Australian National University

POSTGRADUATE PROGRAMS IN APPLIED DATA ANALYTICS

ANU College of
Engineering &
Computer Science

Future-proof yourself.

There is a global shortage of graduates with skills in data analytics, needed to inform high-quality, data-driven decision-making.

OVERVIEW

ANU is pleased to offer new postgraduate study opportunities for professionals interested in developing skills, or reskilling, in the area of data analytics.

These programs are designed to address a global shortage of graduates with skills in data analytics to inform high-quality, data-driven decision-making.

This reflects a wider challenge to Australian businesses, government and the community in terms of the effective use of public data in decision-making.

The rapid expansion of a digitally-enabled environment has broadened both the threat of, and the opportunity for, data-driven innovation. Being able to understand, anticipate and direct developments will require a workforce with a diverse skill set ranging over computational, statistical and methodological concepts, which can be applied across a host of settings and industries.

Our 'T-shaped' programs are designed to develop inter-disciplinary knowledge across the three base disciplines of computing, statistics and social science as well as a specialisation in one of these areas. The integrated suite of programs is designed to have flexible entry and exit points across the stages and includes:

- Master of Applied Data Analytics – typically three years part-time (entry and exit)
- Graduate Diploma of Applied Data Analytics – typically two years part-time (entry or exit)
- Graduate Certificate of Applied Data Analytics – typically one year part-time (exit only)
- Non-award study.

These graduate programs are designed to allow students to apply their skills to solve real-world problems as well as become familiar with the underlying principles often used in 'big data' software systems. This is reflected by case studies embedded throughout key courses in the curriculum.

Through this program you will receive:

- exposure to best practice in data analytics;
- cutting-edge courses in areas of relevance to data analysts;
- an opportunity to deepen your knowledge in computation, statistics, or social science;
- professional development for practising data analytics professionals;
- the opportunity to undertake research of professional relevance.

Pathways and exit points

You may seek admission to the Graduate Diploma of Applied Data Analytics and use this as a pathway to the Masters degree. Both the Graduate Diploma and Graduate Certificate provide early exit points for those who do not wish to complete a longer qualification. Please note that the Graduate Certificate is an exit-only qualification and is not available for admission.

Delivery mode

We aim to deliver your program in a way that is sensitive to the needs of graduate coursework students, using a combination of online learning and a short on-campus component. Typically, each course is designed around a 4+1+4 model – four weeks of online learning, a one week intensive on-campus, and a further four weeks of online learning and major assessment. This provides an opportunity to mix with and learn from fellow practising professionals. In some cases, some courses may be offered in a traditional on-campus mode.

