UNSW Course Outline

MATH3911 Higher Statistical Inference - 2024

Published on the 14 Feb 2024

General Course Information

Course Code : MATH3911
Year : 2024
Term : Term 1
Teaching Period : T1
Is a multi-term course? : No
Faculty : Faculty of Science
Academic Unit : School of Mathematics & Statistics
Delivery Mode : Multimodal
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

This course introduces students to the field of statistical inference including the main parametric and non-parametric techniques. During seminars and tutorials a range of topics will be introduced including Uniformly minimum variance estimation, Cramer-Rao inequality, Lehmann-

Scheffe theorem, Monotone likelihood ratio distributions and uniformly most powerful unbiased tests, Generalised likelihood ratio tests, exact tests and large sample tests, Bayesian point estimation, interval estimation and hypothesis testing, Robustness and bootstrap resampling, oOrder statistics, goodness of fit, contingency tables, Statistical inference based on ranks, Oone sample, two sample and k-sample problems, blocked data, independence and association.

This course is the higher version of MATH3811, with topics explored at greater depth.

Course Aims

The aim of the course is to introduce the main ideas and principles behind the parametric and non-parametric inference procedures. The basic methods of inference used throughout Statistics will be discussed rigorously. Students will learn how to choose the appropriate inference procedure and how to perform inference using the chosen procedure.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Explain how statistical inference arises from the first principles of probability theory.
CLO2 : Select and apply the concepts of finite-sample and asymptotic efficiency of inference procedure to appropriate problems.
CLO3 : Estimate key population parameters of interest, to test hypotheses about them and to construct confidence regions.
CLO4 : Formulate and apply nonparametric estimation and testing procedures.
CLO5 : Use R to perform computer intensive calculations such as bootstrapping, robust estimation and nonparametric.

Course Learning Outcomes	Assessment Item
CLO1 : Explain how statistical inference arises from the first principles of probability theory.	• Assignment 1 • Mid-Term Test • Final exam
CLO2 : Select and apply the concepts of finite-sample and asymptotic efficiency of inference procedure to appropriate problems.	• Assignment 1 • Mid-Term Test • Final exam
CLO3 : Estimate key population parameters of interest, to test hypotheses about them and to construct confidence regions.	• Assignment 2 • Assignment 1 • Mid-Term Test • Final exam
CLO4 : Formulate and apply nonparametric estimation and testing procedures.	• Assignment 2 • Mid-Term Test • Final exam
CLO5 : Use R to perform computer intensive calculations such as bootstrapping, robust estimation and nonparametric.	• Assignment 2

Learning and Teaching Technologies

Moodle - Learning Management System | Blackboard Collaborate | Echo 360

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Assignment 1 Assessment Format: Individual	10%	Start Date: Week 2 Due Date: 08/03/2024 05:00 PM
Mid-Term Test Assessment Format: Individual	20%	Start Date: 25/03/2024 04:00 PM Due Date: 25/03/2024 05:00 PM
Assignment 2 Assessment Format: Individual	10%	Start Date: Week 7 Due Date: 12/04/2024 05:00 PM
Final exam Assessment Format: Individual	60%	Start Date: Not Applicable Due Date: Not Applicable

Assessment Details

Assignment 1

Assessment Overview

In week 4 you will submit answers to an assignment that covers material from the first three weeks of the course. The assignment will be available two weeks before the submission date. Feedback will be given in the form of marks and comments from academic staff within 10 working days of submitting the task.

Course Learning Outcomes

- CLO1 : Explain how statistical inference arises from the first principles of probability theory.
- CLO2 : Select and apply the concepts of finite-sample and asymptotic efficiency of inference procedure to appropriate problems.
- CLO3 : Estimate key population parameters of interest, to test hypotheses about them and to construct confidence regions.

Assessment Length

2 weeks

Assessment information

No late submissions will be accepted past the deadline

Assignment submission Turnitin type

This is not a Turnitin assignment

Mid-Term Test

Assessment Overview

The Midterm Test is designed to assess your knowledge covered in lectures in weeks 1-5 inclusive. The Midterm Test will be typically scheduled in week 7 with a time limit of 50 minutes. Typical questions include problem solving which require clear and logical presentation of correct solutions. You will be provided with feedback with comments and/or solutions within 10 working days of completing the test.

Course Learning Outcomes

- CLO1 : Explain how statistical inference arises from the first principles of probability theory.
- CLO2 : Select and apply the concepts of finite-sample and asymptotic efficiency of inference procedure to appropriate problems.
- CLO3 : Estimate key population parameters of interest, to test hypotheses about them and to construct confidence regions.
- CLO4 : Formulate and apply nonparametric estimation and testing procedures.

