Board of Studies

Course Proposal Template

PROPOSED COURSE TITLE: Machine Learning Methods for Data Science

PROPOSER(S): Nigel Goddard and Amos Storkey

DATE: 1st March 2016

SUMMARY

This template contains the following sections, which should be prepared roughly in the order in which they appear (to avoid spending too much time on preparation of proposals that are unlikely to be approved):

1. Case for Support
– To be supplied by the proposer and shown to the BoS Academic Secretary prior to preparation of an in-depth course description

1a. Overall contribution to teaching portfolio

1b. Target audience and expected demand

1c. Relation to existing curriculum

1d. Resources

2. Course descriptor
- This is the official course documentation that will be published if the course is approved, ITO and the BoS Academic Secretary can assist in its preparation

3. Course materials
- These should be prepared once the Board meeting at which the proposal will be discussed has been specified

3a. Sample exam question

3b. Sample coursework specification

3c. Sample tutorial/lab sheet question

3d. Any other relevant materials

4. Course management

- This information can be compiled in parallel to the elicitation of comments for section 5.

4a. Course information and publicity

4b. Feedback

4c. Management of teaching delivery

5. Comments

- To be collected by the proposer in good time before the actual BoS meeting and included as received

5a. Year Organiser Comments

5b. Degree Programme Co-Ordinators

5c. BoS Academic Secretary

[Guidance in square brackets below each item. Please also refer to the guidance for new course proposals at http://www.inf.ed.ac.uk/student-services/committees/board-of-studies/course-proposal-guidelines. Examples of previous course proposal submissions are available on the past meetings page http://web.inf.ed.ac.uk/infweb/admin/committees/bos/meetings-directory.]

SECTION 1 – CASE FOR SUPPORT

[This section should summarise why the new course is needed, how it fits with the existing course portfolio, the curricula of our Degree Programmes, and delivery of teaching for the different years it would affect.]

This is a proposal for an online version of IAML, for distance postgraduate students, provisionally titled “Machine Learning Methods for Data Science”. The University is offering an expanding set of online courses in the broad area of data science, but there is no course offered yet which introduces students to a range of machine-learning methods, focussing on the methodological and practical issues. This course will start to fill that gap.

The distance learning offering will allow interested students to study in-demand topics without the constraints of campus attendance, and School staff to develop skills and experience in the development and delivery of distance education programmes, and in the support of distance education students. It will also provide the School with another opportunity to establish new relationships across industry, the public sector and academia.

1a. Overall contribution to teaching portfolio

[Explain what motivates the course proposal, e.g. an emergent or maturing research area, a previous course having become outdated or inappropriate in other ways, novel research activity or newly acquired expertise in the School, offerings of our competitors.]

The School is currently in a position to take advantage of the growing market in distance education, specifically in the area of Data Science, and compete with other educational institutions in the UK and abroad offering similar services. The target audience is professionals working in a data-intensive environment, and the School can capitalise on existing links with a wide range of small and large businesses and government agencies with which it collaborates through its various initiatives, the commercialisation unit, the EPSRC CDT in Data Science, and other relevant innovation centres.

1b. Target audience and expected demand

[Describe the type of student the course would appeal to in terms of background, level of ability, and interests, and the expected class size for the course based on anticipated demand. A good justification would include some evidence, e.g. by referring to projects in an area, class sizes in similar courses, employer demand for the skills taught in the course, etc.]

Students are expected to be primarily professionals in data-intensive industries looking to extend their expertise. Market research in early 2014 (conducted as a precursor to obtaining the University's support through the Distance Education Initiative) examined industry activities relating to Data Science. Below is a summary of the survey results relevant to distance education in the area :

- 69 responses from a number of public and private sector organisations.
- 45% of respondents would look to engage with a university to further knowledge/skills.
- Companies spanned a number of industries: Aerospace, Defence, Chemicals, Creative Industry, Education, Engineering, Energy, Financial Services and others.
- Only 1% of respondents had previously worked with a Scottish university through CPD.
- But 63% of respondents either said they were Somewhat Interested, Interested or Very Interested in such Con tinued Professional Development/Training in the future.

2011/12 HESA data indicates that the UK Informatics postgraduate sector is large, with over 16,000 students, and that there is an active area for online distance learning.

1c. Relation to existing curriculum

[This section should describe how the proposed course relates to existing courses, programmes, years of study, and specialisms. Every new course should make an important contribution to the delivery of our Degree Programmes, which are described at http://www.drps.ed.ac.uk/15-16/dpt/drps_inf.htm.