Credit

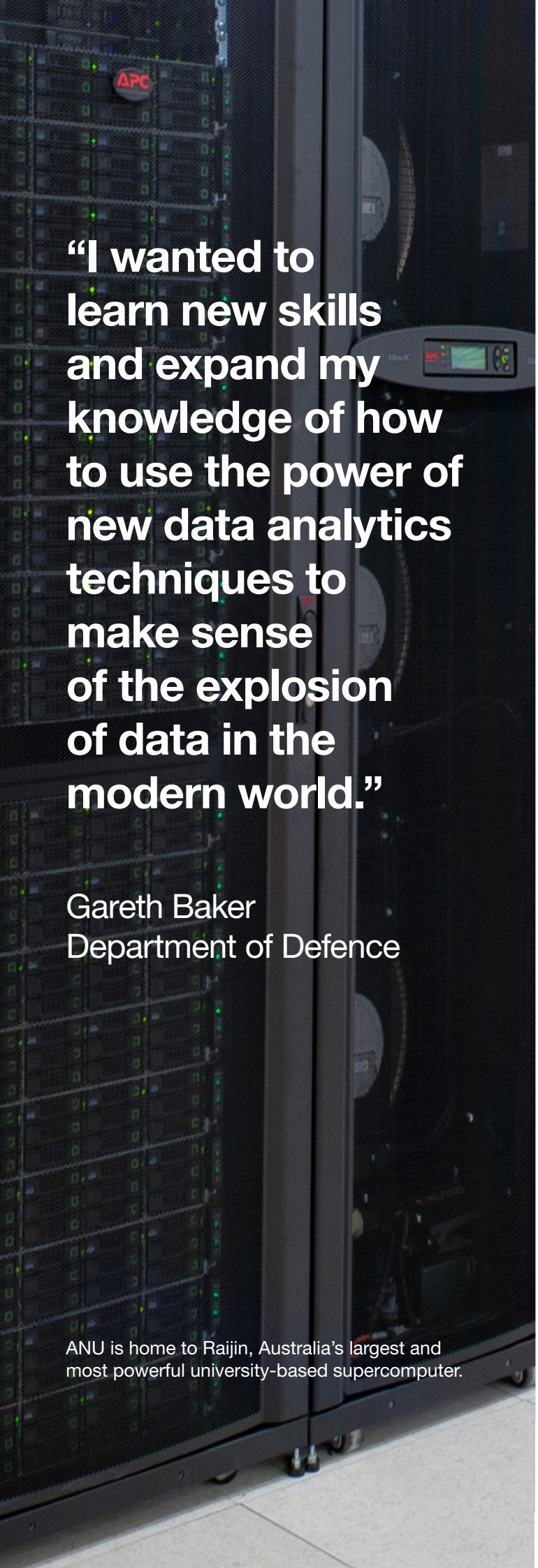
Applicants who have completed a degree in a cognate discipline may be eligible to receive credit towards their degree. Cognate disciplines include: Physics, Statistics, Finance, Actuarial Studies, Computer Science, Information Technology, Criminology, Sociology, Political Science, Psychology, Epidemiology/Public Health, Anthropology, and Demography/Population Studies.

Application process

Application to the Master of Applied Data Analytics and Graduate Diploma of Applied Data Analytics is via the Universities Admissions Centre at uac.edu.au.

If you would like to complete courses from these programs as a non-award student, you can apply directly to the University.

Please note that these programs are not currently available for international students. They may be opened to international students in 2018, please monitor the website for updates.



“I wanted to learn new skills and expand my knowledge of how to use the power of new data analytics techniques to make sense of the explosion of data in the modern world.”

Gareth Baker
Department of Defence

ANU is home to Raijin, Australia’s largest and most powerful university-based supercomputer.

STRUCTURE

Stage 3

This presents an opportunity for specialisation by selection from an offering of advanced courses from the three areas of statistics, computation and social science. The Masters program incorporates two Stage 3 courses which build on six courses from Stage 2, to support students to acquire expertise in an area of their choice. Students who complete this stage of the program will be awarded a Master of Applied Data Analytics.

Stage 2

This presents a graduate-level upskilling opportunity by supporting the development of advanced knowledge across the three areas of statistics, computation and social science. In this stage the program will involve regular opportunities for students to apply their skills in teams, solving problems that reflect real-world conditions in an integrated fashion. Students with a strong discipline background may be granted recognition of prior learning for some courses in Stage 2. Students may choose to leave the program with a Graduate Diploma of Applied Data Analytics after completing four courses from Stage 2.

Stage 1

This presents a graduate-level reskilling opportunity comprising four courses. These courses are designed to introduce graduate students to the key concepts across the two technical disciplines (statistics and computation) relevant to data analytics: statistics and computation. Students with a technical background are highly likely to be granted recognition of prior learning for some or all of Stage 1. Students may choose to leave the program at the end of Stage 1 with a Graduate Certificate of Applied Data Analytics.

	Statistics College of Business & Economics	Computing College of Engineering & Computer Science	Social Science College of Arts & Social Sciences
Stage 3 Expertise in a discipline Masters	STAT 5 STAT 6	COMP 5 COMP 6	SS 3 SS 4
Stage 2 Technical re-skilling across disciplines Graduate Diploma	STAT 4 STAT 3	COMP 4 COMP 3	SS 2 SS 1
Stage 1 Technical re-skilling Graduate Certificate	STAT 2 STAT 1	COMP 2 COMP 1	

Master of Applied Data Analytics

Admission requirements

A completed honours-level degree or equivalent in any discipline from a recognised university or a completed three-year degree plus three years of relevant work experience.

