UNSW Course Outline

ECON3210 Big Data Econometrics - 2024

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General Course Information

Course Code : ECON3210
Year : 2024
Term : Term 2
Teaching Period : T2
Is a multi-term course? : No
Faculty : UNSW Business School
Academic Unit : School of Economics
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

There has been an explosion in the availability, scope and amount of data that is available for organisations to analyse in order to help them make better decisions. 'Big Data' has presented new challenges for data analysts and has meant that traditional statistical and econometric

approaches have had to be improved and supplemented by machine learning methods. This course discusses a range of analytical methods such as regression, model selection and regularisation, regression trees, cross validation, and natural experiments with an emphasis on applications in a data-rich environment. The relative strengths and interaction of these methods will be explored across three types of tasks: description, prediction, and counterfactual prediction. The distinction between experimental and observational data will be stressed and there may be discussion of less traditional types of data structures such as textual, spatial and network data.

Course Aims

The 'Big Data' world characterises an era where data plays a ubiquitous role in problem solving and decision-making in organisations within business, industry and government. ECON3210 provides an appreciation of the challenges of modern data analysis in a 'Big Data' world, emphasising the opportunities for traditional statistical and econometric approaches to be improved and supplemented by machine learning methods.

The prerequisite for this course is Introductory Econometrics (ECON2206) or Business Forecasting (ECON2209). In particular, students are expected to have a good basic knowledge of regression analysis.

Relationship to Other Courses

Course Learning Outcomes

Course Learning Outcomes	Program learning outcomes
CLO1 : Explain the distinction between three types of modelling tasks: description, prediction, and counterfactual prediction.	• PLO1 : Business Knowledge
CLO2 : Use appropriate software to analyse data of various types and structures.	• PLO1 : Business Knowledge • PLO2 : Problem Solving
CLO3 : Make informed decisions about research design, the model building process, the challenges and opportunities afforded by big data and the relevance of theoretical models in conducting applied work.	• PLO1 : Business Knowledge • PLO2 : Problem Solving • PLO3 : Business Communication
CLO4 : Use econometric models and machine learning methods to interpret and analyse real data in economics, finance and other business disciplines.	• PLO1 : Business Knowledge • PLO2 : Problem Solving • PLO3 : Business Communication
CLO5 : Construct written work which communicates ideas in a succinct and clear manner using logical and professional presentation.	• PLO1 : Business Knowledge • PLO2 : Problem Solving • PLO3 : Business Communication
CLO6 : Work collaboratively to complete a task.	• PLO4 : Teamwork
CLO7 : Identify and assess environmental and sustainability considerations in problems in economics and business. Understand the ethical responsibilities associated with reporting econometric results.	• PLO1 : Business Knowledge

Course Learning Outcomes	Assessment Item
CLO1 : Explain the distinction between three types of modelling tasks: description, prediction, and counterfactual prediction.	• Assignment • Project • Final exam • Feedback Quiz
CLO2 : Use appropriate software to analyse data of various types and structures.	• Project
CLO3 : Make informed decisions about research design, the model building process, the challenges and opportunities afforded by big data and the relevance of theoretical models in conducting applied work.	• Assignment • Final exam • Project
CLO4 : Use econometric models and machine learning methods to interpret and analyse real data in economics, finance and other business disciplines.	• Assignment • Final exam • Project
CLO5 : Construct written work which communicates ideas in a succinct and clear manner using logical and professional presentation.	• Final exam • Project
CLO6 : Work collaboratively to complete a task.	• Project
CLO7 : Identify and assess environmental and sustainability considerations in problems in economics and business. Understand the ethical responsibilities associated with reporting econometric results.	• Project

Learning and Teaching Technologies

Moodle - Learning Management System | Zoom | Echo 360

Learning and Teaching in this course

All lectures and most tutorials will be face-to-face. There will be one online tutorial. Course materials are provided online, including lecture recordings, and all assessments require online submission. However, the teaching staff encourage students to engage in face-to-face discussions to complement online interaction.