Please name the Programmes the course will contribute to, and justify its contribution in relation to courses already available within those programmes. For courses available to MSc students, describe which specialism(s) the course should be listed under (see http://web.inf.ed.ac.uk/infweb/student-services/ito/students/taught-msc-2015/programme-guide/specialist-areas), and what its significance for the specialism would be. Comment on the fit of the proposed course with the structure of academic years for which it should be offered. This is described in the Year Guides linked from http://web.inf.ed.ac.uk/infweb/student-services/ito/students.]

The course will become a core module to the PG Certificate in Data Science, Technology and Innovation (Online Distance Learning), with a planned launch date of August 2016, and to the MSc in Data Science, Technology and Innovation (Online Distance Learning), with a planned launch date of 2017; both are offered by MVM. Individual courses can be taken for those interested in comparatively modest investment in continuous professional development.

1d. Resources

Staff: The course lecturer will oversee delivery of the course. PhD students will be recruited for the functions described below.
Course content : Slides and videos for lectures of the existing IAML course may be reused (half of on-campus IAML lectures were delivered online in Semester 1 2015/16), minimising course development and preparation. However, moving these onto the online distance learning delivery platform, with the creation of additional resources as necessary will require some effort. We expect 3 - 4 person weeks are required to convert existing material and create new material as necessary, some of which is already provided by Storkey/Goddard teaching allocation for 2015/16.
Online tutorials: We expect these to be run by current or new tutors, mainly current PhD students, especially in the first few years when student numbers will be at their lowest. Tutorials will be delivered asynchronously, so they will be more like small-group online discussion fora.
Online labs: Asynchronous online labs will involve pair-programming exercises using Python. Four of these will be developed – RA resource is already allocated to creat at least one and probably all four.
Formative coursework: each online lecture will have an associated online self-assessment quiz. Half of these have been developed, 8 remain to be created at about three hours each. During delivery there will need to be some tutor assistance.
Summative coursework: we aim for assignments and exams to be marked by the course lecturer if numbers are low, with PhD student assistance if numbers increase, as for on-campus courses.
Exam preparation: the exam will be written by the course lecturer, and marked as for IAML by the lecturer, with assistance from PhD students if numbers increase. If possible we will use the same exam as for the on-campus course, see below.
Exam delivery: We will follow the practice established by online IVR in this session (15/16). This authors the exam in the Question Mark online environment provided by the University. The student takes the exam on their computer, with remote invigilation by Proctor U. Proctor provides a webapp through which the Question Mark exam is delivered to the student. Proctor require the student to use a webcam and microphone throughout the exam, which is used to monitor the student and the room they are in. Proctor also assays the keyboard interaction to verify that a second party is not using the keyboard at any time. We will schedule the exam in Proctor U to overlap with the on-campus IAML exam time, to avoid opportunities for students to communicate about the exam outside the invigilated setting.
Student interaction: it is important that distance learning students feel a part of both the School and University. Resources are therefore required to engage with and encourage them to work closely with the course team, and to link to peer-to-peer support via the Learn and School social platforms, discussion forums, and specific course activities such as labs, tutorials and formative coursework.
Coursework resources: We will use the Learn platform for self-assessment quizzes. For online labs and coursework we will use iPython available on DICE and give students instructions on how to install it locally. For video production and delivery, we will use IS platforms.

Credit Resources: the course will generate income for the school in proportion t student numbers (as with all MSc courses): 80% of the course fee, which for MVM courses is £1445 for a 20 point course or £725 for a 10 point course. In future we may look to move these courses to the Science and Engineering structure, which attracts a slightly higher fee (£880 for 10 points).

SECTION 2 – COURSE DESCRIPTOR

[This is the official course descriptor that will be published by the University and serves as the authoritative source of information about the course for student via DRPS and PATH. Current course descriptions in the EUCLID Course Catalogue are available at www.euclid.ed.ac.uk under 'DPTs and Courses', searching for courses beginning 'INFR'*]*

2a. Course Title *[Name of the course.]*:

Machine Learning Methods for Data Science

2b. SCQF Credit Points:

[The Scottish Credit and Qualifications Framework specifies where each training component provided by educational institutions fits into the national education system. Credit points per course are normally 10 or 20, and a student normally enrols for 60 credits per semester. For those familiar with the ECTS system, one ECTS credit is equivalent to 2 SCQF credits. See also http://www.scqf.org.uk/The%20Framework/Credit%20Points.]

20?