Degree requirements

The Master of Applied Data Analytics requires the completion of 72 units, which must consist of:

60 units from the following compulsory courses:

- COMP7230 Introduction to Programming for Data Scientists (C1)
- COMP7240 Introduction to Database Concepts (C2)
- COMP8410 Data Mining (C3)
- COMP8430 Data Wrangling (C4)
- SOCR8201 Introduction to Social Science Methods and Types of Data (SS1)
- SOCR8202 Using Data to Answer Policy Questions and Evaluate Policy (SS2)
- STAT7055 Introductory Statistics for Business and Finance (STAT1)
- STAT7001 Applied Statistics (STAT 2)
- STAT6039 Principles of Mathematical Statistics (STAT3)
- STAT7026 Graphical Data Analysis (STAT 4)

12 units from the following lists of courses:

Data Science (C5+C6)

- COMP8600 Introduction to Statistical Machine Learning
- COMP6490 Document Analysis
- COMP8420 Bio-inspired Computing: Applications and Interfaces

Social Science (SS3+SS4)

- SOCR8203 Advanced Techniques in the Creation of Social Science Data
- SOCR8204 Advanced Social Science Approaches to Inform Policy Development and Service Delivery

Statistical Data Analytics (STAT5+STAT6)

- STAT7040 Statistical Learning
- STAT7016 Introduction to Bayesian Data Analysis
- STAT7017 Big Data Statistics

Learning outcomes

Upon successful completion, students will have the skills and knowledge to:

- select, adapt, apply, and communicate advanced data analytics methods and techniques;
- apply data analytics principles to decision-making about policy, business and service delivery;
- examine current issues in data analytics using leading-edge research and practices in the field;
- demonstrate strong cognitive, technical, and communication skills, working independently and collaboratively to collect, process, interpret and communicate the outcomes of data analytics problems; and
- communicate complex data analytics outcomes to diverse audiences.

Graduate Diploma of Applied Data Analytics

The Graduate Diploma is intended for students who:

- wish to acquire a broad skills base in applied data analytics covering computing, social science and statistical topics;
- wish to complete a postgraduate qualification in two years of part-time equivalent study; or
- wish to start a postgraduate qualification after one year of relevant work experience.

Graduate Diploma students study:

24 units from the following compulsory courses:

- COMP7230 Introduction to Programming for Data Scientists (C1)
- COMP7240 Introduction to Database Concepts (C2)
- STAT7055 Introductory Statistics for Business and Finance (STAT1)
- STAT7001 Applied Statistics (STAT2)

24 units from the following compulsory courses:

- COMP8410 Data Mining (C3)
- COMP8430 Data Wrangling (C4)
- SOCR8201 Introduction to Social Science Methods and Types of Data (SS1)
- SOCR8202 Using Data to Answer Policy Questions and Evaluate Policy (SS2)
- STAT6039 Principles of Mathematical Statistics (STAT3)
- STAT7026 Graphical Data Analysis (STAT4)
- STAT7040 Statistical Learning (STAT5)

Learning outcomes

Upon successful completion, students will have the skills and knowledge to:

- apply computing, statistical, and social science principles to solve data analytics problems;
- apply data analytics methods and techniques to decision making about policy, business and service delivery;

- contribute effectively to the performance of a data analytics workplace;
- demonstrate basic technical expertise in computing, statistics, and social science as it pertains to data analytics;
- be able to work to deadlines and specification, document tasks undertaken, and report outcomes to a third party;
- be capable of independent learning with some ability to critically evaluate work undertaken.

Graduate Certificate of Applied Data Analytics

The Graduate Certificate is an exit qualification only. It requires the completion of 24 units, which are outlined below. Students will be considered to have met the requirements for the Graduate Certificate if they complete 24 units of which 18 units must be COMP and STAT courses, with a minimum of at least one course in each area.

