



BUSINESS SCHOOL  
Te Kura Pakihi

DEPARTMENT OF INFORMATION SCIENCE

Practical Data Science  
COMP 120

COURSE OUTLINE

Semester Two 2023

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## Paper Description and Aims

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Data Science skills are in increasing demand in both industry and academia. Being able to effectively and safely manipulate and model data will be a key strategic advantage for future employment. COMP 120 introduces the fundamental concepts of data science to students through practical use of the industry-standard software environment R. You will learn how to program in R, how to effectively manage and manipulate data in R, and be exposed to the “round trip” of data science (Import, Tidy, Transform, Visualise, Model, and Communicate).

COMP 120 operates under a fairly traditional model – lectures and labs will be used to present and discuss material relevant to the paper. Within these sessions, there will be opportunities for discussion, and where appropriate, classes may draw on more interactive techniques to support the content, or refer to external online content for context. Labs in particular will be helpful to solidify and internalise materials covered in the lectures.

## Learning Outcomes

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Upon completion of COMP 120, students should be able to:

1. automate data manipulation tasks using a contemporary software package;
2. develop basic scripts to perform data management tasks;
3. use relevant software to clean, manage and integrate data;
4. create visualisations from data sources using appropriate software; and
5. manage and share data projects using version control systems and repositories.

## Teaching Staff

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### Paper Coordinator and Lecturer

Name: Tony Savarimuthu  
Office: 3.42, 3<sup>rd</sup> Floor, Otago Business School  
Email: tony.savarimuthu@otago.ac.nz  
Office Hours: 2pm-3pm Wednesday

### Lecturer

Name: Brendon Woodford  
Office: 3.47, 3<sup>rd</sup> Floor, Otago Business School  
Email: brendon.woodford@otago.ac.nz  
Office Hours: Arrange via email

### Lab Coordinator and Demonstrator

Name: Chris Edwards  
Office: 3.28, 8<sup>th</sup> Floor, Otago Business School  
Email: chris.edwards@otago.ac.nz  
Office Hours: Arrange via email

You should contact Tony Savarimuthu with any administrative enquiries about the paper such as requests for late submission of assignments due to illness. You should contact Chris Edwards about lab-related queries such as changing lab streams.

## Course Delivery

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Each week, you are expected to attend two 50-minute lectures and one 2-hour practical lab.

- **Lectures** present the key conceptual material through discussion and interaction between teaching staff and students. Multimedia and class exercises may be used to supplement the presentation. Lectures are occasionally supported by readings as indicated on Blackboard.
- **Labs** are interactive, collaborative sessions in which students attempt to cement concepts presented at lectures with their peers in a supportive environment. Labs may also be used to discuss and work on assignment tasks.

*You are free to attend any lab stream that you wish, so long as there are seats available. You are also welcome to attend more than one lab stream if you feel that you need more time to focus on the concepts discussed in a given lab.*

The [Course Calendar](#) (page 6) details semester dates, lecture topics, labs, and assessment related scheduling information. Note that this calendar may change as the course proceeds. These will be announced at lectures and detailed on Blackboard.

*Students are required to prepare for and attend all classes to gain full benefit from the course.*

Lectures and labs should be prepared for by reviewing information detailed on Blackboard and completing any assigned readings. Students unable to attend a lecture are expected to catch up on missed material. Unless stated otherwise, all aspects of the course are examinable (see below).

### Locations and Times

Lectures and labs are held in the following locations:

- Lectures – The lectures are held on Monday: 2pm- 2:50pm and Tuesday: 9am- 9:50am. The Monday lecture will be held in [QUAD1](#) (location the ground floor of the Geology Building). The Tuesday lecture will be held in [BURN7](#) (located on the ground floor of the Arts Building).
- Labs – There are two lab streams in this course and you will be streamed into *one* of these. These are normally held on Fridays from 10am-11:50pm and 12pm-1:50pm in the NCAL lab (located in the ground floor of Sciences III building). **Note that the labs start in the first week.** Just for the first week (week 28), to compensate for Matariki holiday on 14<sup>th</sup> July, you will be streamed into one of two lab streams – Wednesday (12<sup>th</sup> July) from 5pm-6:50pm and Thursday (13<sup>th</sup> July) from 6pm-7:50pm in NCAL. Check eVision for your lab stream.

