Course Proposal Form

Please see Page 2 for instructions on which parts of this form to complete, whom to consult with to avoid unnecessary effort, and where to send the completed form.

Proposer(s): Kobi Gal, Sharon Goldwater, Heather Yorston. Date: 10 Nov, 2019

Cover page: Basic permanent course information

Unless otherwise noted, items in this section are entered into EUCLID and **cannot** be changed without creating an entirely new course.

Course Name	Informatics 2 - Foundations of Data Science
Course Acronym *(used by the School only, e.g., for the Sortable Course List)*	INF2-FDS
Course Level If the course is **only** available to MSc students, then it must be classed as Postgraduate. All other courses, regardless of level, are Undergraduate.	_x_ Undergraduate __ Postgraduate
Normal Year Taken	__UG1 _x_UG2 __UG3 __UG4 __UG5 __MSc
Also available in years *[This can be changed later if need be.]*	__UG1 __UG2 __UG3 __UG4 __UG5 __MSc
SCQF Credit Level Level 8 should normally be used for pre-honours courses. Level 10 should normally be used for optional UG3 courses (so UG4 students may also take them) and for courses aimed mainly at UG4 students. Level 11 should be used for courses aimed mainly at MSc students, whether or not UG4 students can also take them.	__7 _x_8 __9 __10 __11
SCQF Credit Points	__10 _x_20 __40 __60 __80 __Other:
Delivery Location	_x_ Campus __On-line Distance Learning
Course Type	_x_ Standard (default) __Dissertation __Online Distance Learning __Other (specify: Placement, Student Led Individually Created Course, Year Abroad)
Marking Scheme By default, courses use a numerical marking scheme. If you wish to use a grade-only marking scheme, your course proposal below should justify this.	_x_ Standard (numerical) __Letter grade only

Guidance for remaining sections:

For an initial course proposal, please complete the **cover page and Section 1 (Case for Support)**, which asks you to describe the need for this course and to provide an overview of the course design, including the learning outcomes. **Please discuss your plans as early as possible with the head of Curriculum Review to avoid unnecessary effort.**

Send the form with these sections completed to the BoS Academic Secretary and head of Curriculum Review (listed on the BoS page) to obtain their comments before filling out the remainder of the form.

If a full proposal is invited, please complete the remaining sections and send to **iss-bos@inf.ed.ac.uk**.

2. Student-facing course description and additional feedback and assessment information.
This section provides most of the information students see in the DRPS entry for this course, as well as related details for BoS consideration.

3. Further information for BoS consideration: sample materials.

4. Additional Course Details required for DRPS. *[Administrative information such as delivery timing and prerequisites.]*

5. Placement in degree programme tables. *[Required for all level 9-11 courses; used to determine where the course will be added to existing degree programme tables.]*

6. Comments from colleagues. *[All course proposal should be sent to relevant colleagues in the area as well as to the appropriate year organizer and BoS Academic Secretary for comment in good time before the BoS meeting. Use this section to indicate what feedback has been solicited and received.]*

Colour coding and item-by-item guidance:

Guidance is provided in italics for 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 but note that the proposal form was updated in Jan 2019.

Sections in gold are for student view and are required before a course can be entered into DRPS. You must complete these sections even if your course has already been approved based on other documentation.
Sections in orange are for School use but are still required for all courses (even those that have already been approved based on other documentation).
Section in gray are for consideration by the Board of Studies. They are normally required for all new course proposals but may be omitted in some circumstances (e.g., for invited course proposals) if you obtain permission in advance.

1. Case for support

This section is for consideration by the Board of Studies. The final two boxes (Learning Outcomes, Graduate Attributes) will also go into the student-facing course description.

Overall contribution to teaching portfolio and relation to existing curriculum

Please explain (a) what motivates the course proposal (e.g. a previous course having become outdated/inappropriate, an emergent or maturing research area or new research activity in the School, offerings of our competitors) and (b) how it relates to existing courses and degree programmes (including any prerequisite courses). Every new course should make an important contribution to the delivery of our Degree Programmes.

This course is part of the new pre-hons curriculum and will run as a long thin course throughout UG2. Its goal is to introduce foundational technical concepts from data science (e.g., tabular data, exploratory data analysis, basic inferential statistics and machine learning) using an approach that is more integrated with practical and real-world issues (common tools, visualisation, ethical implications) than our current courses where some similar technical content is taught (e.g., Inf1-DA, PwA, Inf2B-Learning).

