Programme Title: MSc Big Data Science

Programme Specification (PG)

Awarding body / institution:	Queen Mary University of London
Teaching institution:	Queen Mary University of London
Name of final award and programme title:	MSc Big Data Science
Name of interim award(s):	PG Certificate and PG Diploma
Duration of study / period of registration:	12 Months
QMUL programme code(s):	H6J7
QAA Benchmark Group:	Computing
FHEQ Level of Award:	Level 7
Programme accredited by:	
Date Programme Specification approved:	
Responsible School / Institute:	School of Electronic Engineering & Computer Science

Schools / Institutes which will also be involved in teaching part of the programme:
NA

Institution(s) other than QMUL that will provide some teaching for the programme:
NA

Programme outline

The Big Data science movement is transforming how Internet companies and researchers over the world address traditional problems. Big Data refers to the ability of exploiting the massive amounts of unstructured data that is generated continuously by companies, users, devices, and extract key understanding from it.

A Data Scientist is a highly skilled professional, who is able to combine state of the art computer science techniques for processing massive amounts of data with modern methods of statistical analysis to extract understanding from massive amounts of data and create new services that are based on mining the knowledge behind the data. The job market is currently in shortage of trained professionals with that set of skills, and the demand is expected to increase significantly over the following years.

The course leverages the world-leading expertise in research at Queen Mary with our strategic partnership with IBM and other leading IT sector companies to offer to students a foundational MSc on the field of Data Science. The MSc modules cover the following aspects:

- Statistical Data Modeling, data visualization and prediction
- Machine Learning techniques for cluster detection, and automated classification

- Big Data Processing techniques for processing massive amounts of data
- Domain-specific techniques for applying Data Science to different domains: Computer Vision, Social Network Analysis, Bio Engineering, Intelligent Sensing and Internet of Things
- Use case-based projects that show the practical application of the skills in real industrial and research scenarios.

Students will be offered lectures that explain the core concepts, techniques and tools required for large-scale data analysis. Laboratory sessions and tutorials will put these elements to practice through the execution of use cases extracted from real domains. Students will also undertake a large project where they will demonstrate the application of Data Science skills in a complex scenario.

The programme is offered by academics from the Networks, Centre for Intelligent Sensing, Risk and Information Management, Computer Vision and Cognitive Science research groups from the School of Electronic Engineering and Computer Science. This is a team of more than 100 researchers (academics, post-docs, research fellows and PhD students), performing world leading research in the fields of Intelligent Sensing, Network Analytics, Big Data Processing platforms, Machine Learning for Multimedia Pattern Recognition, Social Network Analysis, and Multimedia Indexing.

Aims of the programme

The course will provide students with cutting edge tools, methods, and techniques for analysing large-scale datasets in order to detect patterns/trends and extract valuable information from raw data. Programme graduates will be able to pursue careers in Data Scientist positions in Industry, as well as initiate research in multiple scientific domains that rely on performing advanced data analysis.

The programme will cover the following topics:

- Statistical Data Modeling, data visualization and prediction
- Machine Learning techniques for cluster detection, and automated classification
- Big Data Processing techniques for processing massive amounts of data
- Domain-specific techniques for applying Data Science to different domains: Computer Vision, Social Network Analysis, Bio Engineering, Intelligent Sensing and Internet of Things
- Use case-based projects that show the practical application of the skills in real industrial and research scenarios.

What will you be expected to achieve?

Knowledge and understanding of the following items:

Academic Content:	
A1	Statistical modeling of real data sources for trend detection and prediction
A2	Programming tools and techniques for processing massive amounts of data such as Map/Reduce and Hadoop
A3	Methods and techniques for automated classification and pattern recognition

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Disciplinary Skills - able to:	
B 1	Evaluate the scientific, mathematical and software 'tools' relevant to the problem domain of Big Data science
B 2	Develop novel techniques for analyzing unstructured data sources
B 3	Establish hypotheses on data sources, and validate them through statistical techniques

Attributes:	
C 1	Engage critically with knowledge in the domain of Big Data science
C 2	Develop a global perspective on the sources and uses of new data
C 3	Develop information expertise in the domain

How will you learn?

