STAT271

Statistics I

S2 Day 2015

Dept of Statistics

Contents

General Information

Unit convenor and teaching staff
Associate Lecturer
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AHH, Level 2, Workstation 35
To be determined

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 and Type 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 for a single-population, 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.
Correlation and linear regression. Model fitting and inference for simple and multiple linear regression.
Hypothesis testing for k populations. One-way analysis of variance and nonparametric techniques. Multiple comparisons and contrasts.
Hypothesis testing for two factor designs (two-way analysis of variance) - normal theory and nonparametric techniques. Multiple comparisons and contrasts.

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 handwritten 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
Test One	10%	week 7
Test Two	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. 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 will not be permitted to take these 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 and Type 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.
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- Hypothesis testing for k populations. One-way analysis of variance and nonparametric techniques. Multiple comparisons and contrasts.
- Hypothesis testing for two factor designs (two-way analysis of variance) - normal theory and nonparametric techniques. Multiple comparisons and contrasts.

Test One

Due: **week 7**
Weighting: **10%**

This compulsory test (of 45 minutes duration) will be held during a lecture hour in Week 7. The specific date is yet to be determined.

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 and Type II errors. Power. Comparison of competing tests. Relationship between confidence intervals and hypothesis testing.

Test Two

Due: **Week 11**
Weighting: **10%**

This compulsory test (of 45 minutes duration) will be held during a lecture hour in Week 11. The specific date is yet to be determined.

On successful completion you will be able to:

- Confidence intervals and hypothesis testing for the probability parameter in the binomial distribution.
- Confidence intervals and hypothesis testing for location and scale for a single-population, 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 the lecturer. Late submissions without approval of the lecturer will not be marked (and given a zero mark). All extension requests must be approved by the lecturer. Requests for substantial extensions (one week or more) will require documentary evidence.

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- Point estimation methods, including the method of moments and maximum likelihood. Properties of estimators. Asymptotic (large sample) properties.
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- Interval estimation. Confidence intervals.
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- Confidence intervals and hypothesis testing for the probability parameter in the binomial distribution.
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- Correlation and linear regression. Model fitting and inference for simple and multiple linear regression.
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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:

Authors	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

Authors	Title	Library Call No.
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

Learning and Teaching Activities

Lectures

Lecture notes will be made available in advance from iLearn.

Tutorials

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.

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/

Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your

student email address and will be made available in eStudent. For more information visit ask.mq.edu.au.

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 One
- Test Two
- 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 tasks

- Exam
- Test One
- Test Two
- Assignments