Lectures will be interactive and students will be expected to be active participants in lecture exchanges. The lecture material will cover a combination of new methods and their application using appropriate software. Considerable theory underpins the methods but the focus will be on reading and understanding substantial applications provided in published research.

Lectures will be supplemented by problems, case studies, computer exercises and readings and it is essential that students prepare for lectures and tutorials by working through this assigned

material even when it is not directly assessable.

Lectures, tutorials and assessments have been designed to appropriately challenge students and support the achievement of the desired learning outcomes. A climate of inquiry and dialogue is encouraged between students and teachers and among students (in and out of class). The lecturer aims to provide meaningful and timely feedback to students to improve learning outcomes.

Use of your Webcam and Digital Devices: If you enrol in an online class, or the online stream of a hybrid class, teaching and associated activities will be conducted using Teams, Zoom, or similar a technology. Using a webcam is optional, but highly encouraged, as this will facilitate interaction with your peers and instructors. If you are worried about your personal space being observed during a class, we encourage you to blur your background or make use of a virtual background.

Please contact the Lecturer-in-Charge if you have any questions or concerns.

Some courses may involve undertaking online exams for which your own computer or digital devices will be required. Monitoring of online examinations will be conducted directly by University staff and is bound by the University's privacy and security requirements. Any data collected will be handled accordance with UNSW policies and standards for data governance. For more information on how the University manages personal information please refer to the UNSW Student Privacy Statement and the UNSW Privacy Policy.

Learning Activities and Teaching Strategies

The examinable content of the course is defined by the references given in the lecture schedule, the content of lectures, and the content covered in tutorials.

Lectures and tutorials

The lectures are aimed at providing students with some guidance and tools to be able to produce reliable and useful empirical results and to be able to appraise the work of others. Lecture material will be integrated with assigned reading material and tutorial exercises in order to deepen and broaden the major points made in the lectures. An essential component of the course will be the completion of a project to enable students to gain experience in putting these tools into practice and to demonstrate their understanding and creativity.

It is essential that the discussion of how to use modelling tools effectively be complemented

with practice in analysing data. There is no prescribed software package but either Stata or R will be suitable and students are expected to have previous experience with using at least one of these packages.

Out-of-Class Study

While students may have preferred individual learning strategies, it is important to note that most learning will be achieved outside of class time. Lectures and tutorials can only provide a structure to assist your study, and in-class time is limited.

An "ideal" strategy (on which the provision of the course materials is based) might include:

- Reading of the relevant references before the lecture. This will give you a general idea of the topic area.
- Attending lectures. Here the context, importance, and relevance of course material is identified and clarified.
- Attempting tutorial questions before attending the tutorial class. This helps to identify issues that can be clarified or resolved in the tutorial class.

Additional Course Information

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates	Program learning outcomes
Assignment Assessment Format: Individual	20%	Start Date: Not Applicable Due Date: 17/06/2024 01:00 PM	• PLO1 : Business Knowledge • PLO2 : Problem Solving • PLO3 : Business Communication
Project Assessment Format: Group Short Extension: Yes (1 day)	30%	Start Date: Not Applicable Due Date: 29/07/2024 01:00 PM	• PLO1 : Business Knowledge • PLO2 : Problem Solving • PLO3 : Business Communication • PLO4 : Teamwork • PLO5 : Responsible Business Practice • PLO6 : Global and Cultural Competence
Final exam Assessment Format: Individual	50%	Start Date: Not Applicable Due Date: Not Applicable	• PLO1 : Business Knowledge • PLO2 : Problem Solving • PLO3 : Business Communication
Feedback Quiz Assessment Format: Individual	0%	Start Date: 03/06/2024 01:00 PM Due Date: 14/06/2024 12:00 AM	• PLO1 : Business Knowledge • PLO2 : Problem Solving

Assessment Details

Assignment

<u>Assessment Overview</u>

The assignment is designed to assess your understanding of the lecture material covered in Weeks 1 and 2. The criteria used for marking the Assignment are correctness and clarity of the answers presented.

