

FlipAround

Authored by, and for MDSI students

V:2017-03-06

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Chapter 1

Welcome

The purpose of this document is to ensure that all MDSI students have a source that will help to ‘wing’ the ride that is MDSI, to ensure that something exists to help the hectic ride that is Data Science and provides easy resources and easy links to information that can help you.

1.1 Welcome message

MDSI is unique in its approach and feel. MDSI is a ‘boutique degree’ which means we are a small tight-knit data family which means the contacts you walk out (really) knowing are going to be more valuable than the skills you learn. In terms of content, our point of difference is the innovation in our name. We take our innovation component as seriously as data science, and is ingrained in everything that’s taught. For us, a data science degree was our innovation (we were the first of its kind in Australia), and in the rapidly changing context that is data, the ability to innovate and adapt is a pretty great point of difference for you too.

Data science is a collaborative discipline. Students in the MDSI program get hands on experience of working in teams to formulate and solve real-life data science problems. Most courses focus on techniques to solve problems, but spend very little time (if any) on how problems should be formulated. The MDSI program is structured in a way that helps students learn this tacit, but crucial skill.

Another important aspect of data science is that it is a rapidly evolving field. A data scientist must therefore be able to stay current with developments in the field. The MDSI program, with its emphasis on critical self-learning, prepares students to be lifelong learners.

Welcome, and good luck on your MDSI journey

1.2 Checklist of things to do

Getting started on your MDSI journey can be somewhat overwhelming. So to help you ease into life as an MDSI student, the following checklist will help you to get up and running as painlessly as possible.

- Do your statistics pre-flight test
- Activate UTS student email
- Forward UTS student email if required
- Enrol in your subjects
- Review Subject Outlines
- Activate and personalise CICAround
- Join the Slack Channel

- Do your CLARA profile
- Download R & R Studio
- Download Tableau
- Activate Github
- Download Python & Rodeo (optional)
- Download Rapidminer (optional)
- Test your Google Drive
- Test your Office 365 Drive
- Download Quantum GIS (optional)
- Download KNIME (optional)
- Log into Diigo
- Log into SPARK
- Log into Review

1.3 Pre-flight tests

MDSI statistics pre-flight test: <http://www.uts.edu.au/future-students/analytics-and-data-science/essential-information/mdsi-statistics-pre-flight-test>

1.4 MDSI Jargon

Jargon	Description
UTS Online	UTS's Online learning system
CICAround	CIC's blog environment where students can post blogs about their studies and learning
FlipAround	A student guide developed by students for students in a collaborative environment
CIC Squared	Social networking event where students, staff and industry can connect
R	A coding language used in data science
Python	A coding language used in data science
KNIME	A algorithm building tool
Diigo	A collection of resources contributed by the MDSI community
Slack	A 'chat' type application completely driven by the student community.
WordPress	The host of CICAround
Lynda.com	An online learning platform with many free courses
MOOC	Massive Open Online Course
Hackathon	An event, typically lasting several days, where people collaborate to find information in data
Azure	Microsoft's cloud computing platform
AWS	Amazon Web Services' cloud computing services
Coursera	Website host/ service provider of MOOC's
GA	Graduate Attribute
CILO	Course Intended Learning Outcome
SLO	Subject Learning Outcome

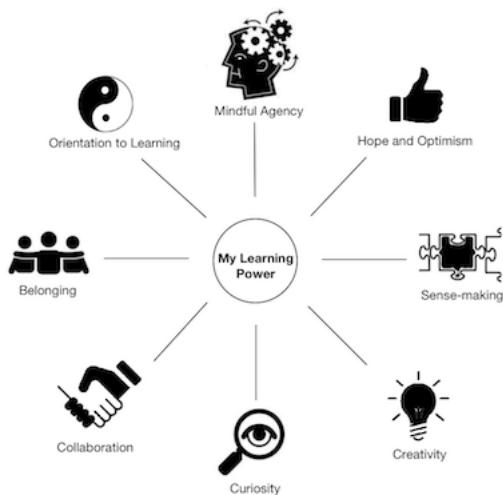
Chapter 2

The data science mindset

2.1 CLARA

Each person has their own learning preferences and habits of mind that shape their response to challenges and learning opportunities.

CLARA (Crick LeArning for Resilient Agency) is a tool used to prompt reflection on a multidimensional construct called “Learning Power” with eight dimensions: curiosity, creativity, sense making, belonging, collaboration, hope and optimism, mindful agency and openness to change. The UTS Graduate Attributes have a strong resonance with these dimensions. The CLARA tool is used as part of MDSI activities, aiming to help the students maximise their development results through understanding themselves better, namely with regards to their approach to learning and challenges.



The tool is survey-based and provides a profile-style feedback covering each of the following dimensions:

Curiosity

- Wanting to get beneath the surface & find out more
- Always wondering why and how

Creativity

- Using my intuition & imagination to generate new ideas & knowledge

- Taking risks & playing with ideas and artefacts to arrive at new solutions

Sense making

- Making connections between what I already know & new information & experience
- Making meaning by linking my story, my new learning & my purpose

Belonging

- Being part of a learning community at work, at home, in education & in my social networks
- Knowing I have social resources to draw on when I need them

Collaboration

- Being able to work with others, to collaborate and co-generate new ideas and artefacts
- Being able to listen and contribute productively to a team

Hope and optimism

- Having the optimism & hope that I can learn & achieve over time
- Having a growth mindset; believing I can generate my own new knowledge for what I need to achieve
- Mindful agency
- Taking responsibility for my own learning over time through defining my purposes, understanding and managing my feelings,
- Knowing how I go about learning & planning my learning journey carefully
- Openness to change
- An emotional orientation of being open & ready to invest in learning, having flexible self-belief, willing to persist & manage any self-doubt
- A necessary prerequisite for developing resilience in learning

Here is an example of an output from CLARA, showing the resulting profile, based on the responses provided in the survey.



