achieved the award learning outcomes.

Students will be eligible for the award of **Degree of Master of Science in Applied Artificial Intelligence and Data Analytics** if they have successfully completed 180 credits and achieved the learning outcomes.

Work Placement Route

Placements are a fantastic way of building on the professional skills developed during the programme and boosting students' practical industry experience prior to going into employment.

Students can choose to embark on the programme with or without placement. The two variants of the programme are open to both home, EU and overseas applicants.

The programme with placement includes a 3-month work placement at the end of the 12-month full-time programme (making this a 15-month degree) or at the end of the 24-month part-time programme (making this a 27-month degree). The placement element is an integral part of the programme and is embedded into the programme. Students complete the placement module with non-credit bearing assessment. Nevertheless, completing the placement is not dependent on getting the degree.

Module Code	Module Title	Module Type	Credit	Study Period
OIM7509-Z	Placement	Core	0	Semester 1

Placements will be sourced either by University of Bradford or student (via the university's Careers Centre). Students securing OfS Scholarships will be placed with a remuneration at the 'living wage' level, either through UoB funding (direct financial contribution) or employer funding (if available). For students awarded OfS Scholarships, the placement is compulsory. The paid placements to underrepresented groups will be offered to Go Higher West Yorkshire (GHWY) members and other collaborators, and to our Tier 1 students with start-up companies based on campus.

Students who wish to participate in a work placement will be required to apply for and make the most of their chosen opportunity and will be supported in doing so by the Programme Team, the Faculty Academic Lead for Placements, as well as the central University Careers and Employability Service. Any placement is subject to approval by the Programme Team.

Further information about general and Faculty-specific placement opportunities is available at: www.bradford.ac.uk/careers/jobs/internships-and-placements

Study Abroad

This programme is not designed to include a study abroad component. However, students are welcome to explore available opportunities for a Study Abroad Semester that may be viable for them via our International Opportunities team.

This option can be available **ONLY** if the modules offered by the host institution allow the student to meet the learning outcomes of the Bradford Programme during Semester 1 **OR** Semester 2.

Any student wishing to study abroad for a semester should first contact the International Opportunities Team to explore the opportunities and funding in place and, secondly, the Faculty Exchange Coordinator to check if the available options and relevant modules are in line with the University requirements. Following these checks, the International Opportunities Team and the Faculty Exchange Coordinator will liaise with the relevant Programme Leader to validate the modules and the semester exchange.

The semester exchange requires students to study only modules suitable to the Bradford programme when abroad. Therefore, all modules selected for the exchange will have to be mapped to the Bradford programme learning outcomes and be approved by the Programme Leader and the Director of Studies in Bradford in advance of the exchange. During the exchange, if the student needs to change the modules, this can only be done after approval of the Programme Leader and Director of Programmes.

If the student fails a module abroad, the student must:

a) inform immediately the International Opportunities Team and the Faculty Exchange Coordinator

b) explore the possibility of re-taking any exams at the host institution.

During the exchange, students will have support from the relevant University services. All credit successfully obtained whilst on study abroad semester will count towards the student's final degree. Our International Opportunities team can advise students about the available funding to support their study or work experience abroad.

The list of exchange partners and network of Universities available for Study Abroad Semester, as well as further information about international opportunities can be found online at www.bradford.ac.uk/exchanges/current-students.

Please note: Some institutions are only available to undergraduate or postgraduate students. Any potential exchange is dependent on student eligibility, student finance, and the appropriate modules required to fulfil the requirements of the programme being available at either institution.