The coverage of machine learning techniques will be different, and somewhat less, than in Inf2B-Learning. This is not a problem because most students also take IAML, and nearly all topics in Inf2B are also covered in IAML. We aim to reduce this redundancy.

Inferential statistics are covered briefly in Inf1-DA but more time will be spent here, with a much broader variety of examples, using simulations to emphasize the importance of randomness and sampling. Inf1-DA also discusses relational databases and relational algebra. This course will cover some material from these topics, but with a less formal and more practical focus: in particular, we plan to use Python packages such as Pandas that support dataframes, and discuss dataframe operations such as selection and join, as well as how to effectively organize data (e.g., Tidy Data).

The course will have a co-requisite of either Discrete Mathematics and Probability (the updated version of DMMR), or Probability (10 credit Maths course). Both are taught in semester one. See below for how this is accommodated in the course structure.

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

Required UG2 course, likely enrolment 300ish (depending on UG1 intake)

Anticipated Resource Requirements

Estimate how much lecturing, tutoring, exam preparation and marking effort will be needed in steady state, and any additional resources needed to set the course up initially. Provide estimates relative to class size where applicable and discuss how support staff will be recruited and supervised, if the class is likely to be very large. Please mention any scaling limits due to equipment or space. If equipment is required, say how it will be procured and maintained.]

Exam marking: standard tariff

Quiz marking: we them to make this multiple choice/fill-in-the blank to reduce marking burden, so should take only 5-8 min per paper.

Formative feedback: we will probably have students work in groups of 2-3 for the formative assessment, and may also include peer feedback. Both of these should reduce marking considerably.

Marking final projects: This will likely require 1/2hr per report, even if length is limited and with a good rubric and markers.

Rooms:

Following discussion of space constraints at last BoS, we do not plan to use specific booked lab times but instead will aim to schedule TA hours for drop-ins, possibly in a lab or possibly in some other room of AT.

We also investigated availability of teaching studios. These are in high demand (booked 48-80% of the time) but there are 9 such rooms in the Central Area with capacity 40-60 students (12 with 36-60). With a class size of ~320 next year (hopefully decreasing slightly after that), we would need 8-9 groups of this size per week, at 1.5hr each (which we hope could be booked back to back for efficiency). This means 14 hours of bookings per week, which I think should be feasible given the large number of possible rooms. (The above figures are for rooms with tables and chairs; there are fewer rooms with group workstations so probably we should assume students work on paper or bring their own laptops).

Tutors: The workshop-style tutorials will require fewer tutors than standard tutorials, but tutors will need to be more experienced: we anticipate using primarily teaching staff, including University Teachers. We hope to do this allocation largely at duties allocation time rather than through the normal tutor allocation process, in order to ensure appropriate staffing.

Quotas, special arrangements or unusual characteristics

Please specify if this course requires any special arrangements such as quotas or other registration arrangements; is a collaboration with another school or institution, or has other atypical characteristics that may affect finances or student registration. Further justification/information may be requested for such courses.

We will need to book teaching studios and tutors for a fixed expected course size. Both of these will be extremely difficult to increase at the last minute due to low availability, so I suggest that we limit the course to Informatics single and joint degree students as this seems to be easier than getting a fixed size quota. Alternatively, we could put a quota and allow some outside students to register.

Narrative description of the course aims and structure

Please describe the main goals of the course and how the course design will allow students to achieve those goals. This section should be consistent with the student-facing information provided below, but should provide additional information to help colleagues at BoS understand the vision and structure of the course. This description may refer to the learning outcomes and graduate attributes (next two boxes) and should explain how activities such as tutorials, labs, or in-lecture activities will support them, and how the proposed assessments will assess them.

For courses that are important pre-requisites for other courses, this section may also provide content/syllabus information which is too detailed for the student-facing description, such as a lecture-by-lecture syllabus.

The course will have a co-requisite of either Discrete Mathematics and Probability (the updated version of DMMR), or Probability (10 credit Maths course). Both are taught in Sem1. Therefore during Sem1 this course will focus on topics that do not require probability theory, and Sem2 will build on the concepts with additional methods that do rely on probability theory. The idea of introducing statistical concepts before introducing probability is not new: a similar syllabus is described in Gelman and Nolan's 'Teaching Statistics' book and is also used by Berkeley's Data 8 course, with an open-source textbook and materials that we plan to draw on.

The course will use Python-based tools (e.g., Pandas, Seaborn, Jupyter notebooks). Case studies will introduce some of the major themes of the course, including sampling bias and other potential ethical issues. Students will also be guided in critical thinking and writing skills, for example through reading and discussion of data science articles and peer feedback on short writing exercises, to help prepare them for a mini-project with report.

