RIT

TITLE

by

Student Name

A Thesis Submitted in Partial Fulfilment of the Requirements for the Degree of Master of Science in Professional Studies: Data Analytics/Smart Cities/ Future Foresight and Planning (select one)

Department of Graduate Programs & Research
Rochester Institute of Technology

Graduation Date

RIT

Master of Science in Professional Studies:
Data Analytics/Smart Cities/ Future Foresight and Planning

Graduate Thesis Approval

Student Name: Name
Thesis Title: Title

Graduate Committee

Name: Dr. Sanjay Modak **Date:**
Chair of Committee

Name: Mentor name **Date:**
Member of Committee

Abstract

An abstract summarizes the following:

- The main themes, ideas or areas of theory being investigated.
- The background and context of the research.
- The questions which informed data collection.
- The main method(s) used to collect data and the sample.
- A summary of the answers to the research questions.
- The conclusions formed from these results.]itemRecommendations for future research and for practice.

Keywords:

Acknowledgements

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Chapter 1

Introduction

The introduction should clearly state the aim of the dissertation and provide a clear rationale for the choice of research topic. It should be clear why this topic is important to your programme subject area theory and/or practice. There should be a clear evidence-based account of important trends, definitions or pivotal ideas which underpin the choice of topic. The final section of the Introduction chapter should indicate the content of each of the following chapters and how the chapters are related to each other. You are providing the reader with a 'road map' of the work ahead. Such a 'map' will enable the reader to navigate their way through your work much more easily and appreciate to the maximum what you have done.

1.1 Background

1.2 Problem Statement

1.3 Research Aim and Objectives

1.4 Research Questions

1.5 Limitations of the study

1.6 Structure of the Thesis

1.7 Tutorial

This LaTeX template and the instructions it contains will enable you to prepare your manuscript in an electronic format (pdf). Authors are responsible for ensuring the accuracy of all infor-

mation contained in their manuscripts (e.g. proper names of organisations, data and findings, references, etc.).

LaTeX is a highly advanced type-setting system with a large number of various packages that can be loaded on demand to access certain type-setting functionalities. Overleaf is a web-service that enables you to write and type-set LaTeX documents even more easily, as (1) it does not require you to install anything on your computer, (2) it saves your document securely online; and (3) it even implements version control so that you could return to some prior version of your document if really necessary.

It is not the intention of this template to list everything possible with LaTeX. However, it will guide you for the most important type-setting issues you will definitely and/or most likely deal with. You will see that, for many of them, we in fact direct you to online resources. This is because these are already of excellent quality and are continuously maintained. It also shows that, when it comes to LaTeX, if you have a question, your best option to find the answer is to search online.

1.8 Resources

We provide some explanations in the following sections on how to create and populate a LaTeX document, but bear in mind that the following resources will soon come in handy.

LearnXinYminutes / LaTeX This gives a quick tour of LaTeX (5 to 10 minutes). It is not meant to be a comprehensive, authoritative resource, but rather an overview of how it works and how to think about it. At the end of the tour it lists very useful resources.

Overleaf's documentation This template is hosted in Overleaf, an incredibly useful service for LaTeX. The documentation is quite useful, and includes a 30-minute overview of LaTeX as well as general introduction to key ideas.

WikiBook / LaTeX An amazing online guide to LaTeX. It is well structured, comprehensive, and is easy to navigate.

Overleaf's templates It is very common to have a look around and find other people's documents doing things that you might want to replicate in your document in terms of LaTeX is used. For example, Overleaf includes a gallery that showcases things that might be helpful.

StackExchange / Tex Questions-Answers website for all things LaTeX. Very often you can just literally write what you are trying to do and it will retrieve useful answers. In fact search engines often return StackExchange pages.

CTAN is the Comprehensive TeX Archive Network. This is the main repository of all the packages that are available in LaTeX. Packages tend to have great documentation. For example:

hyperref This is the package we use for cross-referencing and hyperlinks in this template.

siunitx This package supports typesetting values with units.

1.9 File Structure

Documents prepared and compiled with LaTeX contain in fact a number of files. The general principle is to dissociate content from formatting (aka typesetting) information — following a similar idea to web technology where HTML files normally contain content information while CSS files contain formatting information. The main file types are:

- `.tex` files: these files contain the content of your thesis. Not all the content has to be in one single file. It is totally fine to split it in multiple `.tex` files, for example one per chapter. In this case, one `.tex` file acts as the main document and the other ones are called within it, using the function `\include{...}`. In this template, the main document is the file `RIT_Thesis.tex` and, while most of the content is within it, the front matter content is in the `frontmatter` folder which are contained `abstract.tex`, `acknowledgements.tex`,`signatory page.tex`and `title_page.tex`. Note that some typesetting information may be provided to `.tex` files, but this should be for adhoc typesetting needs not covered in the other files described below.