Here is your Orientation to Learning indicator



Learning profiles can change over time, so MDSI conducts two sets of CLARA tests, to allow the students to compare their profile changes and reflect on their development progress.

CLARA survey will be organised by MDSI and each student will receive a link and instructions on how to utilise this tool.

2.2 Data Science Professional Competencies

Competency can be defined as “effective application of skill, knowledge and abilities to on-the-job-behaviour and capability to perform to job requirements”. MDSI supports the ongoing development professional development efforts and offers a tool that can help the students evaluate their skills and abilities in various domains associated with the data science professional competencies. Students are encouraged to utilise the tool to identify the key competencies associated with their individual career aspirations. For each relevant competency, students evaluate their current competency levels, identify any gaps and use the information to create a set of actions that would form their professional development plan. The competencies model is introduced to students as part of 36100 (Data Science and Innovation) subject through a self-assessment exercise. The competencies are divided into two groups: technical and managerial, describing the following competency (proficiency) levels for each domain: Beginner, Competent, Advanced and Expert.

Technical:

- Mathematics and statistics
- Programming and scripting languages
- Databases and data storage
- Computing systems, platforms, security, integration
- Data mining
- Data modelling
- Analytics, predictive modelling and machine learning
- Data visualisation
- Business analysis and interpretation
- Product development

Interpersonal/managerial:

- Creativity
- Communication
- Data strategy
- Line management
- Data management and governance
- Facilitation and presentation
- Project management

Competency levels:

- **Beginner:** able to assist and perform simple tasks
- **Competent:** able to perform tasks independently
- **Advanced:** able to perform complex tasks
- **Expert:** able to perform complex transformative, strategic or trans-disciplinary tasks

The competencies assessment exercise aims to prompt the students to take a proactive attitude to their professional development efforts and effectively apply their analytical skills, dedication and professionalism in managing their career objectives.

The competencies assessment exercise covers the following steps:

1. Evaluate your current competency level for each domain on the list
2. Choose a set of domains (no more than 6) that are relevant to your planned development for this subject, your course and your career goals.
3. Identify the goal competency levels for the selected domains and describe related professional development outcomes that support your assessment

4. Analyse your development outcomes in the context of your career goals and identify the gaps between your current and goal competency levels
5. Develop a set of actions needed to achieve desired level of competencies and bridge the identified gap
6. Provide feedback and suggestions for the improvement of the current list of competencies, descriptions etc.

2.3 Ethics and Privacy

It's important to understand that security, privacy and ethics are three different things, although heavily intertwined in the 'internet of things'.

What is ethical when it comes to data and the internet of things? Is privacy having a login or not being identifiable as an individual?

The world of Ethics and Privacy is changing, similar to the definition that now includes much more than it did a decade ago. Computer security like a login is no longer sufficient to providing protection of privacy which is more focused on ensuring that only people who should have the authority to access your information should be able to.

Current Privacy legislation addresses control and authentication processes of whom can access your information via direct disclosures and how this information should be stored by the party who is collecting this information, it does not address disclosures that can be made based on inferences that can be drawn from big data of which your information is a part. Is the value or conclusions that could be drawn from information as part of big data considered private information?

A sensible framework in relation to Ethics and Privacy where data is concerned is highlighted in the Belmont report which identifies two rules to consider "(1) do not harm and (2) maximize possible benefits and minimize possible harms."

A big ethical dilemma of late is the rich data sources that various providers hold, that if pooled together will strip all possibility of anonymity.

For more on this read:

<http://www.tandfonline.com/doi/full/10.1080/08900523.2014.863126?src=recsys> http://libres.uncg.edu/ir/uncg/f/N_Kshetri_Big_2014.pdf

2.4 Digital Footprint

Your digital footprint https://en.wikipedia.org/wiki/Digital_footprint is the name given to the data that is recorded about you all day every day. It can be the time and phone number of someone that you called, the mobile phone tower that you were connected to at the time of making the call and how long you spoke for. It is the IP address of your computer when you connect to the internet. It is the list of items you pay for when you go through the checkout at the supermarket and the eftpos card number you used to pay for the items. It is the surveillance footage you appear in when you move through monitored public spaces. It is stories you 'like' or share on social media sites. It is the journeys that your GPS navigation stores about your travels. It is every email you send and every click you make when you browse the internet.

Your digital footprint is the inescapable record of your existence by doing nothing more than living your life. It is an important aspect of modern society as many services that you enjoy depend on the data you generate in order to provide critical services. A bank can't tell you how much money you have without keeping record of your bank transactions. For good or for evil, this data comes embedded with far more information about you. By looking at the kinds of things you spend your money on or the businesses that you spend your money at and the time of day that you spend your money there, it can be determined where you live and where you work.

As an MDSI student, you will learn to think critically and ethically about data collection and how it can be used for good and for evil. The best place to start your thinking is with your own digital footprint, become aware of how big it is and how you feel about it.

It's important to note that very little permission is sought on data collection and when it is sought, very little education is provided in terms of the use of that data. Very few providers who collect data clarify or specify what the data they collect is used for.

You are responsible for your digital footprint. Generate it wisely.

