STAT6110

Statistical Inference

Session 1, In person-scheduled-weekday, North Ryde 2025

School of Mathematical and Physical Sciences

Contents

General Information

Unit convenor and teaching staff
Unit Convenor
Nino Kordzakhia
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TBA

Credit points
10

Prerequisites
MATH6904 and STAT6170 and STAT6180 and STAT6183

Corequisites

Co-badged status
STAT3110

Unit description
While numerous advanced data algorithms are readily available for efficient data analysis, it remains crucial to understand the internal workflows of these 'black boxes.' A robust data analysis workflow hinges on a profound understanding of statistical inference and the capacity to critically assess and compare different statistical procedures. This unit equips you with the essential tools required to construct optimal methods for estimation and hypothesis testing, empowering you to employ the most suitable statistical analyses across a wide spectrum of scenarios. Complementing the theory, this unit incorporates simulation-based exercises, facilitating the development of an intuitive grasp of statistical inference. An introduction to Bayesian inference principles is also provided.

Learning in this unit enhances student understanding of global challenges identified by the United Nations Sustainable Development Goals (UNSDGs) Industry, Innovation and Infrastructure

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: Apply random sampling concepts and estimation principles to assess the

performance of inference procedures.

ULO2: Analyse a range of statistical inference contexts, including frequentists and Bayesian methods, and employ the concept and principles of likelihood.

ULO3: Use hypothesis testing approaches to carry out statistical tests in various contexts.

ULO4: Design and apply simulation-based inference to various statistical inference procedures

ULO5: Effectively communicate statistical inference procedures and results to diverse audiences.

General Assessment Information

Requirements to pass the unit

Achieve a total mark equal to or greater than 50% across all assessments.

Attendance and participation

We strongly encourage students to actively participate in all learning activities. Regular engagement is crucial for your success in this unit, as these activities provide opportunities to

- enhance your understanding of the material

- collaborate with peers

- and receive valuable feedback from instructors

to assist in completing the unit assessments.

Your active participation is essential for the successful completion of the unit.

Late Assessment Submission and Penalties

- **Late Assessment Submission Penalty**

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 - YES, Standard Late Penalty applies

Final Exam - NO, unless Special Consideration is Granted

Special Considerations

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 https://connect.mq.edu.au.

Assessment Tasks

Name	Weighting	Hurdle	Due
Assignment 1	25%	No	23/03/2025
Assignment	25%	No	04/05/2025
Final Exam	50%	No	University Examination Period

Assignment 1

Assessment Type [1]: Quantitative analysis task
Indicative Time on Task [2]: 12 hours
Due: **23/03/2025**
Weighting: **25%**

Reinforce and apply the concepts and skills learned in the unit through data analysis.

On successful completion you will be able to:

- Apply random sampling concepts and estimation principles to assess the performance of inference procedures.
- Analyse a range of statistical inference contexts, including frequentists and Bayesian methods, and employ the concept and principles of likelihood.
- Design and apply simulation-based inference to various statistical inference procedures

Assignment

Assessment Type [1]: Quantitative analysis task
Indicative Time on Task [2]: 12 hours

Due: **04/05/2025**
Weighting: **25%**

Use the statistical testing and inference concepts in the simulated scenarios.

On successful completion you will be able to:

- Apply random sampling concepts and estimation principles to assess the performance of inference procedures.
- Analyse a range of statistical inference contexts, including frequentists and Bayesian methods, and employ the concept and principles of likelihood.
- Use hypothesis testing approaches to carry out statistical tests in various contexts.
- Design and apply simulation-based inference to various statistical inference procedures
- Effectively communicate statistical inference procedures and results to diverse audiences.

Final Exam

Assessment Type [1]: Examination
Indicative Time on Task [2]: 18 hours
Due: **University Examination Period**
Weighting: **50%**

Formal invigilated examination testing the learning outcomes of the unit.

On successful completion you will be able to:

- Apply random sampling concepts and estimation principles to assess the performance of inference procedures.
- Analyse a range of statistical inference contexts, including frequentists and Bayesian methods, and employ the concept and principles of likelihood.
- Use hypothesis testing approaches to carry out statistical tests in various contexts.

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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

Week 1 classes

- **one-hour lecture (workshop)**

Week 2-12 classes

- **one-hour lecture (workshop) each week**
- **two-hour SGTA each week**

Your responsibility includes self-study to master foundational concepts outside of class through watching pre-recorded lectures and textbook readings.

Methods of communication

We will communicate with you via your university email and through announcements on iLearn.

Enquiries to the unit convenor can be sent via the contact email on iLearn or through your university email account.

Recommended Textbooks

Wackerly, D., W. Mendenhall, and R. L. Scheaffer, Mathematical Statistics with Applications. Thomson Brooks/Cole, 7th edition, 2008.

The textbook can be accessed online via Macquarie University Library.

Technology Used and Required

All unit materials are delivered through iLearn.

Unit Schedule

Study Week	Topic
1	Probability and random samples
2 - 3	Large sample probability concepts
4	Estimation concepts
5 - 6	Likelihood

7	Estimation methods
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8	Estimation methods cont.
9	Introduction to hypothesis testing
10 - 11	Hypothesis testing cont.
12	Bayesian inference 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 connect.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 the Service Connect Portal, 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

To enable students more time to focus on learning, understanding, and reflecting on the content of the unit we have revised the assessment structure as follows.

There are now only three assessments: two assignments and a final exam.

The activities in the unit are designed to enhance your understanding of the content and support the completion of assessments.

Unit information based on version 2025.05 of the Handbook