Programme Information		
Programme Title	Programme Code	HECoS Code
Machine Learning and Data Science	I4G1	For Registry Use Only

Award	Length of Study	Mode of Study	Entry Point(s)	Total Credits	
				ECTS	CATS
MSc	2 Calendar Years (24 months)	Part Time	Annually in October	90	180

Ownership			
Awarding Institution	Imperial College London	Faculty	Faculty of Natural Sciences
Teaching Institution	Imperial College London	Department	Mathematics
Associateship	Diploma of Imperial College (DIC)	Main Location(s) of Study	Online

External Reference	
Relevant QAA Benchmark Statement(s) and/or other external reference points	Master's Award in Mathematics, Statistics and Operational Research (MMath) (2015)
FHEQ Level	Level 7
EHEA Level	2nd Cycle

External Accreditor(s) (if applicable)			
External Accreditor 1:	N/A		
Accreditation received:	N/A	Accreditation renewal:	N/A

Collaborative Provision			
Collaborative partner	Collaboration type	Agreement effective date	Agreement expiry date
N/A	N/A	N/A	N/A

Specification Details	
Programme Lead	Professor Nick Heard
Student cohorts covered by specification	2025-26 entry
Date of introduction of programme	October 21
Date of programme specification/revision	March 25

Programme Overview

In this programme, you will develop an in-depth understanding of machine learning models, alongside invaluable practical skills and guided experience in applying them to real-world problems. The curriculum is designed to propel your engineering or data science career forward, allowing you to choose the path that's right for you, be that a role as a data scientist, a machine learning engineer, or a computational statistician. With hands-on projects, you'll build a portfolio to showcase your new skills in everything from probabilistic modelling, deep learning, unstructured data processing and anomaly detection. You will build a strong foundation in mathematics and statistics, giving you confidence in your analytical skills, but also acquire expertise in implementing scalable machine learning solutions using industry-standard tools such as PySpark, ensuring that no data is too big or too complex for you. You will also have the opportunity to broaden your horizons through one of the first of its kind study of ethical topics posed by machine learning. You will graduate with an ability to go beyond the algorithms and turn data into actionable insights, contribute to strategic decision making in your organisation and become a responsible member of this rapidly growing profession.

The Machine Learning and Data Science MSc will train students in the computational, mathematical, and statistical foundations of machine learning, preparing them for the most advanced engineering roles in areas such as AI, data science and machine learning.

You will have the opportunity to work with industry-standard machine learning and statistics tools and, moreover, to develop a deep understanding of the appropriate use of such tools. You will have the opportunity to directly engage with departmental faculty at Imperial. The curriculum also covers the ethics and limitations of machine learning to equip you with the skills to ethically apply these techniques to your future work.

Imperial's flexible approach to learning afforded by an online degree allows us to meet the demands of our growing student base, allowing students for whom study in London or full-time study is not feasible. This will enable a broader base of the best students to access and participate in an Imperial education.

The fully online degree is a part-time programme, delivered across two-years (24 months).

Learning Outcomes

By the end of this programme, you will be able to:

1. Distinguish between machine learning modalities: supervised and unsupervised learning
2. Identify appropriate machine learning methods and paradigms of inference for data analysis, showing awareness of their relative strengths and weaknesses
3. Perform suitable pre-processing steps to prepare raw data for analysis
4. Produce informative graphics and summaries to explore unfamiliar data
5. Anticipate ethical and socially adverse consequences of machine learning methods
6. Assess the performance of machine-learning methods using metrics and diagnostic plots
7. Identify the limitations (computational and statistical) of machine learning methods and be aware of the dangers of working with observational data
8. Interpret the output of machine learning algorithms in the original data science context
9. Design end-to-end pipelines for data science, taking raw data as input and producing predictions and inferences as outputs.
10. Appreciate and critically appraise existing data analysis frameworks and tools.
11. Select computing architectures appropriate to a problem's scale.
12. Summarize and communicate the output of models effectively in plain language
13. Work independently with unfamiliar datasets of diverse types and demonstrate the ability to research novel problems and areas
14. Automate optimal decision in the face of uncertainty.

The Imperial Graduate Attributes are a set of core competencies which we expect students to achieve through completion of any Imperial degree programme. The Graduate Attributes are available at: www.imperial.ac.uk/about/education/our-graduates/

Entry Requirements	
Academic Requirement	As with our existing MSc programmes, the MLDS entry requirements stipulate an undergraduate level of education or comparable/equivalent work experience, to ensure there is an appropriate level of basic knowledge and understanding to be best to cope with the demands of the programme: • a 2:1 Bachelor's Degree with Honours or a taught Master's degree awarded by a UK university institution or a comparable qualification recognised by the university, in a Science, Technology, Engineering or Mathematics subject with appreciable mathematical content to be followed by; or; • a professional or other qualification obtained by written examinations and approved by the university.
Non-academic Requirements	N/A
English Language Requirement	Higher requirement (PG) Please check for other Accepted English Qualifications
Admissions Test/Interview	Consistent with the in-house MSc Statistics, decisions are made purely on application material. However, where appropriate a Special Qualifying exam may be used to deal with Special case applicants.
The programme's competency standards documents are available from the department.	

