UNIVERSITY *of* TASMANIA

School of Natural Sciences

College of Sciences and Engineering

KMA153
DATA HANDLING & STATISTICS 1

Semester 2, 2019

Unit Outline

Danijela Ivkovic

CONTACT DETAILS

Unit coordinator

Unit coordinator:	Danijela Ivkovic
Email:	Danijela.Ivkovic@utas.edu.au
Phone:	(03) 6226 2426
Room:	Sandy bay, Maths & Physics Building, room 436
Consultation hours:	Feel free to drop in, ring or skype anytime. Please note I work part-time, so to check my availability it's best to email.

Lecturers

Video:		Barbara Holland	Barbara.Holland@utas.edu.au
			Physics Building, room 460
Face-to-face:	Hobart	Danijela Ivkovic	Danijela.Ivkovic@utas.edu.au
			Physics Building, room 436
	Launceston	Kathy Farr	Kathy.Farr@utas.edu.au
			Science building, room 262

Tutors

Campus	Tutor	Email
Hobart	Danijela Ivkovic	Danijela.Ivkovic@utas.edu.au
	Damien Palmer	Damien.Palmer@utas.edu.au
	Julia Shore	Julia.Shore@utas.edu.au
Launceston	Kathy Farr	Kathy.Farr@utas.edu.au

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WHAT IS THE UNIT ABOUT?

Unit description

Data Handling and Statistics 1 is the first of three applied statistics units offered by the School of Natural Sciences (Mathematics). Statistics is the science of decision making, and as such forms a key foundation of any scientific research. This unit develops skills in statistical analysis and project design.

Data Handling and Statistics 1 is an applied unit that develops conceptual understanding of the foundations of modern Statistics together with practical skills in data analysis. This is a "hands-on" unit that provides experience with the common techniques of descriptive and inferential statistics.

Intended Learning Outcomes

On completion of this unit, you will be able to:

1. *Summarize* and *explore* large data sets using appropriate numeric and graphical tools in order to *communicate* statistical concepts to both scientific and lay audiences.

2. *Recognize* the key issues involved in designing a survey or experiment, and *assess* strengths and weaknesses in statistical arguments.

3. *Identify* and *apply* appropriate statistical techniques to make inferences based on data.

4. *Perform* common statistical analyses in a statistical computing package.

Alterations to the unit as a result of student feedback

Some students were unsure on the expectations for the projects, so more detailed information on what is expected for the projects has been provided.

Many students reported struggling with time-management in working towards the projects, to help with this, regular participation will be assessed by CHECKPOINTS TASKS that are either posted to MyLO discussion boards or recorded by your tutors.

Many students requested access to solutions for past exams, this was not possible due to the exam being open book. We have now restricted the materials that are allowed in the exam, but now make old exams and solutions available for study.

HOW WILL I BE ASSESSED?

Assessment task	Date due	Percent weighting	Links to Intended Learning Outcomes
Quiz 1: Descriptive Statistics	5th August	5%	1, 4
Project 1: Descriptive Statistics	12th August	15%	1, 4
Quiz 2: Modelling task	26th August	5%	2, 4
Project 2: Design task	See details	10%	2
Quiz 3: Inferential Statistics	30th September	5%	3, 4
Project 3: Inferential Statistics	7th October	15%	3, 4
Quiz 4: ANOVA & Regression	18th October	5%	3, 4
Exam		40%	1, 2, 3, 4

Assessment details

Project 1 – Descriptive Statistics (15%)

Task description	You will be given a dataset to explore. Your job will be to present a report that contains a single page with your aims and four findings, followed by a statistical appendix that includes any figures and tables, and details the analyses you undertook.
	The only statistical tools which we require you to use are those covered in weeks 1-3, and the only computing tool you need is the EXCEL package.
	For further details including a marking guide and a sample report see MyLO.

	Criterion	Measures Intended Learning Outcome:
Criterion 1	*Explore* and *summarize* a data set by applying a range of numeric and graphical summaries of the data	1
Criterion 2	*Communicate* statistical concepts to both statistically literate and lay audiences in a written report with a non-technical front-piece and a statistical appendix	1

Criterion 3	• *Perform* statistical analyses in Excel to create tables and graphs that support the findings of your report.	4
Task length	Maximum of 4 pages	
Due by date	Final due date 5pm 12th August. There are three intermediate CHECKPOINTS: you should get these signed off by the tutor in your tutorial group. • Week 1-2: Prepare 4 questions about the data set • Week 2-3: Draft a finding based on a PivotTable • Week 4: Assess your draft report against the guide Meeting these CHECKPOINTS is part of the performance requirement for this unit (see pg 14). Over the semester you must meet at least 7 of 10 CHECKPOINTS to be eligible to pass the unit. The project 1 CHECKPOINTS will also be used to assess your engagement with the unit (see pg 14).	