Assesses: PLO1, PLO2, PLO3

<u>Course Learning Outcomes</u>

- CLO1 : Explain the distinction between three types of modelling tasks: description, prediction, and counterfactual prediction.
- CLO3 : Make informed decisions about research design, the model building process, the challenges and opportunities afforded by big data and the relevance of theoretical models in conducting applied work.
- CLO4 : Use econometric models and machine learning methods to interpret and analyse real data in economics, finance and other business disciplines.

Detailed Assessment Description

The assignment is designed to assess your understanding of lecture material covered in Weeks 1 and 2.

The criteria used for marking the Assignment are correctness and clarity of the answers presented. The Assignment and the Project (see below) are designed to assess progress toward learning goals listed in the Student Learning Outcomes section of this Course Outline.

Further details of the Assignment will be posted on the course website.

Submission notes

Online

Assignment submission Turnitin type

This is not a Turnitin assignment

Project

Assessment Overview

The Project involves a substantive analysis of data associated with an applied economic problem. The Project will draw on material covered in lectures and will account for 30% of your total assessment for the course.

Assesses: PLO1, PLO2, PLO3, PLO4, PLO5, PLO6

Course Learning Outcomes

- CLO1 : Explain the distinction between three types of modelling tasks: description, prediction, and counterfactual prediction.
- CLO2 : Use appropriate software to analyse data of various types and structures.
- CLO3 : Make informed decisions about research design, the model building process, the challenges and opportunities afforded by big data and the relevance of theoretical models in conducting applied work.
- CLO4 : Use econometric models and machine learning methods to interpret and analyse real data in economics, finance and other business disciplines.
- CLO5 : Construct written work which communicates ideas in a succinct and clear manner using logical and professional presentation.
- CLO6 : Work collaboratively to complete a task.
- CLO7 : Identify and assess environmental and sustainability considerations in problems in economics and business. Understand the ethical responsibilities associated with reporting econometric results.

<u>Detailed Assessment Description</u>

The Project involves a substantive analysis of data associated with an applied economic problem. The Project will draw on material covered in lectures and will account for 30% of your total assessment for the course.

More details on the Project will be posted on the course website.

<u>Submission notes</u>

Printed only

<u>Assignment submission Turnitin type</u>

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

Final exam

<u>Assessment Overview</u>

Open-book exam and will be held during the University exam period.

Assesses: PLO1, PLO2, PLO3

<u>Course Learning Outcomes</u>

- CLO1 : Explain the distinction between three types of modelling tasks: description, prediction, and counterfactual prediction.
- CLO3 : Make informed decisions about research design, the model building process, the challenges and opportunities afforded by big data and the relevance of theoretical models in conducting applied work.
- CLO4 : Use econometric models and machine learning methods to interpret and analyse real data in economics, finance and other business disciplines.
- CLO5 : Construct written work which communicates ideas in a succinct and clear manner using logical and professional presentation.

<u>Detailed Assessment Description</u>

There will be a take-home final exam. The exam will appear on the course website and students will have 24 hours to submit their answers. This is an open-book exam: students are able to consult their textbook, notes, and materials on the course website. However, students should not seek the help of others and the usual rules on plagiarism will also apply. The Turnitin software will automatically check for evidence of such transgressions, and additional methods may also be used to maintain academic integrity.

More details on the Final Exam will be posted on the course website.

Submission notes

Printed only

Assignment submission Turnitin type

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

Feedback Quiz

Assessment Overview

There will be a Feedback Quiz posted on Moodle in Week 2. There will be no marks attached to this and it is designed for self-assessment to give timely feedback to students on their understanding of the course material.

Course Learning Outcomes

- CLO1 : Explain the distinction between three types of modelling tasks: description, prediction, and counterfactual prediction.

Detailed Assessment Description

This will be a Feedback Quiz posted on Moodle in Week 2. There will be no marks attached to this and it is designed for self-assessment to give timely feedback to students on their understanding of the course material.

