FACULTY OF SCIENCE

SCHOOL OF MATHEMATICS & STATISTICS

MATH3821
Statistical Modelling and Computing

Semester 2 2012
Units of Credit
6 UOC

Prerequisites
MATH2831 / MATH2931

Syllabus
The main purpose of this course is to give an introduction to flexible, modern approaches to regression and classification using the statistical package R. In particular, various extensions of the linear models discussed in MATH2831 are considered: we consider regression models where the mean response is not linear in unknown parameters (nonlinear regression), regression models where we allow the mean response to be a quite general smooth function (nonparametric regression methods such as scatter plot smoothing, penalised splines, etc.) and regression models for data which are discrete (such as in classification or pattern recognition problems). The Bayesian linear model is also covered. Monte Carlo methods are also discussed.

Course Notes
Electronic notes of lecture material, as well as tutorial and lab problems will be made available via the BB for MATH3821.

Aims
The aim of MATH3821 is that at the end of session you should understand the concepts and techniques involved in the syllabus and be able to apply those concepts and techniques to the solution of appropriate problems. The R package will allow you to solve problems.
Course Outcomes

A student should

- state definitions as specified in the syllabus
- have working knowledge of appropriate theorems
- apply the concepts and techniques of the syllabus to solve appropriate problems
- have the ability to use specific and general results given specified assumptions.
- use terminology and reporting styles appropriately and successfully to communicate information and understanding

Advice to students

Students are strongly advised to take note of the detailed syllabus and notes provided in lectures and tutorials.

The level of depth of understanding required in this course is best understood by considering the examples given in lectures, exercises in tutorials, assignments and midsession tests (if applicable).

Teaching strategy

MATH3821 is taught through carefully planned lectures that logically develop the concepts and techniques specified in the course. Examples are emphasised as they provide the underlying motivation for the course, and because students best understand the general theory when it is developed from simple, and then more complex examples.

Small group tutorials allow students to apply the material introduced in the lectures. These tutorials provide the opportunity for individual assistance. Students are expected to print out and bring their tutorial exercises and are expected to work conscientiously at the exercises in the tutorials.

Students are encouraged to give constructive feedback during the teaching session. They are encouraged to work collaboratively with other students to develop their understanding and their problem solving skills.
Assessment

Assessment of the subject will be based on the following components with weights as shown:

- Assignments: 20%
- Mid-session test: 20%
- End-of-session Examination: 60%

Note that

- Tutors are expected to enter assessment task marks onto the computer within a fortnight of the due date of the assessment. These marks are then accessible to you through BB. It is your responsibility to check that these marks are correct. If there is an error, speak to your tutor as soon as possible.

- Your final raw mark is scaled by the School of Mathematics and Statistics to produce your final grade. This is done so that the final distribution of the marks is consistent with general university guidelines regarding the percentage of students with various grades, and to maintain consistent standards from year to year. A committee of teaching staff determines the final scaling.

- If your final mark is in the range 40-49, you are automatically awarded additional assessment. However it is your responsibility to check the time and location of AA, no reminders will be sent to you.

Midsession tests

A midsession test will be given around week 7. It will contributing 20% towards the final grade. There will be no lab in this week.

For this test you must bring

- your student ID card
- pen
• your own calculator

Note that Statistical Tables will be provided.

Normal exam conditions apply in tests. In particular, you must not bring any kind of written material into the test and you must not try to get assistance from (or give assistance to) any other person.

If special considerations apply, you should go through the usual applications procedure. However a re-sit is not given for tests conducted during session.

Assignment

There will be a total of two assignments. Each assignment will contribute 10% to the final mark for the course.

Assignments must be handed in by the due date and time. Late submission will not be accepted unless there is documentary evidence of mitigating circumstances.

Each assignment must include a signed declaration of the plagiarism coversheet.

All work submitted for assessment (other than formal examination scripts) will be returned with comments on the assessment where appropriate.

