



# STAT302

## Graphics, Multivariate Methods and Data Mining

S2 Day 2017

*Dept of Statistics*

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#### **Disclaimer**

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## General Information

Unit convenor and teaching staff

Unit Convenor

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11:00 - 13:00 Tue

Instructor

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Credit points

3

Prerequisites

6cp at 200 level including (STAT270 or STAT271 or BIOL235(P) or PSY222 or PSY248(P))

Corequisites

Co-badged status

Unit description

This unit introduces statistical tools for multivariate data analysis such as statistical graphics, discriminant analysis, principal component analysis, cluster analysis and an introduction to data mining, especially classification. Statistical packages are used extensively to illustrate the concepts in lectures and tutorials. Students are given opportunities to share their learning with their peers in tutorials, by presenting to their peers such as solutions to a problem posed in an earlier class, or summary of a specific weeks' learning in one or two slides, similar to 3 minute thesis presentations.

## 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:

Understand the principles underlying graphics, multivariate methods and data mining;

Choose the appropriate statistical analysis, for a given data set, from a wide range of methods based on multivariate methods and data mining;

Choose appropriate graphical techniques for displaying data;

Use a statistical computer package to carry out chosen analyses and interpret the results with understanding; present the results of analyses in a form which is suitable for publication;

Apply statistical techniques to problems arising from diverse fields of research.

## Assessment Tasks

Name	Weighting	Hurdle	Due
<u>Participation and Homeworks</u>	15%	No	Weeks 3, 7 and 11
<u>Test</u>	15%	No	Week 9 (during the lecture)
<u>Practical Test</u>	10%	No	Week 13 tutorial
<u>Final Examination</u>	60%	No	University exam timetable

### Participation and Homeworks

Due: **Weeks 3, 7 and 11**

Weighting: **15%**

**Every week tutorial participation will be monitored and there will be a set of questions to submit at the end of Week 3, 7 and 11.**

#### **Homework due in Week 3, 7 and 11 (15%)**

There will be a penalty for a homework late submission, 10% will be deducted for each day passed after the deadline (e.g. if a homework is worth 10 marks, when it is submitted 5 days late the homework would be marked out of 5 marks).

**No homework submission can be made 5 days after the deadline.**

On successful completion you will be able to:

- Understand the principles underlying graphics, multivariate methods and data mining;
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- Choose appropriate graphical techniques for displaying data;
- Use a statistical computer package to carry out chosen analyses and interpret the results with understanding; present the results of analyses in a form which is suitable for publication;

- Apply statistical techniques to problems arising from diverse fields of research.

## Test

Due: **Week 9 (during the lecture)**

Weighting: **15%**

The Test will be held during the lecture and would be 45 minutes long. This is closed book test.

You are permitted ONE A4 page of paper containing reference material printed or handwritten on both sides. Calculators will be needed but must not be of the text/programmable type.

In case you are not available to sit the Test due to unavoidable circumstances you will need to consult Disruption to Studies Policy

[http://mq.edu.au/policy/docs/disruption\\_studies/policy.html](http://mq.edu.au/policy/docs/disruption_studies/policy.html)

On successful completion you will be able to:

- Understand the principles underlying graphics, multivariate methods and data mining;
- Choose the appropriate statistical analysis, for a given data set, from a wide range of methods based on multivariate methods and data mining;
- Choose appropriate graphical techniques for displaying data;
- Apply statistical techniques to problems arising from diverse fields of research.

## Practical Test

Due: **Week 13 tutorial**

Weighting: **10%**

The practical test, using pcs, will be held in the tutorial in Week 13 and covers the first 12 weeks of material in the unit. Permitted materials are the lecture notes and other teaching material, which were distributed via iLearn.

In case you are not available to sit the Practical Test due to unavoidable circumstances you will need to consult Disruption to Studies Policy

[http://mq.edu.au/policy/docs/disruption\\_studies/policy.html](http://mq.edu.au/policy/docs/disruption_studies/policy.html)

On successful completion you will be able to:

- Understand the principles underlying graphics, multivariate methods and data mining;
- Choose the appropriate statistical analysis, for a given data set, from a wide range of methods based on multivariate methods and data mining;
- Choose appropriate graphical techniques for displaying data;
- Use a statistical computer package to carry out chosen analyses and interpret the results with understanding; present the results of analyses in a form which is suitable for publication;

- Apply statistical techniques to problems arising from diverse fields of research.

## Final Examination

Due: **University exam timetable**

Weighting: **60%**

A three-hour long final examination will be held during the University Examination period.

You are permitted ONE A4 page of paper containing reference material printed or handwritten on both sides. The page will not be returned at the end of the final examination. Calculators will be needed but must not be of the text/programmable type.

**You must present yourself for examination at the time and place designated in the University Examination Timetable.**

The timetable will be available in Draft form approximately eight weeks before the commencement of the examinations and in Final form approximately four weeks before the commencement of the examinations at

<https://students.mq.edu.au/study/exams-and-results/exam-timetables>

The only exception to not sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these circumstances you may wish to consult Disruption to Studies Policy

[http://mq.edu.au/policy/docs/disruption\\_studies/policy.html](http://mq.edu.au/policy/docs/disruption_studies/policy.html)

**Important:**

If you lodge the **Disruption to Studies** application for your final examination, **you must make yourself available for the week of December 11 – 15.**

The Macquarie university examination policy details, the principles and conduct of examinations at the University can be viewed at

<http://www.mq.edu.au/policy/docs/examination/policy.htm>

On successful completion you will be able to:

- Understand the principles underlying graphics, multivariate methods and data mining;
- Choose the appropriate statistical analysis, for a given data set, from a wide range of methods based on multivariate methods and data mining;
- Choose appropriate graphical techniques for displaying data;
- Apply statistical techniques to problems arising from diverse fields of research.