Submission notes

Online

Assignment submission Turnitin type

Not Applicable

General Assessment Information

Grading Basis

Standard

Requirements to pass course

In order to pass this course students must:

• Achieve a composite mark of at least 50 out of 100

• Engage actively in course learning activities and attempt all assessment requirements

• Meet any additional requirements specified in the assessment details

• Meet the specified attendance requirements of the course (see Schedule section)

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 27 May - 2 June	Lecture	Overview • Econometrics in a Big Data world • Econometrics v. Machine Learning or Econometrics & Machine Learning? • Prediction v. Causal Inference Primary references • Fiebig (2017) • Varian (2016)
	Tutorial	NO TUTORIALS IN WEEK 1
Week 2 : 3 June - 9 June	Lecture	Prediction • Modelling innovations in a Big Data world • Lasso & friends for modelling high-dimensional data Primary reference • James et al. (2013) 5.1, 6.2, 6.4, 6.6
	Tutorial	Questions on Week 1 lecture material
	Assessment	Feedback quiz online
Week 3 : 10 June - 16 June	Lecture	Prediction • Tree-based estimators • Random Forest Primary reference • James et al. (2013) 8.1 8.2
	Tutorial	Questions on Week 2 lecture material
Week 4 : 17 June - 23 June	Lecture	Causal Inference • Causal effects under conditional exogeneity • Post-selection inference with Lasso Primary references • Belloni, Chernozhukov, & Hansen (2014a)
	Tutorial	Questions on Week 3 lecture material
	Assessment	Assignment due: 1pm Monday 17 June
Week 5 : 24 June - 30 June	Lecture	Applications I • Prediciton Policy Problem • Algorithm Bias • Revisiting the 401(k) Pension Plan Primary references • Kleinberg et al. (2015) • Obermeyer et al. (2019) • Belloni, Chernozhukov & Hansen (2014a)
	Tutorial	Questions on Week 4 lecture material
Week 6 : 1 July - 7 July	Lecture	NO LECTURES OR TUTORIALS
Week 7 : 8 July - 14 July	Lecture	Causal Inference: • Double Machine Learning Primary references • Chernozhukov et al. (2018)
	Tutorial	Questions on Week 5 lecture material
Week 8 : 15 July - 21 July	Lecture	Causal Inference • Diff-in-Diffs with Post-Selection and DML • Heterogeneous Treatment Effect by Causal Tree Primary references • Angrist & Pischke (2019) 5.2 • Belloni, Chernozhukov & Hansen (2014a) • Athey & Imbens (2016)
	Tutorial	Questions on Week 7 lecture material
Week 9 : 22 July - 28 July	Lecture	Applications II • Unemployment & Smoking • Tutoring During Covid-19 Primary reference • Everding & Marcus (2020) • Carlana & Ferrara (2021)
	Tutorial	Questions on Week 8 lecture material
Week 10 : 29 July - 4 August	Lecture	NO LECTURES
	Tutorial	Questions on Week 9 lecture material
	Assessment	Project due: 1pm Monday 29 July

Attendance Requirements

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

Course Resources

Prescribed Resources

The website for this course is on [Moodle](#).

This subject requires econometric/statistical software for tutorial problems and the Project. There is no prescribed software but there is a preference for either Stata (version 16) or R. Other packages may be suitable but this cannot be guaranteed, and they cannot be supported by teaching staff. Students are presumed to have previous experience in using either Stata or R.

There is no textbook for the course because the material is based almost entirely on recent research papers. A full set of references will be provided on Moodle but only a small number of these are required reading. There will be some key overview papers that students should read as well as a small number of research papers with substantial applications.

The following textbook may provide useful background material for this course:

Wooldridge, J.M. (2020), Introductory Econometrics : A Modern Approach, 7th Edition, South-Western

As a further aid to your study, copies of lecture overheads will be available on the course website.

Course Evaluation and Development

Feedback is regularly sought from students and continual improvements are made based on this feedback. At the end of this course, you will be asked to complete the myExperience survey, which provides a key source of student evaluative feedback. Your input into this quality enhancement process is extremely valuable in assisting us to meet the needs of our students and provide an effective and enriching learning experience. The results of all surveys are carefully considered and do lead to action towards enhancing educational quality.

