STAT823

Statistical Graphics

S1 Online 2019

Dept of Mathematics and Statistics

Contents

General Information

Unit convenor and teaching staff
Unit Convenor & Lecturer
Tania Prvan
tania.prvan@mq.edu.au
Contact via 9850 8561
12 Wally's Walk Office 6.29
Please see iLearn.

Credit points
4

Prerequisites
Admission to MAppStat or MSc or GradCertAppStat or GradDipAppStat or MLabQAMgt or GradDipLabQAMgt or GradCertLabQAMgt or MBiotech or GradDipBiotech or MBioBus or MActPrac or MDataSc or MScInnovation

Corequisites

Co-badged status
STAT723

Unit description
We present the principles of effective graphical presentation, set them in a historical context and apply them to a variety of statistical data sets. Emphasis is given to use of modern multivariate graphical techniques such as trellis/lattice graphs and mosaic plots to show a variety of displays of data and model fits, and to display model consistency with data. To present graphics, we introduce and use R, as well as other standard packages. Participants choose an area for further investigation related to their interests. This unit is appropriate for study at any stage of the student's: as an introduction early in the program, or as an overview towards the end of the program.

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:

Be familiar with important and contemporary examples of graphics, and be able to use them.

Be aware of the elements of graphical design, and use them to critically appraise presented graphics in articles and web pages and suggest appropriate ways to improve them.
Be able to use the computer to generate appropriate graphics using particular packages or languages and be able to develop the ability to do so in others.
Be familiar with a range of modern multivariate graphical techniques and know when it is appropriate to use them.
Use statistical graphics to investigate and analyse data, check statistical model assumptions and effectively present the results of statistical investigations graphically to a range of audiences.

Assessment Tasks

Name	Weighting	Hurdle	Due
Portfolio	25%	No	11:55 pm Friday 12 April
Assignment 1	25%	No	11:55 pm Friday 10 May
Assignment 2	25%	No	11:55 pm Friday 31 May
Final Examination	25%	No	Exam Period

Portfolio

Due: **11:55 pm Friday 12 April**
Weighting: **25%**

An individual portfolio of five items relating to statistical graphics, each item using a maximum of two pages, on topics or questions given in the lecture notes. You will be asked to submit these in iLearn, and they will be graded on a scale of 0-5 each.

The portfolio must be word processed and must be submitted in pdf format online via iLearn by the due date.

Failure to submit this assessment by the due date without relevant documentation to explain the lateness (submitted as a Special Consideration online within 5 working days of due date) will result in a mark of 0 being awarded for this assessment.

On successful completion you will be able to:

- Be familiar with important and contemporary examples of graphics, and be able to use them.
- Be aware of the elements of graphical design, and use them to critically appraise presented graphics in articles and web pages and suggest appropriate ways to improve

them.

- Be familiar with a range of modern multivariate graphical techniques and know when it is appropriate to use them.

Assignment 1

Due: **11:55 pm Friday 10 May**
Weighting: **25%**

Five statistical graphics should be collected during the first half of the semester from newspaper articles or journal articles published this year (i.e. 2019). You must not draw your own graphics or get someone else to do so for you. Credit will be given for interesting, carefully chosen graphics which show evidence of searching widely. The five statistical graphics must be included in your submission along with the source of each graphic (title of the article, authors, source, page numbers or url etc.) and each graphic must be discussed.

This discussion may include the reason why you chose this graphic, it must include strengths and weaknesses of each graphic.

There is no group work.

The report must be word processed and must be submitted in pdf format online via iLearn by the due date. It should be at most 5 pages long (1500 word count) including the graphics. Note that a word document can be saved as pdf.

Failure to submit this assessment by the due date without relevant documentation to explain the lateness (submitted as a Special Consideration online within 5 working days of due date) will result in a mark of 0 being awarded for this assessment.

On successful completion you will be able to:

- Be familiar with important and contemporary examples of graphics, and be able to use them.
- Be aware of the elements of graphical design, and use them to critically appraise presented graphics in articles and web pages and suggest appropriate ways to improve them.
- Be familiar with a range of modern multivariate graphical techniques and know when it is appropriate to use them.

Assignment 2

Due: **11:55 pm Friday 31 May**
Weighting: **25%**

A data set with some documentation will be available from iLearn given at the end of Week 10. This data set must be analysed and a concise, well-organised report on your analysis must be prepared. The analysis must be appropriate and be substantially graphical. Appropriate statistical

graphics explored or mentioned in the lectures should be used. The statistical package R must be used.

There is no group work.

