UNSW Course Outline

MATH3841 Statistical Analysis of Dependent Data - 2024

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General Course Information

Course Code : MATH3841
Year : 2024
Term : Term 2
Teaching Period : T2
Is a multi-term course? : No
Faculty : Faculty of Science
Academic Unit : School of Mathematics & Statistics
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Undergraduate
Units of Credit : 6

<u>Useful Links</u>

<u>Handbook</u> <u>Class Timetable</u>

Course Details & Outcomes

Course Description

This is a third-year statistics course for undergraduate students in mathematics/statistics and data science. Many data applications are concerned with observations that are correlated and sophisticated methods are required to analyze such data. This course extends statistical

modeling from independently distributed data to modelling dependence in observed data and develops an understanding of basic distributions and models useful in practical situations. It continues with the development of statistical methods for analysis of dependent data arising in multivariate observations, longitudinal data, time series and spatial processes. Specific topics include the multivariate normal distribution, linear mixed models, time series models, ARMA and forecasting ARMA, spatial processes, sample semivariograms and Kriging. The teaching activities include weekly lectures in which the methods and theory are explained and weekly tutorials in which the methods can be applied.

Course Aims

The aim of this course is to extend the student's understanding of statistical modelling, predominantly based on independently distributed data, to these important practical examples where dependence is required in the models. The course introduces the multivariate normal distribution which is central to the understanding of dependence between measurements within subjects, across time or space. The aim is to apply the basic properties of the multivariate normal distribution to a series of examples drawn from longitudinal data, time series and spatial processes.

Relationship to Other Courses

Prerequisite: MATH3811 or MATH3911.

Exclusion: MATH3941 Higher Statistical Analysis of Dependent Data

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Identify the existence of correlated data and describe the limitations of standard methods in these settings.
CLO2 : Develop and analytically describe appropriate models for longitudinal, time series and spatial data.
CLO3 : Apply appropriate methods to analyze temporally and spatially dependent data.
CLO4 : Apply statistical software to model and analyze correlated data.

Course Learning Outcomes	Assessment Item
CLO1 : Identify the existence of correlated data and describe the limitations of standard methods in these settings.	• Assignment 1 • Mid-term Test • Assignment 2 • Final Exam
CLO2 : Develop and analytically describe appropriate models for longitudinal, time series and spatial data.	• Assignment 1 • Mid-term Test • Assignment 2 • Final Exam
CLO3 : Apply appropriate methods to analyze temporally and spatially dependent data.	• Mid-term Test • Assignment 2 • Final Exam
CLO4 : Apply statistical software to model and analyze correlated data.	• Assignment 2 • Final Exam

Learning and Teaching Technologies

Moodle - Learning Management System

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Assignment 1 Assessment Format: Individual	10%	Due Date: 23/06/2023 05:00 PM
Mid-term Test Assessment Format: Individual	20%	Start Date: 10/07/2023 03:00 PM
Assignment 2 Assessment Format: Individual	10%	Due Date: 28/07/2023 05:00 PM
Final Exam Assessment Format: Individual	60%	

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.

Course Learning Outcomes

- CLO1 : Identify the existence of correlated data and describe the limitations of standard methods in these settings.
- CLO2 : Develop and analytically describe appropriate models for longitudinal, time series and spatial data.

Detailed Assessment Description

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.

Mid-term Test

Assessment Overview

The Mid-term Test is designed to assess your knowledge covered in lectures in weeks 1-5 inclusive. Mid-term Test will 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.

Course Learning Outcomes

- CLO1 : Identify the existence of correlated data and describe the limitations of standard methods in these settings.
- CLO2 : Develop and analytically describe appropriate models for longitudinal, time series and spatial data.
- CLO3 : Apply appropriate methods to analyze temporally and spatially dependent data.

Detailed Assessment Description

The Mid-term Test is designed to assess your knowledge covered in lectures in weeks 1-5 inclusive. Mid-term Test will 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.

Assignment 2

<u>Assessment Overview</u>

In week 9 you will submit answers to an assignment that covers material from weeks 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.

<u>Course Learning Outcomes</u>

- CLO1 : Identify the existence of correlated data and describe the limitations of standard methods in these settings.
- CLO2 : Develop and analytically describe appropriate models for longitudinal, time series and spatial data.
- CLO3 : Apply appropriate methods to analyze temporally and spatially dependent data.
- CLO4 : Apply statistical software to model and analyze correlated data.

<u>Detailed Assessment Description</u>

In week 9 you will submit answers to an assignment that covers material from weeks 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.

Final Exam

<u>Assessment Overview</u>

The final exam is designed to summarise your learning and problem-solving skills on all topics delivered across 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.

<u>Course Learning Outcomes</u>

- CLO1 : Identify the existence of correlated data and describe the limitations of standard methods in these settings.
- CLO2 : Develop and analytically describe appropriate models for longitudinal, time series and spatial data.
- CLO3 : Apply appropriate methods to analyze temporally and spatially dependent data.
- CLO4 : Apply statistical software to model and analyze correlated data.

<u>Detailed Assessment Description</u>

The final exam is designed to summarise your learning and problem-solving skills on all topics delivered across 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.

General Assessment Information

No late submissions will be accepted past the deadline.

Grading Basis

Standard

Requirements to pass course

Acheieve a composite mark of a tleast 50 out of 100.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 27 May - 2 June	Lecture	Introduction to dependent data. Revision of vectors and matrices.
Week 2 : 3 June - 9 June	Lecture	Multivariate Normal Distribtuion.
Week 3 : 10 June - 16 June	Lecture	Inference for a multivariate normal mean.
Week 4 : 17 June - 23 June	Lecture	Introduction to Time Series. ARMA(p,q) processes.
Week 5 : 24 June - 30 June	Lecture	Parameter estimation and forecasting stationary Time Series.
Week 6 : 1 July - 7 July	Other	Mid-session break.
Week 7 : 8 July - 14 July	Lecture	Introduction to longitudinal data. Exploring longitudinal data.
Week 8 : 15 July - 21 July	Lecture	Parametric models for covariance structure.
Week 9 : 22 July - 28 July	Lecture	Extension of dependence ideas to the spatial domain
Week 10 : 29 July - 4 August	Lecture	Extension of dependence ideas to the spatial domain. Revision.

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

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.**