STAT3008/7001
Applied Statistics

Course Description
Statistics 3008/7001 (Applied Statistics) is a course designed for senior undergraduate and research students who need to design experiments and carry out statistical analysis of their data. Emphasis will be placed on the development of statistical concepts and statistical computing, rather than mathematical details. The content covered will be motivated by problem-solving in many diverse areas of application. The topics covered will include regression modelling with emphasis on model formulation, understanding the implication of model assumptions, diagnostic methods for model checking and interpretation, logistic regression for binary variables and binomial counts, log-linear regression for Poisson counts, and exploratory tools for summarising multivariate responses.

<table>
<thead>
<tr>
<th>Semester and Year</th>
<th>S2 2014</th>
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<tbody>
<tr>
<td>Mode of Delivery</td>
<td>On campus</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>STAT1008 or STAT1003</td>
</tr>
<tr>
<td>Incompatible Courses</td>
<td>N/A</td>
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<tr>
<td>Course Convener</td>
<td>Dr Yanlin Shi</td>
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<tr>
<td>Office Location:</td>
<td>CBE 3.56</td>
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<td>Email:</td>
<td><a href="mailto:yanlin.shi@anu.edu.au">yanlin.shi@anu.edu.au</a></td>
</tr>
<tr>
<td>Consultation hours:</td>
<td>TBA</td>
</tr>
<tr>
<td>Bio and research interests</td>
<td>Dr Shi received his PhD of Statistics at ANU in June, 2014. He joined ANU and started to work as an Associate Lecturer in Statistics since January 2014. His research areas include applied statistics and econometrics.</td>
</tr>
<tr>
<td>Tutor</td>
<td>Le Chang</td>
</tr>
<tr>
<td>Student Administrators</td>
<td>Maria Lander</td>
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<tr>
<td></td>
<td><a href="mailto:maria.lander@anu.edu">maria.lander@anu.edu</a></td>
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COURSE OVERVIEW

Course Learning Outcomes
Upon successful completion of the requirements for this course, students will be able to:

- Working knowledge of the statistical computing package R.
- Fit simple and multiple linear regression models and interpret model parameters.
- Summarise and analyse relationships between a response variable and a covariate or covariates.
- Assess and refine simple and multiple linear regression models based on diagnostic measures.
- Carry out model selection in a multiple linear regression modelling context.
- The above outcomes for logistic and Poisson log-linear regression models.
- To understand basic multivariate analyses techniques and the bootstrap.

Research-Led Teaching
This course involves intermediate level of programming with R. In the lectures and tutorials, we will use real-life datasets to demonstrate the applications of various applied statistical analysis in R. Apart from that, additional research articles including journal publications may be provided. Those articles are good examples of how to use appropriate statistical techniques to analyse and solve research questions step-by-step.

Continuous Improvement
We use feedback from students, professional bodies and staff to make regular improvements to the course. In response to this feedback, design improvements from the previous version of the course include:

- Adjust the weights of assignments
- Adjust the coverage of assignments
- Extend the materials covered by the lecture notes

Technology, Software, Equipment
This course involves intermediate level of programming with R, which is a powerful and free statistical package widely used by industrial professionals and academics.

Requisites
STAT1008 or STAT1003.

Student Feedback
All CBE courses are evaluated using Student Experience of Learning and Teaching (SELT) surveys, administered by Planning and Statistical Services at the ANU. These surveys are offered online, and students will be notified via email to their ANU address when surveys are available in each course. Feedback is used for course development so please take the time to respond thoughtfully. Course feedback is anonymous and provides the Colleges, University Education Committee and Academic Board with opportunities to recognise excellent teaching and to improve courses across the university. For more information on
student surveys at ANU and reports on feedback provided on ANU courses, visit
http://unistats.anu.edu.au/surveys/selt/students/ and
http://unistats.anu.edu.au/surveys/selt/results/learning/

COURSE SCHEDULE

<table>
<thead>
<tr>
<th>Week</th>
<th>Summary of Activities</th>
<th>Assessment</th>
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<tbody>
<tr>
<td>1</td>
<td>Introduction and getting to know R. Simple Linear Regression (SLR). Lectures</td>
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<tr>
<td>2</td>
<td>Multiple Linear Regression. Lectures and Tutorials</td>
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<td>3</td>
<td>Multiple Linear Regression. Lectures and Tutorials</td>
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<td>4</td>
<td>Multiple Linear Regression. Lectures and Tutorials</td>
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<td>5</td>
<td>Multiple Linear Regression. Lectures and Tutorials</td>
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<tr>
<td>6</td>
<td>Multiple Linear Regression/Logistic Regression. Lectures and Tutorials</td>
<td>Assignment 1</td>
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<tr>
<td>7</td>
<td>Logistic Regression. Lectures and Tutorials</td>
<td></td>
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<tr>
<td>8</td>
<td>Logistic Regression/Log-linear Regression. Lectures and Tutorials</td>
<td></td>
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<tr>
<td>9</td>
<td>Log-linear Regression. Lectures and Tutorials</td>
<td></td>
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<tr>
<td>10</td>
<td>Log-linear Regression. Lectures and Tutorials</td>
<td></td>
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<tr>
<td>11</td>
<td>Multivariate Analysis. Lectures and Tutorials</td>
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<tr>
<td>12</td>
<td>Bootstrap. Lectures and Tutorials</td>
<td>Assignment 2</td>
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<tr>
<td>13</td>
<td>Various Topics of Interest. Lectures and Tutorials</td>
<td>Final Exam</td>
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COURSE ASSESSMENT

