MAS8303 Modern Bayesian Inference
Part 2

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Semester 1, 2012-3

In this second part of the module we will be looking more at applications of Bayesian inference. We will consider a number of types of model which can now be analysed within the Bayesian paradigm using modern computational methods.

1   Timetable

Times and locations of classes are as follows.

Monday	9-11	Herschel	TR1	Lecture/Tutorial
Tuesday	11-1	Herschel	TR1	Lecture
Thursday	4-5	Bedson Teaching Centre	2.40	Practical/Tutorial

2   Lectures

In most lectures, handouts will be used but these may be incomplete, requiring students to add some material by copying from the board or screen and by making their own notes. Generally, some of the more "wordy" sections will be provided on handouts. In some lectures the handout might be a summary of the main points. Some lectures may not have handouts at all. Where handouts are provided, I will also make them available on the Web at the following address.

`http://www.mas.ncl.ac.uk/~nmf16/teaching/mas8303/`

You can also find this from "Blackboard".

3   Practicals and Tutorials

There will be weekly practical classes. These are an important part of the course. We will be analysing data using R and BRugs, which is an implementation in R of the BUGS system for "**B**ayesian Inference **U**sing **G**ibbs **S**ampling." I do expect there to be examination questions which involve the use of the BUGS language. Some information will be provided on the examination paper but you will need to have the ability to use it.

You can also use the practicals as tutorials by discussing problems with me during these sessions. There should also be time during some of the lecture periods, particularly the double period on Thursday mornings, for some "tutorial" discussion. In some weeks I will need to use both hours on Mondays as lecture time but not every week. When it is not used for lecture it can be used as tutorial time. Alternatively we could use the second hour on Tuesdays in this way.

I have allocated 12-1 and 2-3 on Mondays as "Office Hours" for this module. If this is not a good time because of other classes, please let me know and I will try to find a better time.

4   Assessment

The assessment for this module is based on three elements as follows.

Coursework assignments	20%
Tests	30%
Examination	50%

You will have already had two assignments and a test in the first part of the module. There will be two further assignments and another test in this part of the module. Each assignment will count for 5% of the module mark. The test will count for 15% of the module mark. Assignments must be handed in by 4.00 pm on the dates given below, in the homework letterbox at the Mathematics and Statistics General Office, 3rd floor, Herschel Building.

Assignment	Hand out	Hand in
3	Week 7	Week 9 (Wednesday November 28th)
4	Week 9	Week 11 (Wednesday December 12th)

It is planned to hold the test in Week 11.

The examination will last two hours and will take place during the normal examination period at the end of the semester.

Late Work Policy

- **This module contains tests worth more than 10% for which rescheduling can be requested (by means of submitting a PEC form). For other coursework it is not possible to extend submission deadlines and no late work can be accepted. For details of the policy (including procedures in the event of illness etc.) please look at the School Web site**

    http://www.ncl.ac.uk/maths/students/teaching/homework/

5   Staff availability

This part of the module will be taught this year by me, Dr. M. Farrow. I work in room 3.12 on the third floor of the Herschel Building. You will have an opportunity to talk to me during the tutorials but, if you feel that it is necessary to see me at another time, then you can contact me by email, perhaps to make an appointment to see me. My email address is `malcolm.farrow@newcastle.ac.uk`. Alternatively you can come to my room without an appointment but, of course, I will not always be there. Information on when I am likely to be available is given on the notice next to the door. In particular I have allocated 12-1 and 2-3 on Mondays as "Office Hours" for this module. If this is not a good time because of other classes, please let me know and I will try to find a better time.

6   Reading List

- Gamerman, D., 2006. *Markov Chain Monte Carlo* (2nd edn.) Chapman and Hall. (R)

- Congdon, P., 2006. *Bayesian Statistical Modelling* (2nd edn.) Wiley. (B)

- Gentle, J.E., 2003. *Random Number Generation and Monte Carlo Methods* (2nd edn.) Springer. (B)

- Lee, P.M., 2004. *Bayesian Statistics: An Introduction* (3rd edn.). Arnold. (B)

- Lunn, D., Jackson, C., Best, N., Thomas, A. and Spiegelhalter, D., 2012. *The BUGS Book: A Practical Introduction to Bayesian Analysis* Chapman & Hall/CRC. (R)

7   Teaching Plan

Here is an outline of the topics which I plan to cover. There are six "Chapters" but the first of
these "Chapter 0" is more-or-less revision material. Each chapter will correspond (roughly) to a
week of term and will finish with a practical. Of course, things do not always go exactly to plan
but I hope to stick reasonably closely to this.

Chapter		Start	
0	Bayesian Inference for More Than One Unknown	Week 6	Monday November 5th
1	The Normal Linear Model	Week 7	Monday November 12th
2	Generalised Linear Models	Week 8	Monday November 19th
3	Missing Data and Data Augmentation	Week 9	Monday November 26th
4	Mixture Models	Week 10	Monday December 3rd
5	Random Effects and Hierarchical Models	Week 11	Monday December 10th