### Lecture recordings

We believe strongly in the importance of attending lectures and labs to maximise your engagement with the course content. Attending lectures and labs is important — it allows you to work with your

peers, and provides the opportunity to develop discussion of key elements of the subject. However, we recognise illness, and other significant unforeseen events do occur. We also appreciate that some students benefit from having the recordings to review again later in their own study time. For these reasons, lecture recordings will be released after the lecture and accessible on Blackboard from that point onward.

## Expectations and Workload

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You are expected to complete approximately 180 hours of work over the semester. This encompasses all activities in the paper (attending lectures and labs) along with any additional work to complete assessments and any necessary preparation for classes.

## Course Learning Resources

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There is no required text for this paper. Where appropriate, we will make use of the following book: Wickham & Golemund: *R for Data Science*, O'Reilly, 2017. This book is available online at: <http://r4ds.had.co.nz/>

### Blackboard

*Blackboard* <https://blackboard.otago.ac.nz/> provides you with access to course materials, class notices, and resources. Blackboard is used to email the whole class so it is important that you check your student email and *Blackboard* regularly.

### Class Representatives

The class (or student) representative system is an avenue for encouraging communication and consultation between staff and students. It provides you with a vehicle for communicating your views on the teaching and delivery of the paper and provides staff with an opportunity to communicate information and gain constructive feedback from students. It contributes to the development of a sense of community within a department and it adds a further dimension to the range of support services offered to students.

Volunteers for the role of class representatives will be called early in the semester. The OUSA invites all class representatives to a training session, conducted by OUSA, about what it means to be a class representative and some of the possible procedures for dealing with issues that arise. They also provide information on the services that OUSA offers and the role OUSA can play in solving problems that may occur. The OUSA provides support to class representatives during the semester. Departmental staff will also meet with class representatives during the semester to discuss general issues or matters they wish to have considered.

Your class representative's name and contact details will be posted on Blackboard early in the semester.

### Student Webmail

**IMPORTANT - DO THIS NOW:**

We will use your student email account to email you information relevant to your study at Otago. To forward your University email address to an email address that you use regularly:

1. Log into your StudentMail account (<http://www.otago.ac.nz/smlanding/>) using your student username and password.
2. Click the **Cog** button (top right corner).
3. Click on **Mail** under **Your App Settings**.
4. Under **Accounts** on left hand side, select **Forwarding**.
5. Under the Forwarding heading, type in the email address you want your email to be forwarded to. You can also choose to have a copy of these emails kept on your StudentMail account, so please check the box if you would like this.
6. Click the **Save** button.

## Assessment

All material presented in classes is assessed through assignments and practical tests. All-important assessment information such as due dates and times, content, guidelines and so on will be discussed at lectures and, where appropriate, detailed on Blackboard. *Students are responsible for ensuring that they are aware of this information, keeping track of their own progress, and catching up on any missed classes.*

There are nine lab quizzes that are worth 20%. Each lab quiz is worth 2.5 marks. Of the nine quizzes, the best eight will be chosen towards 20% (i.e.,  $8 * 2.5 = 20$ ). There are two assignments that are worth 10% each ( $2 * 10 = 20\%$ ). The two practical tests are worth 60% in total (30% and 30% respectively). See details about the due dates for these assessments below.

Assessment	Description	Due date/week
<b>Lab quizzes:</b>		
Quiz I	R Studio basics	21 July (in the lab)
Quiz II	R programming basics	28 July (in the lab)
Quiz III	Reading and writing data	4 August (in the lab)
Quiz IV	Visualisation	11 August (in the lab)
Quiz V	Data wrangling I	18 August (in the lab)
Quiz VI	Data wrangling II	8 September (in the lab)
Quiz VII	Data wrangling III	15 September (in the lab)
Quiz VIII	Web scraping	22 September (in the lab)
Quiz IX	Data modeling	29 September (in the lab)
<b>Assignments:</b>		
Assignment I	Topics covered in lectures 1-10 and corresponding labs	20 August, 11:59pm (through Blackboard)
Assignment II	Topics covered in lectures 10-22 and corresponding labs	8 October, 11:59pm (through Blackboard)
<b>Tests:</b>		
Test 1	Topics covered in lectures 1-10 and corresponding labs	25 August (in the lab)
Test 2	Topics covered in lectures 10-22 and corresponding labs	13 October (in the lab)

**Note: Use of AI-based text generation tools such as ChatGPT for assessments is not allowed. We reserve the right to conduct an oral investigation before releasing marks for assessments.**

## Course Requirements

COMP 120 has the following hurdles to pass the paper.

