STAT8123

Statistical Graphics

Session 2, In person-scheduled-weekday, North Ryde 2023

School of Mathematical and Physical Sciences

Contents

General Information

Unit convenor and teaching staff
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Credit points
10

Prerequisites
(Admission to MAppStat or MDataSc or MSc or MScInnovation or GradCertAppStat or GradDipAppStat or MLabAQMgt or GradDipLabAQMgt or GradCertLabAQMgt or MBiotech or GradDipBiotech or MBioBus or MActPrac or MMarScMgt or GradDipMarScMgt or MBusAnalytics) or (Admission to BMathScMAppStat and STAT1378)

Corequisites

Co-badged status

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 graduate program: 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:

ULO1: be familiar with important and contemporary examples of graphics, and be able to use them.

ULO2: 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.

ULO3: use the computer to generate appropriate graphics using particular packages or languages and be able to develop the ability to do so in others.

ULO4: be familiar with a range of modern multivariate graphical techniques and know when it is appropriate to use them.

ULO5: 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.

General Assessment Information

REQUIREMENTS TO PASS THIS UNIT: To pass this unit you must:

- Achieve a total mark equal to or greater than 50%

All assignments are individual assessment tasks. There is no group work. More details will be provided on the iLearn page in due course.

SPECIAL CONSIDERATION: The Special Consideration Policy aims to support students who have been impacted by short-term circumstances or events that are serious, unavoidable and significantly disruptive, and which may affect their performance in assessment. If you experience circumstances or events that affect your ability to complete the assessments in this unit on time, please inform the convenor and submit a Special Consideration request through ask.mq.edu.au.

ASSIGNMENT SUBMISSION:

Assignment submission will be online through the iLearn page. Read the submission statement carefully before accepting it as there are substantial penalties for making a false declaration. It is your responsibility to make sure your assignment submission is legible. If there are technical obstructions to your submission online, please email us to let us know. You may submit as often as required prior to the due date/time. Please note that each submission will completely replace any previous submissions. It is in your interests to make frequent submissions of your partially completed work as insurance against technical or other problems near the submission deadline.

LATE SUBMISSION OF WORK: Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark of the task) will be applied for each day a written report or presentation assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted. The submission time for all uploaded assessments is 11:55 pm. A 1-hour grace period will be provided to students who experience a technical concern.

For any late submission of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, please apply for Special Consideration.

Assessments where Late Submissions will be accepted

- Assignment 1 - YES, Standard Late Penalty applies
- Assignment 2 - YES, Standard Late Penalty applies
- Assignment 3 - YES, Standard Late Penalty applies

Assessment Tasks

Name	Weighting	Hurdle	Due
Assignment 3	40%	No	Week 13
Assignment 2	35%	No	Week 8
Assignment 1	25%	No	Week 4

Assignment 3

Assessment Type [1]: Quantitative analysis task
Indicative Time on Task [2]: 23 hours
Due: **Week 13**
Weighting: **40%**

A data set with some documentation will be given. This data set must be analysed as per the guidelines given on iLearn. The statistical package R must be used.

On successful completion you will be able to:

- 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.
- 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.

Assignment 2

Assessment Type [1]: Quantitative analysis task

Indicative Time on Task [2]: 20 hours
Due: **Week 8**
Weighting: **35%**

A data set with some documentation will be given. This data set must be analysed graphically according to the details given in the assignment. Appropriate statistical graphics explored or mentioned in the lectures should be used. The statistical package R must be used.

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.
- 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.

Assignment 1

Assessment Type [1]: Qualitative analysis task
Indicative Time on Task [2]: 20 hours
Due: **Week 4**
Weighting: **25%**

Five statistical graphics should be collected and critiqued using the methods discussed in lectures and SGTAs. Details will be given in iLearn.

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.

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[1] If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the Writing Centre for academic skills support.

[2] Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

Delivery and Resources

Lectures

The lectures commence in Week 1 and will be pre-recorded. Videos and lecture materials will be uploaded to iLearn, please refer to the iLearn site for more details.

