

## Informatics Student Course Feedback 2017/18

<http://www.inf.ed.ac.uk/teaching/surveys/2017-18>

This report contains feedback from students about a course taught in the School of Informatics during the 2017/18 academic year, in response to the following questions:

- What would you say to students interested in taking this course?
- What did you find most valuable about the course?
- What improvements, if any, would you make to the course?
- Please add any other comments you have about workshops and tutors

Each course organiser receives this report as well as statistics on multiple-choice responses. All these reports, together with student feedback about individual members of teaching staff, are collected and sent to the Director of Learning and Teaching.

Please note that these are personal responses from individual students: some courses only have a few responses and a small sample can be unrepresentative.

Stereotyping and bias, especially unconscious bias, is a serious concern in any survey gathering personal responses. All students received the rubric below before completing the surveys, and you can read a brief introduction to issues of unconscious bias on the university web pages at <http://edin.ac/2iypZBv>

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### **Rubric given to all students taking the end-of-course feedback survey**

We value your opinions on the courses you take here at the University, as they allow us to shape future delivery and development. We welcome constructive comments about your courses, whether positive or negative, and ask you to give details about any issues in order to help the course organiser to understand and address them.

We encourage you to be aware of the potential for bias in the completion of these questionnaires, so we have developed resources which may be helpful to you:

- Equality, Diversity and Unconscious Bias (<http://edin.ac/2iypZBv>)

You also have a responsibility to provide feedback in a manner which does not breach the University's Dignity and Respect Policy:

- University of Edinburgh Dignity and Respect Policy (<http://edin.ac/1Cq0VZY>)

The results of the questionnaires will never be analysed in a way that seeks to identify individual students from their responses. However, should you wish to remain anonymous, please do not identify yourself in your answers to the survey questionnaire implicitly or explicitly.

## Comments Report

What advice would you give to a student taking this course in future?

- A bit of pre-reading over the summer will go a long way (depending on your background)
- Advice would be to give the programming exercises in the notes a go early on especially if rusty like myself.
- Anyone who want to get detailed idea about ML. The one has basic math background.
- Background information worth reading carefully
- Brush up on your mathematics background.
- Do it! But be prepared to work on your maths above and beyond the lecture material. Even if you have most of the pre-requisites, you'll likely need to work some aspect of your maths to get the most out of the course.
- Do it, it's amazing. Be ready to work a lot
- Don't just try to keep up with the material, start actively studying it in case you have 2 20 credit course exams in the first 4 days of exams and an MLP deadline 8 days before the first one! Read the textbooks. Any and all exposure to the material helps, as does coding as you go.
- Have some background knowledge before move in and prepare your math to a suitable level.
- I'd encourage anyone interested in the theoretical underpinnings of machine learning to take this course, the material can be tough at times but it's really interesting and rewarding and Iain is one of the best lecturers I've had at Edinburgh uni. Saying that, only take this course if you're confident in your maths (seriously); my undergrad was maths so I was fairly confident but it's still difficult at times.
- I've been doing the MSc in Artificial Intelligence part time over 2 years, so I've been able to take IAML, MLP and MLPR; if the maths in MLPR is daunting, or if you're not very interested in the underlying mathematics and just want to focus on how to apply ML algorithms in an effective way, then IAML and MLP is a great combination. If, however, you really want to know what's going on under the hood and want to go on to develop and test new algorithms then this is a fantastic course!
- It has high demand of mathematics, but really worth taking for those who want to do research or work in machine learning area.
- It is a very interesting course with quite a lot of material covered.
- It is difficult (as mentioned explicitly in the online course description on DPRS) but very interesting and I would wholeheartedly recommend it if you're prepared to put the work in. Also, don't make the same mistakes I did: make the most of the huge range of materials provided (particularly Hypothesis) and try doing some programming as you go along!
- It's an intense course but worthwhile. In the middle of term things get crazy with all subjects and it's very easy to stop doing the tutorials for this ahead of time - don't stop! I did and definitely regret it later so I would recommend keeping a few hours a week to work on these tutorials no matter what. Also office hours are helpful and there are less people swarming Iain then after the classes.
- It's quite good but be prepared for the fact that Iain Murray really does expect you to go through worked examples in your own time, and this is pretty important to understanding some of the material.
- It's very important to understand the material of the first three weeks well and try the coding bits in the notes. It will be necessary for the assignments later.
- Keep reading and do exercises in the notes to ensure your understanding
- Lots of material. Learn it as you go along.
- MLPR is a hard course and requires high level of math and coding.
- Make sure to get caught up with maths before the course starts. It is extremely difficult to learn all the maths while learning the material too.
- Only take the course if you have a really strong math background

