PROGRAMME SPECIFICATION

Programme title:	MSc Computational Statistics and 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 2008 (ie the first co-hort)
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://web4.cs.ucl.ac.uk/research/csml/msccsml/
Method of study: Full-time/Part-time/Other	Full-time
Criteria for admission to the programme:	Please see http://web4.cs.ucl.ac.uk/research/csml/msccsml/index.php?n=Main.Admissions
Length of the programme: (please note any periods spent away from UCL, such as study abroad or placements in industry)	One calendar year
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://web4.cs.ucl.ac.uk/research/csml/msccsml/index.php?n=Main.CourseStructure
Board of Examiners:	Board of Examiners in Computational Statistics and Machine Learning

Professional body accreditation (if applicable):	N/A	Date of next scheduled accreditation visit:

EDUCATIONAL AIMS OF THE PROGRAMME:

The aim of this advanced MSc is to produce graduates with a high level of knowledge and practical skill in all areas of Computational Statistics and Machine Learning. On completion of the programme, graduates will understand the fundamental principles underlying the development and application of new techniques in this area, and be aware of the range and scope of algorithms and approaches available. They will be able to design, develop and evaluate appropriate algorithms and methods for new problems and applications, and be able to appreciate the advantages, disadvantages and limitations of different algorithms and approaches. The programme is designed to provide the detailed knowledge and up-to-date technical skills required to undertake research or development work.

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: On completion of the MSc the successful student should: a. Have developed skills in computational statistics and machine learning algorithms development b. Have a complete and up-to-date knowledge of application of machine learning to industry (pharmaceutical or financial) and research.	→	**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 throughout the duration of the programme itself. Both lecturers and the programme director make themselves available to discuss issues of individual concern throughout the year.
	→	**Assessment:** Understanding is assessed implicitly through coursework, practical application, unseen written examinations, and the project assessment process.

B: Skills and other attributes		
Intellectual (thinking) skills: Students will be encouraged to develop their skills in machine learning and statistical applications. This involves the need to: 1. Reason critically, particularly in relation to problems that are constrained by practical considerations. 2. Analyse, compare and evaluate statistical and machine learning methodologies. 3. Reflect on experiences gained by applying knowledge and practical techniques in the solution of problems.	→	**Teaching/learning methods and strategies:** These skills are developed largely as a result of in-class discussions, interactive industrial seminars, project supervision, and other face-to-face meetings. The techniques are formulated orally, and applied both orally and in writing.
	→	**Assessment:** 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: 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. Coursework is either practical, or analytical. If not practically based, it may involve one or more of: 1. application of academic principles in unfamiliar situations 2. research 3. synthesis of solutions 4. critical analysis of the above Students deliver a presentation of the outline of their intended research project for their project management course assessment. This is timed so that they have completed both their project management course and their written examinations and are about to undertake their research project proper. The students are encouraged to observe each other's presentations and to contribute in the ensuing discussion (the assessment of the presentation is done by the course tutor plus the second examiner/Programme Director). Further, the students are asked to critique the project management techniques they are taught.

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	→	**Teaching/learning methods and strategies:** 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 systems in diverse business contexts and is almost entirely delivered by external industrialists. Other optional courses with industry applications are Intelligent Systems in Bioinformatics and Medical Statistics (both pharmaceutical industry-related) and Stochastic Methods in Finance (banking sector). In preparation for the summer project, students undertake a course on which a practitioner teaches them project management techniques. They make use of this course in planning their projects. The summer project will be one in which a practical problem, drawn either from the industrial/commercial or the research domain, is undertaken. Students will meet regularly with academic supervisors and asked to adhere to their plan and produce agreed deliverables. Students on the MSc CSML will be encouraged to undertake projects with an industrial partner so even if their preferred project is research based they are helped to actively seek to collaborate with a relevant industrialist in addition to their academic supervisor.
	→	**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 involves formal specification; practical programming and written material. The project management part of the course is assessed by presentations during the summer, the presentations being based on the techniques learned in the project management course and applied to the summer project in which the students are engaged. Finally, the project is assessed by written report.

D: Skills and other attributes		
Transferable skills (able to): 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. Develop and deliver coherent presentations 6. Work effectively both independently and to contribute to the cohesiveness of the group	→	**Teaching/learning methods and strategies:** 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. 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. 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. Presentations form part of the assessment process for one of the courses.
	→	**Assessment:** Time management is not assessed directly; however, it is an implicit part of coursework, and explicitly a part of project work. A requirement to communicate ideas and describe the structure and efficacy of practical solutions are spread throughout the course in all forms of assessment. Data analysis is assessed through coursework and through project work. The ability to address foundational issues within the area of computational statistics and machine learning, to research those problems and to present that research are key components of the assessment of courses.

The following reference points were used in designing the programme:

- the Framework for Higher Education Qualifications (http://www.qaa.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 David Barber
Date of Production:	2007
Date of Review:	April 2008
Date approved by Head of Department:	TBA

Date approved by Chair of Departmental Teaching Committee:	TBA
Date approved by Faculty Teaching Committee	TBA