The School of Economics strives to be responsive to student feedback. If you would like more information on how the design of this course and changes made to it over time have taken students' needs and preferences into account, please contact the Director of Education at the

School of Economics.

Consent for De-Identified Data to be Used for Secondary Research into Improving Student Experience

To enhance your student experience, researchers at UNSW conduct academic research that involves the use of de-identified student data, such as assessment outcomes, course grades, course engagement and participation, etc. Students of this course are being invited to provide their consent for their de-identified data to be shared with UNSW researchers for research purposes after the course is completed.

Providing consent for your de-identified data to be used in academic research is voluntary and not doing so will not have an impact on your course grades.

Researchers who want to access your de-identified data for future research projects will need to submit individual UNSW Ethics Applications for approval before they can access your data.

A full description of the research activities aims, risks associated with these activities and how your privacy and confidentiality will be protected at all times can be found here.

If you consent to have your de-identified data used for academic research into improving student experience, you do not need to do anything. Your consent will be implied, and your data may be used for research in a format that will not individually identify you after the course is completed.

If you do not consent for this to happen, please email the opt-out form to seer@unsw.edu.au to opt-out from having your de-identified data used in this manner. If you complete the opt-out form, the information about you that was collected during this course will not be used in academic research.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Fangzhou Yu				Tuesday 11:00am-12:00pm and by appointment	No	Yes

Other Useful Information
Academic Information

COURSE POLICIES AND SUPPORT

The Business School expects that you are familiar with the contents of this course outline and the UNSW and Business School learning expectations, rules, policies and support services as listed below:

- Program Learning Outcomes
- Academic Integrity and Plagiarism
- Student Responsibilities and Conduct
- Special Consideration
- Protocol for Viewing Final Exam Scripts
- Student Learning Support Services

Further information is provided on the key policies and support page.

Students may not circulate or post online any course materials such as handouts, exams, syllabi or similar resources from their courses without the written permission of their instructor.

STUDENT LEARNING OUTCOMES

The Course Learning Outcomes (CLOs) – under the Outcomes tab – are what you should be able to demonstrate by the end of this course, if you participate fully in learning activities and successfully complete the assessment items.

CLOs also contribute to your achievement of the Program Learning Outcomes (PLOs), which are developed across the duration of a program. PLOs are, in turn, directly linked to UNSW graduate capabilities. More information on Coursework PLOs is available on the key policies and support page. For PG Research PLOs, including MPDBS, please refer to the UNSW HDR Learning Outcomes.

Academic Honesty and Plagarism

As a student at UNSW you are expected to display academic integrity in your work and interactions. Where a student breaches the UNSW Student Code with respect to academic integrity, the University may take disciplinary action under the Student Misconduct Procedure. To assure academic integrity, you may be required to demonstrate reasoning, research and the

process of constructing work submitted for assessment.

To assist you in understanding what academic integrity means, and how to ensure that you do comply with the UNSW Student Code, it is strongly recommended that you complete the Working with Academic Integrity module before submitting your first assessment task. It is a free, online self-paced Moodle module that should take about one hour to complete.

Submission of Assessment Tasks

SPECIAL CONSIDERATION

You can apply for special consideration when illness or other circumstances beyond your control interfere with your performance in a specific assessment task or tasks, including online exams. Students studying remotely who have exams scheduled between 10pm and 7am local time, are also able to apply for special consideration to sit a supplementary exam at a time outside of these hours.

Special consideration is primarily intended to provide you with an extra opportunity to demonstrate the level of performance of which you are capable. To apply, and for further information, see Special Consideration on the UNSW Current Students page.

Special consideration applications will be assessed centrally by the Case Review Team, who will update the online application with the outcome and add any relevant comments. The change to the status of the application immediately sends an email to the student and to the assessor with the outcome of the application.