## Comments Report

What advice would you give to a student taking this course in future? (continued)

- Prepare yourselves for the basic math skills, familiarise yourselves with multi variable calculus, linear algebra and probability theory, so as not to waste the precious time of other students in the tutorial to help you out with the basics.
- Read Bayesian methods ahead in the notes, if you know ML basics. That way weeks 7-10 will be more manageable.
- Read and understand the notes is very important, also the help codes are also important.
- Revise and learn as much about probability and statistics as you can, and look through the notes of the previous year to understand which particular bits are extremely important. Iain Murray is the best teacher, listen to everything he says and follow his advice religiously.
- Spend more time on it
- Stay on top of the notes and ASK QUESTIONS in the forum. Iain's answers are always helpful, even if they may not seem to be directly addressing your issue.
- Stay on top of your revisions: make sure to watch the lecture recordings again even if you went to the first lecture. As the course continues to build on what was previously covered, if you fall behind you will be completely lost.
- Take Dr Murray's advice seriously about knowing the prerequisite mathematics. Also, do as many practical exercises as you can and play around with the code he gives, or better, write them yourself based on the theory you were taught in class.
- Don't ask questions from him in emails, because he likes if his answers can be seen by other students. Use Hypothesis.
- Take the course seriously, dedicate it plenty of time every week and try to solve the tutorial exercises before going to the tutorial
- The course is definitively worth taking, because it gives you the mathematical foundations and intuition behind basic and advanced machine learning models. With this math, you can learn to form relations between different models, cost functions and training procedures; and this is a really powerful skill if your plans is to push the state of the art of machine learning and create/improve new models (rather than only apply them with some library :)).
- The mathematical background required is quite intense. However, my math's background was far from perfect (I was barely able to complete week's 0 self-assessment), but if you dedicate a \*big\* amount of time to review the maths, you will be (with effort!) able to cope with the course (even if you don't get every single part of the maths they show, it is still worth it)
- The mathematical prerequisites are a baseline, read up!
- This course is really challenging.
- To be really clear with their linear algebra, and while going through the first 3 weeks, when it's still easy to catch up, prepare themselves in probability.
- To spend more time to complete each assignment because these assignments are designed very well to understand each content in the lecture.
- Try to get confident with the maths early on, and try the snippet code provided in the notes. They helped my understanding.
- Try to keep up with the material every week, as sometimes understanding of topic will take a few days
- Work step by step instead of learning all things before exam.
- Work through the statistic/ probability script in the first week. It provides a good background. For me as physicist this was enough to be able to cope with the course.
- Yes.
- You need know a lot mathematics knowledge before taking this course.

## Comments Report

What advice would you give to a student taking this course in future? (continued)

- preview the class note before each class
- To read and review lectures after them in order that you can follow the topics.
- study linear algebra and probability before the course starts

## Comments Report

What did you find most valuable about the course?

