UNSW SYDNEY

Master of Data Science

Be the power behind business decisions.

- Master of Data Science
- Graduate Diploma in Data Science
- Graduate Certificate in Data Science

Contents

UNSW.
A World Leader.

Top three for graduate employability

UNSW is ranked in the top three universities in Australia for graduate employability, and is 27th in the world.

QS World University Rankings by Graduate Employability, 2020

Build multidisciplinary expertise across three leading faculties

UNSW is ranked in the top three universities in Australia in the areas of Mathematics, Economics and Econometrics, and Computer Science and Information Systems.

QS World University Rankings by Subject, 2022

Highest research funding

In 2020, UNSW received more funding than any other Australian University from the Australian Research Council (ARC).

Top earner

UNSW full-time postgraduates are in the top 5% for starting salaries and earn the highest median salary in Australia three years after graduation.

Graduate Outcomes Survey, 2019

Global top 50 university

UNSW is ranked 43rd overall in the world.

QS World University Rankings, 2022

Master of Data Science

Be the power behind the decisions

It takes sophisticated thinking to find simple answers that lie beneath layers of increasingly complex, interwoven webs of data. More and more, businesses are turning to people with the advanced technical and mathematical skills to unpick complexities and make sense of the numbers.

The demand for data scientist's has never been greater.

A Master of Data Science from UNSW Online explores more ways to organise, identify, analyse and ultimately use data to inform strategies, redefine ambiguous questions and find answers that make a genuine impact.

From advanced statistics and machine learning, programming and database systems, to strategic decision making, the skills you develop in this program apply across all fields and industries.

Get your LinkedIn profile to the top of the search results

Ranked in the top five universities in Australia for Engineering and Technology, Mathematics, Economics and Econometrics, Computer Science and Information Systems[1], UNSW Online provides a flexible yet academically rigorous way to study a Master of Data Science.

Combining the faculty's intellectual strength and commercial experience with the acknowledged benefits of online learning, students of this program graduate sooner with the skills and knowledge industry is demanding.

UNSW full-time postgraduates are in the top 5% for starting salaries and earn the highest median salary in Australia three years after graduation[2]. Combine this with the fact that data scientists with the right skills can expect to earn an average salary well into six figures[3], and it is evident that a postgraduate qualification in Data Science from UNSW will be well worth the effort.

Create business and personal opportunities

This program has been designed to deliver skills that are in the highest demand and the most difficult to find. Depending on where you wish to direct your career, you can specialise in areas such as machine learning, database systems or statistics. Regardless of what you choose to specialise in, the foundational skills you will learn before you specialise are as broad as they are deep. You will be in demand for diverse roles (even those yet to be imagined) and across industries, creating a career that is dynamic and filled with potential.

[1]QS World University Rankings by Subject, 2020.

[2]Graduate Outcomes Survey, 2019.

[3]Payscale, 2020.

Program overview

The Master of Data Science comprises 12 courses – six compulsory and six electives. There is also the option to study the Graduate Certificate in Data Science or the Graduate Diploma in Data Science, separately. The Masters program includes the content of the Graduate Certificate and the Graduate Diploma, together with further electives and a capstone course.

COURSES AT A GLANCE

Masters

- Capstone: Data Science Project
- Choose 6 of 9 Electives provided pre-requisites are met and courses are available
- Plus, the Graduate Certificate and Graduate Diploma courses

Graduate Diploma

- Data Mining & Machine Learning ■
- Regression Analysis for Data Scientists ■ ■
- One of: Strategic Decision Making or Database Systems
- Choose 2 of 9 Electives provided pre-requisites are met and courses are available
- Plus, the Graduate Certificate courses

Graduate Certificate

- Principles of Programming
- Foundations of Data Science
- Statistical Inference for Data Scientists
- Choose 1 of 2 Electives

Electives

1. Big Data Management ■
2. Data Visualisation and Communication ■
3. Multivariate Analysis for Data Scientists ■ ■
4. Neural Networks, Deep Learning ■
5. Decision Making in Analytics ■
6. Data and Ethics
7. Bayesian Inference and Computation
8. Database Systems
   (if not chosen as core course)
9. Strategic Decision Making
   (if not chosen as core course)

1. Database Systems
2. Strategic Decision Making

Prerequisites

Certain courses (denoted by ■ or ■ or ■) require corresponding prerequisites below.

