UNIVERSITY of BRADFORD

Faculty of Engineering and Informatics

BSc (Hons) Applied Artificial Intelligence Programme Specification

Programme Details

Academic Year: 2021/22

Degree Awarding Body: The University of Bradford

Final and interim awards:

Honours Degree of Bachelor of Science	[Framework for Higher Education Qualifications (FHEQ) level 6]
Ordinary Degree of Bachelor of Science	[FHEQ level 6]
Diploma of Higher Education	[FHEQ level 5]
Certificate of Higher Education	[FHEQ level 4]

Programme duration: 3 years full-time

UCAS code: I400

Date approved by Senate: January 2020

Minor Modification Schedule

1. June 2021: Specification reformatted and made accessible.
2. August 2021: Annual update for 2021 Academic Year.

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.

Introduction

Artificial Intelligence, commonly known as AI, is the development of computer systems to simulate processes and perform tasks normally requiring human intelligence and reasoning skills. AI is undoubtedly one of the most important and disruptive developments of modern times and has already led to significant advancements in efficiency and automation across a range of different sectors; including healthcare, manufacturing, transport, retail and entertainment.

From facial- and speech-recognition systems and language translations tools to tailored marketing algorithms and smart traffic management systems, the interest in and demand for such innovative technologies is increasing across all areas of industry, research and academia and many institutions, funding bodies and governments are investing heavily in the infrastructure to support this growing sector; be that in the form of new technologies, research, business start-ups and/or education/training.

The increased demand for AI solutions in numerous sectors, combined with the focus of investment cited above, means that the job market for AI professionals is likely to rise sharply in the coming years. To meet this demand, there is a need for a new type of AI professional in the job market; one that goes beyond the traditional skillset of a software developer to focus more on the design, execution and evaluation of creative AI projects to solve emerging issues/problems across a broad range of fields.

From day one of the BSc Applied Artificial Intelligence programme at Bradford, students will be working collaboratively on project briefs from across discipline areas and industry sectors and will be supported to develop the knowledge, skills and behaviours needed to become a self-starting AI professional in the emerging and growing AI job market.

Programme Aims

This programme aims to:

- Combine the study of cutting-edge AI methods and tools with hands-on experience of managing AI projects.
- Develop graduates with the knowledge, skills and professional experience sought-after by employers.
- Use data from across discipline areas and industry sectors, to identify and propose creative solutions to real-world problems.
- Promote cross-University collaboration and local community engagement via the inclusion of guest speakers and the development of multidisciplinary project briefs.
- Help shape the future of the specialism by producing a new generation of self-starting AI professionals.

Programme Learning Outcomes

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

Subject Knowledge and Skills

1. Apply the key aspects of state-of-the-art AI methods and tools and discuss their current and potential application in a variety of real-world contexts.
2. Define and apply fundamental concepts and techniques in computer science, data science, machine learning, big data and programming which underpin the understanding and application of AI.
3. Analyse issues and opportunities in different sectors, organisations and/or among groups of users and use these to inform the design criteria for proposed AI solutions.
4. Examine the legal, ethical and moral considerations involved in the design, development and implementation of AI techniques/applications in different fields and with different user groups.
5. Research, design, develop and evaluate an end-to-end AI solution to a contemporary problem/brief, using relevant project management techniques.

Practical and Transferable Skills

6. Process and analyse complex and dynamic datasets and present the key findings clearly in different media/formats.
7. Work with relevant stakeholders to plan, coordinate, execute and evaluate projects, with explicit consideration of budget/resource planning and risk management.
8. Communicate complex ideas/information and field-specific terminology clearly to a variety of specialist and non-specialist audiences.

Professional Behaviours

9. Manage time and resources effectively and reflect on own strengths and weaknesses to identify development/support needs.
10. Conduct sector- and market analysis to develop commercial awareness and horizon-scanning techniques.
11. Develop and pitch creative/innovative ideas to given problems.
12. Consider and articulate issues of accessibility, inclusivity, diversity and sustainability in defining problems and proposing solutions.
13. Develop a professional portfolio and participate in networking activities to showcase the knowledge, skills, and behaviours developed during the programme.

