Course profile

Welcome to the course profile for STAT3002 in Semester 1, 2005.

Objectives

On completing this course students will:

- understand the method of maximum likelihood estimation and be able to apply this method to simple estimation problems,
- become experienced at statistical model building,
- learn how to use regression diagnostics to check model assumptions,
- understand the limitations of linear models and generalized linear models (GLMs),
- learn how to model overdispersion in GLMs and
- learn the basics of the statistical package R.

Contents Overview

This course is a comprehensive 2-unit study of applied statistical methods with an emphasis on statistical modelling using maximum likelihood theory. This allows for the extension of linear regression models to generalized linear models (GLMs) allowing for separation of the systematic and random components of regression models. Specifically logistic and Poisson regression modelling is explored to allow modelling of count, nominal and ordinal responses. Diagnostics to explore the assumptions such as model mis-specification, mis-specification of link functions, mis-specification of the random distribution and aberrant observations are investigated. Emphasis is placed on regression modelling strategies. The extension of GLMs using quasi-likelihood allows modelling of variances particularly useful for the analysis of overdispersed data. Random effects models are introduced to increase the flexibility of both linear and non-linear regression models. The powerful but freely available, statistical package R is used.
Background

Students will benefit if they have knowledge of random variables, statistical inference, distribution and probability theory, and linear algebra and integration theory would be welcomed.

Staff

Dr Ross Darnell, Course Coordinator

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web: http://www.uq.edu.au/~uqrdarne
phone: 07 3365 6087
fax: 07 3365 4754
room: 84A-822
consultation: Monday 2-4 and Tuesday 2-4.

Teaching and Learning Methods

A 2-hour lecture will be presented each week (Mondays 10-12). Lecture notes will be provided and these will be expanded on with extra examples presented by the lecturer during the lecture.

A 2-hour practical will be available each week (Tuesday 10-12). The first practical period will show students how to access datasets from the course web page, an introduction to the package R and how to incorporate R output into Word documents. Venues for the lecture and practical class are listed on http://www.sinet.uq.edu.au/.

Each of the four practical assignments is to be done during the practical classes. The practicals will allow students to solve applied statistical problems using methods explained in lecture material. The problems will provide training in report writing and communication skills. They will also obtain feedback on the skills they display in their solutions especially in choosing appropriate methods.

Practical problems will be handed out every fortnight and students are expected to solve these problems during the practical classes. The student is encouraged to discuss any of their questions about the practical assignment or lecture material with the course lecturer/tutor during the practical.

Each practical will be part of the assessment of the course and is worth $12\frac{1}{2}$ marks.
Towards the end of the semester, the group assignment, worth 50 marks, is attempted during the practical classes.

One or two lecture periods are allocated at the end of the semester to give students the opportunity to raise any questions regarding the lecture material and to discuss interesting extensions to the lecture material.

**Resource Page**

The course profile and course material can be found on the web at the following address: [http://www.uq.edu.au/~uqrdarne/courses.php](http://www.uq.edu.au/~uqrdarne/courses.php). This also contains up-to-date news about the course material and announcements for students. Please check this regularly during the semester.

**Textbook and references**

No textbook is required. Useful references are


## Assessment Timetable

Below is a summary of the assessment during the semester.

<table>
<thead>
<tr>
<th>Week</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Assignment 1 due (12(\frac{1}{2})%)</td>
</tr>
<tr>
<td>6</td>
<td>Assignment 2 due (12(\frac{1}{2})%)</td>
</tr>
<tr>
<td>8</td>
<td>Assignment 3 due (12(\frac{1}{2})%)</td>
</tr>
<tr>
<td>10</td>
<td>Assignment 4 due (12(\frac{1}{2})%)</td>
</tr>
<tr>
<td>13</td>
<td>Group Assignment due (50%)</td>
</tr>
</tbody>
</table>

Your final mark is the total from these assignments. No exam is set.

The assignments are scheduled to synchronize with the lecture material and therefore it is important for students to hand in assignments on the due date. Variation on these dates need to be discussed with the coordinator. Unless approval has been granted a penalty of 10\% of the maximum assignment mark will be deducted for each day late.

