STAT680

Applied Statistics

S1 External 2016

Dept of Statistics

Contents

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General Information

Unit convenor and teaching staff
Unit Convenor
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AHH, Level 2
Monday 2pm-4pm

Lecturer
Kehui Luo
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AHH, Level 2
Tuesday 10am-12pm (noon)

Credit points
4

Prerequisites
Admission to MAppStat or GradDipAppStat

Corequisites
STAT670

Co-badged status
STAT270

Unit description
This unit aims to extend and broaden statistical experience from STAT670, with a focus on application to real-world analysis. It covers relationships between categorical or continuous explanatory variables and a continuous response variable using the techniques of one-way and two-way analysis of variance and simple and multiple linear regression. Data management, report writing, graphical presentation of results, and power analysis are described.

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:

Create, interpret and thoroughly analyse appropriate visual displays and numerical summaries.

Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.

Have a deep knowledge and understanding of the assumptions underlying the models, and how they can be checked and if invalid how to modify the analysis.

Interpret statistical results and summarise the results in a statistical report.

Apply statistical software packages in data analysis.

Be able to apply non-parametric statistical tests for data that does not adhere to the requirements of the standard ANOVA framework.

General Assessment Information

Note that satisfactory performance in the Final Examination is required for a Pass in the subject.

Assessment Tasks

Name	Weighting	Due
Tutorial Exercises Week 3	4%	22 March
Assignment 1	11%	26 April
Assignment 2	15%	31 May
Statistics Report	10%	7 June
Final exam	60%	Exam Period

Tutorial Exercises Week 3

Due: **22 March**
Weighting: **4%**

Tutorial Exercises from Week 3.

On successful completion you will be able to:
• Create, interpret and thoroughly analyse appropriate visual displays and numerical

summaries.

- Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.
- Have a deep knowledge and understanding of the assumptions underlying the models, and how they can be checked and if invalid how to modify the analysis.
- Apply statistical software packages in data analysis.

Assignment 1

Due: **26 April**
Weighting: **11%**

Covers weeks 1-6

On successful completion you will be able to:

- Create, interpret and thoroughly analyse appropriate visual displays and numerical summaries.
- Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.
- Have a deep knowledge and understanding of the assumptions underlying the models, and how they can be checked and if invalid how to modify the analysis.
- Interpret statistical results and summarise the results in a statistical report.
- Apply statistical software packages in data analysis.

Assignment 2

Due: **31 May**
Weighting: **15%**

Covers weeks 7-11

On successful completion you will be able to:

- Create, interpret and thoroughly analyse appropriate visual displays and numerical summaries.
- Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.
- Have a deep knowledge and understanding of the assumptions underlying the models,

and how they can be checked and if invalid how to modify the analysis.

- Interpret statistical results and summarise the results in a statistical report.
- Apply statistical software packages in data analysis.

Statistics Report

Due: **7 June**
Weighting: **10%**

Covers more advanced material including non-parametric statistical analysis.

On successful completion you will be able to:

- Be able to apply non-parametric statistical tests for data that does not adhere to the requirements of the standard ANOVA framework.

Final exam

Due: **Exam Period**
Weighting: **60%**

Material to be covered will be notified. Satisfactory performance is required for a pass in the subject.

On successful completion you will be able to:

- Create, interpret and thoroughly analyse appropriate visual displays and numerical summaries.
- Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.
- Have a deep knowledge and understanding of the assumptions underlying the models, and how they can be checked and if invalid how to modify the analysis.

Delivery and Resources

Textbook

There is no prescribed textbook.

Software

You will be expected to use R/RStudio to perform data analyses. You will use R/RStudio as part of the tutorials, and you can use the software in the E4B labs when they are not booked for classes. You can find more information on RStudio at their web site: https://www.rstudio.com/. The software is freely available to download at no cost for all standard operating systems (Windows, Mac OS and Linux) at https://www.rstudio.com/products/rstudio/download/

Additional References

These recommended books are available in Reserve at the library.

- Moore, D.S., McCabe, G. P. and Craig, B.A. (2014) Introduction to the Practice of Statistics, Eighth Edition (W.H. Freeman)
- De Veaux, R.D., Velleman, P.F. and Bock, D.E. (2004) Stats Data and Models (Pearson)
- Ramsay, F.L. and Schafer, D.W. (2002) The Statistical Sleuth (Wadsworth)

There are other books that are useful but not guaranteed to be available in Reserve at the library.