Assessment Length

50 minutes

Assignment submission Turnitin type

Not Applicable

Assignment 2

Assessment Overview

In week 9 you will submit answers to an assignment that covers material from week 4-8. The assignment will be available two weeks before the submission date. Feedback will be given in the form of marks and comments from academic staff within 10 working days of submitting the task.

Course Learning Outcomes

- CLO3 : Estimate key population parameters of interest, to test hypotheses about them and to construct confidence regions.
- CLO4 : Formulate and apply nonparametric estimation and testing procedures.
- CLO5 : Use R to perform computer intensive calculations such as bootstrapping, robust estimation and nonparametric.

Assessment Length

2 weeks

Assessment information

No late submissions will be accepted past the deadline

Assignment submission Turnitin type

This is not a Turnitin assignment

Final exam

Assessment Overview

The final exam is designed to summarise your learning and problem-solving skills on all topics delivered across all weeks of the term, including material from lectures and tutorials. The exam is typically 2hrs 10 minutes and consists of short numerical and short answer responses - details will be confirmed during the course. The examination will occur during the official university examination period. Feedback is available through inquiry with the course convenor.

Course Learning Outcomes

- CLO1 : Explain how statistical inference arises from the first principles of probability theory.
- CLO2 : Select and apply the concepts of finite-sample and asymptotic efficiency of inference procedure to appropriate problems.
- CLO3 : Estimate key population parameters of interest, to test hypotheses about them and to construct confidence regions.
- CLO4 : Formulate and apply nonparametric estimation and testing procedures.

Assessment Length

2 hours

Assignment submission Turnitin type

Not Applicable

General Assessment Information

Grading Basis

Standard

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 0 : 5 February - 11 February	Other	O-week
Week 1 : 12 February - 18 February	Other	The general inference problem (2 hours). Principles of Statistical Inference (2 hours)
Week 2 : 19 February - 25 February	Other	Principles of Statistical Inference (2 hours). Information and Likelihood (2 hours)
Week 3 : 26 February - 3 March	Other	Maximum Likelihood Estimation (4 hours)
Week 4 : 4 March - 10 March	Other	Hypothesis Testing including Generalized Likelihood Ratio Tests (GLRT) (4 hours)
Week 5 : 11 March - 17 March	Other	Bayesian Inference. (2 hours) Bootstrap and Jackknife (2 hours)
Week 6 : 18 March - 24 March	Other	Flex Week: No Classes
Week 7 : 25 March - 31 March	Other	Bootstrap computing in R (1 hour). Order Statistics (2 hours)
Week 8 : 1 April - 7 April	Other	Robustness (2 hour). Rank-based Inference (2 hours)
Week 9 : 8 April - 14 April	Other	Rank-based Inferences (1 hour) Goodness-of-fit Tests (2 hours) Contingency Tables (1 hour)
Week 10 : 15 April - 21 April	Other	K samples problems (K > 2) (2 hours). Measures of Association (2 hours)

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
	Tom Stindl					No	Yes

Other Useful Information

Academic Information

Upon your enrolment at UNSW, you share responsibility with us for maintaining a safe, harmonious and tolerant University environment.

You are required to:

- Comply with the University's conditions of enrolment.
- Act responsibly, ethically, safely and with integrity.
- Observe standards of equity and respect in dealing with every member of the UNSW community.
- Engage in lawful behaviour.
- Use and care for University resources in a responsible and appropriate manner.

- Maintain the University's reputation and good standing.

For more information, visit the UNSW Student Code of Conduct Website.

Academic Honesty and Plagarism

Referencing is a way of acknowledging the sources of information that you use to research your assignments. You need to provide a reference whenever you draw on someone else's words, ideas or research. Not referencing other people's work can constitute plagiarism.
Further information about referencing styles can be located at https://student.unsw.edu.au/referencing

Academic integrity is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits: honesty, trust, fairness, respect, responsibility and courage. At UNSW, this means that your work must be your own, and others' ideas should be appropriately acknowledged. If you don't follow these rules, plagiarism may be detected in your work.
Further information about academic integrity, plagiarism and the use of AI in assessments can be located at:

- The Current Students site,
- The ELISE training site, and
- The Use of AI for assessments site.

The Student Conduct and Integrity Unit provides further resources to assist you to understand your conduct obligations as a student: https://student.unsw.edu.au/conduct

Submission of Assessment Tasks

Penalty for Late Submissions
UNSW has a standard late submission penalty of:

- 5% per day,
- for all assessments where a penalty applies,
- capped at five days (120 hours) from the assessment deadline, after which a student cannot submit an assessment, and
- no permitted variation.