1. Take at least 7 out of 9 lab quizzes.
2. Submit both assignments.
3. Take both the tests and score at least 40% average across the two tests. In other words, a student must score at least 24 out of 60 in the tests.

*Failure to achieve the above means that you will not be able to pass the paper irrespective of your overall score in the course.*

## Late Assignments and Special Consideration

*Late assignments are penalised at the rate of 1% per hour* – for every hour that your assignment is late, your raw mark for the assignment is scaled accordingly (e.g. if your raw mark for an assignment is 90%, and your submission of your assignment is ten hours late, your final mark for the assignment will be  $90\% \times (100 - 10)\% = 81\%$ ).

On certain grounds (e.g., illness or bereavement), special consideration on assignments may be given. Special consideration is given on a case-by-case basis and *must be requested from the course coordinator prior to the assessment deadline*.

## Quality Assurance

At the Otago Business School we monitor the quality of student learning and your learning experience. Your assessed work may be used for assurance of learning processes, such as evaluating the level of achievement of learning outcomes, with the aim of improving the quality of our programmes. All material used for quality assurance purposes will be treated as confidential and the outcome will not affect your grades.

## Grading System

The grading scheme used at Otago is given below:

<b>A+</b>	90-100	<b>C+</b>	60-64
<b>A</b>	85-89	<b>C</b>	55-59
<b>A-</b>	80-84	<b>C-</b>	50-54
<b>B+</b>	75-79	<b>D</b>	40-49
<b>B</b>	70-74	<b>E</b>	<40
<b>B-</b>	65-69		

## Academic Integrity and Academic Misconduct (Plagiarism)

**Students should ensure that all submitted work is their own.** Plagiarism is a form of academic misconduct (cheating). It is defined as copying or paraphrasing another's work and presenting it as one's own. Any student found responsible for academic misconduct in any piece of work submitted for assessment shall be subject to the University's dishonest practice regulations, which may result in serious penalties, including forfeiture of marks for the piece of work submitted, a zero grade for the paper, or in extreme cases, exclusion from the University. The University of Otago reserves the right to use plagiarism detection tools.

Students are advised to inform themselves about University policies concerning dishonest practice and take up opportunities to improve their academic and information literacy. If necessary, seek advice from academic staff, or the Student Learning Centre. The guideline for students is available at this link: <http://www.otago.ac.nz/study/academicintegrity/index.html>

## Course Calendar

Week	Date	Lectures	Lecturer	Labs	Assessment/Notes
<b>28</b>	10 Jul -	1 What is Data Science?	TS	1	Introduction to R and R-Studio
	14 Jul	2 Introduction to R and R-Studio	TS		
<b>29</b>	17 Jul -	3 Data Structures (I)	TS	2	Branching, Looping and Functions
	21 Jul	4 Branching, Looping and Functions	TS		
<b>30</b>	24 Jul -	5 Data Structures (II)	TS	3	Reading and Writing data
	28 Jul	6 Importing and Exporting Data	TS		
<b>31</b>	31 Jul -	7 Visualising Data (I) - Basic Plots	TS	4	Visualisation
	4 Aug	8 Visualising Data (II) - ggplot2	TS		
<b>32</b>	7 Aug -	9 Data Type Conversion and Handling Date & Time	TS	5	Data Type Conversion and Data Wrangling (I)
	11 Aug	10 Data Wrangling (I) - Data Manipulation Functions	TS		
<b>33</b>	14 Aug -	11 Data Wrangling (II) - Data Aggregation Functions	TS	6	Data Wrangling (II)
	18 Aug	12 Data Wrangling (III) - Data Reshaping Functions	TS		
<b>34</b>	21 Aug -	13 Review for Test 1	TS	7	Test 1 (in the lab)
	25 Aug	14 Exploratory Data Analysis (EDA)	TS		
<b>35</b>		<b>Mid-Semester Break</b>			
<b>36</b>	4 Sep -	15 Handling Relational Data	TS	8	Data Wrangling (III)
	8 Sep	16 Handling Text Data	TS		
<b>37</b>	11 Sep -	17 Sourcing data using APIs and Web Scraping	TS	9	Web Scraping
	15 Sep	18 Data Modeling (I)	TS		
<b>38</b>	18 Sep -	19 Data Modeling (II)	BW	10	Data Modeling
	22 Sep	20 Data Modeling (III)	BW		
<b>39</b>	25 Sep -	21 Reproducible Research	TS	11	Reproducible Research
	29 Sep	22 Version Control System	TS		
<b>40</b>	2 Oct -	23 Creating Interactive Apps using Shiny	TS	12	Assignment 2 help
	6 Oct	24 Case studies in Data Science (I)	TS		
<b>41</b>	9 Oct -	25 Review for Test 2	TS	13	Test 2 (in the lab)
	13 Oct	26 Case studies in Data Science (II) & Wrap Up	TS		