Project 2 – Design task (10%)

Task description	You will be asked to assess a scenario in which a survey or experiment needs to be designed. You will post a preliminary report to MyLO and then participate in a round of commenting on other students' reports. You should the incorporate feedback that you get from your peers and your tutor into your final submitted project. **For further details including the marking rubric, see MyLO.**	
	Criterion	Measures Intended Learning Outcome:
Criterion 1	*Discuss* the key issues involved in designing a survey so that sampling is done in such a way as to ensure valid conclusions.	1, 2
Criterion 2	Give thoughtful and timely feedback on the design strategies suggested by other students.	1, 2

Criterion 3	Present a practical solution for conducting the survey	2
Task length	Maximum of 3 pages	
Due by date	Final due date 5pm 9th September There are two intermediate CHECKPOINTS that you need to meet: • Draft report to MyLO – 23th August • Feedback on other students' reports – 30th August Meeting these CHECKPOINTS is part of the performance requirement for this unit (see pg 14). Over the semester you must meet at least 7 of 10 CHECKPOINTS to be eligible to pass the unit.	

Project 3 – Inferential Statistics (15%)

Task description	You will be given a dataset to explore along with a suggested set of analyses. Your job will be to present a report that contains a single page with your aims and main findings, followed by a statistical appendix that includes any figures and tables, and details of the analyses you undertook. The only statistical tools which we require you to use are those covered in weeks 7-10, and the only computing tool you need is the EXCEL package. **For further details including the marking guide, see MyLO.**
Assessment criteria	• *Apply* appropriate statistical techniques to make inferences about a data set • *Communicate* statistical concepts to both statistically literate and lay audiences in a written report with a non-technical front-piece and a statistical appendix • *Perform* common statistical analyses in a statistical computing package.
Links to unit's ILOs	3, 4
Task length	Maximum of 6 pages
Date due	Final due date 5pm 7th October

	There are three intermediate CHECKPOINTS: you should get these signed off by the tutor in your tutorial group.
	- By Week 8: Complete t-tests - By Week 9: Complete Confidence Intervals - By Week 10: Complete Chi-square tests
	Meeting these CHECKPOINTS is part of the performance requirement for this unit (see pg 14). Over the semester you must meet at least 7 of 10 CHECKPOINTS to be eligible to pass the unit.

Quizzes (4 x 5%)

Task description	There are 4 online quizzes. The questions are linked to the computer labs and the video lecture material. You will need to have watched all the relevant video lectures and to have completed the computer labs. **You will require access to Excel and the output from the computer labs while completing the quizzes.** It is strongly recommended that you attempt the practice quizzes prior to taking the formally assessed quizzes.
Assessment criteria	Each quiz will consist of 10 multi-choice questions. Each question has equal weight.
Links to unit's ILOs	1, 2, 3, 4
Task length	Each quiz will be open for 24 hours (on the due date), once you begin the quiz you will have 2 hours to complete it. NOTE, unlike the practice quizzes, for the assessed quizzes **you are only permitted a single attempt.**
Date due	Quizzes occur on the Monday in weeks 4, 7, 11 & the Friday of week 13 There will be two CHECKPOINTS in weeks 11-12 that will relate to the analyses required to prepare for Quiz 4. Meeting these CHECKPOINTS is part of the performance requirement for this unit (see pg 14). Over the semester you must meet at least 7 of 10 CHECKPOINTS to be eligible to pass the unit.

Final Exam (40%)

Description / conditions	The exam is closed book but there will be a formula sheet provided and students are also permitted to have a (double sided) A4 page of notes. Calculators are permitted.	
	All questions need to be answered – the format is primarily short answer questions.	
	Practice exams and model solutions will be made available.	
	Criterion	**Measures Intended Learning Outcome:**
Criterion 1	Demonstrate that you are familiar with the methods and concepts studied during the unit. Make sure to give full explanations including the details of any working that led to your answer, not just the answer.	1,2,3,4
Duration	2 hours	
Date	The final exam is conducted by the Student Centre in the formal examination period. See the Examinations and Results page on the University's website, or access your personal exams timetable by logging into the eStudent Centre - Personal Exams Timetable for specific date, time and location closer to the examination period.	