2.5 Opportunity for overseas exchange

Some great opportunities exist within MDSI with our Program Director having many contacts in many other countries which enable us to be able to explore greater opportunities for overseas exchange.

You need to do a few things before this opportunity is explored as set out by the Program Director to ensure for an easier way forward if this is an opportunity you want to explore.

2.6 Electives

You need to select four electives during your MDSI course. These electives should be selected to assist you in your growth as a student and as a data science professional. These subjects enable you to add to your toolbox of where you are heading with your journey.

Electives can be selected from any school however you will still be subjected to the pre-requisites for any possible subject, so it will depend on the requirements of the subject.

We suggest that when you apply for a subject with a prerequisite that you also apply for a waive of the prerequisite if the prerequisite is a subject you are familiar with but have not done with UTS and get exemption for that requisite.

This is not always easy, or approved and is subject to each School's internal views or policies. It is definitely a consideration to take.

You can apply for the subject (and a waiver of prerequisites if required) early as CIC is not limited by inter-faculty time restrictions.

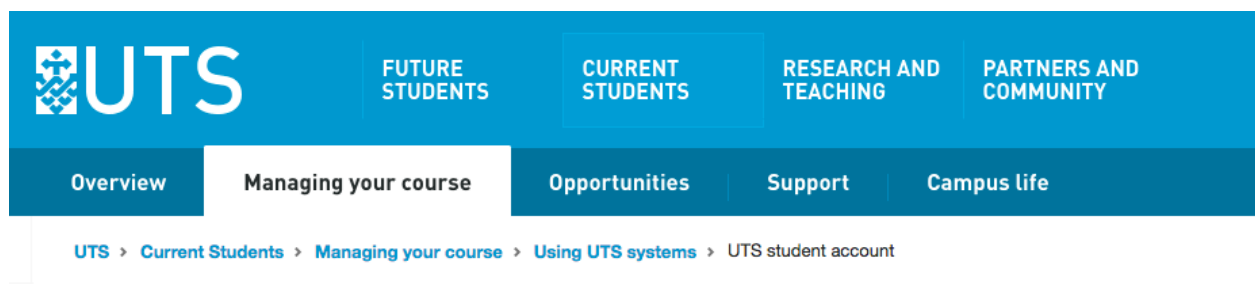
Our best tip is : get in early.

Chapter 3

A ‘survival guide’ to MDSI

3.1 First steps

3.1.1 Your UTS email:



First and foremost you need to activate your UTS email address. All official communications from UTS, subject notifications, MDSI newsletters etc will be sent to this email address. You need to activate your email address before you can access other UTS systems.

Activate your UTS Student email:

- Navigate to <https://email.itd.uts.edu.au/webapps/myaccount/activation/> and follow the steps to activate your UTS student email account.
- ** Protip: ** If you don't want to login frequently to check if you have mail, simply setup a email forwarding to an email address of your choice via the settings page after logging in.

For more general information about using UTS systems go to: <http://www.uts.edu.au/current-students/managing-your-course/using-uts-systems/uts-student-account>

3.1.2 Enrol in your subjects:



It is really important that you check your enrolment. If you are not enrolled, you cannot participate in your studies. This might seem obvious, however at UTS you need to do more than simply accept your offer. Once you have received and accepted your offer to study, you then need to enrol into your subjects.

If you have not enrolled, you need to login into the My Student Admin <https://onestopadmin.uts.edu.au/estudent/Login.aspx> portal to enrol.

For more information about enrollment and a step by step instruction guide, please visit:

<http://www.uts.edu.au/current-students/managing-your-course/your-enrolment/how-enrol>

3.1.3 Get your subject outlines:



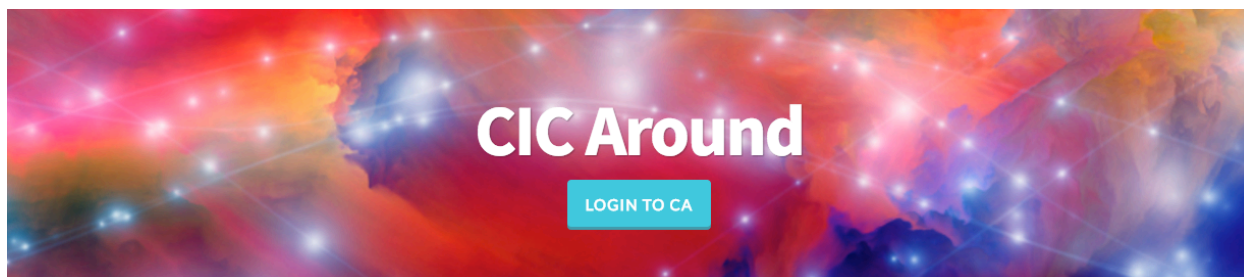
MDSI uses a variety of systems for online teaching and learning. UTSONline <https://online.uts.edu.au/> and CICAround <https://ca.uts.edu.au> are the two primary environments for you to familiarise yourself with.

The first thing you need to do after activating your email address is to login to UTSONline, access your subjects and find your subject outline. Your subject outline contains everything you need to know about your subject for the coming semester. It includes the contact information for your subject co-ordinator, important dates, assessment descriptions and much more. In most cases you can find the answer to any question you might have about your subject addressed in the subject outline.

Find your subject outlines in UTSONline:

- Login to UTSONline at <https://online.uts.edu.au/> using your student ID number and the password you setup for your UTS email account.
- Access your subjects by clicking on your subject name
- Download your subject outline by clicking on the link titled 'Subject Outline' in the left side menu, then click on the subject outline link on the page.

