



Faculty of Science, Engineering and Built Environment

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**SIT718 Real World Analytics**

**Deakin University Unit Guide**

Trimester 1, 2021

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## WELCOME

Welcome to **SIT718 Real World Analytics**.

This unit is available at Burwood and Cloud (online). It introduces students to two topics at the heart of real world analytics: multivariate data analysis with aggregation and optimisation. Students will learn how to apply the concepts of multivariate functions in order to summarise data sets that involve several interrelated variables. They will acquire skills in being able to reasonably analyse data sets by interpreting the parameters associated with commonly used multivariate functions. On the topic of optimisation, students will learn how decision-making problems in industry, business, and civic services can be solved using modern modelling and solution techniques. Students will learn how to make better decisions through mathematical methods in optimisation problems such as: production planning, machine scheduling, robotics/vehicle routing, and resource allocation. Topics covered include means, data approximation using software and fuzzy measures, linear programming models with two and more than two variables and game theory.

Best wishes,

Dr Ye Zhu  
(Unit Chair)

This Unit Guide provides you with the key information about this Unit. For the best chance of success, you should read it very carefully and refer to it frequently throughout the trimester. Your Unit site (accessed in **DeakinSync**) also provides information about your **rights and responsibilities**. We will assume you have read this before the Unit commences, and we expect you to refer to it throughout the trimester.

Due to the coronavirus (COVID-19) situation, you may be learning in a way that is new to you. We appreciate your flexibility and dedication to learning. For a range of helpful services and resources, please go to study support <https://www.deakin.edu.au/students/studying/study-support>.

## WHO IS THE UNIT TEAM?

**Unit chair: leads the teaching team and is responsible for overall delivery of this unit**

Ye Zhu

### Unit chair details

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### Other members of the team and how to contact them

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Name: Anagi Gamachchi, Tutor

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### Administrative queries

- Contact your Unit Chair or Campus Leader
- Drop in or contact [Student Central](#) to speak with a Student Adviser

For additional support information, please see the Rights and Responsibilities section under 'Content' in your unit site.

### ABOUT THIS UNIT

This unit introduces students to two concepts at the heart of real world analytics: optimisation and multivariate data aggregation. Students will learn how decision-making problems in industry, business, and civic services can be solved using modern modelling and solution techniques. Students will learn how to make better decisions through mathematical methods in optimisation problems such as: production planning, time-tabling management, human resource rostering, sports program scheduling, robotics/vehicle routing, network design, and resource allocation. On the topic of aggregation, students will learn how to apply the concepts of multivariate functions in order to summarise datasets that involve several interrelated variables. They will be able to reasonably analyse datasets by interpreting the parameters associated with commonly used multivariate functions.

### Unit development in response to student feedback

Every trimester, we ask students to tell us, through eVALUate, what helped and hindered their learning in each Unit. You are strongly encouraged to provide constructive feedback for this Unit when eVALUate opens (you will be emailed a link).

In previous versions of this unit, students have told us that these aspects of the Unit have helped them to achieve the learning outcomes:

- Recordings of weekly workshops were provided for all students
- Help Hub sessions were provided for all students

They have also made suggestions for improvement, and so this is what we have done:

- Help Hub sessions will be enhanced
- Class (lecture) time will be 2 hours per week

If you have any concerns about the Unit during the trimester, please contact the unit teaching team - preferably early in the trimester - so we can discuss your concerns, and make adjustments, if appropriate.

### Your course and Deakin's Graduate Learning Outcomes

GLO1 Discipline-specific knowledge and capabilities:	appropriate to the level of study related to a discipline or profession
GLO2 Communication:	using oral, written and interpersonal communication to inform, motivate and effect change
GLO3 Digital literacy:	using technologies to find, use and disseminate information
GLO4 Critical thinking:	evaluating information using critical and analytical thinking and judgment
GLO5 Problem solving:	creating solutions to authentic (real world and ill-defined) problems
GLO6 Self-management:	working and learning independently, and taking responsibility for personal actions
GLO7 Teamwork:	working and learning with others from different disciplines and backgrounds
GLO8 Global citizenship:	engaging ethically and productively in the professional context and with diverse communities and cultures in a global context

Each Deakin course has **course learning outcomes** which explain what the Deakin Learning Outcomes mean in your discipline. Learning in each unit builds towards the course learning outcomes.