- The hypothesis forum
- Lecture recordings for viewing after the lectures
- Challenging questions and exercises in the notes. Well-designed assignments and tutorial, they were made for really understand the topics.
- Deeply delving in to machine learning with good use of maths, to explain complicated ideas.
- Detailed mathematical approaches to ML
- Each section is well organized. The course will go well if combining both slides online and lectures, as well as the forum. But unfortunately I am not so used to the forum.
- Everything. Best course I have attended in my life till date.
- Excellent lecture notes and very good teaching.
- Excellent material, demands a lot of thought. Lectures were very interesting.
- Fantastic lecturer, well-resourced with online notes, recorded lectures and interesting tutorials.
- Go through basic ideas and concepts of ML. Hand-write notes make the course comprehensive.
- Good explanations. Good course material. Interesting content.
- Great explanations from the lecturer, great lecture notes with plenty of useful material, the lecturer is very responsive on Hypothesis forum, very interesting topics covered, recorded lectures, guest lecture with real-life examples.
- How knowledgeable the teacher is and how much influence he had on me.
- How there a story along the course, connecting what one learns from a simple model to the following more complex model and so on and so on. This helps you get a perspective of where each of the machine learning models covered in the course are in, and where one could apply them to.
- How to use notes to understand questions.
- I learnt a lot about machine learning in the course, the content is very interesting and useful.
- I really enjoyed the assignment and I think it helped my understanding a lot. The examples and code snippets were always helpful and hypothesis was a very useful tool.
- Iain Murray is a brilliant teacher. Both his lecture style, and the quality of his notes are incredibly valuable. I particularly like his emphasis on "check your understanding", where he gives simple questions that really help develop about rigour and intuition. I also appreciate his encouragement to write code to check your understanding too. He's clearly thought hard about what students will find helpful, and made very reasonable suggestion. Grateful for his participation in the class forum!
- Iain Murray, He is an excellent lecturer and it is very apparent that he has a passion for teaching.
- Iain Murray, Tutorials - Borislav Ikononov
- Iain Murrays lecturing style is amazing!
- Iain is one of the most dedicated lecturers I have had at Edinburgh Uni - its obvious how much time he invests in lectures, tutorials, the forum, coursework and feedback. The lecture by John Quinn inspired me to apply for some Data Science roles for next year.

## Comments Report

What did you find most valuable about the course? (continued)

- Iain's teaching method, he's very good at guiding you through complicated concepts and helping you understand advanced topics without having a hard time and even having a few laughs. His examples are very interesting and the notes are really well made.
- Iain's teaching style was great: he introduced the topics concisely during lectures, and provided very detailed and clear notes on his forum. He was also very friendly answering our questions after lectures, during office hours, or on his forum.
- Iain's lectures are attracting.
- Iain is an engaging lecturer.
- It provided a great theoretical introductory overview of the subject and was exceptionally well taught.
- Lecture contents are very intelligible and lead me to study each of the lecture aims.
- Tutorials extend my thoughts of this subject, hard but very helpful.
- Lecturer, lecture style, notes on the website
- Lectures were perfectly organised, explanation was detailed and comprehensive. Notes are digging deep into details, provide references and all information required.
- Looking into the details of math and reasoning based on the maths made this course distinguishable, and I love it.
- Lot of material and feedback. Very well presented introduction to a complex subject.
- Mathematical skills
- Professor's insight and extra efforts
- The assignments are very useful to understand each contents in this lecture, whose questions are set properly, ranging from intermediate to high levels.
- The careful balance of the theoretical and practical aspects of Machine Learning. A broad range of topics was covered in a fair amount of depth, all teaching was of a very high quality and there were great resources provided. Overall, a very enjoyable course with a lecturer who clearly made a huge effort and has a knack for giving clear explanations.
- The course content was really concise and helped in understanding the topics on a basic level.
- The course is extremely good. Everything about it is great. 10/10.
- The course is well structured. The contents are involved and concerns a lot about the theoretical and mathematical aspects of ml, which is great.
- The explanations beyond the pure math and theory and the real world examples in the lectures. The assignment was a nice example to work on real data.
- The lectures are excellent! The lecturer is very engaging and he's very dedicated to the course and the students.
- The material was challenging and covered a wide range of Machine Learning topics, setting us up for a variety of other courses with a solid theoretical background.
- The mathematical background in machine learning and computer science.
- The professor. He was simply the best.
- The teaching style(writing on the paper in the lecture)
- The workshops

Comments Report

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What did you find most valuable about the course? (continued)

- Very wide range of content.
- all the new topics that I learned
- class notes
- Getting practice with fundamental machine learning concepts along with concise and informative notes and lectures. I especially thought the tutorials were well constructed and informative.