We plan to hold 1-2 hours of lecture per week (no more than 3 in every 2 weeks), plus 1.5 hour workshop-style weekly tutorials for discussion and/or paper exercises. A lot of the work for the course will be lab-based but we are not sure yet whether labs will be scheduled or just have drop-in help available.

1. Data wrangling and exploratory data analysis

- Working with tabular data (selecting rows and columns, joining tables, Tidy Data)
- Visualization of numerical and categorical data (histograms, scatterplots, line and bar charts, transforms; how to use color/style/markers, clutter vs clarity)
- Descriptive statistics (mean, median, mode, percentiles, standard deviation)
- Linear regression and correlation (descriptively) (MSE and optimization, difference between correlation and causation)
- High dimensional data (PCA for dimensionality reduction and visualization)
- k-means clustering (similarity measures, feature transforms)

2. Supervised machine learning

- Classification: k-nearest neighbors
- Regression: linear regression (now for prediction, also show how feature transforms apply here; warning about interpreting coefficients)

- Generalization and regularization (train/dev/test, motivated by choices of similarity measures, feature transforms, etc. Also discuss potential differences between scientific practice, competitions, and real-world use.)

--------- Topics below here rely on probability theory -------

- Logistic regression (probabilistic modelling, optimization)

3. Statistical inference

- Randomness, simulation and sampling
- Confidence intervals, law of large numbers (error bars: difference between standard deviation and confidence interval)
- Randomized studies, hypothesis testing (focusing on the concept rather than on lots of specific tests)

4. Ethics, context, and meta-skills (Interspersed, discussed using case studies during lecture time and/or workshops)

- Where does data come from? (Sample bias, licensing and/or privacy issues)
- Visualization: misleading plots, color and accessibility
- Classification: algorithmic bias, discrimination
- Evaluation and use: error analysis; differences between development and deployment; does using the system change the data distribution?
- Advantages and disadvantages of Notebooks; when to move to a real program
- Scientific communication; structure of a lab report
- Reading and critique of data science findings/articles; role of baselines and controls, claims and evidence (can we conclude X?)

Summary of Intended Learning Outcomes (MAXIMUM OF 5)

List the learning outcomes of the course. These must be assessable (i.e., observable), so must specify what the student should be able to do concretely, not simply what they should "understand". Use concrete verbs that indicate (a) what type of assessment would be appropriate, and (b) what level of knowledge/thinking is expected (from recall to analysis to novel creation). ***Example verbs:*** *define, explain, implement, compare, justify. Assessments (described later) should be tied to the learning outcomes.*

Outcomes should typically focus more on the types of thinking/skills developed than on the detailed course content, and the level of thinking should be appropriate to the level of the course: outcomes for a Level 11 course should include more higher-level thinking skills than for a Level 8 course. Further guidance on writing learning outcomes can be found at https://www.ncl.ac.uk/ltds/assets/documents/res-writinglearningoutcomes.pdf

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

1. Describe and apply good practices for storing, manipulating, summarising, and visualising data.

2. Use standard packages and tools for data analysis and describing this analysis, such as Python and LaTeX.

3. Apply basic techniques from descriptive and inferential statistics and machine learning; interpret and describe the output from such analyses.

4. Critically evaluate data-driven methods and claims from case studies, in order to identify and discuss a) potential ethical issues and b) the extent to which stated conclusions are warranted given evidence provided.

5. Complete a data science project and write a report describing the question, methods, and results.

Graduate Attributes, Personal & Professional Skills

List the personal attributes and generic transferrable skills this course will help develop. Examples include

Cognitive skills: *problem-solving, critical/analytical thinking, handling ambiguity*

Responsibility, autonomy, effectiveness: *independent learning, self-awareness and reflection, creativity, decision-making, leadership, organization and time management, flexibility and change management, ethical/social/professional awareness and responsibility, entrepreneurship*

Communication: *interpersonal/teamwork skills, verbal and/or written communication, cross-cultural or cross-disciplinary communication*

2. Student-facing course description and additional feedback and assessment information

Except where noted, all fields are required and will go into the DRPS entry for the course (for use by students). Important: any text in DRPS is effectively a contract with students, so should not include details that are likely to change from year to year.