- Anderson, J. and Poole, M. (2002) Thesis and Assignment Writing (Wiley)
- Chatterjee, S. Hadi, A. and Price, B. (2006) Regression Analysis By Example (Wiley)
- Devore, J. and Peck, R (2005) Statistics The Exploration and Analysis of Data (Brooks/Cole)
- Utts, J.M. and Heckard, R. F. (2004) Mind on Statistics, (Duxbury Press)
- Utts, J.M. and Heckard, R. F. (2006) Statistical Ideas and Methods, (Duxbury Press)

Online Textbooks

- SurfStat at http://surfstat.anu.edu.au/surfstat-home/surfstat.html is a complete introductory statistics course.
- HyperStat Online at http://davidmlane.com/hyperstat/index.html is at an intermediate level stats course covering ANOVA.
- StatSoft Electronic Textbook at http://www.statsoft.com/textbook/stathome.html is more advanced and material is covered in sections called ANOVA/MANOVA and Linear Regression.

Unit Schedule

Week (begins)	Lectures	Work due
1 (29 Feb)	Review One sample tests + One sided tests;	
2 (7 March)	Review two sample tests + assumptions; Report writing	
3 (14 March)	One way ANOVA	
4 (21 March)	One way ANOVA Multiple comparisons and Transformations	Tutorial Ex 3.
5* (29 March)	Non-parametrics; Power and Sample Size	

6 (4 April)	Data collection and management; Revision	
	Midsemester Break	
7* (26 April)	Simple linear regression and transformations	Assignment 1
8 (2 May)	Multiple regression	
9 (9 May)	Multiple regression continued; Ethics	
10 (16 May)	Two-way ANOVA	
11 (23 May)	Two-way ANOVA continued and Multiple comparsions	
12 (30 May)	ANOVA - Regression connection	Assignment 2
13 (6 June)	Revision	
	Public Holiday Monday on 28th March and 25th April	

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

New Assessment Policy in effect from Session 2 2016 http://mq.edu.au/policy/docs/assessment/policy_2016.html. For more information visit http://students.mq.edu.au/events/2016/07/19/new_assessment_policy_in_place_from_session_2/

Assessment Policy prior to Session 2 2016 http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy prior to Session 2 2016 http://mq.edu.au/policy/docs/grading/policy.html

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

Complaint Management Procedure for Students and Members of the Public http://www.mq.edu.au/policy/docs/complaint_management/procedure.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://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

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

Late Submission

Late submission of assignments will be only accepted by prior arrangement or in accordance with the disruption to studies policy. All other late submissions will incur a penalty of 10% per day or part day.

Graduate Capabilities

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement.

They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcomes

- Create, interpret and thoroughly analyse appropriate visual displays and numerical summaries.
- Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.
- Have a deep knowledge and understanding of the assumptions underlying the models, and how they can be checked and if invalid how to modify the analysis.
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- Apply statistical software packages in data analysis.

Assessment tasks

- Tutorial Exercises Week 3
- Assignment 1
- Assignment 2
- Statistics Report
- Final exam

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

- Create, interpret and thoroughly analyse appropriate visual displays and numerical summaries.
- Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.

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- Assignment 1

- Assignment 2

- Statistics Report

- Final exam

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:

Learning outcomes

- Create, interpret and thoroughly analyse appropriate visual displays and numerical summaries.

- Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.

- Have a deep knowledge and understanding of the assumptions underlying the models, and how they can be checked and if invalid how to modify the analysis.

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- Assignment 1

- Assignment 2
- Statistics Report
- Final exam

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:

Learning outcomes

- Deeply understand, formulate and apply appropriate statistical methods and models for various types of data. Models include one and two way ANOVA, simple and multiple regression.
- Have a deep knowledge and understanding of the assumptions underlying the models, and how they can be checked and if invalid how to modify the analysis.
- Interpret statistical results and summarise the results in a statistical report.
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Assessment tasks

- Tutorial Exercises Week 3
- Final exam

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:

Learning outcomes

- Interpret statistical results and summarise the results in a statistical report.
- Be able to apply non-parametric statistical tests for data that does not adhere to the requirements of the standard ANOVA framework.

Assessment tasks

- Assignment 1
- Assignment 2
- Statistics Report

Changes from Previous Offering

Statistical Software

The statistical software package to conduct analysis is no longer Minitab and the course will now use R/RStudio.

Changes since First Published

Date	Description
15/02/2016	Assessment tasks and learning outcomes have been updated.