Learning & Teaching Approach

Learning and Teaching Delivery Methods
The MLDS programme is delivered as a fully online degree.

Teaching and learning on the programme is delivered by the departmental faculty through a range of methods including: recorded lectures, online tests, scheduled live tutorials, coding exercises. Students will also learn as a cohort through discussion boards (which can be used as assessment through graded discussion prompts) and peer assessed exercises. Appropriate "scaffolding" will be given so that students are able to work effectively. This scaffolding could include core reading, critical thinking skills, transferrable skills.

Online Activities ranging from live classroom sessions to global team projects, allow you to participate in a seamless, flexible, and engaging learning experience including:

1) rigorous assessments and targeted academic feedback at scale;
2) collaborations with other learners through applied projects across regions;
3) participation in a vibrant and supportive social learning community through extensive high engagement features, online collaboration and discussion.

Overall Workload
Your overall workload consists of lectures sessions and independent learning. The following gives an indication of how much time you will need to allocate to different activities at each level of the programme. At Imperial, each ECTS credit taken equates to an expected total study time of roughly 25 hours. Therefore, the expected total study time is around 2250 hours for the programme, (approximately 1030 hours for year 1 and 1220 hours for year 2).

Within Year 1 the student will spend an average one fifth on lectures and tutorials and roughly 800 hours on independent study. For year 2 the student will spend one seventh on lectures and tutorials and around 1100 hours on independent study.

Assessment Strategy

Assessment Methods

The format of assessments will vary according to the aims, content and learning outcomes of each module. There will be short assessments for each module, some of which will be summative, followed by a final substantive summative assessment. Backwards Design is being used throughout, moving from Outcomes, to Assessments, to all video, readings and practice material, so that all course content is working towards the overall achievement of the module and programme-level Learning Outcomes.

Assessment is module-specific and the varied combination will allow a full evaluation of the students' learning and achievements. These assessments will be both summative and formative such that the feedback given to students allows them to improve through the duration of the programme. The balance of summative assessment has been carefully designed and considered with the use of a variety of assessment methods.

The final research project provides training in research focused machine learning and data science. These projects will be motivated by topical research interests, both theoretical and applied. Additionally, there will be the opportunity for industry-motivated projects. The research project provides the space for the learner to synthesize all the learnings from the programme into a single, coherent and novel activity. To support online delivery, and provide scalability, the research project is scaffolded in relation to the typical stages of a research study: literature review, underpinning learning or exploratory data analysis, study design and project proposal, and final deliverable. The final assessment involves both a written report and oral examination. In both cases, consideration will be given to both communication with a technical audience, and a lay audience. It may be possible for projects to be carried out partly or wholly at an external organisation and requests will be considered on a case by case basis.

This approach to the research component of the MLDS is designed to be scalable and will not require a single supervisor dedicated to one or two students. At the end of this module, you will have a comprehensive research project that will equip you with the skills, knowledge and expertise to pursue research in whatever field of Machine Learning and Data Science you choose to engage in.

All modules are assessed primarily by coursework. This will consist of summative assessment with most including a capstone project.

Academic Feedback Policy

The MLDS Assessment Schedule will set out the agreed submission deadlines, marking periods and feedback return dates for each academic year in advance. The individual deadlines captured in the Assessment Schedule will be discussed and confirmed by the teaching team ahead of delivery.

MLDS will provide marks/feedback on assessment to align with university policy. This is a maximum period and much of the feedback will be provided sooner than this. For any quizzes and MCQs, more immediate provisional marks are likely to be available once marks are checked by the team and depending on the nature of the assessment. With each returned coursework assignment, an individual evaluation will be provided. This will ensure that formative assessment is being implemented optimally with the students' learning experience being driven through the feedback received.

General feedback to the cohort is provided on examination performance. You will be provided with a percentage grade for coursework and examinations with the final numerical mark only confirmed after the Board of Examiners Meeting and will be released by Registry. Grades received during the year are deemed provisional until confirmed by the Final Board of Examiners.

Imperial's Policy on Academic Feedback and guidance on issuing provisional marks to students is available at: www.imperial.ac.uk/about/governance/academic-governance/academic-policy/exams-and-assessment/

Re-sit Policy

Imperial's Policy on Re-sits is available at: www.imperial.ac.uk/about/governance/academic-governance/academic-policy/exams-and-assessment/

Mitigating Circumstances Policy

Imperial's Policy on Mitigating Circumstances is available at: www.imperial.ac.uk/about/governance/academic-governance/academic-policy/exams-and-assessment/

Additional Programme Costs		
This section should outline any additional costs relevant to this programme which are not included in students' tuition fees.		
Description	Mandatory/Optional	Approximate cost
N/A	N/A	N/A

Important notice: The Programme Specifications are the result of a large curriculum and pedagogy reform implemented by the Department and supported by the Learning and Teaching Strategy of Imperial College London. The modules, structure and assessments presented in this Programme Specification are correct at time of publication but might change as a result of student and staff feedback and the introduction of new or innovative approaches to teaching and learning. You will be consulted and notified in a timely manner of any changes to this document.