Summary 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. If this course replaces another course, please say so in this summary.*	This course introduces students to a core set of knowledge, skills, and ways of thinking that are needed for data science. It brings together several strands: mathematical and computational techniques from statistics and machine learning; practical work with toolchains for data wrangling, analysis, and presentation; critical thinking and writing skills needed to evaluate and present claims; and case studies prompting discussion of the real world implications of data science.
Keywords *Give a list of searchable keywords.*	data science, statistics, machine learning
Course Description *A more detailed student-facing description of the course, which should normally include (a) a more in-depth academic description of the learning aims, nature and context of the course, (b) a rough outline of the content or syllabus, often as bullet points, and (c) a description of how the course will be taught, how students are expected to engage with their learning and how they will be expected to evidence and demonstrate their achievement of the intended learning outcomes.]*	The course will be delivered through a combination of lectures, workshops, and practical labs; students will be expected to complete both pencil-and-paper and programming-based exercises on their own time as well as during workshops and scheduled labs. Students will complete a data science mini-project to assess their practical and writing skills, and will also sit an exam. Technical topics in the course will be covered in three sections, with indicative topics listed below. Practical aspects of these will use a Python-based ecosystem. 1. Data wrangling and exploratory data analysis • Working with tabular data • Descriptive statistics and visualisation • Linear regression and correlation • Clustering 2. Supervised machine learning • Classification • More on linear regression; logistic regression • Generalization and regularization 3. Statistical inference • Randomness, simulation and sampling • Confidence intervals, law of large numbers • Randomized studies, hypothesis testing Interleaved with these topics will be topics focusing on real-world implications (often using case studies), critical thinking, working and writing skills. These may be introduced in lecture but will often include a workshop discussion and/or peer review of written work. Indicative topics include:

	A. Implications: • Where does data come from? (Sample bias, data licensing and privacy issues) • Visualisation: misleading plots, accessible design • Machine learning: algorithmic bias and discrimination B. Thinking, working, and writing: • Claims and evidence: what can we conclude; analysis of errors • Reproducibility; programming "notebooks" vs modular code • Scientific communication; structure of a lab report • Reading and critique of data science articles
Assessment Weightings: *These should correspond approximately to the proportion of learning outcomes that each component assesses. More than 30% coursework requires specific justification.* *The expectation for a 10pt course is 20% coursework with the equivalent of one 15-20hr assessed assignment (but possibly split into smaller pieces). See 'components of assessment' below.*	Written Exam _60_% Practical Exam _____% (*for courses with programming exams)* Coursework _40__%
Further Assessment Information *Provide any further information that should go on DRPS for students. E.g., if the assessment includes required group work or if students must pass some individual component of assessment as well as the course overall.*	
Components of assessment and time spent on assignments (for BoS only) *If not already included in the course narrative description, please describe the type of assessments (oral presentation, report, programming, etc) and **how each component of assessment will assess the intended learning outcomes**. 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.* *Also estimate **how many hours** students will spend on assignments. Please see the School policy on Workload and Assessment, which states that students should not be expected to spend more than 6-7 hrs/wk per 10 credits, including contact hours.* *Note that it often desirable to include formative assignments which are not formally assessed but*	Likely two assessed courseworks: (1) in-class quiz at the end of semester 1, worth 10% - this will focus on basic technical skills including Python, to make sure students are prepared for the formative and later summative projects. The quiz could be modelled to some extent on midterm/final exams from Berkeley's DS100, which include multiple choice and fill-in-the-blank questions to test that students can read code and do basic manipulations using dataframes, since the coding style is very dense. (There are also questions on many other topics that we could consider modifying for our use.) (2) final project in semester 2, worth 30%.

submitted for feedback, often in combination with peer assessment.	
Feedback Information *Provide a high-level description of how and what type of feedback will be provided to students, for inclusion in DRPS.*	Students will receive feedback from instructors and/or peers during workshop discussions and on at least one formative assessment similar to the final written assignment.
Additional Feedback Information (for BoS use only) *If not already included in the course narrative, provide further details on planned feedback arrangements. This includes how course feedback is solicited from the class and responded to, as well as what feedback students will get (either on work that contributes to their final mark, or not).* *The University is committed to a baseline of principles regarding feedback that we have to implement at every level, and the School encourages submission of at least one piece of written work for formative feedback.* *In general, formative feedback:* • *Should say how students can improve.* • *Need not be on individual work (e.g., consider a lecture or document summarizing common issues.)* • *Can include oral feedback during labs/tutorials* • *Can include feedback from peers* • *Clickers/TopHat/equivalents can provide in-class feedback for both students and lecturer.* • *Is returned in time for other forms of assessment to which it relates, to allow feedforward.*	Since there's no S1 exam, we also plan to have a formative mini-project due near the end of the S1 exam period which would probably be done in groups of 2-3 students. This would allow students to present some exploratory data analysis and simple machine learning in a report style similar to the final project. Students will also be expected sometimes to bring work to the workshop groups for peer review/discussion.