SCQF Credit Level:

[These levels correspond to different levels of skills and outcomes, see http://www.sqa.org.uk/files_ccc/SCQF-LevelDescriptors.pdf At University level, Year 1/2 courses are normally level 8, Year 3 can be level 9 or 10, Year 4 10 or 11, and Year 5/MSc have to be level 11. MSc programmes may permit a small number (up to 30 credits overall) of level 9 or 10 courses.]

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[While a course may be available for more than one year, this should specify when it is normally taken by a student. "5" here indicates the fifth year of undergraduate Masters programmes such as MInf.]

Also available in years: 1/2/3/4/5/MSc

Different options are possible depending on the choice of SCQF Credit Level above: for level 9, you should specify if the course is for 3rd year undergraduates only, or also open to MSc students (default); for level 10, you should specify if the course is available to 3rd year and 4th year undergraduates (default), 4th year undergraduates only, and whether it should be open to MSc students; for level 11, a course can be available to 4th and 5th year undergraduates and MSc students (default), to 5th year undergraduates and MSc students, or to MSc students only]

MSc

2c. Subject Area and Specialism Classification:

[Any combination of Computer Science, Artificial Intelligence, Software Engineering and/or Cognitive Science as appropriate. For courses available to MSc students, please also specify the relevant MSc specialist area (to be found in the online MSc Year Guide at http://web.inf.ed.ac.uk/infweb/student-services/ito/students/taught-msc-2015/programme-guide/specialist-areas), distinguishing between whether the course should be considered as "core" or "optional" for the respective specialist area.]

Data Science. Online MSc won't have specialisms

Appropriate/Important for the Following Degree Programmes:

[Please check against programmes from http://www.drps.ed.ac.uk/15-16/dpt/drps_inf.htm to determine any specific programmes for which the course would be relevant (in many cases, information about the Subject Area classification above will be sufficient and specific programmes do not have to be specified). Some courses may be specifically designed for non-Informatics students or with students with a specific profile as a potential audience, please describe this here if appropriate.]

This course is a core module for the online distance education PG Certificate in Data Science, Technology and Innovation; and the online distance education MSc in Data Science (launch 2017)

Timetabling Information:

[Provide details on the semester the course should be offered in, specifying any timetabling constraints to be considered (e.g. overlap of popular combinations, other specialism courses, external courses etc).]

To be determined as part of distance education marketing.

2d. Summary Course Description:

[Provide a brief official description of the course, around 100 words. This should be worded in a student-friendly way, it is the part of the descriptor a student is most likely to read.]

Organisations seek to make better decisions by examining their data with an aim to discovering and/or drawing conclusions about the information contained within. This course is about the principled application of machine learning techniques to extracting information from data. The main area that will be discussed is supervised learning, which is concerned with learning to predict an output, given inputs. A second area of study is unsupervised learning, where we wish to discover the s tructure in a set of patterns, i.e. there is no output "teacher signal". The primary aim is to provide the student with a set of practical tools that can be applied to solve real - world problems in machine learning, coupled with an appropriate, principled a pproach to formulating a solution.

Course Description:

[Provide an academic description, an outline of the content covered by the course and a description of the learning experience students can expect to get. See guidance notes at: http://www.studentsystems.is.ed.ac.uk/staff/Support/User_Guides/CCAM/CCAM_Information_Captured.html

Introduction to Machine Learning and its Goals. Introduction to Data and Models. Memory based methods: Decision Trees. Error functions, Minimizing Error. Regression, Logistic Regression, Neural Networks. Margin Based Methods: Perceptron, Support Vector Machines. Naïve Bayes. Dimensionality Reduction. Clustering: K-means, Simple Gaussian Mixture Models, Hierarchical Clustering. Evaluation of Performance.

We will also use a modern machine learning programming environment.

Pre-Requisite Courses:

[Specify any courses that a student must have taken to be permitted to take this course. Pre-requisites listed in this section can only be waived by special permission from the School's Curriculum Approval Officer, so they should be treated as "must-have". By default, you may assume that any student who will register for the course has taken those courses compulsory for the degree for which the course is listed in previous years. Please include the FULL course name and course code].

None. Practical Introduction to Data Science is recommended but not required.

Co-Requisite Courses:

[Specify any courses that should be taken in parallel with the existing course. Note that this leads to a timetabling constraint that should be mentioned elsewhere in the proposal. Please include the FULL course name and course code].

None

Prohibited Combinations:

[Specify any courses that should not be taken in combination with the proposed course. Please include the FULL course name and course code].