Learning, Teaching and Assessment Strategy

Programme Strategy

The teaching and learning methods on this programme have been designed to ensure that students are supported to develop the necessary knowledge, skills and professional behaviours to meet the programme learning outcomes and be successful self-starting graduates in relevant further study or employment fields.

In the choice of sessions, speakers and topics on the programme, explicit consideration has been given to promoting diversity, inclusivity and showcasing under-represented groups in AI and related fields, linking in with industry/sector initiatives wherever possible (e.g. Women in AI). Students will be exposed to a variety of issues affecting local and global communities, and will be encouraged to question historical assumptions, stereotypes and conventions associated with different fields/sectors.

A key and distinctive feature of the BSc Applied Artificial Intelligence at Bradford is the inclusion of active, collaborative and creative projects at each stage of the programme. This project-based approach, developed with reference to the Conceive-Design-Implement-Operate (CDIO) framework commonly used in engineering fields, will be scaffolded and guided in Stage 1; supported in Stage 2, but with a greater focus on independent learning and individual choice; moving to a more autonomous, supervised model in Stage 3.

Throughout the programme, the summative assessments have been designed to mirror the type of tasks graduates would be expected to perform in industry and/or other professional settings. These methods include:

- Project proposals, plans, presentation of findings and evaluation reports
- Presentations, both oral and written
- Case study reports
- Practical tasks such as data processing/visualisation or creating blocks of programming code
- Professional portfolio

Formative work is also used throughout the programme to help students reflect on their progress and provide them with feedback to help identify areas of strength and/or areas in need of development/support. Formative assessment may take many forms, for example

in- class tests, directed self-study tasks, workshop tasks, preparatory assignments for summative assessments and tutorial discussions.

Learning, Teaching and Assessment at Stage 1

In Stage 1, students are introduced to the fundamental principles, methods and tools of AI, alongside the subjects which underpin it such as machine learning and data analytics. Students will also explore the relationship between AI and different fields, sectors or organisations and will work collaboratively with peers on a guided group project to put their newly acquired subject-specific knowledge and skills into practice.

Students' knowledge and understanding of the technical fundamentals of AI will be developed through formal and structured learning opportunities such as lectures and seminars and reinforced through practical workshops, lab sessions and directed self-study. The theoretical foundations developed in this stage will then be applied through a scaffolded AI project in which students will work in groups to complete structured project tasks with guidance and support from tutors. Students will also begin to develop their transferable and professional skills, such as commercial awareness, creativity and effective communication, in this stage through active presentation/discussion sessions in the Principles of Responsible Management and Practice module.

At Stage 1, the students will gain experience in the design and development of an AI project. A wide variety of project ideas, relating to real-world situations, will be provided from which group projects will be formed. At this stage students will utilise datasets which are structured and publicly available. As part of the Stage 1 project module, students will also learn how to design project specifications, undertake necessary literature reviews as well as academic presentation of their results.

Further details of teaching, learning and assessment approaches are available in individual module descriptors. At the end of Stage 1, students will be eligible to exit with the award of Certificate of Higher Education if they have successfully completed at least 120 credits.

Learning, Teaching and Assessment at Stage 2

In Stage 2, students will be introduced to topics in a range of academic disciplines by experts in these fields from across the University. A combination of guest speakers, expert panels and field trips will encourage students to consider how AI could solve contemporary problems/issues in different sectors. Students will then use this experience to research, design and execute an AI project in an academic field of their choice.

The focus of teaching and learning moves away slightly from the acquisition of knowledge through formal taught sessions towards a more research- driven and interdisciplinary series of guest speakers, discussion panel sessions and field trips, using expertise from across the University and culminating in a supported group project in a discipline of the students' own choosing. Consideration of legal and ethical issues in Safe AI: Ethics, Law and Governance will be introduced through the exploration of case studies and will encourage students to develop their research skills and make links between the issues discussed and the topics chosen for their discipline-specific project.

