



# STAT6110

## Statistical Inference

Session 2, Online with attendance for exam, Exam centre within Australia 2021

*Archive (Pre-2022) - Department of Mathematics and Statistics*

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### 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.

### Session 2 Learning and Teaching Update

The decision has been made to conduct study online for the remainder of Session 2 for all units WITHOUT mandatory on-campus learning activities. Exams for Session 2 will also be online where possible to do so.

This is due to the extension of the lockdown orders and to provide certainty around arrangements for the remainder of Session 2. We hope to return to campus beyond Session 2 as soon as it is safe and appropriate to do so.

Some classes/teaching activities cannot be moved online and must be taught on campus. You should already know if you are in one of these classes/teaching activities and your unit convenor will provide you with more information via iLearn. If you want to confirm, see the list of [units with mandatory on-campus classes/teaching activities](#).

Visit the [MQ COVID-19 information page](#) for more detail.

## General Information

Unit convenor and teaching staff

Unit Convenor/Lecturer

Jun Ma

[jun.ma@mq.edu.au](mailto:jun.ma@mq.edu.au)

Contact via Email or 9850 8548

Room 526, 12WW

please refer to iLearn

Credit points

10

Prerequisites

((MATH604 or MATH6904 or BCA802 or STAT8602) and (STAT670 or STAT6170) and (STAT680 or STAT6180) and (STAT683 or STAT6183)) or (Admission to MDataSc and (STAT670 or STAT6170) and (STAT680 or STAT6180))

Corequisites

Co-badged status

STAT3110

Unit description

*This unit has an online offering for S2 which is **synchronous**, meaning there will be set times to attend online lectures and tutorials.*

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

**ATTENDANCE and PARTICIPATION:** Please contact the unit convenor as soon as possible if you have difficulty attending and participating in any classes. There may be alternatives available to make up the work. If there are circumstances that mean you will miss a class, you can apply for Special Consideration via [ask.mq.edu.au](https://ask.mq.edu.au)

**ASSIGNMENT SUBMISSION:** Assignment submission will be online through the iLearn page.

Submit assignments online via the appropriate assignment link on the iLearn page. A personalised cover sheet is not required with online submissions. Read the submission statement carefully before accepting it as there are substantial penalties for making a false declaration.

- Assignment submission is via iLearn. You should upload this as a single scanned PDF file.
- Please note the quick guide on how to upload your assignments provided on the iLearn page.
- Please make sure that each page in your uploaded assignment corresponds to only one A4 page (do not upload an A3 page worth of content as an A4 page in landscape). If you are using an app like Clear Scanner, please make sure that the photos you are using are clear and shadow-free.
- It is your responsibility to make sure your assignment submission is legible.
- If there are technical obstructions to your submitting 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:** All assessment tasks must be submitted by the official due date and time. In the case of a late submission for a non-timed assessment (e.g. an assignment),

if special consideration has NOT been granted, 20% of the earned mark will be deducted for each 24-hour period (or part thereof) that the submission is late for the first 2 days (including weekends and/or public holidays). For example, if an assignment is submitted 25 hours late, its mark will attract a penalty equal to 40% of the earned mark. After 2 days (including weekends and public holidays) a mark of 0% will be awarded. Timed assessment tasks (e.g. tests, examinations) do not fall under these rules.

**FINAL EXAM POLICY:** It is Macquarie University policy not to set early examinations for individuals or groups of students. All students are expected to ensure that they are available until the end of the teaching semester, that is, the final day of the official examination period. The only excuse for not sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these special circumstances, you may apply for special consideration via [ask.mq.edu.au](http://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 this 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/FSESup](http://bit.ly/FSESup)) 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.

## Assessment Tasks

Name	Weighting	Hurdle	Due
<a href="#">Assignment 1</a>	15%	No	Week 4
<a href="#">Assignment 2</a>	15%	No	Week 8
<a href="#">Assignment 3</a>	15%	No	Week 11
<a href="#">Final Exam</a>	55%	No	University examination period

### Assignment 1

Assessment Type <sup>1</sup>: Quantitative analysis task

Indicative Time on Task <sup>2</sup>: 10 hours

Due: **Week 4**

Weighting: **15%**

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.

## Assignment 2

Assessment Type <sup>1</sup>: Quantitative analysis task

Indicative Time on Task <sup>2</sup>: 10 hours

Due: **Week 8**

Weighting: **15%**

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:

- 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 3

Assessment Type <sup>1</sup>: Quantitative analysis task

Indicative Time on Task <sup>2</sup>: 10 hours

Due: **Week 11**

Weighting: **15%**

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 <sup>1</sup>: Examination

Indicative Time on Task <sup>2</sup>: 12 hours

Due: **University examination period**

Weighting: **55%**

A closed book written exam is to be scheduled in the university exam period.

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.

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<sup>1</sup> 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.

<sup>2</sup> 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

For each week, there is a one-hour lecture online via Zoom. There will also be another one-hour pre-recorded Zoom lecture that students should watch each week at their own convenient time.

There is also one 2-hour SGTA class each week to attend, either on campus or online - check the timetable for options.

## Unit Schedule

Week	Topic	Work Due
	Large sample probability concepts	
	Estimation concepts	A1 - wk 4
	Likelihood	
	Estimation methods	
	Hypothesis testing concepts	A2 - wk 8
	Hypothesis testing methods	A3 - wk 11
	Bayesian inference	
	Revision	

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](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](#)
- [Grade Appeal Policy](#)
- [Complaint Management Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#)

Students seeking more policy resources can visit [Student Policies \(https://students.mq.edu.au/support/study/policies\)](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 \(https://policies.mq.edu.au\)](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](mailto: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 help you improve your marks and take control of your study.

- [Getting help with your assignment](#)
- [Workshops](#)
- [StudyWise](#)
- [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

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](mailto: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/](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.