Each non-project-based module normally involves lectures, problem solving coursework and practical sessions. Lectures are used to introduce principles and methods and also to illustrate how they can be applied in practice. Coursework allows students to develop their skills in problem solving and to gain practical experience. Practical sessions provide students with guidance and help while solving a problem. These lessons take the form of exercise classes and programming laboratories that allow the students to learn-by-doing in order to complement the lectures.

Individual projects are undertaken during the summer months under the supervision of an academic member of staff with whom there are normally weekly consultancy meetings. These are used for students to report on their progress, discuss research and design issues and plan their future work. This develops and reinforces students' ability to communicate technical ideas clearly and effectively. The Projects Coordinator also runs a thread of taught sessions to support the project module. A number of industrial-linked projects may be offered each year, which students can apply for.

How will you be assessed?

The assessment of the taught course units takes place through a written examination and coursework.

The project is examined on the basis of a written report, a formal oral presentation, and a demonstration of the piece of software developed or the insights from the data analysis carried by the student. The projects will have two examiners each, with a third if there is disagreement.

How is the programme structured?

Please specify the full time and part time programme diets (if applicable). The description should be sufficiently detailed to fully define the structure of the diet.

The programme is organised in three semesters. The first semester is composed by three compulsory modules plus one optional

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module that will cover the foundational techniques and tools employed for Big Data Science analysis. For students who cannot demonstrate solid skills in programming, the module Advanced Program Design will be a mandatory choice in the first semester, so that the adequate software development skills can be acquired for the remaining modules.
The second semester has four modules that are chosen among a set of options. The module selection allows students to focus on domain-specific research or industry applications for Big Data Science. Module options allow students to specialize in several areas: Computer Vision, Internet Services (Semantic Web and Social Media), Business, and Internet of Things.
Students undertake their placement between the taught modules and the project.
Students carry out a large project full time in the third semester, after agreeing to a topic and supervisor in the first semester, and completing the preparation phase over the second semester.

Semester 1
ECS764P Applied Statistics (15 credits)
ECS765P Big Data Processing (15 credits)
ECS766P Data Mining (15 credits)

Select one option from:
ECS708P Machine Learning (15 credits)
ECS782P Introduction to IOT (15 credits)
ECS789P Semi-Structured Data and Advanced Data Modelling (15 credits)
ECS793P Introduction to Object Oriented Programming (15 credits)

Semester 2
Four options from:
ECS735P The Semantic Web (15 credits)
ECS757P Digital Media and Social Networks (15 credits)
ECS773P Bayesian Decision and Risk Analysis (15 (credits)
ECS781P Cloud Computing (15 credits)
ECS784P Data Analytics (15 credits)
ECS794P Machine Learning for Visual Data Analytics (15 credits)
ECS795P Deep Learning and Computer Vision (15 credits)

Semester 3
ECS751P Project (60 credits)

Academic Year of Study FT - Year 1

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Applied Statistics	ECS764P	15	7	Compulsory	1	Semester 1
Big Data Processing	ECS765P	15	7	Compulsory	1	Semester 1
Data Mining	ECS766P	15	7	Compulsory	1	Semester 1
Machine Learning	ECS708P	15	7	Elective	1	Semester 1

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Introduction to IOT	ECS782P	15	7	Elective	1	Semester 1
Semi-Structured Data and Advanced Data Modelling	ECS789P	15	7	Elective	1	Semester 1
Introduction to Object Oriented Programming	ECS793P	15	7	Elective	1	Semester 1
The Semantic Web	ECS735P	15	7	Elective	1	Semester 2
Digital Media and Social Networks	ECS757P	15	7	Elective	1	Semester 2
Bayesian Decision and Risk Analysis	ECS773P	15	7	Elective	1	Semester 2
Cloud Computing	ECS781P	15	7	Elective	1	Semester 2
Data Analytics	ECS784P	15	7	Elective	1	Semester 2
Machine Learning for Visual Data Analytics	ECS797P	15	7	Elective	1	Semester 2
Deep Learning and Computer Vision	ECS795P	15	7	Elective	1	Semester 2
Project	ECS751P	60	7	Core	1	Semester 3

What are the entry requirements?

Further information on the entry requirements can be found at http://eecs.qmul.ac.uk/postgraduates/entry-requirements/

How do we listen to and act on your feedback?