Building from the experience students gain from Stage 1 AI project Design and Development, at this stage the students will have a wider spectrum of choices in terms of the topics with real-world applications they can explore. There will be provision for

students to choose project ideas across various disciplines. Students will be provided with access to specific datasets and tutors. With the help of the tutors, students will take a lead role in creating their own group project specifications and choice of AI methods and techniques to successfully execute the project. Thus, the main idea behind this Stage 2 project is to provide students with the opportunity to explore their own discipline-specific AI routes and provide hands on experience in developing an AI prototype solution.

Further details of teaching, learning and assessment approaches are available in individual module descriptors. At the end of stage 2, students will be eligible to exit with the award of Diploma of Higher Education if they have successfully completed at least 240 credits.

Learning, Teaching and Assessment at Stage 3

In the final stage 3 the curriculum aims to bring together the knowledge, skills and experience acquired in previous stages and focus on the development of students as AI professionals in industry. In the final project module of the programme, students will work with industry experts to design and develop a complete end-to-end AI solution. Alongside this industrial project, students will hone their project management skills and develop a professional portfolio to showcase their work to potential employers.

The teaching and learning approaches in Stage 3 aim to further develop and strengthen students' ability to work independently, to think creatively and to integrate theoretical knowledge (for example in the Advanced AI Tools and Methods module) and practical application (in the Industrial AI Project module). In the final project module, students will be tasked with engaging with industry professionals and other stakeholders to research, design and execute an end-to-end solution to a selected issue/problem. Each student will be assigned a supervisor to help oversee and support the development of the project via tutorial sessions, but a greater level of autonomy is expected of students at this stage. In The AI Professional module, students will work on a series of tasks in seminar/workshop-style sessions to reflect on the knowledge and skills they have developed during the programme and to collate and articulate their experiences via a professional portfolio, with support from the Careers and Employability Service and the Applied AI Programme Team. Students will also work in groups during this final stage on tasks which contribute to the coordination of an end-of-programme exhibition to showcase their final projects.

The industrial AI Project in Stage 3 of this programme will provide students with an opportunity to design, develop and work on a cutting-edge industry standard project. Students will design a real world, industrially relevant project specification. Live industrial datasets and access to the relevant industrial contacts will be provided so that the students can design and deploy an effective project. To deploy the project, students where necessary will use cutting-edge professional AI tools and methods, e.g. supercomputing facilities on Microsoft Azure or Amazon AWS. The outcome of this group project will be a working prototype demonstrating a modern AI solution to a real-life problem. The outcome of this project will also help students to put together their personal portfolio demonstrating their professional technical abilities in applied AI.

Further details of teaching, learning and assessment approaches are available in individual module descriptors.

Students will be eligible to exit with the award of Ordinary Degree of Bachelor if they have successfully completed at 120 credits in both Level 4 and 5 and 60 credits at level 6.

Students will be eligible for the target award of Honours Degree of Bachelor if they have successfully completed at least 360 credits.

Assessment Regulations

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

Programme Structure

Stage/Year	Semester 1 Modules	Semester 2 Modules
Stage 1	Artificial Intelligence Methods and Tools	Machine Learning Methods and Models
	Fundamentals of Artificial Intelligence and Data Analytics	
	Principles of Responsible Management and Practice	
	Artificial Intelligence Project Design and Development	
Stage 2	Data Science for Artificial Intelligence	Safe AI: Ethics, Law and Governance
	Multidisciplinary Issues and Innovations	-
	Discipline-specific Artificial Intelligence Project	
Stage 3	The Applied Artificial Intelligence Professional	
	Advanced AI Methods and Tools	-
	Industrial Artificial Intelligence Project	

Placement and/or Study Abroad

This programme provides the option for students to undertake a work placement or period of study outside their formal semester times. Placements are a fantastic way of building on the professional skills developed during the programme and boosting students' practical industry experience prior to graduating. Equally, study abroad opportunities can be very valuable in giving students experience of academic and/or industrial contexts in other countries.

