STAT271

Statistics I

S2 Day 2014

Statistics

Contents

General Information

Unit convenor and teaching staff
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E4A 526
Tuesday 10 - 12

Unit Convenor
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Wednesday 3-4

Credit points
3

Prerequisites
STAT272(P)

Corequisites

Co-badged status

Unit description
This is a unit in statistical methods for the analysis of data in which attention is given to the theoretical structure underlying the techniques. It aims to equip students with a wide understanding of statistics such that they are able to employ appropriate methods of analysis in various circumstances. The techniques learned are widely used in the sciences, social sciences, business and many other fields of study. This unit is designed for students majoring in statistics and/or actuarial studies.
Topics include: inference about one and two sample problems using normal theory and non-parametric methods; analysis of variance; multiple comparisons; and regression.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

Point estimation methods, including the method of moments and maximum likelihood.
Properties of estimators. Asymptotic (large sample) properties.
Sampling distributions and properties of sample statistics. Definition and derivation of t, F and chi-squared distributions etc.
Interval estimation. Confidence intervals.
Principles of hypothesis testing. Type I & II errors. Power. Comparison of competing tests. Relationship between confidence intervals and hypothesis testing.
Confidence intervals and hypothesis testing for the probability parameter in the binomial distribution.
Confidence intervals and hypothesis testing for location and scale in the single-population case, including related samples (paired comparisons). Classical (normal theory) and nonparametric tests are considered.
Confidence intervals and hypothesis testing for location and scale in the two-population case. Classical (normal theory) and nonparametric tests are considered.
Categorical data analysis (chi-squared tests): goodness of fit tests; tests of association; and tests of homogeneity.
Hypothesis testing for k populations. One-way analysis of variance and nonparametric techniques. Multiple comparisons and contrasts.
Simple linear regression. Correlation. Multiple linear regression.
Hypothesis testing for two factor designs (two-way analysis of variance). Contrasts and multiple comparisons.

General Assessment Information

For the two in-class tests, students are permitted to take into the test room one (1) A4 page of personal summary of formulae or notes, written on one or both sides of the page. These notes may be hand-written or typed. You will be permitted to take this sheet with you at the completion of the tests.

Some formulae will be provided (as per statistical tables available on iLearn); all necessary statistical tables will be provided.

Assessment Tasks

Name	Weighting	Due
Exam	60%	University Examination Period

Name	Weighting	Due
Test 1	10%	Week 7
Test 2	10%	week 11
Assignments	20%	Weeks 3, 5, 9, 13

Exam

Due: **University Examination Period**
Weighting: **60%**

The final examination will be of 3 hours duration with 10 minutes reading time. All material covered in the unit is examinable. Students MUST perform satisfactorily in the final examination in order to pass the unit regardless of their performance throughout the semester.

Relevant statistical tables will be provided at the final examination. These will be the same as the ones made available during the teaching of the unit.

For the final examination you will be permitted to take into the exam room a nonprogrammable calculator and two (2) A4 pages of formulae or notes, written on one or both sides of the page. These notes may be hand-written or typed. Students should anticipate that they will not be able to take these sheets with them at the completion of the exam, and it is recommended that a photocopy be made if a student has a desire to retain them.

On successful completion you will be able to:

- Point estimation methods, including the method of moments and maximum likelihood. Properties of estimators. Asymptotic (large sample) properties.
- Sampling distributions and properties of sample statistics. Definition and derivation of t, F and chi-squared distributions etc.
- Interval estimation. Confidence intervals.
- Principles of hypothesis testing. Type I & II errors. Power. Comparison of competing tests. Relationship between confidence intervals and hypothesis testing.
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- Confidence intervals and hypothesis testing for location and scale in the two-population case. Classical (normal theory) and nonparametric tests are considered.

- Categorical data analysis (chi-squared tests): goodness of fit tests; tests of association; and tests of homogeneity.
- Hypothesis testing for k populations. One-way analysis of variance and nonparametric techniques. Multiple comparisons and contrasts.
- Simple linear regression. Correlation. Multiple linear regression.
- Hypothesis testing for two factor designs (two-way analysis of variance). Contrasts and multiple comparisons.

Test 1

Due: **Week 7**
Weighting: **10%**

This test (of 45 minutes duration) will be held during the lecture on Tuesday 16th September 2014, in Week 7.

On successful completion you will be able to:

- Point estimation methods, including the method of moments and maximum likelihood. Properties of estimators. Asymptotic (large sample) properties.
- Sampling distributions and properties of sample statistics. Definition and derivation of t, F and chi-squared distributions etc.
- Interval estimation. Confidence intervals.
- Principles of hypothesis testing. Type I & II errors. Power. Comparison of competing tests. Relationship between confidence intervals and hypothesis testing.

Test 2

Due: **week 11**
Weighting: **10%**

This compulsory test (of 45 minutes duration) will be held during the lecture on Tuesday 28th October 2014, in Week 11.

On successful completion you will be able to:

- Point estimation methods, including the method of moments and maximum likelihood. Properties of estimators. Asymptotic (large sample) properties.
- Sampling distributions and properties of sample statistics. Definition and derivation of t, F and chi-squared distributions etc.
- Interval estimation. Confidence intervals.
- Principles of hypothesis testing. Type I & II errors. Power. Comparison of competing tests. Relationship between confidence intervals and hypothesis testing.

