UNSW Course Outline

MATH2931 Higher Linear Models - 2024

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General Course Information

Course Code : MATH2931
Year : 2024
Term : Term 3
Teaching Period : T3
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

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

This course is intended for students completing data science and statistics majors Through a series of lectures and tutorials, the course will cover key topics including linear regression computation and inference, and modern model/feature selection methods used in data mining

and computational statistics. Where content is in common with MATH2831, this course aims to give students a deeper level of understanding.

Course Aims

This course aims to introduce students to some of the fundamentals of data science and computational statistics. Topics covered include the mathematical tools and analytical reasoning needed to design and implement practical statistical learning algorithms. The course covered both theoretical and applied aspects of linear models and their extensions.

Relationship to Other Courses

Prerequisite: MATH2901 or MATH2801(DN)

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Use key theoretical tools to explore properties of linear statistical models.
CLO2 : Apply key methods of inference and model choice for linear models in advanced applied settings.
CLO3 : Derive fundamental results in the theory of linear statistical models.
CLO4 : Apply linear statistical models in new contexts, such as finance, economics, engineering and medicine.

Course Learning Outcomes	Assessment Item
CLO1 : Use key theoretical tools to explore properties of linear statistical models.	• Assignment 1 • Final exam • Assignment 2
CLO2 : Apply key methods of inference and model choice for linear models in advanced applied settings.	• Assignment 1 • Final exam • Assignment 2
CLO3 : Derive fundamental results in the theory of linear statistical models.	• Assignment 1 • Final exam • Assignment 2
CLO4 : Apply linear statistical models in new contexts, such as finance, economics, engineering and medicine.	• Assignment 1 • Final exam • Assignment 2

Learning and Teaching Technologies

Moodle - Learning Management System

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Assignment 1 Assessment Format: Individual	20%	Due Date: Week 4
Final exam Assessment Format: Individual	60%	Due Date: Exam Period
Assignment 2 Assessment Format: Individual	20%	Due Date: Week 9

Assessment Details

Assignment 1

Assessment Overview

You will complete an assignment which covers the material up to week 4, including theoretical proofs in the basic theory of linear regression. The assignment will include a choice between a theoretical, or computing question, or both. The task is due in Week 4.

General feedback will be provided in the lectures and individual feedback will be provided in the tutorials within two weeks of submission.

Course Learning Outcomes

- CLO1 : Use key theoretical tools to explore properties of linear statistical models.
- CLO2 : Apply key methods of inference and model choice for linear models in advanced applied settings.
- CLO3 : Derive fundamental results in the theory of linear statistical models.
- CLO4 : Apply linear statistical models in new contexts, such as finance, economics, engineering and medicine.

Assignment submission Turnitin type

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.

For more information on Generative AI and permitted use please see here.

Final exam

Assessment Overview

The final exam is designed to test your knowledge of linear models and extensions, covering all topics delivered across the term, including material from lectures and tutorials.

The examination will occur during the official university examination periods and will be 2 hours in duration.

Feedback is available through inquiry with the course convenor.

Course Learning Outcomes

- CLO1 : Use key theoretical tools to explore properties of linear statistical models.
- CLO2 : Apply key methods of inference and model choice for linear models in advanced applied settings.
- CLO3 : Derive fundamental results in the theory of linear statistical models.
- CLO4 : Apply linear statistical models in new contexts, such as finance, economics, engineering and medicine.

Generative AI Permission Level

No Assistance

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For more information on Generative AI and permitted use please see here.

Assignment 2

Assessment Overview

You will complete an assignment which covers the material up to week 9, including modern methods for feature selection. The assignment will include a choice between a theoretical, or computing question, or both. The task is due in Week 9.

General feedback will be provided in the lectures and individual feedback will be provided in the tutorials within two weeks of submission.

Course Learning Outcomes

- CLO1 : Use key theoretical tools to explore properties of linear statistical models.

- CLO2 : Apply key methods of inference and model choice for linear models in advanced applied settings.
- CLO3 : Derive fundamental results in the theory of linear statistical models.
- CLO4 : Apply linear statistical models in new contexts, such as finance, economics, engineering and medicine.

Assignment submission Turnitin type

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.
For more information on Generative AI and permitted use please see here.

General Assessment Information

Standard late submission penalties apply (ie: the rules below)

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.

Grading Basis

Standard

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 9 September - 15 September	Lecture	Simple and General linear regression Formulation of the simple and general linear regression model; least squares estimation; estimation of error variance; maximum likelihood; confidence and prediction intervals; hypothesis testing; multicollinearity.
Week 2 : 16 September - 22 September	Lecture	Simple and General linear regression Formulation of the simple and general linear regression model; least squares estimation; estimation of error variance; maximum likelihood; confidence and prediction intervals; hypothesis testing; multicollinearity.
Week 3 : 23 September - 29 September	Lecture	Simple and General linear regression Formulation of the simple and general linear regression model; least squares estimation; estimation of error variance; maximum likelihood; confidence and prediction intervals; hypothesis testing; multicollinearity.
Week 4 : 30 September - 6 October	Lecture	Model selection Model criticism; PRESS; cross validation, Mallow's C_p, sequential procedures; limitations of automated model selection procedures.
Week 5 : 7 October - 13 October	Lecture	Model selection Model criticism; PRESS; cross validation, Mallow's C_p, sequential procedures; limitations of automated model selection procedures.
Week 6 : 14 October - 20 October	Lecture	Flexibility week (no classes, tutorials or labs).
Week 7 : 21 October - 27 October	Lecture	Residuals diagnostics and Transforms Residual plots; outlier detection; partial regression and residual plots; testing for normality; influence measures; Generalized and Weighted regression; Non-linear transformations; Box-Cox, Box-Tidwell, Atkinson's Score Method;
Week 8 : 28 October - 3 November	Lecture	Residuals diagnostics and Transforms Residual plots; outlier detection; partial regression and residual plots; testing for normality; influence measures; Generalized and Weighted regression; Non-linear transformations; Box-Cox, Box-Tidwell, Atkinson's Score Method;
Week 9 : 4 November - 10 November	Lecture	Categorical predictors Categorical predictor variables; dummy variables; hypothesis testing; interactions. One-way classification model with fixed effects;
Week 10 : 11 November - 17 November	Lecture	Categorical predictors and Review Categorical predictor variables; dummy variables; hypothesis testing; interactions. One-way classification model with fixed effects; Course review.

Attendance Requirements

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

General Schedule Information

Below are list of topics to be covered in lectures and tutorials.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
	Zdravko Botev					No	No
	Scott Sisson					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 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.**