## Assessment Criteria

To earn a Grade of 7, you must achieve a final mark between 85-100\% by demonstrating an excellent understanding of the course material. You will be able to analyse a broad range of data settings, providing insight and thoroughness in the form of necessary assumptions and other factors that might effect the analysis. You will demonstrate excellent proficiency in communicating statistical ideas in writing and a high level of accuracy in graphical and numerical work.

To earn a Grade of 6, you must achieve a final mark between 75-84\% by demonstrating a comprehensive understanding of the course material. You will be able to analyse most data settings, identifying important assumptions and other factors that might effect the analysis. You will demonstrate proficiency in communicating statistical ideas in writing and a high level of accuracy in graphical and numerical work.
To earn a Grade of 5, you must achieve a final mark between 65-74% by demonstrating an adequate understanding of the course material. You will be able to analyse many data settings, identifying the key assumptions that might effect the analysis. You will demonstrate the ability to write statistical reports and show accuracy in graphical and numerical work.

To earn a Grade of 4, you must achieve a final mark between 50-64% by demonstrating an understanding of the basic concepts of the course. You will be able to analyse the important data settings, identifying some key assumptions that might affect the analysis. You will demonstrate the ability to write statistical reports and show accuracy in graphical and numerical work.

To earn a Grade of 3, you must achieve a final mark between 45-49% by demonstrating some knowledge of the basic concepts of the course. You will be able to analyse the important data settings. You will demonstrate the ability to write statistical reports and show accuracy in graphical and numerical work.

To earn a Grade of 2, you must achieve a final mark between 20-44% by demonstrating some knowledge of the basic concepts of the course. You will be able to partially analyse a few important data settings. Written reports may be poor and accuracy in graphical and numerical work may be low.

To earn a Grade of 1, you must achieve a final mark between 0-19%. You will be able partially analyse very few data settings. Written reports will be poor and accuracy in graphical and numerical work will be low.

**Assessment policy**

Students should be familiar with the rules which relate to assessment in their degrees as well as general university policy such as found in the General Award Rules. These are all set out on the myAdvisor page on the UQ website [http://www.uq.edu.au/student/GeneralRules2003/2003GARs.htm](http://www.uq.edu.au/student/GeneralRules2003/2003GARs.htm).

**Graduate Attributes**

The University has a statement of Graduate Attributes which describes core attributes to be developed in an undergraduate program [http://www.uq.edu.au/hupp/contents/view.asp?sl=3&s2=20&s3=5](http://www.uq.edu.au/hupp/contents/view.asp?sl=3&s2=20&s3=5).

The following graduate attributes, taken from the University statement, will be emphasized in this course. Brief comments on how these will be
developed are given.

**In-Depth Knowledge of the Field of Study**

Through theory and applications in lectures and through experiments carried out for project work you will develop

- A comprehensive and well-founded knowledge of the field of study.
- An understanding of how other disciplines relate to the field of study.

**Effective Communication**

Communication skills will be developed through informal interactions in tutorials and in group project work. Written communication will be emphasised in reviewing scientific papers and writing project reports, which will also require the use of information resources. Through these activities you should develop

- The ability to collect, analyse, and organise information and ideas, and to convey those ideas clearly and fluently, in both written and spoken forms.
- The ability to interact effectively with others in order to work towards a common outcome.
- The ability to select and use the appropriate level, style and means of communication.
- The ability to engage effectively and appropriately with information and communication technologies.

**Independence and Creativity**

Project work is designed to encourage independence and creativity and develop

- The ability to identify problems, create solutions, innovate and improve current practices.
Critical Judgement

Analytical and critical thinking will be illustrated in lectures and in textbook readings. Activities in tutorials and project work will build on this to develop

- The ability to define and analyse problems
- The ability to apply critical reasoning to issues through independent thought and informed judgement
- The ability to evaluate opinions, make decisions and to reflect critically on the justifications for decisions.

Ethical And Social Understanding

An important part of statistics is the design of experiments within a social and ethical context. This will be emphasized in lecture examples to help develop

- An appreciation of the philosophical and social contexts of a discipline.

Plagiarism:

All work on the five practical assignments is to be that of the individual student. I encourage students to discuss the assignment questions but the written reports must be the sole work of the individual student.

The group assignments allow groups of no more than 2 students to submit a joint report. The University rules regarding plagiarism are defined below.