Breakdown of Learning and Teaching Activities

State how many hours students spend on each part of the course. The total should be 10 x course credits, but please also see the School policy on Workload and Assessment.which states that students should not be expected to spend more than 6-7 hrs/wk per 10 credits, including contact hours.

Assume 10 weeks of lectures slots and 10 weeks of tutorials, but these need not all be used. As a guideline, a 10-pt course typically has 18-20 lecture hours, but should have only around 15 lectures of examinable material; the rest should be used for guest lectures, revision sessions, introductions to assignments, etc.

Contact hours

Hours	Type
30	Lecture Hours
	Seminar/Tutorial Hours
	Dissertation Project Supervision Hours
27	Supervised practical/Workshop/Studio hours
	Feedback/Feedforward hours
2	Summative assessment hours
	Revision Session Hours

Non-contact hours

Hours	Type
141	Directed Learning & Independent Learning hours

Total hours: 200

Reading List/Learning Resources

You are encouraged to create resource lists using LEGANTO

3. Further information for BoS consideration: sample materials

A full proposal for a new course must include examples of exercises and assessment. Please provide these below, along with publicity information if the course is to be advertised outwith the School.

Course information and publicity *The course web page (typically the Learn landing page) will be linked from the Sortable Course List, and information such as timetables and assignment deadlines must be made available prior to the start of the academic year. Please specify here if any additional info/publicity is needed for your course: typically only if it is aimed largely at non-SoI students.*	Not needed.
Sample tutorial/lab sheet questions *Provide a list of tutorial questions and answers and/or samples of lab sheets. These need not be fully fleshed out but should indicate what sort of exercises will be provided to help students learn the material.*	
Sample assessment materials *If the course is primarily assessed by **exam**, provide a sample exam question with model answers. Any non-standard exam format must be justified. The online list of past exam papers gives an idea of typical and alternative exam formats: http://www.inf.ed.ac.uk/teaching/exam_papers/.* *If the course is largely or primarily assessed by **coursework**, provide a sketch of a possible assignment with an estimate of effort against each sub-task and a description of marking criteria.*	See attachment for exam questions.
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.*	

4. Additional Course Details for DRPS

Except where otherwise noted, these fields are required for entry into EUCLID and will be visible to students in the DRPS entry.

Planned Academic Year of Delivery *(The first year you anticipate the course running, e.g. AY 2019-20)*	2020-21
Course Organiser *(By default, the course proposer)*	TBD following duties allocation
Intended Delivery Period	___Semester1 ___Semester 2 _x_Full Year ___Summer ___Other (please specify):
Timetable considerations/conflicts *For School use. Please specify any constraints to be considered (e.g. overlap of popular combinations, other specialism courses, external courses etc). Include whether the semester delivery is constrained or could be flexible.*	Avoid conflicts with all Inf2 courses, DMP, and with UG2 courses required/suggested on joint degrees.
Is this course available to visiting students?	___Yes (default) _x_No **If no, please provide a justification here:** First year of delivery, need to work out problems with as small a class as possible initially.
Required pre-requisite courses *Use sparingly: these are enforced in PATH and can only be waived by approval from the School's Curriculum Approval Officer. Note that cross-year required pre-requisites may prevent MSc students from registering; consider using recommended pre-requisites or "other requirements" instead.*	___No _x_Yes (please specify full course name(s) and code(s)): Informatics 1 - Introduction to Computation (INFR08025) AND Informatics 1 - Object Oriented Programming (INFR08029) AND Introduction to Linear Algebra (MATH08057)
Recommended pre-requisite courses	___No _x_Yes (please specify full course name(s) and code(s)): Calculus and its Applications (MATH08058)