None

Other Requirements:

[Please list any further background students should have, including, for example, mathematical skills, programming ability, experimentation/lab experience, etc. It is important to consider that unless there are formal prerequisites for participation in a course, other Schools can register their students onto our courses, so it is important to be clear in this section. If you want to only permit this by special permission, a statement like "Successful completion of Year X of an Informatics Single or Combined Honours Degree, or equivalent by permission of the School." can be included.]

Maths requirements:

1. Probability theory: Discrete and continuous univariate random variables. Expectation, variance. Univariate Gaussian distribution. Joint and conditional distributions.
2. Linear algebra: Vectors and matrices: definitions, addition, m atrix multiplication, matrix inversion. Eigenvectors, determinants quadratic forms.
3. Calculus: Functions of several variables. Partial differentiation. Multivariate maxima and minima.
4. Special functions: Log, exp
5. Geometry: Basics of lines, planes and hyperplanes. Coordinate geometry of circle, sphere, ellipse, ellipsoid and n - dimensional generalizatio ns.
6. Entropy: is useful, but will be covered in the lectures

Programming requirements:

Students should be familiar with programming in a modern object-oriented language, ideally Python which is the course language.

Available to Visiting Students: Yes/No

[Provide a justification if the answer is No.]

No – this is for online distance education only

2e. Summary of Intended Learning Outcomes (MAXIMUM OF 5):

[List the learning outcomes of the course, emphasising what the impact of the course will be on an individual who successfully completes it, rather than the activity that will lead to this outcome. Further guidance is available from https://canvas.instructure.com/courses/801386/files/24062695]

On completion of this course, the student will be able to:

1. Explain the scope, goals and limits of machine learning, and the main sub-areas of the field.
2. Describe the various techniques covered in the syllabus and where they fit within the structure of the discipline.
3. Students should be able to critically compare, contrast and evaluate the different ML techniques in terms of their applicability to different Machine Learning problems.
4. Given a data set and problem students should be able to use appropriate software to apply these techniques to the data set to solve the problem.
5. Given appropriate data students should be able to use a systematic approach to conducting experimental investigations and assessing scientific hypotheses.

Assessment Information

[Provide a description of all types of assessment that will be used in the course (e.g. written exam, oral presentation, essay, programming practical, etc) and how each of them will assess the intended learning outcomes listed above. Where coursework involves group work, it is important to remember that every student has to be assessed individually for their contribution to any jointly produced piece of work. Please include any minimum requirements for assessment components e.g. student must pass all individual pieces of assessment as well as course overall].

Formative-only:

1. Online lecture quizzes
2. Tutorial exercises
3. Pair-programming lab exercises

Formative & Summative:

4. Coursework (four assignments)

Summative-only:

5. Exam

Assessment Weightings:

Written Examination: _70__%

Practical Examination: ___%

Coursework: _30__%

Time spend on assignments:

[Weightings up to a 70/30 split between exam and coursework are considered standard, any higher coursework percentage requires a specific justification. The general expectation is that a 10-point course will have an 80/20 split and include the equivalent of one 20-hour coursework assignment (although this can be split into several smaller pieces of coursework. The Practical Examination category should be used for courses with programming exams. You should not expect that during term time a student will have more than 2-4 hours to spend on a single assignment for a course per week. Please note that it is possible, and in many cases desirable, to include formative assignments which are not formally assessed but submitted for feedback, often in combination with peer assessment.]

Each of the four coursework assignments are designed to take the student 5 hours work.

The coursework assignments are a key part of the student engagement strategy for online learning, involving peer-comment and discussion which is a assessed for a small fraction of the mark (15% of the coursework mark, so 4.5% of the overall course mark).

Academic description:

[A more technical summary of the course aims and contents. May include terminology and technical content that might be more relevant to colleagues and administrators than to students.]

Syllabus:

[Provide a more detailed description of the contents of the course, e.g. a list of bullet points roughly corresponding to the topics covered in each individual lecture/tutorial/coursework. The description should not exceed 500 words but should be detailed enough to allow a student to have a good idea of what material will be covered in the course. Please keep in mind that this needs to be flexible enough to allow for minor changes from year to year without requiring new course approval each time.]

Introduction to Machine Learning and its Goals. Introduction to Data and Models. Memory based methods (e.g., Decision Trees). Error functions, Minimizing Error. Regression, Logistic Regression, Neural Networks. Margin Based Methods (e.g., Perceptron, Support Vector Machines. Naïve Bayes) Dimensionality Reduction. Clustering: (e.g., K-means, Simple Gaussian Mixture Models, Hierarchical Clustering. Boosting Approaches). Model Averaging, Mixtures of Experts. Evaluation of Performance.