The report must be word processed and must be submitted in pdf format online via iLearn on the due date. It should be at most 5 pages long (1500 word count) including the graphics. Note that a word document can be saved as pdf.

Failure to submit this assessment by the due date without relevant documentation to explain the lateness (submitted as a Special Consideration online within 5 working days of due date) will result in a mark of 0 being awarded for this assessment.

On successful completion you will be able to:

- Be familiar with important and contemporary examples of graphics, and be able to use them.
- Be aware of the elements of graphical design, and use them to critically appraise presented graphics in articles and web pages and suggest appropriate ways to improve them.
- Be able to use the computer to generate appropriate graphics using particular packages or languages and be able to develop the ability to do so in others.
- Be familiar with a range of modern multivariate graphical techniques and know when it is appropriate to use them.
- Use statistical graphics to investigate and analyse data, check statistical model assumptions and effectively present the results of statistical investigations graphically to a range of audiences.

Final Examination

Due: **Exam Period**
Weighting: **25%**

The final examination will be held during the Examination period. The final exam is 2 hours long (with an additional 10 minutes reading time).

The final examination covers all course material. Students may take into the final examination ONE A4 page of notes handwritten (not typed) on BOTH sides. Rulers will be needed.

You are expected to present yourself for the 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.

If documented illness or unavoidable disruption prevent you from sitting the examination you may wish to consider applying for a Special Consideration. Failure to sit the final examination without relevant documentation to explain the absence (submitted as a Special Consideration online within 5 working days of the final examination) will result in a mark of 0 being awarded for the

final examination. Students need to apply for Special Consideration online at https://ask.mq.edu.au

If you receive special consideration for the final exam, a supplementary exam will be scheduled in the interval between the regular exam period and the start of the next session. By making a special consideration application for the final exam you are declaring yourself available for a resit during the supplementary examination period and will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure you are familiar with the policy prior to submitting an application. You can check the supplementary exam information page on FSE101 in iLearn (bit.ly/FSESupp) for dates, and approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.

On successful completion you will be able to:

- Be familiar with important and contemporary examples of graphics, and be able to use them.
- Be aware of the elements of graphical design, and use them to critically appraise presented graphics in articles and web pages and suggest appropriate ways to improve them.
- Be familiar with a range of modern multivariate graphical techniques and know when it is appropriate to use them.
- Use statistical graphics to investigate and analyse data, check statistical model assumptions and effectively present the results of statistical investigations graphically to a range of audiences.

Delivery and Resources

There are 2 hours of lectures each week which commence in Week 1. Lecture material will be put up on iLearn. After the two hour lecture a recording with visual capture will be put up on iLearn.

There is no specified textbook for this unit and a variety of readings will be available. The following books are good general references that may be used during the semester.

- Chen, C., Hardle, W. and Unwin, E. (eds.) (2008) Handbook of Data Visualization. Springer-Verlag, Berlin.
- Cleveland, W. (1993) Visualizing Data. Hobart Press, New Jersey.
- Rahlf, T. (2017) Data Visualisation with R. Springer International Publishing AG.
- Tufte, E. (2001) The Visual Display of Quantitative Information (Second Edition). Graphics Press: Cheshire, Conn.
- Tufte, E. (1990) Envisioning Information. Graphics Press: Cheshire, Conn.
- Tufte, E. (1997) Visual Explanations: Images, and quantities, evidence and narrative

(third edition). Graphics Press: Cheshire, Conn.

There will be weekly readings.

Technologies used and required

Lecture material will be placed on iLearn. R (https://www.r-project.org/), RStudio (https://www.rstudio.com/) and Mondrian (http://www.theusrus.de/Mondrian/) will be used in some of the lectures. Students will need to use R or RStudio and Mondrian. All assessments except for the final examination must be word processed and converted to pdf files for online submission in iLearn. A Word document can be saved as pdf.

Unit Schedule

Week	Topic
1 (25 Feb)	Introduction to statistical graphics
2 (4 Mar)	Principles of statistical graphics
3 (11 Mar)	Getting familiar with R
4 (18 Mar)	More R
5 (25 Mar)	Mosaic Plots
6 (1 Apr)	Parallel Coordinate Plots
7 (8 Apr)	More R
	Two Week Recess
8 (29 Apr)	Linear Models I
9 (6 May)	Linear Models II
10 (13 May)	Time and time-oriented data
11 (20 May)	Visual Data Mining
12 (27 May)	High dimensional graphics
13 (3 Jun)	Review

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Grade Appeal Policy
- Complaint Management Procedure for Students and Members of the Public
- Special Consideration Policy *(**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)*

Undergraduate students seeking more policy resources can visit the Student Policy Gateway (https://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/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/study/getting-started/student-conduct

Results

Results published on platform other than eStudent, (eg. iLearn, Coursera etc.) 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 or if you are a Global MBA student contact globalmba.support@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

If you are a Global MBA student contact globalmba.support@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.