3.1.4 Join the MDSI community:



Your next stop should be CICAround. Here you will connect with your peers in an academic capacity. There are discussion forums for your subjects where you can post questions. CICAround most notably is where you will go to blog about your experiences throughout your MDSI journey. The first step is to activate your blog. Then you can browse through the blogs of your new MDSI family and read about their experiences and the things they have learnt.

Activate and personalise your CICAround profile:

- Navigate to <https://ca.uts.edu.au/using-ca/>
- Watch the welcome video then login to CICAround using your student ID and password.
- Put up your first CICAround Blog post

3.1.5 Join the MDSI chatter:

Slack has proven to be a very useful tool so far. It is completely driven by the student community and is where the MDSI student community goes to socialise, organise BBQs, ask each other for technical help and share useful resources. If you need a quick answer, Slack is the place to go.

Join the Slack Channel

- You can download the Slack application from <https://slack.com/downloads>
- You can also get the app for IOS, Android and Windows phones.
- You do not need to pay for a subscription.
- Sign Up to the MDSI group at: <https://utsmdsi.slack.com/>

If you're completely new to Slack, there are some helpful getting started guides at <https://get.slack.help/hc/en-us/categories/202622877-Slack-Guides>

3.2 Technology**3.2.1 R / R Studio**

'R' is a coding language used by most of the data science community. RStudio is a software program or 'Integrated Development Environment' (IDE) that makes working with the R language ALOT easier. The programming environment is really flexible as it allows you the joy of working in a notebook format, scripting, markdown and publishing your work as a PDF.

You will use R in many of your subjects and being able to use it well will give you a serious edge over your classmates and competitors at hackathons.

Download and install R & RStudio free

- Download and install the R language: <https://cran.rstudio.com/>
- Download and install RStudio IDE: <https://www.rstudio.com/products/rstudio/download/>

Libraries well worth their weight in gold:

- tidyverse <http://tidyverse.org/> A collection of libraries that make data analysis easier
 - readr <http://readr.tidyverse.org/> for reading all kinds of data formats
 - stringr <http://stringr.tidyverse.org/> for working with text

- ggplot2 <http://ggplot2.tidyverse.org/> for visualising data
- tidyr <http://tidyr.tidyverse.org/> for creating tidy data
- dplyr <https://github.com/hadley/dplyr> for manipulating data
- caret <http://topepo.github.io/caret/index.html> for creating predictive models
- Bookdown <https://bookdown.org/> for creating beautiful documents

There are many resources to get you started in doing data science with R. Refer to the resources section for more information.

3.2.2 Tableau



Tableau is a tool for visualising data. It is quite powerful in its ability to connect to a variety of data sources both on your computer and through the internet. It is also relatively intuitive to use.

As a student you can apply to the company for a free license to their commercial desktop version. <https://www.tableau.com/academic/students>

3.2.3 Github



Github is a fantastic tool to become familiar with. It is a great place to store code, collaborate with others and even host your own website or blog.

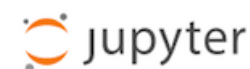
Github has a really generous collection of free stuff for students. To claim yours head over to: <https://education.github.com/pack>

3.2.4 Python / Rodeo / Jupyter Notebook



Python is a general purpose coding language widely used by the data science community. A great place to start is with Anaconda from Continuum Analytics : <https://www.continuum.io/downloads>

Anaconda comes with a ‘container’ management environment called ‘conda’ and ships with a collection of scientific python libraries that have optimised for fast computation. It is also really helpful to manage your libraries and will let you know if there are incompatibilities between the libraries you are using. This is just the tip of the Anaconda iceberg.



Python for data science is commonly used in a notebook format. To this end Jupyter notebooks will become a familiar friend. Fortunately it is included as part of Anaconda. For more info, refer to the resources section.



If you prefer an 'R' style IDE, then Rodeo by Yhat is for you. <https://www.yhat.com/products/rodeo>

If you prefer a traditional IDE, you can get a free license for PyCharm (as well as all their other products) from JetBrains using your student details: <https://www.jetbrains.com/student/>

Libraries well worth their weight in gold:

- Numpy <http://www.numpy.org/> for working with numerical arrays
- Scipy <https://www.scipy.org/scipylib/index.html> for scientific computing with python
- Matplotlib <http://matplotlib.org/> for visualising data
- Seaborn <http://seaborn.pydata.org/index.html> for statistical visualisation
- Pandas <http://pandas.pydata.org/> for working with data
- Statsmodels <http://www.statsmodels.org/stable/index.html> for creating statistical models
- Scikit-Learn <http://scikit-learn.org/stable/> for doing machine learning with python
- Tensorflow <https://www.tensorflow.org/> 'deep learning' with python

Note: Python comes in two different flavours: 2.7 and 3.x. You can start with either version, but it is worth learning what the subtle differences are (eventually).

A couple of blog posts to help you choose between R and Python:

- R vs Python for Data Science: The Winner is <http://www.kdnuggets.com/2015/05/r-vs-python-data-science.html>
- R vs Python for Data Science: Summary of Modern Advances <https://elitedatascience.com/r-vs-python-for-data-science>

3.2.5 KNIME



KNIME Analytics Platform is an open source solution that enables quick, fast data driven designs for machine learning. Its a visual tool to learn and use when you need to get the job done quickly (without writing any code) and need to create algorithms quickly but you don't have the time to learn the mathematics behind the algorithms. Its friendly and easy to use to find the hidden 'story' in the data.

Go to <https://www.knime.org/knime-analytics-platform> to download KNIME for free.