How your final result is determined

Your final grade for the unit will be based on the submission of the 3 reports (40%), four online quizzes (20%), and the final exam (40%).   In order to pass the unit you must achieve at least 50% overall grade and you must also demonstrate that you have achieved each of the Intended Learning Outcomes (ILOs). The exam is the only assessment piece in which your identity is fully verified so it carries a greater weight in determining attainment of the ILOs. If you achieve a satisfactory performance for the internal assessment component of an ILO but fail to reach an acceptable standard in the exam (i.e. 40% or greater) you will be deemed to have not attained the ILO.

Projects should be submitted via Dropbox. The coversheet can be found on MyLO, you should fill it in and have it at the beginning of each of your submissions.

Requests for extensions, deferred examinations and special consideration

A request for an extension to the due date for an assessment task should be made in writing and emailed to Daniejla.Ivkovic@utas.edu.au. If the reason for an extension is easily foreseeable the request should be received well before the assignment due date. Requests for extensions received within three days of the due date will only be considered in extreme circumstances. Requests for extensions by students who have not completed intermediate CHECKPOINTS for projects will not be viewed favorably! Independent documentation (medical certificate, counsellor's report, etc.) in support of the application should be attached to the form OR a current Learning Access Plan may be used as supporting documentation, as appropriate.

If you are ill on the day of an examination or have other serious circumstances which prevent you from sitting an examination, you may apply for a deferred examination (see http://www.utas.edu.au/__data/assets/pdf_file/0006/314628/Application-for-a-Deferred-Examination-1.0.pdf for form and further details). If you are ill, you should see a doctor on the day of the examination and the doctor must return the form to the Exams Office within 3 working **days** of the examination. Please note that having a medical certificate does not guarantee that a deferred examination will be approved.

Students who have completed an examination(s) and who feel that they have been disadvantaged due to illness or other circumstances affecting their study may request special consideration in the marking of their examination(s) (see http://www.utas.edu.au/__data/assets/pdf_file/0019/314623/Special-Consideration.pdf for form). Forms should be submitted directly to the relevant school, accompanied by appropriate supporting documentation, as soon as possible after the completion of the examination(s) and no more than 3 working days after completion of the student's last examination. Granting of special consideration is at the discretion of the lecturer and school.

Penalties

In most circumstances project reports that are received late without prior arrangement of an extension will receive a maximum grade of CR (1-3 days late), and a maximum grade of PP (4-7 days late). If they are more than 1 week late they will usually not be marked.

Review of results and appeals

If you think a grade you have received is incorrect or unfair then please contact me for a review. If you are still unhappy with a grading decision, you should submit a complaint in writing to the Head of Discipline (Mathematics), Professor Andrew Bassom.

Academic misconduct

Academic misconduct includes cheating, plagiarism, allowing another student to copy work for an assignment or an examination, and any other conduct by which a student:

a. seeks to gain, for themselves or for any other person, any academic advantage or advancement to which they or that other person are not entitled; or

b. improperly disadvantages any other student.

Students engaging in any form of academic misconduct may be dealt with under the Ordinance of Student Discipline, and this can include imposition of penalties that range from a deduction/cancellation of marks to exclusion from a unit or the University. Details of penalties that can be imposed are available in Ordinance 9: Student Discipline – Part 3 Academic Misconduct.

Please read the following statement on plagiarism. Should you require clarification please see your unit coordinator or lecturer.

Plagiarism

Plagiarism is a form of cheating. It is taking and using someone else's thoughts, writings or inventions and representing them as your own; for example, using an author's words without putting them in quotation marks and citing the source, using an author's ideas without proper acknowledgment and citation, copying another student's work.

If you have any doubts about how to refer to the work of others in your assignments, please consult your lecturer or tutor for relevant referencing guidelines. You may also find the site http://www.utas.edu.au/curriculum-and-quality/academic-integrity-and-misconduct/for-students of assistance.

The intentional copying of someone else's work as one's own is a serious offence punishable by penalties that may range from a fine or deduction/cancellation of marks and, in the most serious of cases, to exclusion from a unit, a course or the University.

The University and any persons authorised by the University may submit your assessable works to a plagiarism checking service, to obtain a report on possible instances of plagiarism. Assessable works may also be included in a reference database. It is a condition of this arrangement that the original author's permission is required before a work within the database can be viewed.

WHAT LEARNING OPPORTUNITIES ARE THERE?

MyLO

MyLO is the online learning environment at the University of Tasmania. This is the system that will host the online learning materials and activities for this unit. This will include: the links to video lectures, the weekly activity sheets for the computer labs, full details on all the assessment, online quizzes, practice exams, and discussion forums.