Graduate Capabilities

PG - Capable of Professional and Personal Judgment and Initiative

Our postgraduates will demonstrate a high standard of discernment and common sense in their professional and personal judgment. They will have the ability to make informed choices and decisions that reflect both the nature of their professional work and their personal perspectives.

This graduate capability is supported by:

Learning outcomes

- Be familiar with important and contemporary examples of graphics, and be able to use them.
- Be aware of the elements of graphical design, and use them to critically appraise presented graphics in articles and web pages and suggest appropriate ways to improve them.
- Be able to use the computer to generate appropriate graphics using particular packages or languages and be able to develop the ability to do so in others.
- Be familiar with a range of modern multivariate graphical techniques and know when it is appropriate to use them.
- Use statistical graphics to investigate and analyse data, check statistical model assumptions and effectively present the results of statistical investigations graphically to a range of audiences.

Assessment tasks

- Portfolio

- Assignment 1
- Assignment 2
- Final Examination

PG - Discipline Knowledge and Skills

Our postgraduates will be able to demonstrate a significantly enhanced depth and breadth of knowledge, scholarly understanding, and specific subject content knowledge in their chosen fields.

This graduate capability is supported by:

Learning outcomes

- Be familiar with important and contemporary examples of graphics, and be able to use them.
- Be aware of the elements of graphical design, and use them to critically appraise presented graphics in articles and web pages and suggest appropriate ways to improve them.
- Be able to use the computer to generate appropriate graphics using particular packages or languages and be able to develop the ability to do so in others.
- Be familiar with a range of modern multivariate graphical techniques and know when it is appropriate to use them.
- Use statistical graphics to investigate and analyse data, check statistical model assumptions and effectively present the results of statistical investigations graphically to a range of audiences.

Assessment tasks

- Portfolio
- Assignment 1
- Assignment 2
- Final Examination

PG - Critical, Analytical and Integrative Thinking

Our postgraduates will be capable of utilising and reflecting on prior knowledge and experience, of applying higher level critical thinking skills, and of integrating and synthesising learning and knowledge from a range of sources and environments. A characteristic of this form of thinking is the generation of new, professionally oriented knowledge through personal or group-based critique of practice and theory.

This graduate capability is supported by:

Learning outcomes

- Be familiar with important and contemporary examples of graphics, and be able to use them.
- Be aware of the elements of graphical design, and use them to critically appraise presented graphics in articles and web pages and suggest appropriate ways to improve them.
- Be able to use the computer to generate appropriate graphics using particular packages or languages and be able to develop the ability to do so in others.
- Be familiar with a range of modern multivariate graphical techniques and know when it is appropriate to use them.
- Use statistical graphics to investigate and analyse data, check statistical model assumptions and effectively present the results of statistical investigations graphically to a range of audiences.

Assessment tasks

- Portfolio
- Assignment 1
- Assignment 2
- Final Examination

PG - Research and Problem Solving Capability

Our postgraduates will be capable of systematic enquiry; able to use research skills to create new knowledge that can be applied to real world issues, or contribute to a field of study or practice to enhance society. They will be capable of creative questioning, problem finding and problem solving.

This graduate capability is supported by:

Learning outcome

- Use statistical graphics to investigate and analyse data, check statistical model assumptions and effectively present the results of statistical investigations graphically to a range of audiences.

Assessment tasks

- Assignment 2
- Final Examination

PG - Effective Communication

Our postgraduates will be able to communicate effectively and convey their views to different

social, cultural, and professional audiences. They will be able to use a variety of technologically supported media to communicate with empathy using a range of written, spoken or visual formats.

This graduate capability is supported by:

Learning outcomes

- Be familiar with important and contemporary examples of graphics, and be able to use them.
- Be aware of the elements of graphical design, and use them to critically appraise presented graphics in articles and web pages and suggest appropriate ways to improve them.
- Be able to use the computer to generate appropriate graphics using particular packages or languages and be able to develop the ability to do so in others.
- Be familiar with a range of modern multivariate graphical techniques and know when it is appropriate to use them.
- Use statistical graphics to investigate and analyse data, check statistical model assumptions and effectively present the results of statistical investigations graphically to a range of audiences.

Assessment tasks

- Portfolio
- Assignment 1
- Assignment 2
- Final Examination