

University of Wollongong
School of Mathematics and Applied Statistics

Information Sheet for
Modern Inference - STAT901

Autumn 2007
Wollongong Campus

Subject Coordinator and Lecturer:

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Consultation: Tuesday 8.30 - 10.30, Wednesday 8.30 - 10.30

This information sheet must be read in conjunction with the general information on educational issues and student matters provided in the document "Policies and Services of the University, Faculty and School" published by the School of Mathematics and Applied Statistics. A copy may be obtained from the subject coordinator or at <http://www.math.uow.edu.au/current/generic.html>.

Topics

This subject will introduce some of the computationally intensive methods of statistical inference which have been developed in recent years. The common feature of these methods is that they enable the data values to "speak for themselves" rather than imposing restrictive parametric models. This is achieved by such devices as leaving out data values one at a time (jackknife), sampling with replacement from the data (bootstrap), shuffling the data (permutation tests), or simulating a fitted model (Monte Carlo testing). Iteration is sometimes a key element, as in the case of Markov Chain Monte Carlo methods. Both theory and practical implementation will be discussed. Computation using the R package will be an integral component of the subject, but no prior knowledge of this package will be assumed. In particular, the following topics will be covered:

Introduction to programming in R
Jackknife
Bootstrap
Nonparametric Confidence Intervals
Permutation and Monte Carlo tests
Bayesian Inference
Markov Chain Monte Carlo methods
Simulated Annealing
EM Algorithm

Textbook & Reference Books

There is no assigned text for this subject.

References:

- Efron, B. (1982) *The Jackknife, the Bootstrap and Other Resampling Plans*. Society for Industrial and Applied Mathematics, Philadelphia.
- Efron, B. & Tibshirani, R.J. (1993) *An Introduction to the Bootstrap*. Chapman & Hall, New York.
- Good, P. (1994) *Permutation Tests, A Practical Guide to Resampling Methods for testing Hypotheses*. Springer-Verlag, New York.

Maindonald, J. and Braun, J. (2003) *Data analysis and graphics using R: an example based approach*, Cambridge University Press, New York.

Manly, B.F.J. (1991) *Randomization and Monte Carlo Methods in Biology*. Chapman & Hall, London.

Mooney, C.Z. and Duval, R.D. (1997) *Bootstrapping: a nonparametric approach to statistical inference*, Sage, Newbury Park.

Noreen, E.W. (1989) *Computer Intensive Methods for Testing Hypotheses: An Introduction*. John Wiley, New York.

Tanner, M.A. (1996) *Tools for statistical inference: methods for the exploration of posterior distributions and likelihood functions*, Springer, New York.

You are not required to purchase reference books. Copies of all these books are available in the Library. These readings are recommended only and are not intended to be an exhaustive list. You are encouraged to use the Library catalogue and databases to locate additional readings with similar titles and contents.

Notices/Website

Lecture notes and assignments will be available from www.math.uow.edu.au/handouts/stat901.shtml. The subject coordinator may need to contact you concerning STAT901/471. Messages will be sent to your University email address. *You should check your email account at least once a week.*

Subject Learning Outcomes

After successful completion of this subject, students should be able to

- (i) Discuss concepts of modern statistical inference.
- (ii) Implement computationally intensive techniques of statistical inference using the R package.
- (iii) Interpret the results of modern inference techniques applied to particular datasets.

Lectures

Lectures for STAT901 are timetabled as follows.

Monday 10.30 - 12.30 15.113

You are required to attend *all lectures* in STAT901. Experience has shown that poor attendance at lectures leads to poor performance in this subject.

There are no tutorials in this subject.

Assessment

Your final mark in STAT901 will be determined as follows:

Assignments	–	40%
Final Exam	–	60%
Total	–	100%

Scaling of marks may be applied to the examination component of this subject.

Note that you are not required to “pass” each individual component to receive a Pass grade in STAT901. However, you would seriously jeopardize your chances of passing this subject if you do not aim to be successful in every component of the assessment.

Calculators

Calculators are permitted in the final examination for this subject. They must not have alphanumeric keyboards (or capabilities) and they must not be programmable in any way.

Final Examination

The final examination in STAT901 will be as follows:

Duration:	3 hours and 15 minutes
Value:	60% of final mark.

The examination will be held during the examination period in June at a time to be advised by the subject coordinator. As a student enrolled in the University of Wollongong, you are required to be available for the entire examination period in June

Assignments

Each week apart from Weeks 5, 12 and 13 you will be given an assignment. It should be handed in at the lecture in the following week. Assignments will be marked during the ensuing week and returned with solutions one week after submission in class. The ten assignments will contribute a **total** of 40% towards your final mark in STAT901.

- Each assignment will be graded out of 10.
- Late assignments will be accepted without penalty until the Friday after the due date, after which there will be a penalty of 1 mark per day.
- You must show working for each question on the assignment, including computer code where relevant.
- Assignments are only **part** of the expected weekly workload.
- You should keep a copy of all work submitted.

Every assignment submitted will contribute towards your final assessment. *However, the primary purpose of each assignment is to give you feedback on your progress and understanding of the work.*

If you wish to seek special consideration for a late assignment, you must apply for special consideration via SOLS, and submit your documentation to the University Administration. Submit the assignment to the course coordinator as early as possible. In any case, assignments submitted more than 7 days after the original due date will not be accepted and other arrangements may be necessary. In this instance, contact the subject coordinator immediately.

Cheating and Plagiarism

The University does not tolerate cheating nor plagiarism and regards them very seriously. For more information, see the document “Policies and Services of the University, Faculty and School” and the section in the University Undergraduate Handbook entitled “Acknowledgement Practice/Plagiarism”, or visit <http://www.uow.edu.au/handbook/courserules/plagiarism.html>

Consultation

If you are having any difficulties with STAT901, you are encouraged to seek advice from the subject coordinator.

If you cannot come at the listed consultation times, contact the subject coordinator to arrange an appointment at a mutually convenient time.

**If you are having any difficulty with STAT901,
you should seek advice before it is too late.**