## Comments Report

What improvements, if any, would you make to the course?

- Another tutorial on Variational Inference and the last part of the course could be useful
- The pace of the course is somewhat strange - having done 2b/ IAML, the first part is very slow with the last couple of weeks being a flood of new information. While I understand that for masters' students this probably is easier so that they have more time to absorb the basics, the majority of new material for undergraduates is done when most other courses have coursework deadlines, which is not fun. It might be interesting to experiment with two lecture slots covering the basics each week and a third dedicated to Bayesian methods, however that will disturb the flow of the course. After week 3, we have covered all the prerequisites for Bayesian regression and Gaussian processes and we could have started those in week 4, rather than week 7. That way there is more time between lectures and we don't jump between Bayesian regression, Gaussian Processes and Variational Inference within two weeks.
- A bit more fake code or examples on how to apply the algorithms.
- A list of answers to the tricky questions asked in the notes, once the classes are done and students have had enough time to think about them. It's slightly time taking to read the discussions on hypothesis, especially when you are revising.
- All recordings work.
- An extra week in the introductory week to give an overview the basic topics of Machine Learning like k-NN, Random Forests and SVM.
- Difficult to improve, as long as the teaching is of this high quality. Any additions would be at the cost of some other good aspect of the course.
- The one lecture / small bit of material I found less useful was on the "Netflix Prize" - in my opinion could be dropped to give a bit more time to the rest of the material.
- The topic I found most difficult to really understand from the lecture material and notes was the week 2 material on CLT, error bars and multivariate gaussians. I'm pleased this was included, but found myself needing to rely on other sources more than I did in the rest of the course.
- Have a practical once every two weeks to implement some of the things learnt.
- I can't think of anything.
- I don't think the structure of the course is clear enough.
- I honestly can't think of any!
- I know programming is a prerequisite to the course but it would be nice to 'walk through' simpler coding examples before being thrown into the more challenging assignments.
- I still recommend having some conceptual introduction before heading into each new sections. Sometimes students may just not be able to go through the notes before each class. Just some overall introductions will be fine. I have considered IAML but I do not agree to take that one if a student does not have much background knowledge in machine learning but enough math to go for this course on the other hand.
- I think I would get more advantage from the course by doing project assignments instead of a big exam at the end.
- I think the answer of "check your understanding" part in notes should be added.
- I would prefer not to have too much new material in the tutorials; I appreciate that lecture time is limited and that this may curtail the amount of material that can be covered in the course, however I feel from past courses that tutorials work best to consolidate material learnt in lectures through example questions and discussions. In my group there was only really interaction by 3 or 4 individuals (Including myself) and I think this may be because some of the tutorial questions were new material and people felt less able to take part. I understand this is a 20 credit course and people should be putting in the time to get up to speed with the tutorial material, however I felt that this may have taken away from the helping to focus on and discuss the lecture material



## Comments Report

What improvements, if any, would you make to the course? (continued)