### Your Unit Learning Outcomes

Each Unit in your course is a building block towards these Graduate Learning Outcomes - not all Units develop and assess every Graduate Learning Outcome (GLO).

	These are the Learning Outcomes (ULO) for this Unit <b>At the completion of this unit successful students can:</b>	<a href="#">Deakin Graduate Learning Outcomes</a>
ULO1	Apply knowledge of multivariate functions data transformations and data distributions to summarise data sets.	GLO1: Discipline-specific knowledge and capabilities GLO5: Problem solving
ULO2	Analyse datasets by interpreting summary statistics, model and function parameters.	GLO1: Discipline-specific knowledge and capabilities GLO4: Critical thinking
ULO3	Apply game theory, and linear programming skills and models, to make optimal decisions.	GLO1: Discipline-specific knowledge and capabilities GLO4: Critical thinking GLO5: Problem solving
ULO4	Develop software codes to solve computational problems for real world analytics.	GLO1: Discipline-specific knowledge and capabilities GLO4: Critical thinking GLO5: Problem solving
ULO5	Demonstrate professional ethics and responsibility for working with real world data.	GLO8: Global citizenship

These Unit Learning Outcomes are applicable for all teaching periods throughout the year

### ASSESSING YOUR ACHIEVEMENT OF THE UNIT LEARNING OUTCOMES

#### Summative assessments

(tasks that will be graded or marked)

Deakin has a universal assessment submission time of 8 pm AEDT/AEST. A late penalty will apply to assessments submitted after 11.59 pm AEDT/AEST.

**NOTE: It is your responsibility to keep a backup copy of every assignment where it is possible (eg written/digital reports, essays, videos, images).** In the unusual event that one of your assignments is misplaced, you will need to submit the backup copy. Any work you submit may be checked by electronic or other means for the purposes of detecting collusion and/or plagiarism.

When you are required to submit an assignment through your unit site (accessed in DeakinSync), you should receive an email to your Deakin email address confirming that it has been submitted. You should check that you can see your assignment in the Submissions view of the Assignment folder after upload, and check for, and keep, the email receipt for the submission.

**- Summative assessment task 1**

	<b>Assessment 1 (Online quizzes x 5)</b>
<b>Brief description of assessment task</b>	The online quizzes, given every fortnight, will allow students to demonstrate their understanding of the fundamental concepts. Questions will either require students to solve a problem and give a numerical answer or to identify the correct description or solution from multiple options.
<b>Detail of student output</b>	Assessment Task 1 is conducted online and contains multiple choice questions as well as numerical entry questions. It will be split into 5 parts – each quiz will cover the topics learned blocks of two weeks' worth of content.
<b>Grading and weighting</b> (% total mark for unit)	20%. students will receive a mark for this assessment.
<b>This task assesses your achievement of these Unit Learning Outcome(s)</b>	ULO1 – assessed through student ability to apply knowledge of multivariate functions, data transformations and data distributions to summarise data sets. ULO2 – assessed through student ability to analyse datasets by interpreting summary statistics, model and function parameters. ULO3 – apply game theory, and linear programming skills and models, to make optimal decisions. ULO5 – assessed through student ability to demonstrate professional ethics and responsibility for working with real world data.
<b>This task assesses your achievement of these Graduate Learning Outcome(s)</b>	GLO1 - assessed through student ability to demonstrate knowledge of the topics covered. GLO4 – assessed through student ability to interpret information and reason about appropriate methodologies GLO5 – assessed through student ability to apply appropriate methods and techniques for developing solutions GLO8 – assessed through student ability to apply understanding of ethical standards to select appropriate professional practices
<b>How and when you will receive feedback on your work</b>	Students will receive their overall grade and find out which questions they answered incorrectly immediately after submitting the quiz.
<b>When and how to submit your work</b>	Five bi-weekly quizzes available in the unit site (accessed in DeakinSync). Each quiz is open for a limited time and must be completed within the period specified below. Once the quiz starts students will be given a limited time to complete it; this will vary between 1 to 2 hours. Further details will be provided in the unit site. Quizzes close: 8:00 pm (Melbourne time) on the following Tuesdays,  <ul style="list-style-type: none"> <li>• <b>Quiz 1</b> - opens Week 3, Tuesday 23 March – <b>due by</b> Week 5 Tuesday 13 April</li> <li>• <b>Quiz 2</b> - opens Week 5, Tuesday 13 April – <b>due by</b> Week 7, Tuesday 27 April</li> <li>• <b>Quiz 3</b> - opens Week 7, Tuesday 27 April – <b>due by</b> Week 8, Tuesday 4 May</li> <li>• <b>Quiz 4</b> - opens Week 8 Tuesday 4 May – <b>due by</b> Week 10, Tuesday 18 May</li> <li>• <b>Quiz 5</b> - opens Week 10 Tuesday 18 May - <b>due by</b> Week 12, Tuesday 1 June 2021.</li> </ul>