If plagiarism is proven, the marks from the particular assignment will be annulled.

Plagiarism is the action or practice of taking and using as one’s own the thoughts or writings of another (without acknowledgement). The following practices constitute acts of plagiarism and are a major infringement of the University’s academic values:

- where paragraphs, sentences, a single sentence or significant part of a sentence which are copied directly, are not enclosed in quotation marks and appropriately footnoted;
• where direct quotations are not used, but are paraphrased or summarised, and the source of the material is not acknowledged either by footnoting or other simple reference within the text of the paper;

• where an idea which appears elsewhere in print, film or electronic medium is used or developed without reference being made to the author or the source of that idea.

When a student knowingly plagiarises someone’s work, there is intent to gain an advantage and this may constitute misconduct.

Students are encouraged to study together and to discuss ideas, but this should not result in students handing in the same or similar assessment work. Do not allow another student to copy your work. While students may discuss approaches to tackling a tutorial problem, care must be taken to submit individual and different answers to the problem. Submitting the same or largely similar answers to an assignment or tutorial problem may constitute misconduct.

For more information on the University policy on plagiarism, please refer to http://www.uq.edu.au/hupp/contents/view.asp?si=3&s2=40&s3=12.

**Supplementary examinations**

A supplementary examination may be awarded in one course to students who obtain a grade of 2 or 3 in the final semester of their program and require this course to finish their degree. You should check the rules for your degree program for information on the possible award of supplementary examinations. Applications for supplementary examinations must be made to the Director of Studies in the Faculty.

EPSA Faculty policy on the award of supplementary exams may be found via the Faculty Guidelines from the EPSA student page http://www.epsa.uq.edu.au/index.html?id=9329&pid=7564.

**Special examinations**

If a student is unable to sit a scheduled examination for medical or other adverse reasons, she/he can and should apply for a special examination. Applications made on medical grounds should be accompanied by a medical certificate; those on other grounds must be supported by a personal declaration stating the facts on which the application relies.
Applications for special examinations for central and end-of-semester exams must be made through the Student Centre. Applications for special examinations in school exams are made to the course coordinator.


EPSA Faculty policy on the award of special exams may be found via the Faculty Guidelines from the EPSA student page [http://www.epsa.uq.edu.au/index.html?id=9329&pid=7564](http://www.epsa.uq.edu.au/index.html?id=9329&pid=7564).

**Feedback on assessment**

You may request feedback on assessment in this course progressively throughout the semester from the course coordinator. Feedback on assessment may include discussion, written comments on work, model answers, lists of common mistakes and the like.

Students may peruse examinations scripts and obtain feedback on performance in a final examination provided that the request is made within six months of the release of final course results. After a period of six months following the release of results, examination scripts may be destroyed.

Information on the University’s policy on access to feedback on assessment may be found at [http://www.uq.edu.au/hupp/contents/view.asp?sl=3&s2=30&s3=5](http://www.uq.edu.au/hupp/contents/view.asp?sl=3&s2=30&s3=5).


**Students with disabilities**

Any student with a disability who may require alternative academic arrangements in the course is encouraged to seek advice at the commencement of the semester from a Disability Adviser at Student Support Services.

**Assistance for Students**

Students with English language difficulties should contact the course coordinator or tutors for the course.

Students with English language difficulties who require development of their English skills should contact the Institute for Continuing and TESOL
Education on extension 56565.

The Learning Assistance Unit located in the Relaxation Block in Student Support Services. You may consult learning advisers in the unit to provide assistance with study skills, writing assignments and the like. Individual sessions are available. Student Support Services also offers workshops to assist students. For more information, phone 51704 or click here.

**Student Liaison Officer**

The School of Physical Sciences has a Student Liaison Officer as an independent source of advice to assist students with resolving academic difficulties.

The Student Liaison officer during 2004 will be Dr Peter Adams, Room 547 Priestley building, (email pa@maths.uq.edu.au).

**Library contact**

The liaison librarian for the physical sciences disciplines is located in the Physical Sciences and Engineering Library in the Hawken Building and may be consulted for assistance in the course:

Leith Woodall
Email: l.woodall@library.uq.edu.au
Extension: 52367