Course Report AS7021 VT19

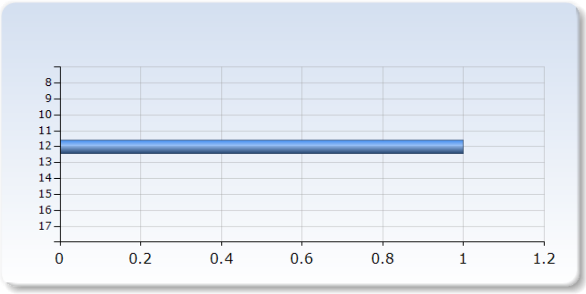
Respondents: 1
Answer Count: 1
Answer Frequency: 100.00 %

. Teacher

Teacher
Daniel Mortlock

. Number of students who took the exam

Number of students who took the exam	Number of Responses
8	0 (0.0%)
9	0 (0.0%)
10	0 (0.0%)
11	0 (0.0%)
12	1 (100.0%)
13	0 (0.0%)
14	0 (0.0%)
15	0 (0.0%)
16	0 (0.0%)
17	0 (0.0%)
Total	1 (100.0%)



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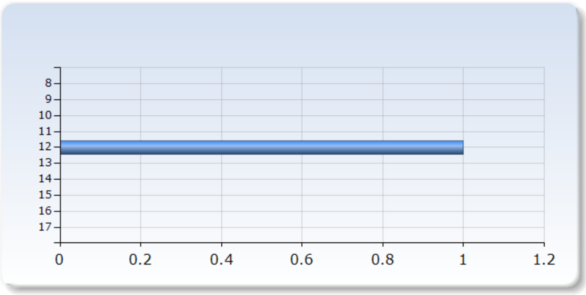

. Description of changes since the previous time the course was given.

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The Bayesian Statistics for Astronomers and Physicists course was first delivered in Spring Term of the 2016-2017 academic year; the current version, delivered in the Spring Term of the 2018-2019 academic year, was the second edition of the course.

After delivering the course the first time it was clear that the approach taken initially had been overly-theoretical, and that the range of the students' previous experience in statistics and data analysis was sufficiently broad that it would only be possible to cover a small number of core topics given the available contact hours. It was also clear that more time should be spent on examples, although the first priority remained fundamentals, as a good grounding in the basics of Bayesian statistics is what is required to apply these methods to, e.g., research problems. As such, the course as delivered in 2018-2019 had just three basic (and inter-linked) components: fundamentals of probability theory; Bayesian parameter estimation; and a computational section on Markov Chain Monte Carlo (MCMC) methods and, in particular, the Metropolis algorithm.

These changes have apparently been effective, but the very wide range of responses to the post-course survey is such that it's difficult to make generic statements about the course, and the below analysis of the course's apparent strong and weak points should both be read with this in mind.

. What are the course's strong points according to the students (summary based on the numerical results as well as their free text answers)

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Overall, it seems the best aspects of the course, at least for those students who found it useful and/or enjoyable, was the combination of fundamental theory and applied numerical methods that, together, could be used subsequently on research problems. (This was also the case the first time the course was delivered, and several students subsequently went on to use the techniques from the course in their PhD projects, resulting in refereed publications.)

A second positively-received aspect of the course was the in-class sessions where problems were analysed at a very low level, with the focus on the fundamental ideas. However, this approach is quite time-consuming, and so there was an inevitable trade-off between that and looking at a wider range of problems at a shallower level.

The students also broadly found the course to be well structured and well organised, and that they were able to get support to reach the learning outcomes.

. What are the course's weak points according to the students (summary based on the numerical results as well as their free text answers)

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The main thing that the students flagged up as a weak point of the course was the perceived gap between the theoretical material presented in the lectures, the applied questions on the problem sheets, and the assessed assignments. It was a deliberate choice to emphasise the fundamentals and underlying principles in the lectures, but clearly one that does not work for all students.

A related point is that the assignments were handed out after the relevant sections of the course were delivered, which was contrary to the expectations of some students. For the students who are used to having the assignments to work on during the lectures; a knock-on effect was that some students then had significant competing demands on their time, and weren't able to devote as much time as they'd have liked to the assignments.

. The teacher's analysis of the course

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The course was delivered broadly as planned, although some difficulties were caused by conflicts with other scheduled teaching and research activities, meaning that attendance was somewhat patchy. This was particular important in the second part of the course, on computing techniques, as this was designed around active learning during the sessions, and so self-teaching was not so effective.

It was also clear that the students taking the course had a very wide range of experience in expertise in terms of statistics, mathematics and (numerical) programming. This meant that most lectures/sessions were inevitably going to be ineffective for at least some of the students (although this was less important in the computational sessions, as the interactions were with individuals or pairs of students).

. Conclusions as well as suggestions for improvements

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The basic aim and content of the course is sound and will stay the same as it is currently, but several aspects of the structure and what is given most time in lectures will be changed.

The main area in which the course could be improved in a way that will benefit most/all students is in the coordination between the lectures and the assignments. For the next version (scheduled for the 2020-2021 academic year) the assessed assignments will be integrated with the lectures so that some of the sessions can be devoted to this material. In particular, the end-of-course assignment will be made available for the "hands on" lectures in which the students develop their MCMC code. So rather than working only on simple test problems it will be the applied problem in the assignment that is the main focus from the start.

Some of the more theoretical derivations will be replaced with more applied material, leaving the rigorous proofs and general calculations for self-study (hence effectively optional for those students who want to understand the main results from first principles). The notes will hence be modified to include such material in a complete form, rather than relying on material in the lectures.