  Finally, do not rename the `RIT_Thesis.tex` file.

- `.sty` files: these files define what are called *packages* that define typesetting. First, as you can see at the top of the `RIT_thesis.tex` file, this thesis template uses the 'report' `documentclass`. That document class already comes with a number of pre-defined typesetting definitions. but, these can be altered or augmented with additional typesetting definitions by loading *packages*. Packages come in two forms; they are either:

  - Ad-hoc `.sty` files that are added to your latex project. For example, this thesis template includes the `.ply` package; or
  - Existing packages that can simply be loaded in `.tex` or `.ply`. Existing packages are loaded using the `\usepackage{...}` function and you can see at the beginning of the `RIT_Thesis.tex` file that this thesis template already loads a dozen packages. While we think these packages should already enable you to do most things you may wish to do in a thesis (e.g. add URLs or having figures with sub-figures), you may have additional needs.

- `.bib` files: these are what are called Bibtex files. Bibtext is a open standard file format which is used to describe lists of references. This template document contains the `mybib.bib` file that contains the references that you wish to cite in the thesis. The file is

called at the end of the `RIT_thesis.tex` file (because the list of references goes at the end of the thesis), with the command `\bibliography{thesisReferences}`.

- Graphics/Image files: these are the graphics and images you wish to add to your thesis as figures. LaTeX supports many grapchics and image file formats, including: `.png`, `.jpeg` (`.jpg`), `.pdf` and `.eps`. You are most certainly familiar with the first three, but likely not the last one. In fact, one should distinguish them in two groups:
  - *Raster formats* (`.png` and `.jpeg` (`.jpg`)): these file formats store the graphic information as an array of pixels. This means that their file size grows with the number of pixels. These formats are recommended for storing photos/pictures or other types of graphics when the second group of formats below cannot be used or is not available.
  - *Vector formats* (`.eps` and `.pdf`): these file formats store the graphic information in a vector format. For example, instead of storing a black line as a series of pixels, it will store it as a line object with a start and end point and a black colour. They also store text as actual text. These formats are ideal to store graphs, diagrams and similar graphic objects. Note that using these formats normally lead to smaller file sizes (the image itself AND your final thesis), and they respond much better to graphic sizing in the template (e.g. adjusting text font size in accordance with the scaling of the image in the document). Importantly, note that if you take a graphic in raster format and save it in a vector format, it will not magically change the pixels into smart graphic objects. Any content in raster format will simply be re-included as raster content in the file.

1.10 Text Structure

The thesis is composed of each chapters that are themselves composed of sections, subsections, etc. To create such a heading structure, you can use the commands `\chapter{}`, `\section{}`, `\subsection{}`, `\subsubsection{}`, and `\paragraph{}`. Note that, while `\section{}` should be inside a `\chapter{}`, a `\subsection{}` inside a `\section{}`, etc., a `\paragraph{}` is not numbered and can thus be added inside any of those.

If you wish to cross-reference a heading elsewhere in the text, you will need to do two things. First you must give that heading a *label* using the command `\label{}`, e.g. `\label{sec:TextStructure}`. This label should be put right after the heading declaration: either on the same line or the next one. Then, you can cross-reference the heading in the text using commands like `\cref{}`.

1.10.1 Front matter

The front matter of your thesis contains the title page and a number of sections, some mandatory, others optional. In order, these are:

Title page: This is generated automatically by LaTeX. To ensure it is complete, you must just enter your thesis title in the command `\title{}` and your full name in the command `\Student name{}`, both located at the file `title_page.tex`.

SignatoryPage: This is generated automatically by LaTeX. To ensure it is complete, you must just enter your full name in the command `\Student Name{}` (as already explained for the title page) and your supervisor's name in the command `\mentor name{}`, both located at the file `Signatory Page.tex`. The text content of the signatory page is defined in the corresponding environment located in the file `\frontmatter.tex`. However, you should not need to alter it.

Abstract: This is mandatory. Your abstract should be in the region of 300 words long with 5-6 Keywords, covering the following:

1. The scientific domain and the problem within the domain which is the subject matter of the thesis;
2. The research question to be answered in the thesis;
3. The means and methods (scientific tools) used to obtain the answer to the stated research question;
4. The answer to the research question; and
5. The meaning and importance of the answer and the results obtained,

The text content of the abstract must be entered in the corresponding environment located in the file `\frontmatter.tex`.

Table of Content: This is generated automatically by LaTeX.

List of Figures: This is generated automatically by LaTeX.

List of Tables: This is generated automatically by LaTeX.

Abbreviations (optional: This is required if you use abbreviations, in particular acronyms, in your thesis (which is very likely). All acronyms must be defined in the file `abbreviations.tex` which the text content of the abbrevations is defined in the corresponding environment located in the file `\frontmatter.tex`. if you need it then you must create in the RIT-Thesis.tex file the following line: `\input{frontmatter/abbreviations}`.