Lecturers in charge

Dr Yanan Fan (Roon RC2055)
Phone: 9385 7034 Email: Y.Fan@unsw.edu.au

Lectures

Monday 4-5pm: CLB4 L Weeks 1-12
Thursday 9-10am: Webst ThB L Weeks 1-12
Thursday 1pm-3pm: RedC G12A LAB Weeks 2-13
Thursday 4pm-6pm: G12A LAB Weeks 2-13
Tutorials and Lab classes

Each student in MATH3821 is enrolled in a time slot. Note there is no tutorial (or lab) in week 1. Some tutorial classes will be held in the computer labs. The main purpose of tutorials is to provide you with an opportunity to get help with any problems which you find difficult and any parts of the lectures or textbook which you do not understand. In order to get real benefit from tutorials you should

- study your lecture notes and attempt relevant problems before the tutorial so that you can find out the areas which you have difficulties.
- make sure that your tutor is aware of the areas in which you need help.
- be specific as possible in describing your difficulties – don’t just say ”could you explain about regression”.
- be active participant in tutorials, asking and answering questions rather than just sitting and watching.

Getting help outside tutorials

If you are having difficulty understanding the lectures or doing suggested problems, always try to get help through your tutorials. However if this is not possible please make an appointment with the lecturer in charge.

Textbook

Notes are available for the subject in the form of a course pack. The course pack can be purchased from the University bookshop. Supplementary reading for the course can be found in the following:


T. J. Hastie, R. J. Tibshirani and J Friedman (2001), *The Elements of Statistical Learning: Data mining, inference and prediction*, Springer


Annette J. Dobson (1990), *An Introduction to Generalized Linear Models*, Chapman and Hall.


**Computing**

Students are expected to have access to the computing labs in the School. A basic knowledge of R is assumed.

**Graduate Attributes**

This course allows you to enhance your research, inquiry and analytical thinking skills. This is because the understanding of concepts and problem solving skills are strongly emphasised in the course, and because you need to show independence to master the use of R, try to develop your communication skills to be active participants in your tutorials, and in writing clear, logical arguments when solving problems.

**Academic Misconduct**

It is very important that you understand the University’s Rules for the conduct of Examination and the penalties for Academic Misconduct Guide. This
information can be accessed through myUNSW at
https://my.unsw.edu.au/student/academiclife/assessment/
examinations/examinations.html. In recent years, there has been cases
where severe penalties have been imposed for misconduct in relations to tests
and exams in Mathematics courses.

**Plagiarism**

**What is Plagiarism?**
Plagiarism is the presentation of the thoughts or work of another as ones
own.* Examples include:

- direct duplication of the thoughts or work of another, including by
copying work, or knowingly permitting it to be copied. This includes
copying material, ideas or concepts from a book, article, report or other
written document (whether published or unpublished), composition,
artwork, design, drawing, circuitry, computer program or software, web
site, Internet, other electronic resource, or another persons assignment
without appropriate acknowledgement

- paraphrasing another persons work with very minor changes keeping
the meaning, form and/or progression of ideas of the original;

- piecing together sections of the work of others into a new whole;

- presenting an assessment item as independent work when it has been
produced in whole or part in collusion with other people, for example,
another student or a tutor; and,

- claiming credit for a proportion a work contributed to a group assess-
ment item that is greater than that actually contributed. †.

Submitting an assessment item that has already been submitted for aca-
demic credit elsewhere may also be considered plagiarism.

The inclusion of the thoughts or work of another with attribution appro-
priate to the academic discipline does not amount to plagiarism.

Students are reminded of their Rights and Responsibilities in respect of
plagiarism, as set out in the University Undergraduate and Postgraduate
Handbooks, and are encouraged to seek advice from academic staff whenever necessary to ensure they avoid plagiarism in all its forms.

The Learning Centre website is the central University online resource for staff and student information on plagiarism and academic honesty. It can be located at: [www.lc.unsw.edu.au/plagiarism](http://www.lc.unsw.edu.au/plagiarism)

The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

- correct referencing practices;
- paraphrasing, summarising, essay writing, and time management;
- appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

Individual assistance is available on request from The Learning Centre.

Students are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.

* Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle.
† Adapted with kind permission from the University of Melbourne.