Programme Structure[1]

Year 1 - FHEQ Level 7
You will study all core and compulsory modules.

Code	Module Title	Core/ Compulsory	Group	Term	Credits
MATH70094	Programming for Data Science	Core		Autumn	5
MATH70095	Applicable Mathematics	Core		Autumn	5
MATH70096	Exploratory Data Analysis and Visualisation	Compulsory		Spring	5
MATH70097	Supervised Learning	Compulsory		Spring	7.5
MATH70098	Ethical Machine Learning and Data Science (Part 1-2) P1	Core		Spring	3.75
MATH70100	Bayesian Methods and Computation	Compulsory		Summer	7.5
MATH70102	Unsupervised Learning	Compulsory		Summer	7.5
	Note: Ethical Machine Learning and Data Science (Part 1-2) is one 7.5 ECTS module				
				Credit Total	41.25

Year 2 - FHEQ Level 7
You will study all core and compulsory modules.

Code	Module Title	Core Compulsory/ Elective	Group	Term	Credits
MATH70103	Unstructured Data Analysis	Compulsory		Autumn	7.5
MATH70104	Learning Agents	Compulsory		Autumn	5
MATH70101	Deep Learning	Compulsory		Spring	7.5
MATH70099	Big Data: Statistical scalability with PySpark	Compulsory		Spring	5
MATH70098	Ethical Machine Learning and Data Science (Part 1-2) P2	Core		Spring	3.75
MATH70105	Research Project	Compulsory		Summer	20
	Note: Ethical Machine Learning and Data Science (Part 1-2) is one 7.5 ECTS module				
				Credit Total	48.75

[1] **Core** modules are those which serve a fundamental role within the curriculum, and for which achievement of the credits for that module is essential for the achievement of the target award. Core modules must therefore be taken and passed in order to achieve that named award. **Compulsory** modules are those which are designated as necessary to be taken as part of the programme syllabus. Compulsory modules can be compensated. **Elective** modules are those which are in the same subject area as the field of study and are offered to students in order to offer an element of choice in the curriculum and from which students are able to select. Elective modules can be compensated.

Progression and Classification

Award and Classification for Postgraduate Students

Award of a Masters Degree (including MRes)

To qualify for the award of a postgraduate degree you must have:

1. accumulated credit to the value of no fewer than 90 credits at level 7;
2. and no more than 15 credits as a Compensated Pass;
3. met any specific requirements for an award as outlined in the approved programme specification for that award.

Classification of Postgraduate Taught Awards

The university sets the class of Degree that may be awarded as follows:

1. Distinction: 70.00% or above
2. Merit: 60.00% or above but less than 70.00%.
3. Pass: 50.00% or above but less than 60.00%.

Your classification will be determined through the weighted average mark in the designated 'taught' and 'research' aspects of the programme each meeting the threshold for the relevant classification band. The mark (pass/fail) of the MATH70094 Programming for Data Science is not included in the weighted average mark in the designated 'taught' aspect of the programme..

Your degree algorithm provides an appropriate and reliable summary of your performance against the programme learning outcomes. It reflects the design, delivery, and structure of your programme without unduly over-emphasising particular aspects.

Programme Specific Regulations

N/A

Supporting Information
The Programme Handbook is available from the department.
The Module Handbook is available from the department.
Imperial's entry requirements for postgraduate programmes can be found at: www.imperial.ac.uk/study/apply/postgraduate-taught/entry-requirements/
Imperial's Quality & Enhancement Framework is available at: www.imperial.ac.uk/registry/proceduresandregulations/qualityassurance
Imperial's Academic and Examination Regulations can be found at: www.imperial.ac.uk/about/governance/academic-governance/regulations
Imperial College London is an independent corporation whose legal status derives from a Royal Charter granted under Letters Patent in 1907. In 2007 a Supplemental Charter and Statutes was granted by HM Queen Elizabeth II. This Supplemental Charter, which came into force on the date of Imperial's Centenary, 8th July 2007, established Imperial as a University with the name and style of "The Imperial College of Science, Technology and Medicine". www.imperial.ac.uk/admin-services/secretariat/university-governance-structure/charters/
Imperial College London is regulated by the Office for Students (OfS) www.officeforstudents.org.uk/advice-and-guidance/the-register/
This document provides a definitive record of the main features of the programme and the learning outcomes that you may reasonably be expected to achieve and demonstrate if you take full advantage of the learning opportunities provided. This programme specification is primarily intended as a reference point for prospective and current students, academic and support staff involved in delivering the programme and enabling student development and achievement, for its assessment by internal and external examiners, and in subsequent monitoring and review.