The Student-Staff Liaison Committee provides a formal means of communication and discussion between the School and its students. The committee consists of student representatives from each cohort, together with appropriate representation from School staff. It is designed to respond to the needs of students, as well as act as a forum for discussing programme and module developments. Student-Staff Liaison Committees meet four times a year, twice in each teaching semester.

Each semester, students are invited to complete a web-based module questionnaire for each of their taught modules, and the results are fed back through the SSLC meetings. The results are also made available on the student intranet, as are the minutes of the SSLC meetings. Any actions necessary are taken forward by the relevant Senior Tutor, who chairs the SSLC, and general issues are discussed and actioned through the School's Student Experience Learning Teaching And Assessment (SETLA) Committee .

The School's SETLA Committee advises the Director of Taught Programmes on all matters relating to the delivery of taught

programmes at school level including monitoring the application of relevant QM policies and reviewing all proposals for module and programme approval and amendment before submission to Taught Programmes Board. Student views are incorporated in this Committee's work in a number of ways, including through student membership and consideration of student surveys and module questionnaires.

The School participates in the College's Annual Programme Review process, which supports strategic planning and operational issues for all undergraduate and taught postgraduate programmes. The APR includes consideration of the School's Taught Programmes Action Plan, which records progress on learning and teaching related actions on a rolling basis. Students' views are considered in the APR process through analysis of the NSS and module questionnaires, among other data.

What academic support is available?

All students will be assigned a tutor, with whom they will have bi-weekly meetings. In addition the students will have all the standard induction, advice and supervisory arrangements normally offered to students within EECS.

The school handbook will be provided (and made accessible at all times) to students, where all the channels of support will be outlined. These include the support channels within the school and also those available at College level.

Programme-specific rules and facts

The programme adheres to the standard Academic Regulations for taught postgraduate programmes, with a special regulation for a progression point after the taught component.

Specific support for disabled students

Queen Mary has a central Disability and Dyslexia Service (DDS) that offers support for all students with disabilities, specific learning difficulties and mental health issues. The DDS supports all Queen Mary students: full-time, part-time, undergraduate, postgraduate, UK and international at all campuses and all sites.

Students can access advice, guidance and support in the following areas:
• Finding out if you have a specific learning difficulty like dyslexia
• Applying for funding through the Disabled Students' Allowance (DSA)
• Arranging DSA assessments of need
• Special arrangements in examinations
• Accessing loaned equipment (e.g. digital recorders)
• Specialist one-to-one "study skills" tuition
• Ensuring access to course materials in alternative formats (e.g. Braille)
• Providing educational support workers (e.g. note-takers, readers, library assistants)
• Mentoring support for students with mental health issues and conditions on the autistic spectrum.

Links with employers, placement opportunities and transferable skills

The School has a wide range of industrial contacts secured through research projects and consultancy, our Industrial Experience programme and our Industrial Advisory Panel.

The Industrial Advisory Panel works to ensure that our programmes are state-of-the-art and match the changing requirements of this fast-moving industry. The Panel includes representatives from a variety of Computer Science oriented companies ranging from SMEs to major blue-chips. These include: Microsoft Research, IBM, The National Physical Laboratory, National Instruments, PA Consulting, Rohde and Schwarz, O2, Cisco Systems, ARM, Selex and BAE Systems.

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Recent graduates have found employment as IT consultants, specialist engineers, web developers, systems analysts, software designers and network engineers in a wide variety of industries and sectors. A number of students also go on to undertake PhDs in electronic engineering and computer science. Merril Lynch, Microsoft, Nokia, Barclays Capital, Logica,, Credit Suisse, KPMG, Transport for London, Sky and Selex ES are among the organizations that have recently employed graduates of EECS programmes.

Transferable skills are developed through a variety of means, including embedding of QM Graduate Attributes in taught modules and the summer project, together with the opportunity to participate in extra-curricular activities, e.g. the School's E++ Society, the School's Annual Programming Competition and external competitions with support from the School.

Students have the opportunity to undertake an industrial-linked project in the summer - these are very competitive.

Programme Specification Approval

Person completing Programme Specification:	Rupal Vaja
Person responsible for management of programme:	Felix Cuadrado
Date Programme Specification produced / amended by School / Institute Learning and Teaching Committee:	29th January 2018
Date Programme Specification approved by Taught Programmes Board:	

Queen Mary University of London