Please note the following:

1. Applications can only be made through Online Services in myUNSW (see the UNSW Current Students page). Applications will not be accepted by teaching staff. The lecturer-in-charge/ course coordinator will be automatically notified when your application is processed.
2. Applying for special consideration does not automatically mean that you will be granted a supplementary exam or other concession.
3. If you experience illness or misadventure in the lead up to an exam or assessment, you must submit an application for special consideration, either prior to the examination taking place, or prior to the assessment submission deadline, except where illness or misadventure prevent you from doing so.
4. If your circumstances stop you from applying before your exam or assessment due date, you must apply within 3 working days of the assessment or the period covered by your supporting documentation.

5. Under the UNSW Fit To Sit/Submit rule, if you sit the exam/submit an assignment, you are declaring yourself well enough to do so and are cannot subsequently apply for special consideration.
6. If you become unwell on the day of – or during – an exam, you must stop working on your exam, advise your course coordinator or tutor and provide a medical certificate dated within 24 hours of the exam, with your special consideration application. For online exams, you must contact your course coordinator or tutor immediately via email, Moodle or chat and advise them you are unwell and submit screenshots of your conversation along with your medical certificate and application.
7. Special consideration requests do not allow the awarding of additional marks to students.

Further information on Business School policy and procedure can be found under "Special Consideration" on the key policies and support page.

LATE SUBMISSION PENALTIES

For assessments other than examinations, late submission will incur a penalty of 5% per day or part thereof (including weekends) from the due date and time. An assessment will not be accepted after 5 days (120 hours) of the original deadline unless special consideration has been approved. An assignment is considered late if the requested format, such as hard copy or electronic copy, has not been submitted on time or where the 'wrong' assignment has been submitted.

For assessments which account for 10% or less of the overall course grade, and where answers are immediately discussed or debriefed, the LIC may stipulate a different penalty. Details of such late penalties will be available on the course Moodle page.

FEEDBACK ON YOUR ASSESSMENT TASK PERFORMANCE

Feedback on student performance from formative and summative assessment tasks will be provided to students in a timely manner. Assessment tasks completed within the teaching period of a course, other than a final assessment, will be assessed and students provided with feedback, with or without a provisional result, within 10 working days of submission, under normal circumstances. Feedback on continuous assessment tasks (e.g. laboratory and studio-based, workplace-based, weekly quizzes) will be provided prior to the midpoint of the course.

Faculty-specific Information

PROTOCOL FOR VIEWING FINAL EXAM SCRIPTS

UNSW students have the right to view their final exam scripts, subject to a small number of very specific exemptions. The UNSW Business School has set a [protocol](#) under which students may view their final exam script. Individual schools within the Faculty may also set up additional local processes for viewing final exam scripts, so it is important that you check with your School.

If you are completing courses from the following schools, please note the additional school-specific information:

- Students in the **School of Accounting, Auditing & Taxation** who wish to view their final examination script should also refer to [this page](#).
- Students in the **School of Banking & Finance** should also refer to [this page](#).
- Students in the **School of Information Systems & Technology Management** should also refer to [this page](#).

COURSE EVALUATION AND DEVELOPMENT

Feedback is regularly sought from students and continual improvements are made based on this feedback. At the end of this course, you will be asked to complete the [myExperience survey](#), which provides a key source of student evaluative feedback. Your input into this quality enhancement process is extremely valuable in assisting us to meet the needs of our students and provide an effective and enriching learning experience. The results of all surveys are carefully considered and do lead to action towards enhancing educational quality.

QUALITY ASSURANCE

The Business School is actively monitoring student learning and quality of the student experience in all its programs. A random selection of completed assessment tasks may be used for quality assurance, such as to determine the extent to which program learning goals are being achieved. The information is required for accreditation purposes, and aggregated findings will be used to inform changes aimed at improving the quality of Business School programs. All material used for such processes will be treated as confidential.

TEACHING TIMES AND LOCATIONS

Please note that teaching times and locations are subject to change. Students are strongly advised to refer to the [Class Timetable website](#) for the most up-to-date teaching times and locations.