

PROGRAMME SPECIFICATION

Programme title:	MSc Machine Learning	
Final award (BSc, MA etc): (where stopping off points exist they should be detailed here and defined later in the document)	MSc	
Cohort(s) to which this programme specification is applicable: (e.g. from 2008 intake onwards)	From 2009	
Awarding institution/body:	University College London	
Teaching institution:	University College London	
Faculty:	Engineering Sciences	
Parent Department: (the department responsible for the administration of the programme)	Computer Science	
Departmental web page address: (if applicable)	http://www.csml.ucl.ac.uk/courses/msc_ml/	
Method of study: Full-time/Part-time/Other	Full-time	
Criteria for admission to the programme:	Please see http://www.csml.ucl.ac.uk/courses/msc_ml/?q=node/101	
Length of the programme: (please note any periods spent away from UCL, such as study abroad or placements in industry)	One calendar year (approx).	
Level on Framework for Higher Education Qualifications (FHEQ) (see Guidance notes)	M	
Relevant subject benchmark statement (SBS) (see Guidance notes)	Not applicable. There is currently no Master's level benchmark statement for this subject area.	
Brief outline of the structure of the programme and its assessment methods: (see guidance notes)	Please see http://www.csml.ucl.ac.uk/courses/msc_ml/?q=node/143	
Board of Examiners:	Board of Examiners for the MSc Machine Learning	
Professional body accreditation (if applicable):	IET	Date of next scheduled accreditation visit: 2010/2011

EDUCATIONAL AIMS OF THE PROGRAMME:

The MSc Machine Learning is an advanced Masters programme for suitably qualified Science and Engineering graduates. It was developed to help meet a growing demand for very well qualified and experienced people in this specialist area. The programme aims to provide its graduates with the foundational principles and the practical experience needed by employers in this area and graduates of this programme will have had the opportunity to develop their skills by tackling problems related to industrial needs or to leading edge research.

The programme provides a sound basis for those embarking on a career in research or development or those taking up responsible positions within industry in any area where machine learning is currently applied or will be applied in the future; for example: finance, banking and insurance, retail and e-commerce, pharmaceuticals, and computer security.

The fundamental educational aims of the programme are therefore to accept high quality applicants from the UK and overseas, challenge them both academically and organisationally, and produce world-class graduates from the Masters programme. This is done in several ways: primary material is provided which is updated regularly to reflect our perception of both current practice and future importance; students obtain exposure to industrial and commercial constraints through a seminar series delivered largely by industry; opportunities are provided for students to put both academic and project management skills into practice which includes a substantial research project and students are encouraged to undertake their research projects in conjunction with our industrial partners.

PROGRAMME OUTCOMES:

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the following areas:

A: Knowledge and understanding

Knowledge and understanding of:

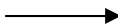
The Bateson Learning 0/I objectives for the MSc ML include the development of an understanding of fundamental principles of:

1. the full range of machine learning techniques currently available and the ability to select an appropriate technique for a given task;
2. developing new machine learning techniques and the awareness of the foundational issues affecting the performance of such techniques in a given scenario;
3. be able to assess the relative merits of competing approaches to the solution of a given problem involving machine learning.

We do not aim to concentrate on fact accumulation and, whilst we provide the required material in this area, we actively encourage deeper approaches to learning than simple regurgitation.

Thus our aims include in particular a detailed understanding of Bayesian and Statistical machine learning methodologies. As such we expect the student to obtain:

1. Knowledge of a variety of classic ML algorithms and techniques under current research.
2. Knowledge of the mathematical foundations underpinning the motivations and applications of algorithms. This will include the ability to both understand and give proofs of salient characteristics.
3. For a variety of algorithms to be able to implement a program associated with an algorithm or apply a relevant package to given data.

1**Teaching/learning methods and strategies:**

We do not aim to concentrate on surface approaches to learning and we recognize that foundational material is essential, particularly given the wide spread of backgrounds in our intake. Whilst we only admit students of high quality, the course aims to be international and mixed in ages, different students attending with different prior experiences although all those accepted will have fulfilled the prerequisites as set out in our documented requirements of the programme (print and web based).

We deliver primary material through lectures and discussions within class time. However, we expect students to engage in self-directed study, both before arriving on the course and throughout the duration of the course itself. Both lecturers and the course director make themselves available to discuss issues of individual concern throughout the year.

