STAT3110

Statistical Inference

Session 2, In person-scheduled-weekday, North Ryde 2024

School of Mathematical and Physical Sciences

Contents

General Information	2
Learning Outcomes	3
General Assessment Information	3
Assessment Tasks	4
Delivery and Resources	6
Unit Schedule	7
Policies and Procedures	7
Changes from Previous Offering	9

Disclaimer

Macquarie University has taken all reasonable measures to ensure the information in this publication is accurate and up-to-date. However, the information may change or become out-dated as a result of change in University policies, procedures or rules. The University reserves the right to make changes to any information in this publication without notice. Users of this publication are advised to check the website version of this publication [or the relevant faculty or department] before acting on any information in this publication.

General Information

Unit convenor and teaching staff
Unit Convenor
Karol Binkowski
karol.binkowski@mq.edu.au
Contact via Email
12WW, room 614
Refer to iLearn page

Lecturer
Jun Han
jun.han@mq.edu.au
Contact via jun.han@mq.edu.au
12WW, Level 6
Refer to iLearn page

Credit points
10

Prerequisites
(20cp at 2000 level including (STAT272 or STAT2372 or STAT273 or STAT2173)) or [(STAT270 or STAT2170) and (COMP257 or COMP2200) and (admission to BIT or BAdvIT)]

Corequisites

Co-badged status
STAT6110

Unit description
This unit introduces the fundamental principles of statistical inference and estimation theory. The unit begins with a discussion of random samples and their use in drawing inferences about a population. A discussion of estimation concepts is then provided, particularly unbiasedness, consistency and efficiency. Likelihood theory is developed, including the concept of sufficiency and the maximum likelihood approach to estimation. Hypothesis testing concepts and methods are discussed with a particular focus on likelihood ratio, score and Wald tests. The relative frequency interpretation of key concepts such as confidence intervals and p-values is emphasised. An introduction to Bayesian inference principles is also provided.

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 to make inferences about a population.

ULO2: Use estimation principles (including unbiasedness, consistency and relative efficiency) to assess the performance of inference procedures.

ULO3: Analyse a range of statistical inference contexts and evaluate how the concept of likelihood and the principle of maximum likelihood estimation can be applied.

ULO4: Use hypothesis testing approaches (including likelihood ratio tests, score tests and Wald tests) to carry out statistical tests in various contexts.

ULO5: Evaluate the relevance of the principles of Bayesian inference in various contexts, and apply them to solve inference problems.

General Assessment Information

Requirements to Pass this Unit: To pass this unit, you must:

1. Attempt all assessment tasks
2. Achieve a total mark equal to or greater than 50%

Late Assessment Submission Penalty:

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 submit an application for Special Consideration.

Assessments where Late Submissions will be accepted.

1. Assignment 1 and Assignment 2– YES, Standard Late Penalty applies
2. Class Test – NO, unless Special Consideration is granted
3. 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 submit a Special Consideration request through ask.mq.edu.au.

Assessment Tasks

Name	Weighting	Hurdle	Due
Assignment 1	25%	No	Week 4
Class Test	15%	No	Week 8
Assignment 2	25%	No	Week 11
Final Exam	35%	No	Exam Period

Assignment 1

Assessment Type [1]: Quantitative analysis task
Indicative Time on Task [2]: 10 hours
Due: **Week 4**
Weighting: **25%**

Students are required to submit their assignments (pdf documents) before the due time.
Students will submit their assignments via a link on iLearn.

On successful completion you will be able to:

- Apply random sampling concepts to make inferences about a population.
- Use estimation principles (including unbiasedness, consistency and relative efficiency) to assess the performance of inference procedures.

Class Test

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 10 hours
Due: **Week 8**
Weighting: **15%**

Students are required to take a test.

On successful completion you will be able to:

- Use estimation principles (including unbiasedness, consistency and relative efficiency) to

assess the performance of inference procedures.
- Analyse a range of statistical inference contexts and evaluate how the concept of likelihood and the principle of maximum likelihood estimation can be applied.

Assignment 2

Assessment Type [1]: Quantitative analysis task
Indicative Time on Task [2]: 10 hours
Due: **Week 11**
Weighting: **25%**

Students are required to submit their assignments (pdf documents) before the due time. Students will submit their assignments via a link on iLearn.

On successful completion you will be able to:
- Use hypothesis testing approaches (including likelihood ratio tests, score tests and Wald tests) to carry out statistical tests in various contexts.
- Evaluate the relevance of the principles of Bayesian inference in various contexts, and apply them to solve inference problems.

Final Exam

Assessment Type [1]: Examination
Indicative Time on Task [2]: 12 hours
Due: **Exam Period**
Weighting: **35%**

Formal invigilated examination testing the learning outcomes of the unit.

On successful completion you will be able to:
- Apply random sampling concepts to make inferences about a population.
- Use estimation principles (including unbiasedness, consistency and relative efficiency) to assess the performance of inference procedures.
- Analyse a range of statistical inference contexts and evaluate how the concept of likelihood and the principle of maximum likelihood estimation can be applied.
- Use hypothesis testing approaches (including likelihood ratio tests, score tests and Wald tests) to carry out statistical tests in various contexts.

- Evaluate the relevance of the principles of Bayesian inference in various contexts, and apply them to solve inference problems.

---

[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

Students should enrol in the following classes each week:

- 1 x 1-hour Q&A lecture beginning in **Week 1**
- 1 x 2-hour SGTA beginning in **Week 2**

Your responsibility includes self-study to master foundational concepts outside of class through watching pre-recorded lectures and textbook readings. Subsequently, you engage in a one-hour Q&A lecture session, fostering the reinforcement and application of your understanding through interaction with both peers and the lecturer.

The timetable for classes can be found on the University website at: http://publish.mq.edu.au

Students can change their SGTA classes online using eStudent at: https://student1.mq.edu.au/.

Method of Communication

We will communicate with you via your university email or through announcements on iLearn. Enquiries to the unit convenors can be posted to a dedicated discussion forum on iLearn.

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 the semester. If there are any changes to this unit in relation to COVID, these will be communicated via iLearn.

Recommended Textbooks

Recommended textbooks can be found on the iLearn page and accessed via Library.

Technology Used and Required

All unit material is delivered through iLearn. The link may be found at http://ilearn.mq.edu.au

Unit Schedule

Week	Topic
1	Probability and random samples
2 - 3	Large sample probability concepts
4	Estimation concepts
5 - 6	Likelihood
7 - 8	Estimation methods
8 - 9	Hypothesis testing concepts
10 - 11	Hypothesis testing methods
12	Bayesian inference
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 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

We value student feedback to be able to continually improve the way we offer our units. As such we encourage students to provide constructive feedback via student surveys, to the teaching staff directly, or via the FSE Student Experience & Feedback link in the iLearn page.

Student feedback from the previous offering of this unit was very positive overall, with students pleased with the clarity around assessment requirements and the level of support from teaching staff. We have incorporated internal recommendations and student feedback, the unit materials and assessments are continuously adapted to enhance the overall unit experience and facilitate improved student performance in achieving the intended learning outcomes.

Unit information based on version 2024.02 of the Handbook