■ Foundations of Data Science ■ Statistical Inference for Data Scientists

■ Principles of Programming

Knowledge areas

The masters is split into three core pillars of knowledge and skill development:

Business and strategy

Understanding the business context in which you operate and how you can add value to strategic decision making is crucial to your success. Therefore, the program includes core courses such as Strategic Decision Making, Data and Ethics, and Data Visualisation and Communication. You will develop your strategic decision-making skills, a comprehensive understanding of ethical data analytics practices and how organisations and industry influence behaviours. You will also learn the skill of good data storytelling – an essential tool for any good data scientist.

Statistics and machine learning

The core skill that will see a data scientist last through technological advances is statistics. In addition to this capability and increasingly in demand are machine learning skills. Therefore, built into the core Master of Data Science program are courses that introduce you to probability and distribution theory and statistical inference, regression analysis using R, and data mining and machine learning techniques and technology.

You can then choose to enhance your knowledge with electives such as Multivariate Analysis and Bayesian Inference, Neural Networks and Deep Learning and/or Optimisation for Data Scientists.

Programming and database systems

Complementary to the statistical and machine learning skills are those in programming and database systems. The core courses introduce you to the most common programming language, Python, learning program design, techniques, data structures, algorithms, debugging, testing and simulation, database systems and modelling, relational database management systems and architecture, and database application design and implementation.

You can then continue to build skills in this area by selecting the Big Data Management and Information Retrieval and Web Search electives.

The UNSW Online experience

Supporting you every step of the way

- To help you graduate from one of the world's leading universities, we're here to support you, every step of the way. The design of our online learning environment seamlessly fits into your busy lifestyle. You'll have access to course resources on any device, at any time.
- Our academics are some of the best in the world, so you can take confidence in knowing that your online learning experience will have the same high standard as the on-campus experience.
- Throughout your study journey, you'll be able to turn to your Student Success Advisor (SSA), who is committed to assisting you at every stage, from enrolment through to graduation. Your SSA is on hand to help with all non-academic queries by phone or email.

Program details

Indicative domestic program fees^

Master of Data Science	Program code: 8646	12 courses	$51,390*
Graduate Diploma in Data Science	Program code: 5646	8 courses	$34,590*
Graduate Certificate in Data Science	Program code: 7446	4 courses	$17,340

^All prices are listed in Australian dollars.

**Master of Data Science and Graduate Diploma in Data Science prices are subject to choice of elective course.*

All prices are listed in Australian dollars. Go to our Fees page for up-to-date information inclusive of 2022 indicative International program fees. Fees are subject to annual review by the University and may increase annually, with the new fees effective from the start of each calendar year. Indicative fees are a guide for comparison only based on current conditions and available data. You should not rely on indicative fees.

Program intakes (Hexamesters)

Six intakes annually

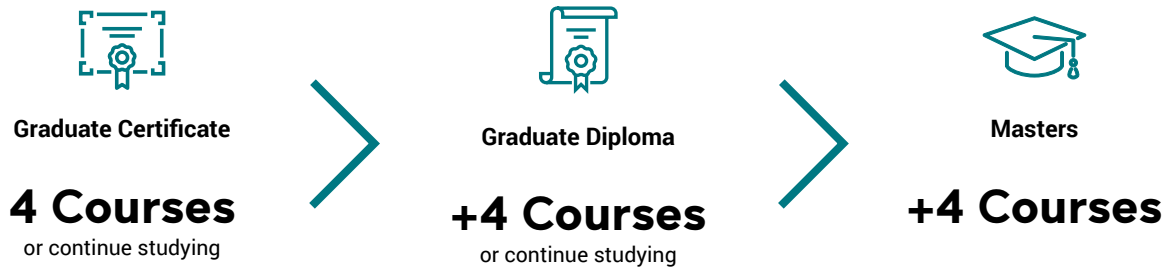
January, March, May, July, September, October

Program duration

Each course is seven weeks long. UNSW Online advises a minimum of 15-20 hours of study per week. The program can be completed in as little as two years.