24 units from completion of the following compulsory courses:

- COMP7230 Introduction to Programming for Data Scientists
- COMP7240 Introduction to Database Concepts
- STAT7001 Applied Statistics
- STAT7055 Introductory Statistics for Business and Finance

Learning outcomes

Upon successful completion, students will have the skills and knowledge to:

- apply basic technical expertise in computer programming, databases, and statistical data analysis to solve data analytics problems;
- contribute effectively to the performance of a data analytics workplace;
- be able to work to deadlines and specification, document tasks undertaken, and report outcomes to a third party.

Non-award study

Students are able to enrol in individual courses on a non-award basis to meet their personal and professional interests and requirements. Non-award students will be able to convert these courses into credit towards a formal award at a later stage, subject to University policies on credit transfer.

The application process for non award study is different to that of a formal award. Students interested in this option are encouraged to contact us by email for more information:

dataanalytics.cecs@anu.edu.au

Please note that FEE-HELP is not available to students choosing to study on a non-award basis.

Delivery to meet your needs

We aim to deliver the program in a way that is sensitive to the needs of graduate coursework students, using a combination of online learning and a short on-campus component.

Typically, each course is designed around a 4+1+4 model – four weeks online learning, one week intensive on-campus, and a further four weeks of online learning and major assessment. In some cases, some courses may be offered in a traditional on-campus mode.

The on-campus component has been highly valued by students and provides the additional benefit of an opportunity to mix and learn from fellow practising professionals.

Workload

The expected workload for ANU courses is 130 hours per course. This includes some preparation, approximately 10 hours per week for the online component, plus the intensive on-campus week.

"I really enjoyed the flexible learning system. Studying from home in my own time was great, with the intensive week really consolidating my learning."

Hayley Purdon, Data Analyst
Department of Social Services

Courses

Stage 1

C1 — Introduction to Programming for Data Scientists (COMP7230)

This course teaches introductory programming within a problem-solving framework applicable to data science. An emphasis is placed on technical programming, data processing, and data manipulation.

The course focuses on designing and writing correct code. Testing and debugging are treated as integral to the programming enterprise, with the course also teaching how to use computational tools for effective data analysis.

C2 — Introduction to Database Concepts (COMP7240)

This course is an introduction to database concepts and the general skills needed to design and use databases. The topics include the relational data model, SQL, the entity-relationship model, dependencies, query processing and optimisation, and database transactions and security.

In order to expand students' understanding of relational databases, the current industry development of database systems such as NoSQL databases will be introduced.

STAT1 — Introductory Statistics for Business and Finance (STAT7055)

This course will introduce students to basic statistical methods, with a focus on applying these methods to the business world. This course assumes no statistics background.

STAT2 — Applied Statistics (STAT7001)

This course builds on Statistics STAT1 (STAT7055) and provides an introduction to common applied techniques for carrying out statistical analysis. This course assumes knowledge of STAT7055.

Stage 2

C3 — Data Mining (COMP8410)

Large amounts of data are increasingly being collected by public and private organisations, and research projects. Additionally, the Internet provides a very large source of information about almost every aspect of human life and society.

This course provides a practical focus on the technology and research in the area of data mining. It focuses on algorithms and techniques, rather than on mathematical or statistical foundations.

C4 — Data Wrangling (COMP8430)

Real-world data is commonly messy, distributed, and heterogeneous. This course introduces core concepts of data cleaning, standardisation and integration, it also discusses data quality, management, and storage issues as they pertain to data analytics.

SS1 — Introduction to Social Science Methods and Types of Data (SOCR8201)

This course provides an introduction to the main empirical social science methods, types of data, and techniques for collecting social science data.

SS2 — Using Data to Answer Policy Questions and Evaluate Policy (SOCR8202)

This course will provide students with a range of analytical techniques, which can be used to answer policy and service delivery questions and measure the impact of policy.