3.2.6 Rapidminer



Rapidminer is another visual tool for doing data analysis, modelling and machine learning. You can get access to their commercial tools using your student status from <https://rapidminer.com/educational-program/>

3.2.7 Quantum GIS



QGIS is a really nice open source tool for working with geospatial data. To get started just head over to <http://www.qgis.org/en/site/index.html>

3.2.8 Diigo



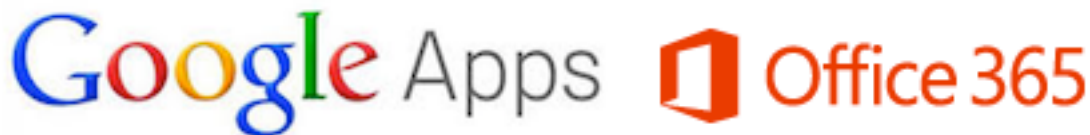
A collection of resources contributed by the MDSI community.

Join the Diigo group - simply create a Diigo account and request access. https://groups.diigo.com/group/cic_mdsi

Frequently used search tags include:

“DSI, DAM, Data, big_data, case studies, visualization, teaching_tools, statistics, stats-thnkg, privacy, Algorithms, ethicsVSD, realworldDM, video, Analytics, human-machine, history, data,mining, Data_science, cisco, R, IoE, TEDtalks, values, QSPProject, Algorithmic, Accountability, industry, sociotechnical, systems, AI, podcast, professional_practice, portfolio, storytelling, bbc, QS, DMonline, innovation, humanismprofessional, development, open_data, speculative_futures, RealWorld, ted, transdisciplinarity, creativity, algorithm, sociotechnical, BowkerStar, futuresgender, challenge, data-sets, accountability, digital_futures, tools, DM, reading, DVN, equality, infographic”

3.2.9 Google / Office 365



Your university account allows you access to Google Apps and Office 365.

Google Apps access does not include Gmail. You can not login to your UTS google apps account via gmail or if you are already logged in with a personal gmail account, you will need to log out completely from gmail. Once you have done this, you can log in using your student email address. This will revert you to a UTS login page. Use your UTS student number and password and it will revert you back to the Google Drive, but you will be logged into the drive.

Similarly you can mimic the same steps for Office 365.

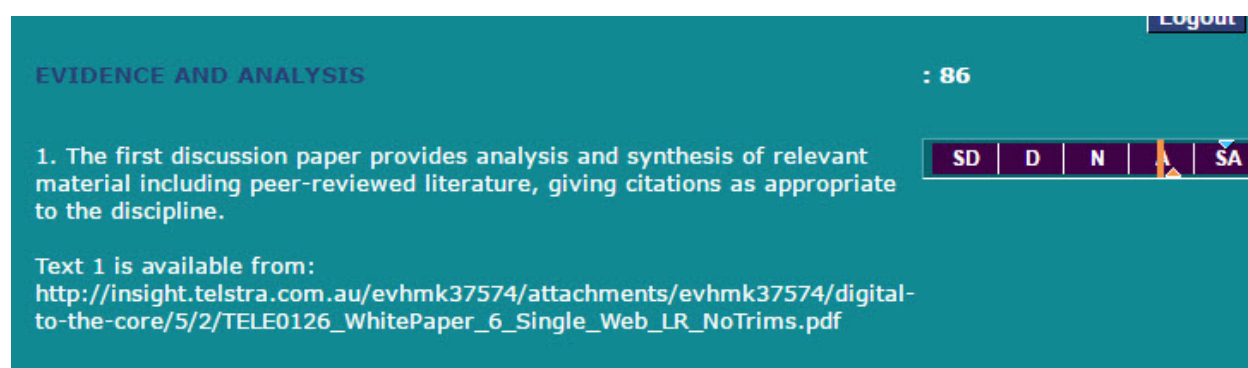
3.2.10 SPARK-Plus



SPARK is an acronym for Self and Peer Assessment Review Kit. This tool has been developed to assist with in class activities as well as being able to self and peer assess assignments. Its also one of the few tools that make group assessments/work easier, in particular to marking.

Login with your student ID and Password

<https://uts.sparkplus.com.au/login.php>



3.2.11 Review



Review is an assessment tool that is used to mark your work, give you feedback about your work and for you to develop a sense of what is expected by marking your own work before it is assessed by teaching staff.

Review allows you to see feedback from your lecturer as well as your mark broken down by specific GA/CILO set out by your assignment.

It also allows you to self assess your assignment, which allows the lecturer to see if your expectation is in line with their expectation. It's important to note that the lecturer will not be able to see your self assessment until after they have saved your mark.

You are also able to see the average of the class as well as where the staff has measure you.

<https://uts.review-edu.com/uts/>

slider: ▼ self ▲ average ▲ staff ▲ with penalty

Download PDF LEGEND

Marking has been published, no changes allowed self marking ✓ staff marking ✓ published ✓

■ Application of literature and industry standards evident in your portfolio

Final mark: **D**

Comment: You could use CRISP-DM approach for explaining how you delivered the data analytic project. You need to explain in more detail how did you approach the data understanding.

■ Effective data analytic practices evident in your activity descriptions and samples

Final mark: **HD**

3.3 Writing

3.3.1 Blogs

More and more academics and workplaces use blog posts to reach clients, audiences and share knowledge. Blogs can be useful for many reasons and is used as a reflective tool for students as well as providing an opportunity to share any learning.