- Confidence intervals and hypothesis testing for the probability parameter in the binomial distribution.
- Confidence intervals and hypothesis testing for location and scale in the single-population case, including related samples (paired comparisons). Classical (normal theory) and nonparametric tests are considered.
- Confidence intervals and hypothesis testing for location and scale in the two-population case. Classical (normal theory) and nonparametric tests are considered.
- Categorical data analysis (chi-squared tests): goodness of fit tests; tests of association; and tests of homogeneity.

Assignments

Due: **Weeks 3, 5, 9, 13**
Weighting: **20%**

There will be four assignments due at approximately fortnightly intervals. Due dates/times and submission details will be specified separately for each assignment. The assignments will be made available at least one week prior to when they are due. Some marks will be allocated for clarity of reasoning and presentation in each assignment.

If a student is unable to submit an assignment on time, they must contact one of the lecturers. Late submissions without approval of the lecturer(s) will not be marked (and given a zero mark). All extension requests must be approved by one of the lecturers. Requests for substantial extensions (one week or more) will require documentary evidence.

On successful completion you will be able to:

- Point estimation methods, including the method of moments and maximum likelihood. Properties of estimators. Asymptotic (large sample) properties.
- Sampling distributions and properties of sample statistics. Definition and derivation of t, F and chi-squared distributions etc.
- Interval estimation. Confidence intervals.
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Delivery and Resources

Classes

STAT271 is delivered by lectures (3 per week) and tutorials (1 per week, commencing in week 2). All teaching material will be available on iLearn.

Required and Recommended Texts and/or Materials

Recommended: Mendenhall W, Wackerly D and Scheaffer R. “Mathematical Statistics with Applications”, Seventh Edition QA276 .M426 2008

Copies of this book are held in Special Reserve in the University Library. The Library also holds copies of the sixth and previous editions as well as the Student solutions manual.

The following books are useful references for this unit:

Author(s)	Title	Library Call No.
Bain, L.J. & Engelhardt, M.	Introduction to Probability and Mathematical Statistics	QA273.B2546 / 1992
Conover, W.J.	Practical Nonparametric Statistics	QA278.8.C65 / 1999
Hogg, R.V. & Craig, A.T.	Introduction to Mathematical Statistics	QA276.H59 / 1995
Larson, H.J.	Introduction to Probability Theory and Statistical Inference	QA273.L352 / 1982
Walpole, R.E. & Myers, R.H.	Probability and Statistics for Engineers and Scientists	TA340.W35 / 1993

Tutorial Exercises

Tutorial Exercises and solutions will be available from iLearn at least five days prior to the tutorial. Tutorials will be run as "drop-in" clinics in which students can ask for assistance or further explanation on the tutorial exercises or lecture material. Students may attend as many tutorials as desired.

Technologies Used and Required

Calculators: You will need to equip yourself with a small calculator, preferably one that does

simple statistical calculations and/or simple linear regression. You should bring it to all tutorials. You will also need your calculator for the mid-session tests and the final examination. You will not be permitted to use a programmable calculator or one with a full alpha character set in any examination.

Computing and Software: Students will need access to a computer with internet access on a regular basis. Computers are available at various locations on campus for those students who do not own their own. The following software will be used in STAT271:

Minitab (Version 16 or 17): Macquarie University has a license agreement with Minitab which allows students to download a version of Minitab for their computer. Information and instructions for downloading are available from the student portal: https://my.mq.edu.au/. Details of computer rooms set aside for individual student usage can be found at http://www.efs.mq.edu.au/current/ug/resources/labs.

Microsoft Excel and Word (or any other word processor).

Teaching and Learning Strategy

Whilst you are encouraged to discuss the work extensively with your peers, it is expected that the final material submitted will be your own work. Any work that is copied from another student will result in disciplinary action for all students involved.

There is no specific word length for any section of the assessment tasks. Students should note, however, that all real-world problems need to be properly answered. Answers should include definitions of any variables used, the specific hypotheses being tested, a brief rationale for the analysing technique and a meaningful conclusion.

Changes from Previous Unit

None.

Unit Schedule

Week	Work Due	Submission Details	Value
1			
2			
3	Assignment 1		5%
4			
5	Assignment 2		5%
6			
7	Class Test 1	Tue 16 Sep	10%
Break	Two weeks (Mon 6 Oct = Public Holiday)		
8			

9	Assignment 3		5%
10			
11	Class Test 2	Tue 28 Oct	10%
12			
13	Assignment 4	Mon 11am	5%

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy http://mq.edu.au/policy/docs/grading/policy.html

Grade Appeal Policy http://mq.edu.au/policy/docs/gradeappeal/policy.html

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the Learning and Teaching Category of Policy Central.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/support/student_conduct/

All requests for special consideration regarding the mid-session test or final exam must be lodged via the ask@mq facility.

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- Workshops

- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

Student Services and Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help

For help with University computer systems and technology, visit http://informatics.mq.edu.au/help/.

When using the University's IT, you must adhere to the Acceptable Use Policy. The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- Point estimation methods, including the method of moments and maximum likelihood. Properties of estimators. Asymptotic (large sample) properties.
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Assessment tasks

- Exam
- Test 1
- Test 2
- Assignments

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Assessment task

- Assignments

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Assessment task

- Assignments

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Assessment task

- Assignments

Changes since First Published

Date	Description
29/07/2014	Changed assignment number to four.
28/02/2014	The Description was updated.