## Delivery and Resources

**Classes**

**Lectures begin in Week 1.**

**Tutorials begin in Week 2.**

Students must attend 2 hours of lectures and 2 hours of tutorial per week.

Lecture notes will be posted on iLearn site of the unit before the lecture.

Students should make sure they login at

<https://ilearn.mq.edu.au/login/MQ/>

regularly to access the teaching material.

**Software:**

SPSS, SPSS Modeler

There are no prescribed texts for this unit, but the following list provides useful references.

**Recommended texts:**

Chambers J M et al (1983) Graphical Methods for Data Analysis.

Cleveland W S (1994) Elements of Graphing Data.

Tufte E R (2001) The Visual Display of Quantitative Information.

Everitt B S et al (2001) Applied multivariate data analysis.

Johnson, R.A. & Wichern, D.W. (2002) Applied Multivariate Statistical Analysis.

Manly, B F J (2004) Multivariate Statistical Methods - A Primer.

## Unit Schedule

WEEK	TOPICS	WORK DUE
1	Introduction & presenting data numerically	
2	Different graphical displays	
3	Displaying multivariate data	<b>Homework</b>

4	Similarities and distances	
5	Hierarchical cluster analysis	
6	K-means clustering	
7	Eigenvalues and eigenvectors	<b>Homework</b>
<i>Midsession Break – Two Weeks</i>		
8	Principal component analysis	
9	Principal component analysis cont.	<b>Class test</b>
10	Discriminant analysis	
11	Multiple discriminant analysis	<b>Homework</b>
12	Classification and regression trees	
13	Review	<b>Practical Test</b>

## 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](http://mq.edu.au/policy/docs/academic_honesty/policy.html)

Assessment Policy [http://mq.edu.au/policy/docs/assessment/policy\\_2016.html](http://mq.edu.au/policy/docs/assessment/policy_2016.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](http://www.mq.edu.au/policy/docs/complaint_management/procedure.html)

Disruption to Studies Policy (in effect until Dec 4th, 2017): [http://www.mq.edu.au/policy/docs/disruption\\_studies/policy.html](http://www.mq.edu.au/policy/docs/disruption_studies/policy.html)

Special Consideration Policy (in effect from Dec 4th, 2017): <https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/special-consideration>

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/](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](http://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](http://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/](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.

## Graduate Capabilities

### Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:



## Learning outcomes

- Choose the appropriate statistical analysis, for a given data set, from a wide range of methods based on multivariate methods and data mining;
- Choose appropriate graphical techniques for displaying data;
- Use a statistical computer package to carry out chosen analyses and interpret the results with understanding; present the results of analyses in a form which is suitable for publication;
- Apply statistical techniques to problems arising from diverse fields of research.

## Assessment task

- Participation and Homeworks

## 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

- Choose the appropriate statistical analysis, for a given data set, from a wide range of methods based on multivariate methods and data mining;
- Choose appropriate graphical techniques for displaying data;
- Use a statistical computer package to carry out chosen analyses and interpret the results with understanding; present the results of analyses in a form which is suitable for publication;
- Apply statistical techniques to problems arising from diverse fields of research.

## Assessment tasks

- Participation and Homeworks
- Test
- Practical Test
- Final Examination

## Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they

participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

## **Learning outcome**

- Apply statistical techniques to problems arising from diverse fields of research.

## **Assessment tasks**

- Participation and Homeworks
- Practical Test
- Final Examination

## **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**

- Understand the principles underlying graphics, multivariate methods and data mining;
- Choose the appropriate statistical analysis, for a given data set, from a wide range of methods based on multivariate methods and data mining;
- Choose appropriate graphical techniques for displaying data;
- Use a statistical computer package to carry out chosen analyses and interpret the results with understanding; present the results of analyses in a form which is suitable for publication;
- Apply statistical techniques to problems arising from diverse fields of research.

## **Assessment tasks**

- Participation and Homeworks
- Test
- Final Examination

## **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**

- Use a statistical computer package to carry out chosen analyses and interpret the results with understanding; present the results of analyses in a form which is suitable for publication;
- Apply statistical techniques to problems arising from diverse fields of research.

## **Assessment tasks**

- Participation and Homeworks
- Test
- Practical Test
- Final Examination

## **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 outcome**

- Apply statistical techniques to problems arising from diverse fields of research.

## **Assessment tasks**

- Test
- Practical Test
- Final Examination

## **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**

- Participation and Homeworks
- Test
- Practical Test

## **Engaged and Ethical Local and Global citizens**

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

### **Learning outcome**

- Apply statistical techniques to problems arising from diverse fields of research.

## **Socially and Environmentally Active and Responsible**

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

### **Assessment tasks**

- Practical Test
- Final Examination

## **Changes from Previous Offering**

## **Teaching and Learning Strategy**

Students are expected to:

- attend two-hour lectures (beginning in Week 1) and two-hour tutorials (beginning in Week 2);
- complete the Assessment Tasks according to schedule.

## Changes since First Published

Date	Description
25/07/2017	N/A