TS – Tony Savarimuthu, BW – Brendon Woodford



# Student Learning Support and Information

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## Student Charter

<http://www.otago.ac.nz/about/otago0005275.html>

## Guidelines for Learning at Otago

<https://www.otago.ac.nz/hedc/otago616123.pdf>  
<http://hedc.otago.ac.nz/hedc/learning/>

## Student Learning Development

The Higher Education Development Centre (<https://www.otago.ac.nz/hedc/students/index.html>), provides learning support, free of charge, to ALL enrolled students. Their services include:

- a workshop programme designed to help students to improve their learning strategies and their generic skills;
- individual assistance with learning issues;
- on-line study skills advice;
- a student leadership programme
- a student-led peer support programme for students of all ages and backgrounds.
- conversational English groups for students from a non-English speaking background

The Student Learning Development team has produced helpful study guides on various topics (e.g., how to become a successful student and how to take notes) and these are available on the HEDC website (<https://www.otago.ac.nz/hedc/students/digital/index.html>).

## Library Support

The Library website <http://www.otago.ac.nz/library> provides access to resources and services, including group room bookings, library hours and locations, past exam papers, subject guides, article databases and more.

If you need assistance either check out the self-help guides <http://otago.libguides.com/selfhelp>, or ask Library staff at the ground floor service desks, or email [ask.library@otago.ac.nz](mailto:ask.library@otago.ac.nz)

## Pacific Student Support Facilitators

Malo e lelei

Falaviena (Viena) Faiva works part-time in the Dean's Office at the Otago Business School, Division of Commerce. Viena is of Tongan descent and one of our two Pacific Student Support Facilitators. She is responsible for all second-year Pacific students within the division.

Deans Office, Otago Business School  
Division of Commerce  
Email: [viena.faiva@otago.ac.nz](mailto:viena.faiva@otago.ac.nz)  
Cell Phone: 021 279 0914



Bula Vinaka

Jekope Ramala Maiono also works part time in the Dean's Office at the Otago Business School, Division of Commerce.

Maiono is of Fijian descent and our other Pacific Student Support Facilitator. He is responsible for all first-year Pacific students in the division.

Deans Office, Otago Business School

Division of Commerce

Email: [jekope.maiono@otago.ac.nz](mailto:jekope.maiono@otago.ac.nz)

Cell Phone: 021 279 0871



### **Kaiāwhina Māori | Māori student support**

Ben Sommerville is the Kaiāwhina Māori (Māori student support) for Te Kura Pākihi | Otago Business School. He is able to answer any questions you may have about studying here at the University of Otago. He can provide information about scholarships, campus services, pastoral and financial care. Ben is also here to support those students who are studying away from their whānau, hapū and iwi, to ensure they feel safe and supported. He has a passion for the development of Rangatahi and understands the struggles that can come with academic life.



Tel +64 27 513 6991

Email [ben.sommerville@otago.ac.nz](mailto:ben.sommerville@otago.ac.nz)

### **Disability Information and Support**

Students are encouraged to seek support if they are having difficulty with their studies due to disability, temporary or permanent impairment, injury or chronic illness. It is important to seek help early, through one of the contacts below:

Website: <http://www.otago.ac.nz/disabilities>

65 Albany St, West Lane, ISB, Student Services

Tel: +64 3 479 8235 Email: [disabilities@otago.ac.nz](mailto:disabilities@otago.ac.nz)

## **Disclaimer**

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While every effort is made to ensure that the information contained in this document is accurate, it is subject to change. Changes will be notified in class and via Blackboard. Students are encouraged to check Blackboard regularly. It is the student's responsibility to be informed.