STAT3 — Principles of Mathematical Statistics (STAT6039)

This course builds on STAT1 (STAT7055) and STAT2 (STAT7001) and provides an introduction to mathematical statistics with applications.

STAT4 — Graphical Data Analysis (STAT7026)

This course introduces the principles of data representation, summarisation and presentation with particular emphasis on the use of graphics.

Stage 3

C5 & C6

Statistical Machine Learning (COMP8600)

This course provides a broad but thorough introduction to the methods and practice of statistical machine learning. The course covers a broad range of topics including the major techniques used in machine learning.

Document Analysis (COMP6490)

Processing of semi-structured documents such as Internet pages, PDF brochures and RSS feeds and accompanying news items, is considered from the perspective of interpreting the content. This course considers the 'document' and its various genres as a fundamental object for business, government and community.

Bio-inspired Computing: Applications and Interfaces (COMP8420)

Bio-inspired Computing is the combination of computational intelligence and collective intelligence. This course introduces the fundamental topics in bio-inspired computing, and builds proficiency in the application of various algorithms to real-world problems.

SS3 & SS4

Advanced Techniques in the Creation of Social Science Data (SOCR8203)

This course will provide students with a detailed understanding of the main techniques for the collection of policy relevant social science data. Students will be well placed to design and undertake their own research and to commission others to design and undertake fieldwork and analysis.

Advanced Social Science Approaches to Inform Policy Development and Service Delivery (SOCR8204)

This course will provide a more advanced treatment of how social science approaches can be used to inform policy development and service delivery approaches.

STAT5 & STAT6

Statistical Learning (STAT7040)

This course provides an introduction to statistical learning and aims to develop skills in modern statistical data analysis.

Introduction to Bayesian Data Analysis (STAT7016)

The aim of this course is to equip students with the skills to perform and interpret Bayesian statistical analyses.

Big Data Statistics (STAT7017)

This course provides an overview of recent statistical theory that addresses topics such as high-dimensionality, large sample sizes, sequential prediction and incremental and parallel statistical learning. The goal of this is course is to build on the knowledge developed in Statistical Learning in order to understand new and effective methods for analysing Big Data.

Prerequisites

Stage	Course	Prerequisite
1	**COMP7230** Introduction to Programming for Data Scientists	None
1	**COMP7240** Introduction to Database Concepts	None
1	**STAT7055** Introductory Statistics for Business and Finance	None
1	**STAT7001** Applied Statistics	**STAT7055**
2	**COMP8430** Data Wrangling	**COMP7230** AND **COMP7240**
2	**COMP8410** Data Mining	**COMP7240**
2	**STAT7026** Graphical Data Analysis	**STAT7055 OR STAT6039**
2	**STAT6039** Principles of Mathematical Statistics	**STAT7001**
2	**SOCR8201** Introduction to Social Science Methods	None
2	**SOCR8202** Using Data to Answer Policy Questions	None
3	**COMP8600** Statistical Machine Learning	Email dataanalytics.cecs@anu.edu.au to confirm
3	**COMP6490** Document Analysis	Email dataanalytics.cecs@anu.edu.au to confirm
3	**COMP8420** Bio-inspired Computing: Applications and Interfaces	Email dataanalytics.cecs@anu.edu.au to confirm
3	**STAT7016** Introduction to Bayesian Data Analysis	**STAT6039**
3	**STAT7017** Big Data Statistics	**STAT6039**
3	**STAT7040** Statistical Learning	**STAT6039**
3	**SOCR8203** Advanced Techniques in the Creation of Social Science Data	**SOCR8201 AND SOCR8202**
3	**SOCR8204** Advanced Social Science Approaches to Inform Policy Development and Service Delivery	**SOCR8201 AND SOCR8202**

2017 Course Schedule

Please see below the 2017 course schedule.