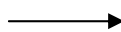
	→	<p>Assessment:</p> <p>Assessment of base-level material is through unseen written examination.</p> <p>The remainder of our assessment process concentrates on application, analysis, synthesis and evaluation; the upper levels of Bloom's taxonomy. Understanding is therefore also assessed implicitly through coursework, practical application and the project assessment process.</p>
B: Skills and other attributes		
<p>Intellectual (thinking) skills:</p> <p>We seek actively to encourage the development of Bateson Learning II (and III, insofar as this has real meaning), which involves the contextualisation of Learning I (and II). This involves the need to:</p> <ol style="list-style-type: none"> 1. Reason critically, particularly in relation to problems that are constrained by practical considerations. 2. Analyse, compare and evaluate intelligent system using both numerical techniques and those based on argumentation. 3. Reflect on experiences gained by applying knowledge and practical techniques in the solution of problems. 	→	<p>Teaching/learning methods and strategies:</p> <p>These skills are developed largely as a result of in-class discussions, project supervision, and other face-to-face meetings.</p> <p>The techniques are formulated orally, and applied both orally and in writing.</p>
	→	<p>Assessment:</p> <p>The vast bulk of our assessment is concerned with application of knowledge, both practically and intellectually. Consequently, all our assessment procedures seek to encourage the skills identified:</p> <p>Unseen written examinations include both those that are subject-based and a paper that covers broader thinking across subject areas linked by applications in industry.</p> <p>Coursework is either practical, or analytical. If not practically based, it may involve one or more of:</p> <ol style="list-style-type: none"> 1. application of academic principles in unfamiliar situations 2. research 3. synthesis of solutions 4. critical analysis of the above

C: Skills and other attributes

Practical skills (able to):

Given the nature of the subject and our expected outcomes, we consider practical ability in the field to be essential. Consequently, we address this on several fronts – we require students to be able to:

1. Plan and undertake practical, problem solving exercises
2. Locate and analyze and research appropriate literature
3. Organize the development of systems and testing where appropriate



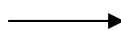
Practical skills are taught throughout the year, starting in induction week, and proceeding through courses that are assessed either wholly or partially on the basis of practical coursework through to unseen examination and the final research project.

Students receive initial guidance on research techniques, and early formative assessment of their practical abilities, on which individually tailored remedial work is planned if necessary in order to bring students up to the required standard.

Students are expected to apply practical skills in many of the course modules and one course, Intelligent Systems in Business, is entirely devoted to the industrial application of machine learning in diverse business contexts and is almost entirely delivered by external industrialists.

The summer project is one in which a practical problem, drawn either from the industrial/commercial or the research domain, is undertaken. Students meet regularly with academic supervisors and are asked to adhere to their plan and produce agreed deliverables.

Assessment:




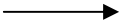
Assessment of practical skills takes place through a mixture of routes:

For most courses where there is a practical element, it is assessed through coursework. Much of this coursework involves programming and/or data analysis.

For that part of the taught course that is assessed solely by coursework, the assessment mathematical problem-solving; practical programming and written material.

Finally, the project is assessed by written report.

D: Skills and other attributes

<p>Transferable skills (able to):</p> <ol style="list-style-type: none"> 1. Manage time effectively 2. Structure and communicate ideas, practical solutions, and test data in a coherent accessible way 3. Analyse data 4. Research and analyse ideas and solutions 5. Work effectively both independently and to contribute to the cohesiveness of the group 		<p>The programme is quite intense and pressured. Students are expected to organize themselves in such a way that they can complete the given work within the time available. We continuously monitor student performance, and provide support as required.</p> <p>Data analysis is not commonly viewed as a transferable skill. However, within the area of the programme the ability to analyse data and to understand and to apply the most appropriate technique is central. We assert that this is therefore a transferable skill and a fundamental part of our programme.</p> <p>All courses require regular coursework, and feedback is given on this in order to develop understanding of the core material, argumentation and research skills where appropriate, and logical and clear presentation.</p> <p>Presentations form part of the assessment process for one of the courses.</p>
		<p>Assessment:</p> <p>Time management is not assessed directly; however, it is an implicit part of coursework, and explicitly a part of project work.</p> <p>A requirement to communicate ideas and describe the structure and efficacy of practical solutions are spread throughout the course in all forms of assessment.</p> <p>Data analysis is assessed through coursework and through project work.</p> <p>The ability to address foundational issues within the area of machine learning, to research those problems and to present that research are key components of the assessment of courses.</p>

The following reference points were used in designing the programme:

- the Framework for Higher Education Qualifications (<http://www.gaa.ac.uk/academicinfrastructure/benchmark/default.asp>);
- the programme specifications for UCL degree programmes in relevant subjects (where applicable);
- UCL teaching and learning policies;
- staff research.

Please note: This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of each course unit/module can be found in the departmental course handbook. The accuracy of the information contained in this document is reviewed annually by UCL and may be checked by the Quality Assurance Agency.

Programme Organiser(s) Name(s):	Dr Mark J Herbster
Date of Production:	June 2003
Date of Review:	September 2009
Date approved by Head of Department:	TBA
Date approved by Chair of Departmental Teaching Committee:	TBA
Date approved by Faculty Teaching Committee	TBA