**- Summative assessment task 2**

	<b>Assessment 2 (Problem solving)</b>
<b>Brief description of assessment task</b>	This task requires students to apply their understanding of fundamental concepts of statistical data analysis and data distributions to real world scenarios using real data. It also requires the use of appropriate computer language for data analysis.
<b>Detail of student output</b>	This is an individual assessment task. Students are to provide written solutions to a problem set. Students can apply mathematical and statistical methodology and provide procedural solutions to problems.
<b>Grading and weighting</b> (% total mark for unit)	20% (Students will receive a mark for this assessment)
<b>This task assesses your achievement of these Unit Learning Outcome(s)</b>	ULO1 – assessed through student ability to apply knowledge of multivariate functions, data transformations and data distributions to summarise data sets. ULO2 – assessed through the student ability to analyse datasets by interpreting summary statistics, model and function parameters. ULO4 - assessed through student ability to develop software codes to solve computational problems for real world analytics. ULO5 – assessed through student ability to demonstrate professional ethics and responsibility for working with real world data.
<b>This task assesses your achievement of these Graduate Learning Outcome(s)</b>	GLO1 - assessed through student ability to demonstrate knowledge of statistical data analysis, data distributions and introduction to appropriate computer language for data analysis. GLO4 – assessed through student ability to apply logical and analytical thinking in considering a number of variables to suggest optimal strategies and solutions. GLO5 – assessed through student ability to create models and perform computations, to develop relevant solutions to given problems GLO8 – assessed through student ability to use public data using the correct policies and permissions.
<b>How and when you will receive feedback on your work</b>	Students will receive written feedback to aid reflection and analysis of problem strategies and solutions for consideration in the upcoming problem solving tasks.
<b>When and how to submit your work</b>	Due by 8:00 pm AEST on Sunday of Week 7 (2 May 2021).  Assignment (a report in pdf format, software code and/or data) must be submitted via the assignment dropbox in the unit site (accessed in DeakinSync).  No e-mail or hardcopy submissions are accepted.

**- Summative assessment task 3**

	<b>Assessment 3 (Problem solving)</b>
<b>Brief description of assessment task</b>	This task requires students to apply their understanding of multivariate parameters and functions and aggregation techniques to analyse data. As well as demonstrating their grasp of the fundamental concepts associated with multivariate functions, students will interpret the relationship between input and output (predictor and response) variables through the parameters obtained from fitted or specified models and summarise data sets using appropriate function-based indices.
<b>Detail of student output</b>	This is an individual assessment task. Students are to provide written solutions to a problem set. Students can apply mathematical methodology and provide procedural solutions to problems.
<b>Grading and weighting</b> (% total mark for unit)	30% (Students will receive a mark for this assessment)