You can use some tools to turn topics into amazing titles by using keyword suggesters (<http://keywordtool.io>), title generators (<https://www.portent.com/tools/title-maker>), and you can also test your headlines with the following tool (<http://coschedule.com/headline-analyzer#>)

Tips for new bloggers

- Use an eye catching title
- In-text links
- Use pictures, pictures speak a thousand words
- Keep post to 1000-1500 words
- Use social sharing buttons
- Use paragraphs - one idea per paragraph
- Revise and Rewrite
- Omit needless words - Use the KISS (Keep It Simple, Stupid) Principle
- Use definite, specific concrete language - direct and to the point
- Write in a way that comes naturally - use your active voice
- Be clear - make it simple to read and understand
- Avoid fancy words
- Do not take shortcuts at the cost of clarity

Tips on writing blog posts : <https://probblogger.com/how-to-write-great-blog-content/> and <http://www.socialmediaexaminer.com/26-tips-for-writing-great-blog-posts/>

3.3.2 White papers

Where do you start with a white paper and what are they? White papers are originally documents written for government policies however this is most recently being used by companies and universities to get new policies and research into the public space.

There are some things to consider when writing a white paper:

- Pick a topic people will want to read or a problem you want to solve

- Pick a generic title that describes the problem at hand
- Engage, inform and convince your reader
- Be descriptive and professional
- Consider the audience you are 'speaking' to and accommodate for their level of expertise
- Set up a great intro
- Emphasize the value you want to or will create
- Decide on a length for the white paper (1-5 pages are the norm)
- Describe the solution you are proposing
- Remember a summary that reviews the problem, solution and result of the outcome
- Proofread your document, and ensure someone else reads it before you submit/publish it.
- Follow the 3-30-3 rule (you have three seconds to captures your audience's attention from a glance at your piece, if you succeed at capturing their attention then you have 30 more seconds to ensure they continue reading, if you pass the 3-30 rules then your reader will give you three more minutes to make your point).

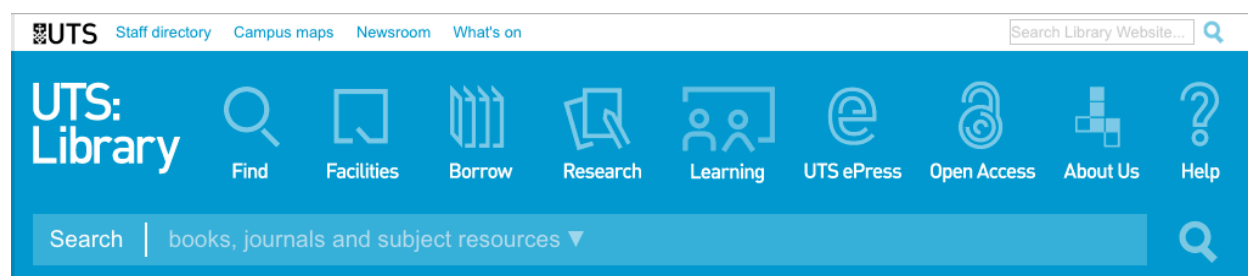
If you would like to enhance your academic writing skills, you might be interested in have a look at the Academic Phrase Bank: <http://www.phrasebank.manchester.ac.uk/>

3.3.3 Assessments

The majority of your information regarding a subject and the assessments is contained in your subject outline. This is your base document and you should follow it closely. In addition you will get an assignment brief for each assignment you have due. Its is recommended that you review these briefs and that you follow the detailed instructions set out for you.

3.4 Research & Library Access

Research is something you will do a lot throughout your studies. There are many contexts that will shape the way you research. For the purposes of finding academic peer reviewed sources, some tips below will likely come in very handy.



The Library (<http://www.lib.uts.edu.au>) has great resources, workshops and tools that will help you during your education if you choose to utilise them.



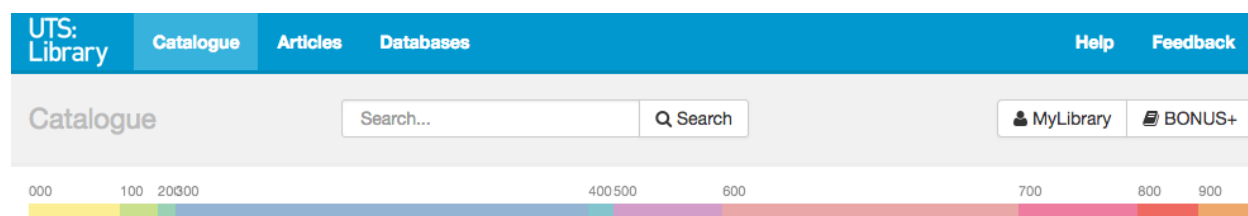
If you need some help understanding how to use the library, they have produced some short videos to help you get started: <http://www.lib.uts.edu.au/headsup>



The library website has an entire section dedicated to research: <http://www.lib.uts.edu.au/research>

There is also some self paced training modules you can do to help you get the most of what the library can offer for your research. <http://www.lib.uts.edu.au/headsup-researchers>

3.4.1 Searching the catalogue



One of the great things about the library catalogue is that it returns results far beyond the resources held by the library itself. UTS pay subscription fees to many 3rd party resources including journals, publishers and more. The best thing about this is that if you find something that has an online source available, you will likely be able to download a copy to your computer for later reading.

As an example, the link below will take you some search results for the term “Data science” and was then filtered to only show ‘online’ resources.

<http://find.lib.uts.edu.au/search?Ntx=matchallpartial&Ntk=All&N=4294967183&Ntt=data%20science>

If you click on the ‘Available’ link underneath each resource, it will then offer you the option of launching the electronic resource.