Nested qualifications

The Master of Data Science also includes a Graduate Certificate in Data Science and Graduate Diploma in Data Science, both of which are entry and exit points. For those who do not qualify for direct entry into the masters program, you may be eligible for entry into the Graduate Certificate and can articulate from this into the masters program (upon completion of the Graduate Certificate and Graduate Diploma). Alternatively, if, for any reason, you choose not to continue to complete the masters program you can exit with a Graduate Certificate or Graduate Diploma.



Study plans and completion times might vary depending on elective choice, RPL, leave and subject availability.
For more information, speak with a Student Advisor.

Entry requirements

UNSW's Admission Entry Calculator

To assist us in assessing your previous study and eligibility for this course, we recommend using the UNSW Admissions Entry Calculator as a guide. This calculator converts and scales the grading schemes across the world into a percentage that applies to UNSW entry requirements.

To be eligible for the Master of Data Science, you must have either:

1. Completed the Graduate Diploma in Data Science with a WAM of 65 or higher OR
2. Completed an undergraduate degree in Data Science or cognate discipline (e.g., Computer Science, Economics, Mathematics, Statistics) AND have sufficient Data Science background as indicated by an average mark of 70 or above across three Level III courses in Mathematics and/or Statistics and/or Computer Science and/or Econometrics.

Advanced standing or exemption can be granted in the program for cases where core courses were completed in a prior program.

Alternative Entry Pathways

Earn a 65% average mark and above in the Graduate Diploma in Data Science (Online) 5646.

To be eligible for the Graduate Diploma in Data Science, you must have either:

1. Completed the Graduate Certificate in Data Science with a WAM of 65 or higher OR
2. Completed an undergraduate degree in Data Science or cognate discipline (e.g., Computer Science, Economics, Mathematics, Statistics) AND have sufficient Data Science background as indicated by an average of 65 or above across three Level III courses in Mathematics and/or Statistics and/or Computer Science and/or Econometrics. OR
3. Completed a degree in a non-cognate discipline AND have sufficient Data Science background as indicated by at least five years of experience in a data science or data analytics role.

Advanced standing or exemption can be granted in the program for cases where core courses were completed in a prior program.

Alternative Entry Pathways

Earn a 65% average mark and above in the Graduate Certificate in Data Science (Online) 7446.

Applicants with a degree from a non-cognate area (with an average mark of 65% or greater) who have at least five years experience in a data science or data analytics role may also be considered for entry to the program.

To be eligible for the Graduate Certificate in Data Science, you must have either:

1. Completed at a minimum an undergraduate degree in Data Science or cognate discipline (e.g., Computer Science, Economics, Mathematics, Statistics). OR
2. Completed an undergraduate degree in a non-cognate discipline AND have sufficient Data Science background as indicated by an average of 65 or above across three Level III courses in Mathematics and/or Statistics and/or Computer Science and/or Econometrics. OR
3. Completed a degree in a non-cognate discipline AND have sufficient Data Science background as indicated by at least two years of experience in a data science or data analytics role.

Entry requirements

English Language

You may need to provide evidence of your English language proficiency to study at UNSW, depending on your educational background and citizenship. UNSW requires a minimum level of English language competency for enrolment. English language skills are essential for webinar comprehension and the completion of coursework, assignments and examinations.

If English is not your first language, you will need to provide proof of your English proficiency before you will be given an offer to study at UNSW. You can do this by providing evidence that you meet one or more of the following criteria:

- English language tests and university English courses
- Prior study in the medium of English
- Other qualifications
- English waivers

Eligibility for admission does not guarantee offer of a place.

