STAT8126

Visualisation and Analysis of Multivariate Data

Session 2, Online-flexible-In person assessment, North Ryde 2024

School of Mathematical and Physical Sciences

Contents

General Information

Unit convenor and teaching staff
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Credit points
10

Prerequisites
STAT806 or STAT810 or STAT6110 or STAT8310 or BUSA6004

Corequisites

Co-badged status

Unit description
This unit provides students with a comprehensive overview of multivariate data analysis and visualisation. Through hands-on experience with R and other tools, students will learn to manipulate, summarize, and visualise data with multiple variables. They will explore a range of multivariate graphical techniques, such as grouping, faceting, clustering, and time-dependent graphs, and will be introduced to modern methods for hypothesis testing, including MANOVA and multivariate regression. The unit will also cover the creation of interactive dashboards. Students will develop the ability to use statistical graphics to explore data, check statistical model assumptions, and effectively communicate results to diverse audiences. By the end of the unit, students will have a solid understanding of the differences between univariate and multivariate analysis, and will be equipped with valuable skills for working with complex data sets and creating informative dashboards.

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: Demonstrate a comprehensive understanding of multivariate data analysis, including its limitations and applications, and the connection between multivariate and corresponding univariate techniques.
ULO2: Select and apply statistical tests to test hypotheses related to multivariate data and critically evaluate the reliability and validity of the statistical tests.
ULO3: Proficiently conduct MANOVA and multivariate regression models in real-world scenarios.
ULO4: Employ modern graphical techniques appropriately to reveal insights and patterns in multivariate data.
ULO5: Generate appropriate graphics using particular software packages or languages, and demonstrate the ability to adapt graphical techniques to other software
ULO6: 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:

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

ASSIGNMENT SUBMISSION: Assignment submission will be online through the iLearn page. Submit assignments online via the appropriate assignment link on the iLearn page.

- Assignment submission is via iLearn. You should upload this as a single scanned PDF file.
- It is your responsibility to make sure your assignment submission is legible.

You may submit as often as required before 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 Assessment Submission Penalty

From 1 July 2022, Students enrolled in Session based units with written assessments will have the following university standard late penalty applied.

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark) will be applied each day a written 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. Submission time for all written assessments is set at 11:55 pm.

A 1-hour grace period is 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, students need to apply for Special Consideration.

Assessments where Late Submissions will be accepted

In this unit, late submissions will be accepted as follows:

- **Quiz - YES, Standard Late Penalty applies**
- **Group Project - YES, Standard Late Penalty applies**
- **Quantitative Data Analysis task - YES, Standard Late Penalty applies**
- **Final Examination - NO, unless Special Consideration is Granted**

The University Key Dates

Information about important academic dates including deadlines for withdrawing from units is available at https://www.mq.edu.au/study/calendar-of-dates

Assessment Tasks

Name	Weighting	Hurdle	Due
Quiz	10%	No	Week 4
Group Project	30%	No	Week 8
Quantitative Data Analysis task	20%	No	Week 11
Final Exam	40%	No	University Examination Period

Quiz

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 1 hours
Due: **Week 4**
Weighting: **10%**

Quiz on infographics

On successful completion you will be able to:

- Demonstrate a comprehensive understanding of multivariate data analysis, including its limitations and applications, and the connection between multivariate and corresponding univariate techniques.
- Employ modern graphical techniques appropriately to reveal insights and patterns in multivariate data.

Group Project

Assessment Type [1]: Project
Indicative Time on Task [2]: 20 hours
Due: **Week 8**
Weighting: **30%**

The group project will involve creating a dashboard on a case study and a media presentation targetting a general audience

On successful completion you will be able to:

- Demonstrate a comprehensive understanding of multivariate data analysis, including its limitations and applications, and the connection between multivariate and corresponding univariate techniques.
- Select and apply statistical tests to test hypotheses related to multivariate data and critically evaluate the reliability and validity of the statistical tests.
- Employ modern graphical techniques appropriately to reveal insights and patterns in multivariate data.
- Generate appropriate graphics using particular software packages or languages, and demonstrate the ability to adapt graphical techniques to other software
- 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.