Small-Group Teaching Activities (SGTAs)

SGTAs classes will start in Week 2, please refer to iLearn for more details.

Recommended Books

The following books are highly recommended reading materials.

- 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.
- Keen, K. J. (2010), Graphics for statistics and data analysis with R. Chapman and Hall/CRC.
- Rahlf, T. (2017), Data Visualisation with R. Springer International Publishing AG.
- Sievert, C. (2020), Interactive Web-Based Data Visualization with R, plotly, and Shiny, Chapman and Hall/CRC.
- Wickham, H. (2016), ggplot2: Elegant Graphics for Data Analysis. Springer International Publishing.

- Wickham, H. and Grolemund, G. (2017), R for Data Science Import, Tidy, Transform, Visualize, and Model Data. O'Reilly Media, Inc, USA.

Methods of Communication

We will communicate with you via your university email, iLearn forums, or through announcements on iLearn. Queries to the convenors can either be placed on the iLearn discussion board or sent to the staff email address from your university email address.

COVID Information

For the latest information on the University's response to COVID-19, please refer to the Coronavirus infection page on the Macquarie website: https://www.mq.edu.au/about/coronavirus-faqs. Remember to check this page regularly in case the information and requirements change during semester. If there are any changes to this unit in relation to COVID, these will be communicated via iLearn.

Unit Schedule

Week 1: A Brief History of Data Visualisation and R Basics.

Week 2: Principle of Statistical Graphs and ggplot Basics.

Week 3: Univariate Plots. Graphs for categorical data and numerical data.

Week 4: Bivariate Plots. Stacked bar charts, cluster bar charts, Mosaic plots, line plots, and violin plots.

Week 5: Multivariate Plots. Multivariate visualisation with grouping, faceting and clustering.

Week 6: Maps. Dot density maps, Choropleth maps, and map-making tools in R: ggplot with sf (simple feature).

Week 7: Statistical Model (Part 1). Scatterplot matrices, correlation plots, linear model and visualisation of regression and diagnostic plots.

Week 8: Statistical Model (Part 2). Residual plots, spline, generalised linear models, and tidy model outputs with broom package.

Week 9: Time-dependent Graphs. Dumbbell graphs, slope graphs, stacked area charts, and visualising time series with dygraphs package.

Week 10: More Graphs. Bubble plots, Waffle charts, flow diagrams word clouds.

Week 11: Interactive Graphs. Basic interactive plot with plotly, interactive maps with leaflet, diagrams with networkD3.

Week 12: Best Practices. Labels, titles, the principles of choosing colours with RColorBrewer, and control the overall appearance of plots.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://policie

s.mq.edu.au). 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
- Assessment Procedure
- Complaints Resolution Procedure for Students and Members of the Public
- Special Consideration Policy

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

To find other policies relating to Teaching and Learning, visit Policy Central (https://policies.mq.edu.au) and use the search tool.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/admin/other-resources/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

Academic Integrity

At Macquarie, we believe academic integrity – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free online writing and maths support, academic skills development and wellbeing consultations.

Student Support

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

The Writing Centre

The Writing Centre provides resources to develop your English language proficiency, academic writing, and communication skills.

- Workshops
- Chat with a WriteWISE peer writing leader
- Access StudyWISE
- Upload an assignment to Studiosity
- Complete the Academic Integrity Module

The Library provides online and face to face support to help you find and use relevant information resources.

- Subject and Research Guides
- Ask a Librarian

Student Services and Support

Macquarie University offers a range of Student Support Services including:

- IT Support
- Accessibility and disability support with study
- Mental health support
- Safety support to respond to bullying, harassment, sexual harassment and sexual assault
- Social support including information about finances, tenancy and legal issues
- Student Advocacy provides independent advice on MQ policies, procedures, and processes

Student Enquiries

Got a question? Ask us via AskMQ, or contact Service Connect.

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.