Assessment Summary

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
<th>Due Date</th>
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<tbody>
<tr>
<td>1. Assignments</td>
<td>30%</td>
<td>Week Six and Week Twelve</td>
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<tr>
<td>2. Final Exam</td>
<td>70%</td>
<td>Exam Period</td>
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Assessment Task 1: Assignment 1

Details of task: Simple/multiple linear regression. Students will use R to analyse and interpret supplied datasets.

Assessment Task 2: Assignment 2

Details of task: Logistic/Poisson regression and some multivariate statistics. Students will use R to analyse and interpret supplied datasets.

Assessment Task 3: Final Exam

Details of task: Three-hour Open-book exam. The exam will cover materials from the entire course.
**Assignment Submission**
Assignments must be submitted to the School Office and include a cover sheet. Email and fax submissions are not acceptable. You must keep a copy of assessment materials submitted for your records.

**Extensions and Penalties**

**Returning Assignments**
Students can collect their marked assignments from school office.

**Examinations**
The final examination will be 3 hours long with a 15 minutes reading time. This is an open-book exam and students can bring all hard-copy materials like lecture notes and textbook.

**Scaling**
Your final mark for the course will be based on the raw marks allocated for each assignment or examination. However, your final mark may not be the same number as produced by that formula, as marks may be scaled. Any scaling applied will preserve the rank order of raw marks (i.e. if your raw mark exceeds that of another student, then your scaled mark will exceed or equal the scaled mark of that student), and may be either up or down.

**READING LISTS**
Lecture notes and other course materials will be updated weekly with the progress of this course in Wattle.

**Recommended textbook**
*The Statistical Sleuth: A Course in Methods of Data Analysis (3rd edition)* by Ramsay and Schafer

**COMMUNICATION**

**Email**
If necessary, the lecturers and tutors for this course will contact students on their official ANU student email address. Information about your enrolment and fees from the Registrar and Student Services’ office will also be sent to this email address.

**Announcements**
Students are expected to check the Wattle site for announcements about this course, e.g. changes to timetables or notifications of cancellations. Notifications of emergency cancellations of lectures or tutorials will be posted on the door of the relevant room.

**Course URLs**
More information about this course may be found on:

- Programs and Courses (http://programsandcourses.anu.edu.au/2014/Catalogue)
• the College of Business and Economics website (http://cbe.anu.edu/courses) and
• Wattle (https://wattle.anu.edu.au), the University's online learning environment. Log on to Wattle using your student number and your ISIS password.

TUTORIAL AND /OR SEMINAR REGISTRATION

Enrolment in tutorials will be completed online using the CBE Electronic Teaching Assistant (ETA). To enrol, follow these instructions:

1. Go to http://eta.fec.anu.edu.au
2. You will see the Student Login page. To log into the system, enter your University ID (your student number) and password (your ISIS password) in the appropriate fields and hit the Login button.
3. Read any news items or announcements.
4. Select "Sign Up!" from the left-hand navigation bar.
5. Select your courses from the list. To select multiple courses, hold down the control key. On PCs, this is the Ctrl key; on Macs, it is the ⌘ key. Hold this key down while selecting courses with the mouse. Once courses are selected, hit the SUBMIT button.
6. A confirmation of class enrolments will be displayed. In addition, an email confirmation of class enrolments will be sent to your student account.
7. For security purposes, please ensure that you click the LOGOUT link on the confirmation page, or close the browser window when you have finished your selections.
8. If you experience any difficulties, please contact the School Office (see page 1 for contact details).
9. Students will have until the end of week 2 to finalise their enrolment in tutorials. After this time, students will be unable to change their tutorial enrolment.

POLICIES

The University offers a number of support services for students. Information on these is available online from http://students.anu.edu.au/studentlife/

ANU has educational policies, procedures and guidelines, which are designed to ensure that staff and students are aware of the University's academic standards, and implement them. You can find the University's education policies and an explanatory glossary at: http://policies.anu.edu.au/

Students are expected to have read the Student Academic Integrity Policy before the commencement of their course.

Other key policies include:

• Student Assessment (Coursework)
• Student Surveys and Evaluations
• http://cbe.anu.edu.au/students/student-information/examinations-assessment/