Quantitative Data Analysis task

Assessment Type [1]: Quantitative analysis task

Indicative Time on Task [2]: 15 hours
Due: **Week 11**
Weighting: **20%**

Written report

On successful completion you will be able to:

- Select and apply statistical tests to test hypotheses related to multivariate data and critically evaluate the reliability and validity of the statistical tests.
- Proficiently conduct MANOVA and multivariate regression models in real-world scenarios.
- Employ modern graphical techniques appropriately to reveal insights and patterns in multivariate data.
- Generate appropriate graphics using particular software packages or languages, and demonstrate the ability to adapt graphical techniques to other software
- 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 Exam

Assessment Type [1]: Examination
Indicative Time on Task [2]: 2 hours
Due: **University Examination Period**
Weighting: **40%**

An invigilated exam is to be scheduled in the university exam period.

On successful completion you will be able to:

- Demonstrate a comprehensive understanding of multivariate data analysis, including its limitations and applications, and the connection between multivariate and corresponding univariate techniques.
- Select and apply statistical tests to test hypotheses related to multivariate data and critically evaluate the reliability and validity of the statistical tests.
- Proficiently conduct MANOVA and multivariate regression models in real-world

scenarios.

- Employ modern graphical techniques appropriately to reveal insights and patterns in multivariate data.
- 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.

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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

Classes

Lectures (commencing **Week 1**): two-hour lecture per week.

SGTA classes (commencing **Week 2**): one-hour class per week.

Technologies used and required

- iLearn

All unit-related materials including lecture notes, SGTA's, and instructions for assessment tasks and administrative updates, will be published on iLearn https://ilearn.mq.edu.au/login/

- Software

The statistical software ***R*** will be used. This is a free software environment for statistical computing and graphics and can be downloaded from the website https://www.r-project.org/

As GUI you will also need to download ***RStudio***

https://www.rstudio.com/products/rstudio/download/#download

Texts and materials

There is no required textbook for this unit.

- Recommended reference sources

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.

Johnson, R. A. and Wichern D. W. Applied Multivariate Statistical Analysis. 6th edn. [electronic copy is available];

Manly, B. and Navarro Alberto J. A. (2016) Multivariate Statistical Methods: A Primer. 4th edn. Chapman and Hall/CRC.

Everitt, B. and Hothorn T. (2011) An introduction to applied multivariate analysis with R. Springer.

Methods of Communication

We will communicate with you via your university email or through announcements on iLearn. Queries to lecturers can be sent through direct email using the University email account.

Students can access the *iLearn* page by logging on at https://ilearn.mq.edu.au. Students must log in regularly to read the Announcements and access the teaching material.

COVID Information

If there are any changes to this unit concerning COVID-19, these will be communicated to you.

Unit Schedule

Study Week	Lecture topics
1	A Brief History of Data Visualisation and Principles of Statistical Graphs
2	Visualisation of Data from Univariate, Bivariate to Multivariate Plots
3	Maps and Time-Dependent Graphs
4	Interactive Graphs
5	Dashboard Creation Using PowerBI
6	Dashboard Creation Using PowerBI cont-ed
7	Introduction to multivariate analysis
8	Multivariate sample statistics; Some useful multivariate distributions
Mid-Session Break	

9	Inference: estimation and hypothesis testing
10	MANOVA
11	Multivariate regression
12	Principal component analysis (PCA); Factor analysis (FA)
13	Revision

Policies and Procedures

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

Changes from Previous Offering

This is the first offering of STAT8126 and we encourage students to provide their constructive feedback via FSE Student Experience & Feedback link on iLearn.

Unit information based on version 2024.03 of the Handbook