Required co-requisite courses *Specify any courses that must be taken in parallel with the existing course. Note that this leads to a timetabling constraint that should be mentioned elsewhere in the proposal.*	___No _x_Yes (please specify full course name(s) and code(s)): Discrete Mathematics and Probability (new course, add code when available) OR Probability (MATH08066)
Prohibited Combinations *Specify any courses that may not be taken in combination with the proposed course].*	_x_No ___Yes (please specify full course name(s) and code(s)):
Other Requirements/Additional Information *This information is often used by MSc students and students from other Schools to see if they have appropriate background without having done our School's courses. So please avoid course titles, instead list specific knowledge and skills (such as mathematical concepts, programming ability or specific languages, etc).* *Also list any other constraints on registration, for example: "Only available to 4th Year Informatics students including those on joint degrees." or "This course is open to all Informatics students including those on joint degrees, and to students in the School of Mathematics. Other external students whose DPT does not list this course should seek permission from the course organiser."*	___No _x_Yes (please specify): To be finalized: please check before going live. Ideally: "Only available to Informatics students, including those on joint degrees". Alternatively, we need a course quota due to space in rooms, and the following: Students should have at least two semesters of programming experience and a course on linear algebra (familiarity with vectors, matrices, and their operations). Students should also be comfortable with the concepts of derivatives and integrals (from calculus) and be able to differentiate and integrate single variables. In addition, the second semester of this course assumes familiarity with basic probability theory (computations with conditional and joint probabilities, Bayes' Rule, common discrete and continuous distributions) so students should have taken a course in probability or complete one during the first semester of this course.
Visiting Student Pre-requisites	_x_Same as "other requirements" ___Different than "other requirements" (please specify):

5. Placement in degree programme tables: for level 9-11 courses only

This section is for consideration by the Board of Studies and will be used later by ITO to determine where the course will be added to existing degree programme tables.

Is this course restricted to students on a specific degree? *E.g., some courses are only available to students on a specific CDT or MSc.*	___No ___Yes (please specify and provide justification):
Is this course compulsory for students on any degree(s)?	___No ___Yes (please specify and provide justification):
Any issues for part-time students? *Normally, part-time students have access to the same courses as full-time students on the equivalent degree. If you anticipate any problems with this, please specify here.*	

For optional courses:

If this course is available but non-compulsory for students on various degrees (most courses), please fill in this section. The choices here determine where the course appears in degree programme tables (DPTs) and the 2-3 character tags are displayed in the Informatics sortable course list.

Should this course be tagged as 'ML' (machine learning foundations and methods)? *Courses with the ML tag are typically very high-demand and most degrees limit the number of ML credits. If your course might appeal to a similar audience but draw off students from these large courses, please select 'no' and choose one of the tags below.*	__No __Yes
If you chose 'no', please choose at least one of the following tags… *Ideally, select exactly one, unless there is a good argument for more than one. These three are used in various combinations for many of our degrees.*	__**FSS** (CS foundations, systems, and software) __**AIA** (artificial intelligence applications and paradigms) __**COG** (cognitive science: including HCI and NLP courses, but not most other AI courses. Please restrict to courses most relevant to natural cognition.)
…and also tick if any of the following tags or categories apply. *Do not tick any of these if you selected 'ML' already.*	__**NS** (natural systems: e.g., computation by or about biological or social systems. Many COG courses are also NS. This tag is mainly relevant for MSc in Informatics.) __**SE** (software engineering: including courses that are highly relevant to SE degrees. All SE courses should also be FSS. This tag is mainly relevant for UG SE degrees.)

	__Databases and data management systems (used for Data Science MSc and MSc(R)) __Unstructured data and applications (used for Data Science MSc and MSc(R)) __Level 11 Security courses (used for Security MSc)
If you are not sure which tags are most appropriate or have other questions about this section, please note any comments/issues here.	

6. Comments from colleagues

All course proposal should be sent to relevant colleagues in the area as well as to the appropriate year organizer and BoS Academic Secretary for comment in good time before the BoS meeting. Please indicate here what feedback has been solicited and received.

Additional Comments *Summarise any comments received from relevant individuals prior to proposing the course. If you have not discussed this proposal with others please note this.*	Comments from Steve Renals about transitioning from Notebooks to real programs are incorporated above in the Thinking, Working, and Writing part. We also took into account comments from Iain Murray about which methods of ML are most critical and about understanding confidence intervals. Ian Stark said the preliminary proposal looked good. Issues about space raised by Jane are now addressed as much as possible. Other comments about content/delivery at the initial BoS meeting were all positive.
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.]*	Rik writes that overall the proposal looks good. "Good to see that it has a component on confidence of statistical inference. I feel this general importance of rigor of statistical inference should get some emphasis. That is, other than how to compute confidence intervals, some discussion of why "confidence" of an inference is important, why not knowing confidence of an inference can be bad with examples etc."
BoS Academic Secretary Comments *Proposals must 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.*	