<b>This task assesses your achievement of these Unit Learning Outcome(s)</b>	ULO1 – assessed through student ability to apply knowledge of multivariate functions, data transformations and data distributions to summarise data sets. ULO2 – assessed through the student ability to analyse datasets by interpreting summary statistics, model and function parameters. ULO3 – assessed through student ability to apply game theory, and linear programming skills and models, to make optimal decisions. ULO4 - assessed through student ability to develop software codes to solve computational problems for real world analytics. ULO5 – assessed through student ability to demonstrate professional ethics and responsibility for working with real world data.
<b>This task assesses your achievement of these Graduate Learning Outcome(s)</b>	GLO1 - assessed through student ability to demonstrate knowledge of multivariate functions and aggregation techniques to analyse data and to interpret the relationship between input and output variables. GLO4 – assessed through student ability to apply logical and analytical thinking in considering a number of variables to suggest optimal strategies and solutions. GLO5 – assessed through student ability to reason about and select appropriate aggregation and transformation functions, to develop relevant solutions to given problems
<b>How and when you will receive feedback on your work</b>	Students will receive written feedback to aid reflection and analysis of problem strategies and solutions for consideration in the upcoming problem solving task.
<b>When and how to submit your work</b>	Due by 8:00 pm AEST on Sunday of Week 11 (30 May 2021).  Assignment (a report in pdf format, software code and/or data) must be submitted via the assignment dropbox in the unit site (accessed in DeakinSync). No e-mail or hardcopy submissions are accepted.

**- Summative assessment task 4**

	<b>Examination (online)</b>
<b>Brief description of assessment task</b>	Students will attend a final online exam that covers both major topics covered by the unit. They will be required to demonstrate their understanding by providing solutions for real-world scenarios using optimisation and aggregation techniques.
<b>Detail of student output</b>	Students are required to sit a 2-hour, <b>scheduled online release</b> exam. The content is based on a range of topics presented during Weeks 1 to 10.
<b>Grading and weighting</b> (% total mark for unit)	30%
<b>This task assesses your achievement of these Unit Learning Outcome(s)</b>	ULO1 – assessed through student ability to apply knowledge of multivariate functions, data transformations and data distributions to summarise data sets. ULO2 – assessed through the student ability to analyse datasets by interpreting summary statistics, model and function parameters. ULO3 – assessed through student ability to apply game theory, and linear programming skills and models, to make optimal decisions.
<b>This task assesses your achievement of these Graduate Learning Outcome(s)</b>	GLO1 – assessed through student ability to demonstrate a clear understanding of multivariate functions and how to interpret the parameters and output results of simple models. GLO4 – assessed through student ability to apply logical and analytical thinking when using functions to summarise real world data sets taking into account the context and nature of the data, and to reasonably interpret models and findings in light of the data.  GLO5 – assessed through student ability to develop mathematical models that meet specific constraints, and to use models to obtain solutions to given problems, through the development of software codes



<b>How and when you will receive feedback on your work</b>	Deakin University will release the final assessment results at the stipulated timeframe. Students will receive a mark, which is an indicator of their overall performance in this unit of study.
<b>When and how to submit your work</b>	Students will be required to undertake a timed online assessment during the examination period. It is the responsibility of students to review their examination timetable when it is released via DeakinSync.

### Your learning experiences in this Unit - and your expected commitment

To be successful in this unit, you must:

- Read all materials in preparation for your classes or seminars, and follow up each with further study and research on the topic;
- Start your assessment tasks well ahead of the due date;
- Read or listen to all feedback carefully, and use it in your future work;
- Attend and engage in all timetabled learning experiences as follows:

#### Scheduled learning activities - campus

1 x 2 hour class per week, 1 x 2 hour workshop per week.

#### Scheduled learning activities - cloud

1 x 1 hour scheduled online seminar per week.

#### Note (on-campus learning activities)

Teaching will be delivered in line with the COVIDSafe health guidelines. All classes will be delivered online but other activities may include a combination of online and on-campus activities. Please refer to the details provided below, and check your unit site for announcements and updates.

Students will on average spend 150 hours studying this unit. This includes engaging in online learning activities, assessment activities, readings and study time. Students are expected to complete all allocated learning and assessment tasks for each week and actively engage in discussions with other students and their teaching staff.