Get in touch

Our Student Enrolment Advisors are here to help you with all your program and enrolment queries.

studyonline.unsw.edu.au

1300 974 990

future-student@studyonline.unsw.edu.au

Have a question?

Book a 15-minute chat with a Student Advisor

Schedule a call →

Course descriptions

Foundations of Data Science

Course overview

This course covers the fundamentals of data science as it is applied in computer science, economics and mathematics and statistics. The course will provide an introduction to topics such as databases, data analytics, data mining, Bayesian statistics, statistical software, econometrics, machine learning and business forecasting. The course also aims to indicate the relevance of the courses that follow in the program (including electives) and their place in data science and its applications.

Principles of Programming

Course overview

This course provides an introduction to programming in Python and covers the following essentials:

- Program design and implementation in a high-level language, with procedural and object-oriented constructs and some functional features.
- Fundamental programming techniques, data structures and algorithms.
- Debugging and testing.
- Simulation.
- Applications in different areas, including those involving graphical user interfaces and animations.

Statistical Inference

Course overview

This course provides an introduction to probability and distribution theory and introductory statistical inference. Students will learn the fundamental principles of inference: sufficiency, likelihoods, ancillary statistics, equivariance, maximum likelihood and Bayesian methods. Estimation, confidence set construction and hypothesis testing, and computationally intensive methods such as the bootstrap method are also discussed.

Database Systems

Course overview

This course takes a deep dive into data models, application and management, including:

- Data models: entity-relationship, relational, object-oriented.
- Relational database management systems: data definition, query languages, development tools.
- Database application design and implementation.
- Architecture of relational database management systems: storage management, query processing, transaction processing.
- Lab: design and implementation of a database application.

Strategic Decision Making

Course overview

This course covers the fundamentals of Game Theory and its applications. Game Theory is a revolutionary way of analysing strategic interactive situations. It is basic to the understanding of market competition among large firms, the designing of incentive contracts, bidding at auctions, bargaining, and other similar problems central to economics and business. This course covers simultaneous and sequential games and their solution concepts, games of imperfect information, repeated games, and a selection of applications and case studies.

Data Mining and Machine Learning

Course overview

Increasingly, organisations need to analyse enormous data sets to determine useful structure in them. In response to this, a range of statistical methods and tools have been developed in recent times to allow accurate and quick analysis of these sets. Machine learning is the algorithmic approach to learning from data. This course covers the key techniques in data mining technology, gives their theoretical background and shows their application.

Topics include:

- decision tree algorithms
- regression and model tree algorithms
- neural network learning
- support vector machines
- rule learning (such as association rules)
- lazy learning
- version spaces
- evaluating the performance of machine learning algorithms
- Bayesian learning and model selection
- algorithm-independent learning
- ensemble learning
- kernel methods
- unsupervised learning (such as clustering) and inductive logic programming (relational learning).

Regression Analysis

Course overview

Regression is a set of statistical techniques widely used to analyse relationships between several variables. The topics covered in this course include: linear regression; weighted least squares; generalised linear models; fitting GLMs and diagnostics; Poisson, binomial regression; analysis of variance; penalised regression methods; splines; penalised splines; thin plate splines; variable selection; generalised cross-validation; local likelihood; kernel smoothing; generalised additive models; multinomial logit analysis and ordinal logistic regression. The lectures will be complemented with worked examples using the R data analysis and statistical programming software.

Multivariate Analysis for Data Scientists

Course overview

The course gives a methodological background in Multivariate Analysis as a backbone of Applied Statistics. It introduces multivariate techniques including principal component analysis; canonical correlation analysis; cluster analysis; factor analysis; and discriminant analysis. Computing and data analysis features prominently in this course.

Big Data Management

Course overview

This course introduces the core concepts and technologies involved in managing Big Data.

Topics include:

- characteristics of Big Data and Big Data analysis
- storage systems (e.g. HDFS, S3)
- techniques for manipulating Big Data (e.g. MapReduce, streaming, compression)
- programming languages (e.g. Spark, PigLatin)
- query languages (e.g. Jaql, Hive)
- database systems (e.g. noSQL systems, HBase)
- typical applications (e.g. recommender systems, dimensionality reduction, text analysis).