Because the student cohort is in multiple locations I will aim to use the News feature in MyLO as the primary way of communicating about course logistics and upcoming assessment. You should check the unit page a couple of times a week to keep up-to-date with any announcements.

Getting help with MyLO

It is important that you are able to access and use MyLO as part of your study in this unit. To find out more about the features and functions of MyLO, and to practice using them, visit the Getting Started in MyLO unit.
For access to information about MyLO and a range of step-by-step guides in pdf, word and video format, visit the MyLO Student Support page on the University website.
If something is not working as it should, contact the Service Desk (Service.Desk@utas.edu.au, phone 6226 1818).

Resources

Required readings

There is no required text. Readings are available on MyLO.

Recommended readings

There are many good first year statistics textbooks that would provide a useful companion to the unit, such as *Mind on Statistics* by Utts and Heckard, which has a new NZ and Australian edition.

If you enjoy reading popular science, then some recent books with great statistics content include

- *How not to be wrong: The power of mathematical thinking* by Jordan Ellenberg
- *Bad Science* by Ben Goldacre

Activities

Details of teaching arrangements

To succeed in this unit, it is important to keep making steady progress each week and not get behind on watching lectures or completing project work. The best way to organise yourself is to work through the weekly study guide on MyLO - this organises

all the activities for each week (video lectures, computer lab activities, quizzes, discussions etc).

The unit is taught in a blended style, meaning that it is a mixture of online content and face-to-face activities. Each week you will:

- **Watch the video lectures**. There will be ~5 short videos per week. The PowerPoint slides are available to print out and make notes on – many students find this to be a good approach.
- **Attend a tutorial/computer laboratory session** where you will
  - Learn the computing skills necessary for the projects and quizzes.
  - Work on, and get feedback on, the projects. Most weeks have a project CHECKPOINT TASK that you should discuss with your tutor and get them to sign off.
- **Attend the face-to-face lecture**. This will be used to review the lecture content, discuss any questions that you have, and to work on practice questions.

Timetable

Hobart (Sandy Bay campus):

Face-to-face lecture (Danijela):   Thursday 1pm, Physics Lecture Theatre 3 (rm 315)

Tutorial Stream A (Damien):   Monday 11:00am-12:50pm in Maths lab 329
Tutorial Stream B (Julia):   Monday 1:00pm-2:50pm in Maths lab 329
Tutorial Stream C (Danijela):   Tuesday 9:00am-10:50am in Maths lab 329

Launceston (Newnham campus):

Face-to-face lecture (Kathy):   Thursday 1pm, Building C, room 227

Tutorial (Kathy):   Wed 1:00-2:50pm, Building B, Computer Lab 220

Specific attendance/performance requirements

Students are required to achieve **at least 7 of 10 project CHECKPOINTS** for a pass in this unit. These CHECKPOINTS will be assessed via your participation in the discussion board for your tutorial group.

Early on in the semester your engagement with the unit will be monitored by checking that you have completed the following tasks:

1. Get the first project 1 CHECKPOINT signed off by your tutor (see pg 6)
2. Complete the week 2 Practice Quiz

If you do not appear to have engaged actively with this unit by completing these two activities by Week 4 of semester, your enrolment may be cancelled, or you may be withdrawn from the unit.

Unit schedule

Week	Date beginning	Topic/ Module/ Focus Area	Activities	Resources/ Readings/ Further Information
1	15th July	Exploratory Data Analysis	**Video lectures:** The statistical process, Types of data, Graphs and tables for categorical data, Summary statistics for categorical variables, Reporting risk, Simpson's paradox. **Computer Lab & Practice Quiz**: Introduction to Excel. **Project work**: Introduce yourself, pick a tutorial stream, get familiar with the fishing dataset. CHECKPOINT 1- Write 4 questions about the fishing data	Module 1 notes
2	22nd July	Exploratory Data Analysis	**Video lectures:** Summary statistics for scaled variables, Graphs for univariate data, Scatterplots and correlation, Caution with summary statistics, Correlation vs causation. **Computer Lab & Practice Quiz**: Excel tools for project 1 (PivotTables). **Project work**: Use PivotTables and Scatterplots to address the questions you posed in week 1, draft some findings. CHECKPOINT 2- Create a PivotTable that addresses one of your questions, write a draft finding to go with the table/figure	Module 1 notes
3	29th July	Probability and Polishing Project 1	**Video lectures:** Tips for tables, tips for graphs, Probability concepts, Working with probabilities, Law of Large Numbers & the Gambler's fallacy, Random variables. **Computer Lab**: Catch-up session. **Project work**: Finish creating PivotTables, begin preparing your draft report. Last chance to catch up on CHECKPOINTS 1 or 2.	Module 1 notes
4	5th Aug	Useful distributions	**Video lectures:** Binomial distribution, Poisson distribution, Continuous random variables, Normal distribution, Normal tables. **Computer Lab & Practice Quiz**: Binomial and Poisson distributions. **Project work**: Finalise your report for project 1 CHECKPOINT 3- Assess your draft report against the Project 1 guide.	Module 2 notes, pgs 22-35.