- I would split it 60/40 exam/coursework and include a second assignment that covered later topics. Assignment solutions - Providing a concrete example of what the 100% assignment would have looked like would be very helpful when trying to figure out where marks were lost.
- Iain Murray is a very good lecturer, and he encourages questions, but he can also come across quite annoyed when it seems like a question is beneath what he expects of the students. That can encourage people to just not ask & so fall even further behind - although I think he knows this
- Include maybe one more assignment (which is graded)
- It is basically perfect, although it sometimes seems to me there is too much material. We could be also given solutions to previous exam papers.
- Labs would be useful, if lab time is not possible even releasing suggested lab sheets alongside tutorial sheets with solutions later would be a great resource.
- Although I realise that no one has control over when in the exam weeks the course is examined, it is regrettable that the exam is so early in December. It would be inaccurate not to mention that the late (and very large for 25%) MLP deadline definitely impacted the study time for this course despite best efforts, which is a shame. Many people take both although clearly the lecturer for this course could not have helped either of those things, it is more a comment for the overall Masters organisation.
- Make sure that Iain Murray teaches it forever.
- Make the notation of the notes and the one used in the lectures more similar.
- Separate tutorials by levels.
- Give grades aside from the feedback on the first mock assignment so we can get an idea of that aspect as well.
- More code for visualisation and trying things on your own. Often I felt unsure whether I had properly understood the ideas, especially the statistics and probability part.
- I feel like labs might have been more useful for this course than tutorials.
- More communication between the lecturer and students (I know it is hard because there are so many students...)
- Perhaps the notes, especially for the topics covered during the last 3 weeks of the course are a bit hard to follow. I'd like to have seen more detailed notes
- Practice more
- Sometimes I felt that the lecturer had passive-aggressive attitude -- he would comment on students doing silly things (normal part of the learning experience) and putting them down. It was done in jokes but still it made me really upset sometimes.
- I expected that lecturer would answer even simple/stupid questions without hesitation and be worried if some concepts are unclear. Because of this attitude, I decided not to actively participate in the course.
- The 1 hour tutorials are quite short in time for the exercises. More time could be useful to discuss things more in depth. Since the tutorials are mandatory it would be good to improve the learning outcome for the tutorials. For me it felt either like a superficial rush through the exercises or like stuff I already understood. I could not really see the benefit. I think the exercises itself are good. I really liked the course project. An example to apply the more advanced stuff on real data might be nice.
- The course is great as it is.
- The past of the course is good. However, given the intense work load of the other courses it is sometimes near impossible to keep up with the math's of the last weeks. Because of this a good improvement would be to either reduce the pace of the course a bit, or allow students more time to mathematically grip the last week's topics.

## Comments Report

What improvements, if any, would you make to the course? (continued)

- The tutorials are a great opportunity to ask questions in person, but my group is much too advanced which makes understanding the tutorial very difficult, let alone asking questions. Perhaps having tutorials where students work through exercises together IN the tutorial (after having worked through some ourselves) would reduce this disparity in abilities... It's quite off-putting to leave a tutorial feeling more confused than before going in.
- There are so many hard questions in notes that I cannot solve and there are not solutions available.
- There is a big gap between lecture notes and tutorial questions. I think tutorial questions are so difficult that lecture notes are useless. I hope tutorial question levels are decreased.
- add more examples for solving real problems
- slow down or divided into two semester