Relevant QAA Computing Curriculum Sections:

[Please see http://www.qaa.ac.uk/en/Publications/Documents/SBS-Computing-consultation-15.pdf to check which section the course fits into.]

I460 Machine Learning

I400 Artificial Intelligence

Graduate Attributes, Personal and Professional skills:

[This field should be used to describe the contribution made to the development of a student's personal and professional attributes and skills as a result of studying this course – i.e. the generic and transferable skills beyond the subject of study itself. Reference in particular should be made to SCQF learning characteristics at the correct level http://www.sqa.org.uk/files_ccc/SCQF-LevelDescriptors.pdf].

N/A

Breakdown of Learning and Teaching Activities:

[Total number of lecture hours and tutorial hours, with hours for coursework assignments.]

[The breakdown of learning and teaching activities should only include contact hours with the students; everything else should be accounted for in the Directed Learning and Independent Learning hours.

The total being 10 x course credits. Assume 10 weeks of lectures slots and 10 weeks of tutorials, though not all of these need to be filled with actual contact hours. As a guideline, if a 10-pt course has 20 lecture slots in principle, around 15 of these should be filled with examinable material; the rest should be used for guest lectures, revision sessions, introductions to assignments, etc. Additional categories of learning and teaching activities are available, a full list can be found at:

http://www.euclid.ed.ac.uk/Staff/Support/User_Guides/CCAM/Teaching_Learning.htm]

Lecture Hours: _20___ hours

Seminar/Tutorial Hours: _0___ hours

Supervised practical/Workshop/Studio hours: __0__ hours

Summative assessment hours:22 hours

Feedback/Feedforward hours: __20__ hours

Directed Learning and Independent Learning hours: 138 hours

Total hours: 200 hours

You may also find the guidance on 'Total Contact Teaching Hours' and 'Examination & Assessment Information' at:
http://www.studentsystems.ed.ac.uk/Staff/Support/User_Guides/CCAM/CCAM_Information_Captured.html

Keywords:

[A list of searchable keywords.]

Data analytics

machine learning

data mining

SECTION 3 - COURSE MATERIALS

3a. Sample exam question(s)

[Sample exam questions with model answers to the individual questions are required for new courses. A justification of the exam format should be provided where the suggested format non-standard. The online list of past exam papers gives an idea of what exam formats are most commonly used and which alternative formats have been http://www.inf.ed.ac.uk/teaching/exam_papers/.]

See IAML exams and previous discussion (1d) of how the exam will be delivered.

3b. Sample coursework specification

[Provide a description of a possible assignment with an estimate of effort against each sub-task and a description of marking criteria.]

Assignments are being developed in Python, based on the IAML assignments. The format will be somewhat different to encourage peer-interaction and learning in the online setting. Each assignment will require the students to do some work and post it online for other students to comment on and discuss. The comments and discussion will attract 15% of the coursework mark, and students will be given a breakdown of the types of comments and discussion that are required (see D. Gasevic online assessment materials) – in other words students will be led through the process of learning how to make constructive and insightful interactions, which are not necessarily obvious to them. See as an example the first assignment outline document. Other assignments will use material from the existing IAML coursework.

3c. Sample tutorial/lab sheet questions

[Provide a list of tutorial questions and answers and/or samples of lab sheets.]

Tutorials: these will be based on the existing IAML tutorial questions and answers. Delivery will be via an online forum such as NB or Learn, which allows students to ask and answer questions. Students will be expected to work on the tutorials and ask and answer questions in a peer-to-peer setting. After a few days or a week, a tutor will engage in the discussion, providing guidance to students and outlining approaches to solutions. The answer sheets will be posted online after two weeks.

Labs: these will be based on existing IAML labs but converted and adapted for Python. They will feature a pair-programming format, in which students work online in pairs, sharing screens. One will be coding with the other watching and providing comments and suggestions, and the students will alternate roles. This is an established software-engineering practice which we can adapt to foster peer-to-peer interaction and learning. See the attached outline documents describing the pair-programming instructions/exercise and the first lab.

3d. Any other relevant materials

[Include anything else that is relevant, possibly in the form of links. If you do not want to specify a set of concrete readings for the official course descriptor, please list examples here.]