Any variations to the above will be explicitly stated in the Course Outline for a given course or assessment task.

Students are expected to manage their time to meet deadlines and to request extensions as early as possible before the deadline.

Special Consideration

If circumstances prevent you from attending/completing an assessment task, you must officially apply for special consideration, usually within 3 days of the sitting date/due date. You can apply by logging onto myUNSW and following the link in the My Student Profile Tab. Medical documentation or other documentation explaining your absence must be submitted with your application. Once your application has been assessed, you will be contacted via your student email address to be advised of the official outcome and any actions that need to be taken from there. For more information about special consideration, please visit: https://student.unsw.edu.au/special-consideration

Important note: UNSW has a "fit to sit/submit" rule, which means that if you sit an exam or submit a piece of assessment, you are declaring yourself fit to do so and cannot later apply for Special Consideration. This is to ensure that if you feel unwell or are faced with significant circumstances beyond your control that affect your ability to study, you do not sit an examination or submit an assessment that does not reflect your best performance. Instead, you should apply for Special Consideration as soon as you realise you are not well enough or are otherwise unable to sit or submit an assessment.

Faculty-specific Information

Additional support for students

- The Current Students Gateway
- Student Support
- Academic Skills and Support
- Student Wellbeing, Health and Safety
- Equitable Learning Services
- UNSW IT Service Centre
- Science EDI Student Initiatives, Offerings and Guidelines

School-specific Information

School of Mathematics and Statistics and UNSW Policies

The School of Mathematics and Statistics has adopted a number of policies relating to enrolment, attendance, assessment, plagiarism, cheating, special consideration etc. These are in

addition to the Policies of The University of New South Wales. Individual courses may also adopt other policies in addition to or replacing some of the School ones. These will be clearly notified in the Course Initial Handout and on the Course Home Pages on the Maths Stats web site. Students in courses run by the School of Mathematics and Statistics should be aware of the School and Course policies by reading the appropriate pages on the web site starting at: The School of Mathematics and Statistics assessment policies

The School of Mathematics and Statistics will assume that all its students have read and understood the School policies on the above pages and any individual course policies on the Course Initial Handout and Course Home Page. Lack of knowledge about a policy will not be an excuse for failing to follow the procedure in it.

Special Consideration - Short Extension Policy

The School of Mathematics and Statistics has carefully reviewed its range of assignments and projects to determine their suitability for automatic short extensions as set out by the UNSW Short Extension Policy. Upon comprehensive examination of our course offerings that incorporate these types of assessments, we have concluded that our current deadline structures already accommodate the possibility of unexpected circumstances that may lead students to require additional days for submission. Consequently, the School of Mathematics and Statistics has decided to universally opt out of the Short Extension provision for all its courses, having pre-emptively integrated flexibility into our assessment deadlines. The decision is subject to revision in response to the introduction of new course offerings. Students may still apply for Special Consideration via the usual procedures.

Computing Lab

The main computing laboratory is room G012 of the Anita B.Lawrence Centre (formerly Red Centre). You can get to this lab by entering the building through the main entrance to the School of Mathematics (on the Mezzanine Level) and then going down the stairs to the Ground Level. A second smaller lab is Room M020, located on the mezzanine level through the glass door (and along the corridor) opposite the School's entrance.

For more information, including opening hours, see the computing facilities webpage. Remember that there will always be unscheduled periods when the computers are not working because of equipment problems and that this is not a valid excuse for not completing assessments on time.

School Contact Information

School Contact Information

Please visit the School of Mathematics and Statistics website for a range of information.

For information on Courses, please go to “Student life & resources” and either Undergraduate and/or Postgraduate and respective "Undergraduate courses" and "Postgraduate courses" for information on all course offerings.

All school policies, forms and help for students can be located by going to the "Student Services" within “Student life & resources” page. We also post notices in "Student noticeboard" for your information. Please familiarise yourself with the information found in these locations. If you cannot find the answer to your queries on the web you are welcome to contact the Student Services Office directly.

Undergraduate

E: ug.mathsstats@unsw.edu.au

P: 9385 7011 or 9385 7053

Postgraduate

E: pg.mathsstats@unsw.edu.au

P: 9385 7053

Should we need to contact you, we will use your official UNSW email address of in the first instance. **It is your responsibility to regularly check your university email account. Please use your UNSW student email and state your student number in all emails to us.**