Quiz 1 opens 00:01 August 6th and closes 23:59 August 6th. It is worth 5% of your final mark
5	12th Aug	Sampling, bias & types of investigations	**Video lectures:** The central limit theorem, sampling distributions. Normal approximations, Regression to the mean. **Computer Lab & Practice Quiz:** The normal distribution. **Project work:** Start work on modelling a scenario where we need to test a population for presence of a disease.	Module 2 notes, pgs 1-22.
Project 1 is due 5pm 12th August. It is worth 15% of your final mark
6	19th Aug	Sampling distributions	**Video lectures:** Sampling, Representative samples, Sampling schemes, Surveys, Comparative studies, Experiments, randomization, replication, Controls. **Computer Lab:** Catch-up session. **Project work:** Finish preparing required tables for the modelling task. Post a draft response to the survey design questions on your tutorial group's discussion board CHECKPOINT 4 – Draft survey design posted (due 24th Aug, by 5PM)	Module 2 notes, pgs 37-52.
7	26th Aug	Introducing inference	**Video lectures:** Introduction to inference, example hypothesis tests, p-values, choosing hypotheses. **Computer Lab & Practice Quiz:** t-tests. **Project work:** Discuss the design task with members of your tutorial group. Write comments on the discussion board that include strengths and weaknesses CHECKPOINT 5 – Comment on 3 students' draft designs. (due 31st August, by 5PM)	Module 3 notes, pgs 1-14
Quiz 2 opens 00:01 August 26th and closes 23:59 August 26th. It is worth 5% of your final mark
Mid-semester break (3rd September – 9th September)
8	9th Sep	Hypothesis testing	**Video lectures:** Normal approximation to the binomial, normal approximation to Poisson, When is it okay to use the normal distribution, t-tests, distribution free tests **Computer Lab & Project work:** Use this time do the required t-tests for project 3 CHECKPOINT 6 – Complete all the t-tests required for project 3	Module 3 notes, pgs 16-21 & 25-28
Project 2 is due 5pm September 9th . It is worth 10% of your final mark
9	16th Sep	Confidence Intervals	**Video lectures:** Intro to Confidence Intervals, CIs for proportions, CIs for means, precision vs accuracy, CIs using t-distribution, CI using normal approximations, why CIs are more useful than p-values. **Computer Lab & Practice Quiz:** Confidence intervals	Module 3 notes pages 14-16 and 22, 23, 27, and 28.

			Project work: Work on the confidence intervals required in project 3. CHECKPOINT 7 – Complete all the confidence intervals required for project 3	
10	23rd Sep	Chi-square tests	**Video lectures:** Chi-squared test of association, chi-squared tests of goodness-of-fit **Computer Lab & Practice Quiz**: Chi-square tests **Project work**: Work on the chi-square tests required in project 3. CHECKPOINT 8 – Complete all the Chi-square tests required for project 3	Module 3 notes, pgs 29-33
11	30th Sep	ANOVA	**Video lectures:** Introduction to ANOVA, Sums of squares – partitioning variation, examples, multiple testing **Computer Lab**: ANOVA **Project work**: Finalise your project 3 report CHECKPOINT 9 – Discuss the ANOVA results for the B&A dataset	Module 4 notes, ANOVA section
— Quiz 3 opens 00:01 September 30th and closes 23:59 September 30th . It is worth 5% of your final mark				

Quiz 3 opens 00:01 September 30th and closes 23:59 September 30th . It is worth 5% of your final mark

12	7th Oct	Regression	**Video lectures:** Simple linear regression, using a fitted model, Model fit and interpreting SPSS output **Computer Lab**: Regression **Project work**: Catch-up on ANOVA lab CHECKPOINT 10 – Discuss the regression results for the Supermarket Profit dataset	Module 4 notes, Regress. section

Project 3 is due 5pm October 7th It is worth 15% of your final mark

13	14th Oct	Exam practice and review	**Video lectures:** no new material **Computer Lab**: no new material **Project work**: Catch-up on Regression lab, prep for Quiz 4	

Quiz 4 opens 00:01 October 18th and closes 23:59 October 18th. It is worth 5% of your final mark