Sample lecture videos: http://ir.inf.ed.ac.uk/iaml/videos/7.html

Sample lecture quiz (request access from ngoddard@inf):
https://www.learn.ed.ac.uk/webapps/assessment/take/launchAssessment.jsp?course_id=_45066_1&content_id=_1606297_1&mode=view

Resources

- Books. The course textbook is Data Mining: Practical Machine Learning Tools and Techniques (Third Edition, 2011) by Ian H. Witten and Eibe Frank.
  Other good books:
  - Pattern Recognition and Machine Learning by C. Bishop
  - Elements of Statistical Learning by Hastie, Tibshirani and Friedman
  - Bayesian Reasoning and Machine Learning by D. Barber
  - Machine Learning by T. Mitchell
  - Reinforcement Learning by R. Sutton and A. Barto
- Past years' exam papers are available online. Solutions are not available.
- The lecture notes from the old Learning from Data course are useful, although they contain more mathematical detail than we are expecting for IAML.
- A Few Useful Things to Know about Machine Learning by P. Domingos

SECTION 4 - COURSE MANAGEMENT

4a. Course information and publicity

[Describe what information will be provided at the start of the academic year in which format, how and where the course will be advertised, what materials will be made available online and when they will be finalised. Please note that University and School policies require that all course information is available at the start of the academic year including all teaching materials and lecture slides.]

Course content will be served from Learn hosted by the University, initially hosting the lecture set, self-assessment quizzes, tutorials, labs and reading list. This course will be advertised alongside the MVM marketing of the PG Certificate in Data Science, Innovation and Technology programme, making relevant industries aware, etc. It should also be promoted on the Informatics website along with our other online offerings in vision and robotocs.

4b. Feedback

[Provide details on feedback arrangements for the course. This includes when and how course feedback is solicited from the class and responded to, what feedback will be provided on assessment (coursework and exams) within what timeframe, and what opportunities students will be given to respond to feedback.

The University is committed to a baseline of principles regarding feedback that we have to implement at every level, these are described at http://www.docs.sasg.ed.ac.uk/AcademicServices/Policies/Feedback_Standards_Guiding_Principles.pdf.

Further guidance is available from http://www.enhancingfeedback.ed.ac.uk/staff.html.]

We plan a rich and well-resourced level of engagement between distance education students and world-leading Informatics teaching and research staff:

- Extensive use of the School and University level virtual learning environments (VLE) such as Learn and social platform is planned.
- Course forums will allow students to ask questions to both teaching staff and to other students.
- Online peer-feedback as well as tutor-feedback is designed into all the tutorials, labs and coursework.

4c. Management of teaching delivery

[Provide details on responsibilities of each course staff member, how the lecturer will recruit, train, and supervise other course staff, what forms of communication with the class will be used, how required equipment will be procured and maintained. Include information about what support will be required for this from other parties, e.g. colleagues or the Informatics Teaching Organisation.]

The course lecturer will be responsible for management and delivery of the course. Tutors will be recruited and trained via the usual mechanisms. Additional training will be provided for the online context (Learn and other platforms), and we plan to solicit the advice of expert staff such as Prof. Gasevic to design this training. Communiction with the class will be extensive as described above. Students will be enrolled and administered as for any other non-Informatics student taking an Informatics course. Students will require DICE accounts.

The primary delivery platform for course content will be Learn. For programming, we are considering two options and will offer one or both:

1. DICE environment on students own machine. We are not sure if this is possible.
2. Virtual Box image, running in Virtual Box on students machine. This is possible.

SECTION 5 - COMMENTS

[This section summarises comments received from relevant individuals prior to proposing the course. If you have not discussed this proposal with others please note this].

A very preliminary version of this was discussed at BoS in February and March 2015, and there has subsequently been wide-ranging discussion with both machine-learning teaching staff and the School's working group on online and distance education, which has proposed guidelines for BoS to evaluate proposals for new online and distance courses.

5a. Year Organiser Comments

[Year Organisers are responsible for maintaining the official Year Guides for every year of study, which, among other things, provide guidance on available course choices and specialist areas. The Year Organisers of all years for which the course will be offered should be consulted on the appropriateness and relevance on the course. Issues to consider here include balance of course offerings across semesters, subject areas, and credit levels, timetabling implications, fit into the administrative structures used in delivering that year.]

N/A

5b. BoS Academic Secretary

[Any proposal has to be checked by the Secretary of the Board of Studies prior to discussion at the actual Board meeting. This is a placeholder for their comments, mainly on the formal quality of the content provided above.]