## Comments Report

Please add any other comments you have about workshops and tutors

- A tutor that belongs to my tutorial group is not helpful because the tutor does not explain a question that all of the groups cannot answer.
- As a general point, I often found that I didn't understand the real question being asked in tutorial questions etc, and it seemed I wasn't too alone in that. Once I understood what was being asked I fared much better, so perhaps just something to consider. My tutor Arturs Bekasovs was brilliant and had a great way of explaining the solutions and guiding the discussion.
- Feedback on assignment was largely negative even if a good mark was gotten and was often unclear what additional was required -providing a concrete example of what the 100% assignment would have looked like would be very helpful when trying to figure out where marks were lost.
- Conor did a great job.
- George Papamakarios was an excellent tutor. These sessions were my favourite time of the week.
- George Papamakarios was excellent and I appreciate that he made sure everyone was following. I thought the workshops were challenging but George's explanations were clear.
- Helped me a lot.
- I didn't attend workshops. I did find the workshop sheets and the assignments to be well thought out and interesting, and required much more reasonable amounts of time than the assignments set by other courses (from which I often found myself learning much less than MLPR assignments). In fact, if other courses made more reasonable demands, in line with MLPR (which is still challenging!) then I would have liked to put more time into MLPR.
- I feel my tutor lacked experience in explaining concepts, and often his math was more complicated than it needed to be when comparing with the given solutions
- I had tutorials with George Papamakarios, and they were amazing - he is extremely knowledgeable and able to lead the tutorials well. I also liked how he tried to motivate us to be active in the tutorials. We also had some interactive demonstrations to help us understand the topics better, and it was pretty useful. I think I learned a lot from the tutorials.
- I often get extra explanations and extension in tutorial. We often do not have enough time go through all questions. I know we will get the answer, but I prefer get them in class.
- Matt (Rounds) was a really good tutor.
- More guidance
- More specific questions involving calculations.
- My tutor Tania Bakhos, was awesome, she was willing to answer any questions and provided really good explanations for every tutorial. She even organised an extra session on a Saturday to further explain topics.
- My tutor, Conor Durkan, was very knowledgeable, and his explanations were very clear. The tutorial of Carl Allen, on the other hand, was less helpful, for example he did not give insights into how we could think about the subject better.
- My tutors George Papamakarios, was extremely well prepared and helpful to understand the tutorials problem
- Nice tutor, inspiring instructions on tutorial questions.
- Sometimes there are students who clearly haven't met the prerequisites of the course. These students sometimes ask useless questions in the tutorial and made the tutor to talk about these issues for a very long time, which makes the tutorial extremely inefficient. I hate it when I have to spend 40 minutes listening to the tutor explaining the most basic definitions in linear algebra, multivariate calculus and probability theory, again and again.

## Comments Report

Please add any other comments you have about workshops and tutors

- Tania Bakho was my tutor for this course and I had a good time for each tutorial. Each time she went through all the questions while being able to make most of the contents clear. Although I may not be able to follow every time, I would say the tutorials I had really helped.
- The tutorial exercises were really hard and took a lot of time, but they were also very helpful
- The tutorial questions were inspiring and helpful, but the tutorials didn't match the questions, most times we were stuck in the discussion to those super useless and easy and elementary calculations to take care of one or two students. That was disturbing and a huge waste of time.
- The tutorials and tutor were very well organised, repeating my comments on tutorials from the course comments: I would prefer not to have too much new material in the tutorials; I appreciate that lecture time is limited and that this may curtail the amount of material that can be covered in the course, however I feel from past courses that tutorials work best to consolidate material learnt in lectures through example questions and discussions. In my group there was only really interaction by 3 or 4 individuals (Including myself) and I think this may be because some of the tutorial questions were new material and people felt less able to take part. I understand this is a 20 credit course and people should be putting in the time to get up to speed with the tutorial material, however I felt that this may have taken away from the helping to focus on and discuss the lecture material
- The tutors who took the tutorial group I attended (Conor and Carl) were very knowledgeable and helpful. The tutorial sheets were interesting and challenging.
- They are good, however, the time allocated is too short and the math's (in that short period of time) might be too overwhelming ... perhaps longer or more slowly passed tutorials would help those with a good but not perfect mathematical background
- They need to be longer to ensure all questions can be discussed.
- They were largely helpful
- Tutor (Kamen Brestnichki) was very helpful and approachable.
- Tutor is great. But time is so limit, I could not solve all questions in tutorials.
- Tutor is very nice and good at guiding us to handle problems.
- Tutor was really helpful and took extra sessions to clear our doubts.
- Tutor wasn't very good, ill-prepared and too stressed out to effectively communicate. Spent too much time fielding and getting confused about trivial questions, and wasn't able to respond to non-trivial questions properly.
- Tutorials were well organized, the tutor was always prepared and willing to answer questions and further explaining topics. Tutorial sessions with Conor Durkan were really inspiring and helped me a lot.
- exercises were too hard to solve, it would be good idea if you
- tutor - Conor
- Helpful and approachable