Subject to availability, students wishing to take this option will have the opportunity to work over the summer periods within various research centres, research groups in the University and potentially with collaborating industrial partners.

Curriculum Structure

The curriculum may change subject to public health concerns and the University's programme monitoring and review processes.

Stage 1 Modules

FHEQ Level	Module Title	Module Type	Credit	Study Period	Module Code
4	AI Methods and Tools	Core	20	1	GAV4015-B
4	Machine Learning Methods and Models	Core	20	2	GAV4016-B
4	Fundamentals of AI and Data Analytics	Core	20	1+2	OIM4012-B
4	Principles of Responsible Management and Practice	Core	20	1+2	OIM4013-B
4	AI Project Design and Development	Core	40	1+2	GAV4017-D

At the end of Stage 1, students will be eligible to exit with the award of Certificate of Higher Education if they have successfully completed at least 120 credits.

Stage 2 Modules

FHEQ Level	Module Title	Module Type	Credit	Study Period	Module Code
5	Data Science for AI	Core	20	1	GAV5026-B
5	Multidisciplinary Issues and Innovations	Core	20	1	GAV5027-B
5	Safe AI: Ethics, Law and Governance	Core	20	2	LAW5012-B
5	Discipline-specific AI Project	Core	60	1+2	GAV5028-E

At the end of Stage 2, students will be eligible to exit with the award of Diploma of Higher Education if they have successfully completed at least 240 credits.

Stage 3 Modules

FHEQ Level	Module Title	Module Type	Credit	Study Period	Module Code
6	Advanced AI Methods and Tools	Core	20	1	GAV6009-B
6	The Applied AI Professional	Core	40	1+2	GAV6010-D
6	Industrial AI Project	Core	60	1+2	GAV6011-E

Students will be eligible to exit with the award of Ordinary Degree of Bachelor if they have successfully completed at 120 credits in both Level 4 and 5 and 60 credits at level 6.

Students will be eligible for the award of Honours Degree of Bachelor if they have successfully completed at least 360 credits.

Admission Requirements

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.

A typical offer to someone seeking entry through the UCAS scheme would be 112 points (this is BBC at A-Level or its equivalent), to include at least one technical subject such as Technology, Electronics, Engineering, Mathematics, Physics or Software Development.

All applicants need GCSE Mathematics grade C/4 and GCSE English grade C/4 or equivalent. Other RQF Level 2 qualifications such as Key Skills are acceptable. Students whose first language is not English should check the standard University language requirements at https://www.bradford.ac.uk/international/entry-requirements/.

Please note: This information is relevant to the contemporary recruitment cycle and therefore may be different now to when this document was originally published.
The current UCAS tariff for the programme, as well as accepted equivalent qualifications, is published at https://www.bradford.ac.uk/courses/ug/applied-artificial-intelligence-bsc/.

Access and Recognition of Prior Learning

Applications are welcome from students with non-traditional qualifications, and/or significant personal/professional experience. For such applicants, evidence of their interests and work experience would be required and this would likely take the form of a portfolio of work and/or an interview with the programme.

The University of Bradford has always welcomed applications from disabled students. To discuss adjustments or to find out more about support and access, you may wish to contact the Disability Service before you apply at www.bradford.ac.uk/disability/before .

Applications are particularly welcomed from adult learners (those aged 21+ at the start of the programme), armed forces families, carers and care leavers, estranged or orphaned learners, refugees and asylum seekers, and Romani or Traveller families. To find out more about the University of Bradford Progression Scheme, visit the webpage: https://www.bradford.ac.uk/applicants/progression-scheme/

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. For more details on RPL, visit the webpage: https://www.bradford.ac.uk/teaching-quality/prior-learning/.