3.4.2 Databases & Articles



If you prefer to search specific sources, you can browse the databases section for 3rd party providers. This includes sources that UTS subscriptions that allow you access as a student.

Similarly if you wish to focus your search for specific journal articles rather than journals or books, the ‘Articles’ button is a great place to go.

3.4.3 Referencing

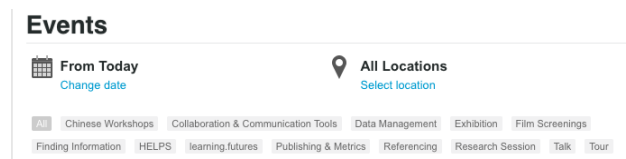


It is really important that you get used to referencing from the start. UTS uses the Harvard Referencing style. Fortunately there is an interactive referencing guide available through the library to make things easier:

<http://www.lib.uts.edu.au/help/referencing>

Make sure to browse through some of the other links at the above link. You might find some other useful tips (tools).

3.4.4 Library events & tours



The library team will help you wherever they can. It is recommended that you keep an eye out for all their events on <http://www.lib.uts.edu.au/events>

The following events, particularly for MDSI students, are coming up in the next month and below are links where you can register.

MDSI: Data Science Research and Referencing Tue, 14 March, 2017 **10:00 AM to 11:30 AM**
This workshop is a practical introduction to advanced research skills and reference management tools, with a focus on data science. Laptops are recommended but not essential. Participation is open to MDSI students. A concurrent workshop will run if more than 24 participants register for this session. <http://www.lib.uts.edu.au/event/609872/mdsi-data-science-research-and-referencing>

MDSI: Library Tour and Scavenger Hunt Tue, 14 March, 2017 **6:00 PM to 7:00 PM** An interactive tour (it's a scavenger hunt) of the UTS Library services and facilities for MDSI students. Meet in the Library foyer. <https://www.lib.uts.edu.au/event/609880/mdsi-library-tour-and-savenger-hunt>

3.5 Professional Experience

At times Industry will approach CIC for students who might be interested in internships. These are posted by the CIC:MDSI team in CICAround whenever these possibilities comes up.

You can find the postings on CICAround (<https://ca.uts.edu.au/blog/>)

3.6 Data Security

include a security/privacy sub section (must cover concepts of masking, encrypting etc data)

Data security is defined as measures that is used to protect digital privacy as to prevent unauthorised access to computers, databases, websites and other digital items. It also protects data from corruption.

Data security can include backups, data masking, encryption or even data erasure.

Data masking is defined as the process of changing certain part of data so that the structure remains the same but the information itself is changed to protect sensitive information. It ensures that sensitive information is unavailable beyond the permitted environment. It ensures that the original values are not re-engineered or identified. Eg is user training and software testing.

Data encryption ensures that data is unreadable to users who are not authorised to access the data and who do not have the 'key'.

One of the most common ways of securing data is using authentication like passwords, and other data that can verify an identity (like email and password login) prior to granting access to a system. These measures are taken to ensure hackers that use alternative system access methods to sabotage computer systems and networks.

Hacker actions can be illegal or legal depending on the purpose behind the actions. There are three categories of hackers :

- Black hat hackers break into computer systems illegally and cause harm by stealing or destroying data, i.e., a banking system to steal money for personal gain.
- White hat hackers use their skills to help enterprises create robust computer systems.
- Grey hat hackers perform illegal hacking activities to show off their skills, rather than to achieve personal gain.

10 General Data Security Tips:

1. Back up early and often
2. Use file-level and share-level security
3. Password protect documents
4. Use EFS encryption
5. Use disk encryption
6. Use a public key infrastructure
7. Hide data
8. Protect data in transit
9. Secure wireless transmission
10. Use management or access control

Types of Encryption:

- Triple DES : It uses three individual keys with 56 bits each that adds up to 168 bits. This is a dependable hardware encryption solution
- RSA : A public-key encryption algorithm and is standard for encrypting data over the internet. Is a asymmetric algorithm due to use of a pair of keys. There is a public key, to encrypt, and a private key, used to decrypt.
- Blowfish : the symmetric cipher splits messages into blocks of 64 bits and encrypts them individually. Its high speed and very effective. It's also free source software.
- Twofish : Symmetric algorithm with keys up to 256 bits, only one key is needed. The fastest of its kind and ideal for hardware and software. It's also free source software.
- AES : Most trusted algorithm by U.S. Government. Has an efficient 128-bit but also a 192 and 256 bit algorithms for heavy duty encryption purposes. Considered impervious to attacks except brute force.
- Honey Encryption : deters hackers by serving fake data for every incorrect guess. It slows down attackers but also provides a haystack of false hopes and makes it difficult for hackers to find the correct key.

<http://www.computerworld.com/article/2546352/data-center/top-10-ways-to-secure-your-stored-data.html>

<http://www8.hp.com/us/en/software-solutions/what-is/data-security.html>

<http://www.lexisnexis.com.au/en-au/products/privacy-confidentiality-and-data-security.page>

3.7 Hackathons

Hackathons are competitions (socially or sometimes for a prize) that challenge you with a goal or a problem. In a data science context this typically involves datasets and your wits against a clock. Hackathons are a fantastic way to learn from each other, to ideate, validate, develop your skills and sometimes even build a prototype. Hackathons are one of the most authentic learning experiences you can have as a data science student. You will practice all sorts of skills you need to become amazing:

- Team work
- How to frame a problem
- Data investigation
- Practicing and learning all kinds of technical skills
- Data storytelling
- Presentation & selling your ideas
- Networking

Hackathons are educational, engaging and empowering. You do not need to feel ready before you participate. The only thing you need to do is show up, have a positive ‘can do’ attitude and have fun.

