

## 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 Machine Learning for Visual Data Analytics
Name of interim award(s):	PG Certificate and PG Diploma
Duration of study / period of registration:	12 Months
QMUL programme code(s):	H6JE
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

As recent developments in computers and sensors make easier the generation, storage and processing of visual data, methods that enable a machine to analyse and understand images and videos become increasingly relevant. Increasingly so, the analysis of the images and image sequences that are produced in an unprecedented pace, is done with Machine Learning methodologies. The advances in the field are behind Google's autonomous vehicles, Facebook's face and image analysis technologies, face recognition systems at border controls and car plate recognition systems, to name just a few of the applications that have found their way in our everyday life. As the field matures, more applications in areas such as Robotics, Human Computer Interaction, Medical Imaging, Security and Surveillance, and Multimedia Indexing and Retrieval are to be expected.

The course aims at providing the students with the knowledge and skills to pursue a career in research or in related industries. It covers

Fundamental methods and techniques in Computer Vision, Machine Learning and Image Processing  
Programming tools, languages and techniques for application of Machine Learning methods for the Analysis of Visual Data  
Methods and techniques for Systems and Applications

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The students are given

- Lectures in which the theory and the algorithms are presented
- Practical sessions / labs in which they get hands on experience with tools and algorithms
- A final year project in which they are supervised by world leading experts in cutting edge research topics.

The programme is offered and taught by academics from the Computer Vision group and the Multimedia and Vision group of 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 Surveillance, Face and Gesture Recognition, Multimedia Indexing and Retrieval and Robotics.

### Aims of the programme

The course will enable students to study cutting edge technologies in the field of Machine Learning for Visual Data Analytics, and will provide them with the background and skills they need to pursue careers in research or in related industries. Specific aims include the completion of a broad range of advanced study in methods for design, build, and evaluation of related systems.

The course will give training and experience through lectures with associated lab and coursework, and a major individual project. The course covers is developed around three core strands.

- 1) Fundamental methods and techniques (in Computer Vision, Machine Learning and Image Processing)
- 2) Programming tools, languages and techniques
- 3) Methods and techniques for Visual Analytics Systems and Applications

### What will you be expected to achieve?

Students who successfully complete the programme will be able to meet the following learning outcomes.

#### Academic Content:

A 1	Machine learning and image processing
A 2	Programming tools and techniques for systems for Visual Analytics using Machine Learning methods and tools
A 3	Methods and techniques for Image and Video understanding

#### Disciplinary Skills - able to:

B 1	Recognise insufficient existing knowledge and search for the necessary scientific, mathematical and software 'tools' relevant to that particular issue
B 2	Develop novel concepts for image analysis and recognition
B 3	Critically reflect on their own performance in vision projects and apply to future projects

Attributes:	
C 1	Engage critically with knowledge
C 2	Produce analyses that are based on evidence
C 3	Explain and argue clearly
C 4	Integrate scholarship, research and professional activities with the discipline in a developing professional career

### 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 taught modules normally consists of a combination of written examination and coursework.

The project is examined on the basis of a written report, a formal oral presentation, and, where applicable, a demonstration of any software and/or hardware developed by the student.

### 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.

Semester 1  
ECS708P Machine Learning (15 credits)  
ECS709P Introduction to Computer Vision (15 credits)

Plus two options from:  
ECS762P Computer Graphics (15 credits)  
ECS765P Big Data Processing (15 credits)  
ECS766P Data Mining (15 credits)

Semester 2

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ECS797P Machine Learning for Visual Data Analytics (15 credits)

ECS795P Deep Learning and Computer Vision (15 credits)

Plus two options from:

ECS776P Image Processing (15 credits)

ECS757P Digital Media and Social Networks (15 credits)

ECS759P Artificial Intelligence (15 credits)

Semester 3

ECS751P Project (60 credits)

Academic Year of Study

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Machine Learning	ECS708P	15	7	Compulsory	1	Semester 1
Introduction to Computer Vision	ECS709P	15	7	Compulsory	1	Semester 1
Computer Graphics	ECS762P	15	7	Elective	1	Semester 1
Big Data Processing	ECS765P	15	7	Elective	1	Semester 1
Data Mining	ECS766P	15	7	Elective	1	Semester 1
Machine Learning for Visual Data Analytics	ECS797P	15	7	Compulsory	1	Semester 2
Deep Learning and Computer Vision	ECS795P	15	7	Compulsory	1	Semester 2
Image Processing	ECS776P	15	7	Elective	1	Semester 2
Digital Media and Social Networks	ECS757P	15	7	Elective	1	Semester 2
Artificial Intelligence	ECS759P	15	7	Elective	1	Semester 2
Project	ECS751P	60	7	Core	1	Semester 3

**What are the entry requirements?**

Further information on our 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 are assigned an academic advisor during induction week. The advisor 's role is to guide their advisees in their academic development including module selection, and to provide first-line pastoral support.

In addition, the School has a Senior Tutor for postgraduate students who provides second-line guidance and pastoral support for students, as well as advising staff on related matters.

EEvery member of teaching staff holds 2 open office hours per week during term-time.

Additional academic support is provided to those students who are successful in securing an industrial-linked project.

## 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.

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. Merrill 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:**

Yiannis Patras

**Date Programme Specification produced / amended by School / Institute Learning and Teaching Committee:**

29th January 2018

**Date Programme Specification approved by Taught Programmes Board:**