Stage	Session	Course	Apply before	Course starts	Course census	Intensive week	Course finish
1	2720 Summer	**COMP7240** Introduction to Database Concepts	19 Dec	16 Jan	3 Feb	13 - 17 Feb	17 Mar
2	2720 Summer	**COMP8430** Data Wrangling	10 Feb	6 Mar	24 Mar	3 - 7 April	5 May
2	2720 Summer	**STAT7026** Graphical Data Analysis	10 Feb	6 Mar	24 Mar	3 - 7 April	5 May
2	2740 Autumn	**COMP8410** Data Mining	8 May	29 May	16 June	26 - 30 June	28 July
2	2740 Autumn	**SOCR8201** Introduction to Social Science Methods	8 May	29 May	16 June	26 - 30 June	28 July
1	2750 Winter	**STAT7001** Applied Statistics	17 July	7 Aug	25 Aug	4 - 8 Sept	6 Oct
1	2750 Winter	**COMP7230** Introduction to Programming for Data Scientists	17 July	7 Aug	25 Aug	4 - 8 Sept	6 Oct
1	2770 Spring	**STAT7055** Intro to Statistics for Business and Finance	1 Aug	2 Oct	20 Oct	30 Oct - 3 Nov	1 Dec
2	2770 Spring	**SOCR8202** Using Data to Answer Policy Questions	1 Aug	2 Oct	20 Oct	30 Oct - 3 Nov	1 Dec

How to apply

Application to the Master and Graduate Diploma of Applied Data Analytics is via the Universities Admissions Centre.

UAC application process

This application and enrolment process has five key steps.

1. Lodge an application through the Universities Admissions Centre (uac.edu.au/postgraduate). You should include details of any work experience as well as your qualifications.
2. You will receive an email from the University's Domestic Admissions team, containing an offer for study.
3. Complete the online acceptance process, and receive your ANU logon and enrolment instructions from the Data Analytics Team.
4. Log on to ISIS, the University's Interactive Student Information System, to enrol yourself in your chosen courses.
5. Log on to Wattle, the University's online learning portal, to access your course materials.

Non-award study application process

Students who would like to complete courses from these programs as a non-award student can apply directly to the University.

For details on direct application processes please email dataanalytics.cecs@anu.edu.au.

Please note that these programs are not currently available for international students. They may be opened to international students in 2018, please monitor the website for updates.

Fees

The majority of domestic graduate coursework and non-award students at ANU are required to pay domestic tuition fees (DTF).

The amount of tuition a student pays is determined by the courses in which that student enrols. Each course has a defined tuition fee and the total tuition fees for all enrolled courses in a given academic session are invoiced collectively.

Domestic students who are required to pay DTF, and who also meet the citizenship and residency requirements may defer the payment of part or all of their tuition fees using FEE-HELP.

Please check the Programs and Courses website for individual course tuition fees.

W programsandcourses.anu.edu.au

CUSTOMISED DATA ANALYTICS TRAINING

Partner with us

Our multi-disciplinary approach to data analytics provides business and government departments with skilled employees, who are qualified to make informed decisions and evaluations through factual, data-driven approaches.

Consider strengthening your own team's ability through our customised data analytics courses. We have a range of non-award and award delivery options, taught by world-class experts who work directly with your business needs.

By empowering your employees with skills in data analysis, you can potentially reduce operational costs and make faster, better decisions.

Contact us for partnership opportunities.

E dataanalytics.cecs@anu.edu.au

Our partners

The College is delighted to partner with a range of organisations to deliver our data analytics courses to their staff. This includes:

- Australian Institute of Health and Welfare
- Department of Social Services
- Department of Defence
- Department of Human Services

Barry Sandison

Director (CEO)
Australian Institute of Health & Welfare

"At the Australian Institute of Health and Welfare it is abundantly clear that high level capability in data management and data analytics across the organisation is key to meeting our objectives.

Our people, and their skills, is our capability!

Good data is the foundation and infrastructure for good policy and good services. The right data at the right time is needed to guide the development of the policy or the service and to assist with the measurement of outcomes.

This is only achieved by having people with the qualifications and knowledge in relevant data-related fields."

CONTACT US

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