They last anything from a few hours to a few days.

MDSI students have been leaving their mark at these events by taking home the prizes as well as the really big prize checks as can be seen on display in CIC.

The most popular one to get involved in is ‘Unearthed’: <http://unearthed.solutions/> Our very own ‘Data Cake’ took home the first prize in 2016, ‘Perry’s Fan Club’ took home shared second prize in 2016 as well as ‘Team Beaver’ taking home Young Innovator Award.

If you don’t want to wait for an event and want to sink your teeth into a hackathon right now, you can participate in online data science competitions. Here are a few links to get your started:

- Kaggle <https://www.kaggle.com/>
- DrivenData <https://www.drivendata.org>
- InnoCentive <https://www.innocentive.com/ar/challenge/browse>

A list of hackathons updated weekly : <http://disruptorshandbook.com/big-list-hackathons/> Another good source of hackathons : <http://www.hackathonsaustralia.com/>

3.8 Cloud Computing

Cloud computing is a phrase used to describe the act of doing things that you could do on your own computer but doing it on a remote computer instead. There several reasons why you might choose to do this. In the context of data science, this is usually to take advantage of ‘compute clusters’.

Compute clusters are exactly what it sounds like. A cluster of computer processors are used together to give you the advantage of their combined power which leads to faster data processing. This makes it possible to run analysis routines on large datasets (gigabytes, terabytes or even petabytes) that could take days or weeks to run on your laptop, in mere minutes or hours. There are a few more concepts to understand, but essentially the bottom line is that cloud computing makes things faster and big datasets more accessible from an analysis point of view.

There are several providers that operate in this space for data science purposes. Some of these include:

- Amazon Web Services (AWS) https://aws.amazon.com/big-data/?nc2=h_l3_bh
- Microsoft Azure <https://azure.microsoft.com/en-us/services/machine-learning/>
- Google Cloud Platform <https://cloud.google.com/>

Make sure you claim your \$100 student credit when you sign up to the Github student pack <https://education.github.com/pack>

3.9 The art of ‘self learning’

Self learning is the process of teaching ‘self’. With the boom in freely available technology it has become possible for each student to dictate their own learning experience and how much they want to expand. They can either learn the minimum of what is being taught in class, or they can put in extra time and work and participate in the exciting adventure of self learning.

This involves using various resources from YouTube, Journals, Additional Books and anything else you can get your hands on that adds to your skillset and your knowledge base.

In recent days self learning is considered an art with lecturers there as guidance or mentors on this journey where you can develop your skills to great depth in a short amount of time.

There are a few things to keep in mind during this journey :

- Reputable sources for learning a concept is required. If you plan to embark on the art of self learning you need to make sure that the sources you are learning from, know what they are talking about. What can be considered reputable sources?
 - Academic journals or white papers
 - Non- biased sources
 - Generally, personal blogs are avoided. However, in this constantly updating space we might need to learn from other expert in the field that explain these fast changing concepts.
- Read textbooks and books about the topic. A large collection of books are available to you as a student for free via the Library (you can sometimes even download a pdf version for your personal use).
- Watch the videos on YouTube on the topic, especially for the more tricky, hands on or mathematical based subjects.
- Learn from your surroundings. Never underestimate the value others can bring to your journey. This ranges from mentors to other students, some students are further in their journey and can help you along. There are also various meet-ups and networking events surrounding these topics.
- Hands-on experience is by far the best. Join a hackathon, or get an internship.
- Use guided learning experiences, like MOOC’s on Coursera or a range of other platforms.
- Plan your success. Write down your goals, learning outcomes and what you would like to master or be able to do and endeavour to move toward those goals (this will be really handy in iLab too).

3.10 Resources and learning

Online short courses:

- **Lynda.com** : you have free membership via the Library which gives you access to all the courses, <https://www.lib.uts.edu.au/goto?url=https://shib.lynda.com/Shibboleth.sso/InCommon?providerId=https://aaf-login.uts.edu.au/idp/shibboleth>
- **Coursera** : membership is free, <https://www.coursera.org/>
- **DataCamp** : you have free membership via MDSI which gives you access to all the courses, <https://www.datacamp.com/>, once you join ask to join MDSI group and the courses open up.

Online Books:

- **R for Data Science** by Garrett Golemund and Hadley Wickham - <http://r4ds.had.co.nz/>
- **Applied Predictive Modelling** by Max Kuhn - available via the library <https://link-springer-com.ezproxy.lib.uts.edu.au/book/10.1007%2F978-1-4614-6849-3> (requires login with your student ID and password)

- **Python Data Science** by Jake VanderPlas <https://github.com/jakevdp/PythonDataScienceHandbook>

Github repositories with great links:

- **Free programming books** <https://github.com/vhf/free-programming-books/blob/master/free-programming-books.md#python>
- **Python Data Science tutorials:** <https://github.com/ujjwalkarn/DataSciencePython>
- **R Data Science tutorials:** <https://github.com/ujjwalkarn/DataScienceR>
- **Machine learning & Deep learning tutorials:** <https://github.com/ujjwalkarn/Machine-Learning-Tutorials/blob/master/README.md>
- **Some more Github resources and corners of the web to explore:** <https://www.analyticsvidhya.com/blog/2016/09/most-active-data-scientists-free-books-notebooks-tutorials-on-github/>

Chapter 4

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