Data Visualisation and Communication

Course overview

Data visualisation and communication is increasingly important as a complement to the study of analytics. The ability to present visual access to the huge amounts of data that business creates is an essential skill for any analyst. The creation of easily digestible visuals graphics is often the simplest and most powerful tool to enable communication of business insights gained from data.

This course will introduce statistical and visualisation tools for the exploratory analysis of data. Students will learn what makes an effective data visualisation and how to create interactive data visualisations. Visualisation in R, Tableau and other tools including cutting-edge graphical, immersive techniques will be used. There will be a strong focus on developing the skill of data storytelling — where students will learn to combine data, its visualisation and a narrative to create a powerful story to drive change.

Neural Networks, Deep Learning

Course overview

This course aims to introduce students to the main topics and methods in the field of neural networks and deep learning, ranging from traditional neural network models to the latest research and applications of deep learning.

Topics will be chosen from: perceptrons, feedforward neural networks, backpropagation, deep convolutional networks for image processing; geometric and complexity analysis of trained neural networks; recurrent networks, language processing, semantic analysis, long short-term memory; deep reinforcement learning; Hopfield and Kohonen networks, restricted Boltzmann machines and autoencoders; designing successful applications of neural networks and recent developments in neural networks and deep learning.

Bayesian Inference and Computation

Course overview

After describing the fundamentals of Bayesian inference, this course will examine the specification of prior and posterior distributions, Bayesian decision theoretic concepts, the ideas behind Bayesian hypothesis tests, model choice and model averaging, and evaluate the capabilities of several common model types, such as hierarchical and mixture models. An important part of Bayesian inference is the requirement to numerically evaluate complex integrals on a routine basis. Accordingly, this course will also introduce the ideas behind Monte Carlo integration, importance sampling, rejection sampling, Markov chain Monte Carlo samplers such as the Gibbs sampler and the Metropolis-Hastings algorithm, and use of the WinBuGS posterior simulation software.

Data and Ethics

Course overview

Data analytics takes place within an information supply chain comprising upstream sources and downstream uses of data. Within this supply chain are multiple participants, interests and power relationships, yet firms that collect and analyse data are often invisible to users. The use of data by firms and other organisations has already given rise to a range of practices and outcomes that were clearly harmful to individuals or groups, leading to broad public concerns and legal ramifications.

It is therefore incumbent on data professionals to consider the ethical implications of their data generation and use. This includes questions such as:

- what questions should be asked about data and its sources?
- how do downstream users of data protect or impact individuals and groups?
- what are the rights of various stakeholders including consumers?; and
- who owns data, particularly within secondary markets?

Consideration of these implications gives rise to questions around the ethics of data (how data is generated, recorded and shared), the ethics of algorithms (how data is interpreted) and the ethics of practices (responsible data analytics).

This course will consider these issues and provide students with a set of thinking tools with which they can navigate ethical dilemmas and guide decisions and behaviours. The role of organisation and industry cultures in shaping ethical (or unethical) data analytics practices will also be considered.

Decision Making in Analytics

Course overview

Businesses deal with an ever-increasing array of data, in terms of volume and sources. This presents businesses with opportunities to harness insights from this data to support decision making. This course will introduce students to a range of decision-making techniques and strategies, drawing on leading business practices. Using an applied approach, a range of business problems and decisions in areas such as marketing, human resources, and finance will be considered.

Students will be shown how to design and implement application systems to support evidence-based decision making in organisational contexts. It will include a range of business intelligence and analytics solutions based on online analytical processing (OLAP) models and technologies. Students will also evaluate a number of contemporary modelling approaches and their integration.

Data Science Project (Capstone)

Course overview

This inquiry-based course exposes students to research methods by having them apply data science techniques to a research project. The course serves as a capstone in the masters program. Students will be required to apply and demonstrate their learning from the courses in the program, and to present their work in visual and verbal forms, including a presentation.