In terms of COVID advice, the 1 x 1 hour weekly seminar originally scheduled for Cloud students will be replaced by a 1 x 2 hour weekly workshop that will run on-campus and online. Both Cloud and Campus students will have the opportunity to attend these weekly online workshops to practice, explore and expand their knowledge and skills. Collectively these learning experiences are designed to ensure and support student success. The online workshop timetable will be updated in the unit announcement.

The unit will utilise a problem-based approach to engage students in learning about real- world analytics. Students will be able to apply fundamental theories, concepts and approaches introduced in the class and via the cloud in solving problems. Students must begin by reading the relevant material and readings provided to them and gain an overview of the content covered each week. They are also required to conduct further independent research by examining information from relevant sources on the web or in textbooks or academic papers covering related information.

#### Note

At Deakin,

- *Lectures* are referred to as *classes* (definition: a general meeting for all students, for which students do not need to register and where students are engaged through presentations and learning activities)
- *Tutorials, workshops and seminars* are referred to as seminars (definition: more interactive meetings for smaller groups of students).
- For the complete list of agreed definitions for learning experiences, see the [Course Design and Delivery Procedure](#).

## UNIT LEARNING RESOURCES

Your unit learning resources are available in your unit site accessed in DeakinSync.

The texts and reading list for the unit can be found on the University Library via the link below: [SIT718](#) Note: Select the relevant trimester reading list. Please note that a future teaching period's reading list may not be available until a month prior to the start of that teaching period so you may wish to use the relevant trimester's prior year reading list as a guide only.

### Essential learning resources

A study guide and notes that cover the essential information on all topics will be available on the unit site.

### Recommended learning resources

- An Introduction to Data Analysis using Aggregation Functions in R, by James, Simon (2016).

The text is free to Deakin students through [SpringerLink](#)

- Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, edited by EMC Education services (2015). Indianapolis,IN: John Wiley and Sons.
- Operations Research: Applications and Algorithms (4th edition), by Wayne L. Winston, 2004

There are other optional reading books provided in the reading list on the unit site. Note that students are not required to purchase any textbook in this unit because most of them are available from the library.

## KEY DATES FOR THIS TRIMESTER

<b>Trimester begins (classes begin)</b>	Monday 8 March 2021
<b>Intra-trimester break (a short break during trimester)</b>	Friday 2 April - Sunday 11 April 2021
<b>Trimester ends (classes cease)</b>	Friday 28 May 2021
<b>Study period (examination preparation period)</b>	Monday 31 May - Friday 4 June 2021
<b>Examinations begin</b>	Monday 7 June 2021
<b>Examinations end</b>	Friday 18 June 2021
<b>Inter-trimester break (the period between trimesters)</b>	Monday 21 June - Friday 9 July 2021
<b>Unit results released</b>	Thursday 8 July 2021 (6pm)

**UNIT WEEKLY ACTIVITIES**

Week	Commencing	Topic	Assessment activity
1#	8 March 2021	Introduction to Data Analysis	
2	15 March	Aggregation Functions	
3	22 March	Data Distributions	
4^	29 March	Data Transformations	
5	12 April	Weighted Data Models	Online Quiz 1 (Weeks 1 and 2) closes
6	19 April	Fitting Aggregation Functions to Data	
7*	26 April	Introduction to Linear Programming	Online Quiz 2 (Weeks 3 and 4) closes Assessment 2 (Problem solving)
8	3 May	Solving Linear Programming Models	Online Quiz 3 (Weeks 5 and 6) closes
9	10 May	Two Player Zero Sum Game	
10	17 May	Other Game Scenarios	Online Quiz 4 (Weeks 7 and 8) closes
11	24 May		Assessment 3 (Problem solving)
12 (study week)	31 May		Online Quiz 5 (Weeks 9 and 10) closes

#Victorian Labour Day public holiday: **Monday 8 March** - University open

^Easter vacation/intra-trimester break: **Friday 2 April - Sunday 11 April 2021** (between weeks 4 and 5)

\*ANZAC Day observed, **Monday 26 April (in lieu of 25 April)** - University closed