Nomenclature (optional: This is optional but welcome if you use many mathematical variables throughout your thesis. All terms/variables must be defined must be defined in the file `nomenclature.tex` which the text content of the nomenvalture is defined in the corresponding environment located in the file `\frontmatter.tex`. if you need it then you must create in the RIT-Thesis.tex file the following line: `\input{frontmatter/nomenclature}`.

1.10.2 Lists

1. Numbered lists should be presented using the environment `enumerate` like in this example. This environment applies the numbering and defines the format and spacing automatically.

2. Add the option `[noitemsep]` to the environment to have no additional space between numbered list items.

- Bulleted lists should be presented using the environment `itemize` like in this example. This environment applies the numbering and defines the format and spacing automatically.

-

Label 1 Finally, description lists can be created when a label is preferred for each entry, as opposed to a bullet of a number.

Note that the three lists above were generated using the environments and options described within them.

1.11 Figures

1.11.1 Simple Figure

The lines below show an example of LaTeX code to create an environment that displays the image `graph_a.pdf`, gives it a caption and centres everything. It also gives the figure a label so that it can be easily cross-referenced in the text. The figure produced by that code is shown as 1.1.

```
\begin{figure}[!ht]
  \centering
  \includegraphics[scale=0.7]{graph_a.pdf}
  \caption{An example graph in PDF format.}
  \label{fig:SimpleFigure}
\end{figure}
```

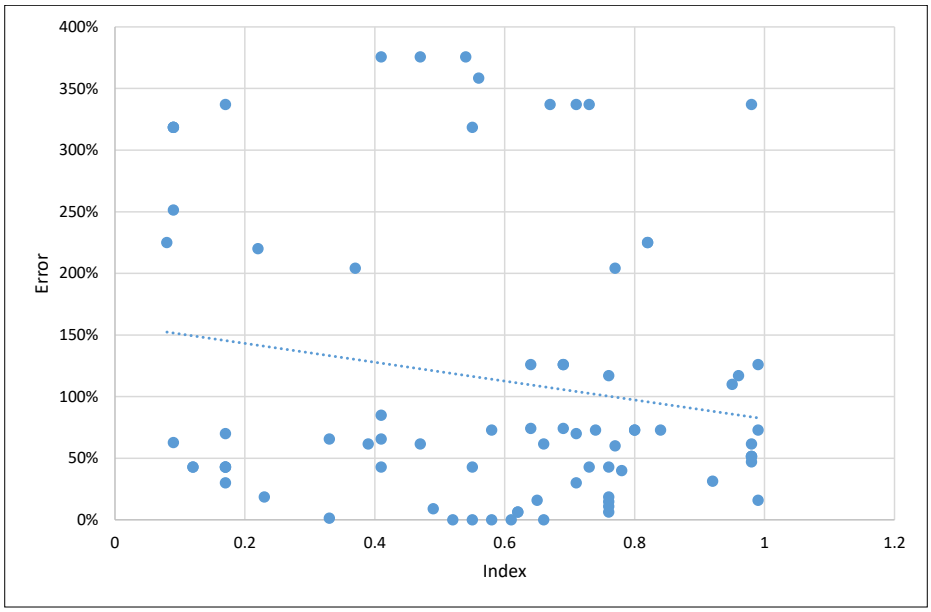


Figure 1.1: An example graph in PDF format.

Note that you normally have to give the full path of an image in the LaTeX project tree in order for it to be retrieved and loaded successfully. To keep things tidy, we created a folder *Fig* in the thesis project file structure and added the line `\graphicspath{{Figures/}}` at the beginning of the `RIT_Thesis.tex` file. This way, if you upload all your images in the folder *Figures*, then in the command `includegraphics{}` you only need to give the image filename, and not the full path to that image file.

1.11.2 Raster vs Vector format

1.2 shows what appears to be twice the same figure. However, the top one is rasterised (i.e. it is a grid of pixels) and is 83Kb in size, while the second is vectorised (i.e. canvas filled with shapes, including text) and is only 32Kb in size. The benefit of vectorised is not just the (generally) reduced size, but also that it does not pixelise when zooming on it.

WARNING: ".eps" and ".pdf" are common formats used in LaTeX for vectorised images. However, having this file type does **not** necessarily mean that the content is vectorised. For example, it is possible to save a ".png" picture of a graph into ".pdf". This does not magically transfer the picture into a vectorised image.

Useful software packages to create diagrams and vector images:

- Draw.io (opensource): create diagrams (save EPS, or PDF)
- MS Powerpoint: create diagrams (save PDF)
- Inkscape (opensource): to manipulate vector file (e.g. crop PDF image from MS Powerpoint to fit content).

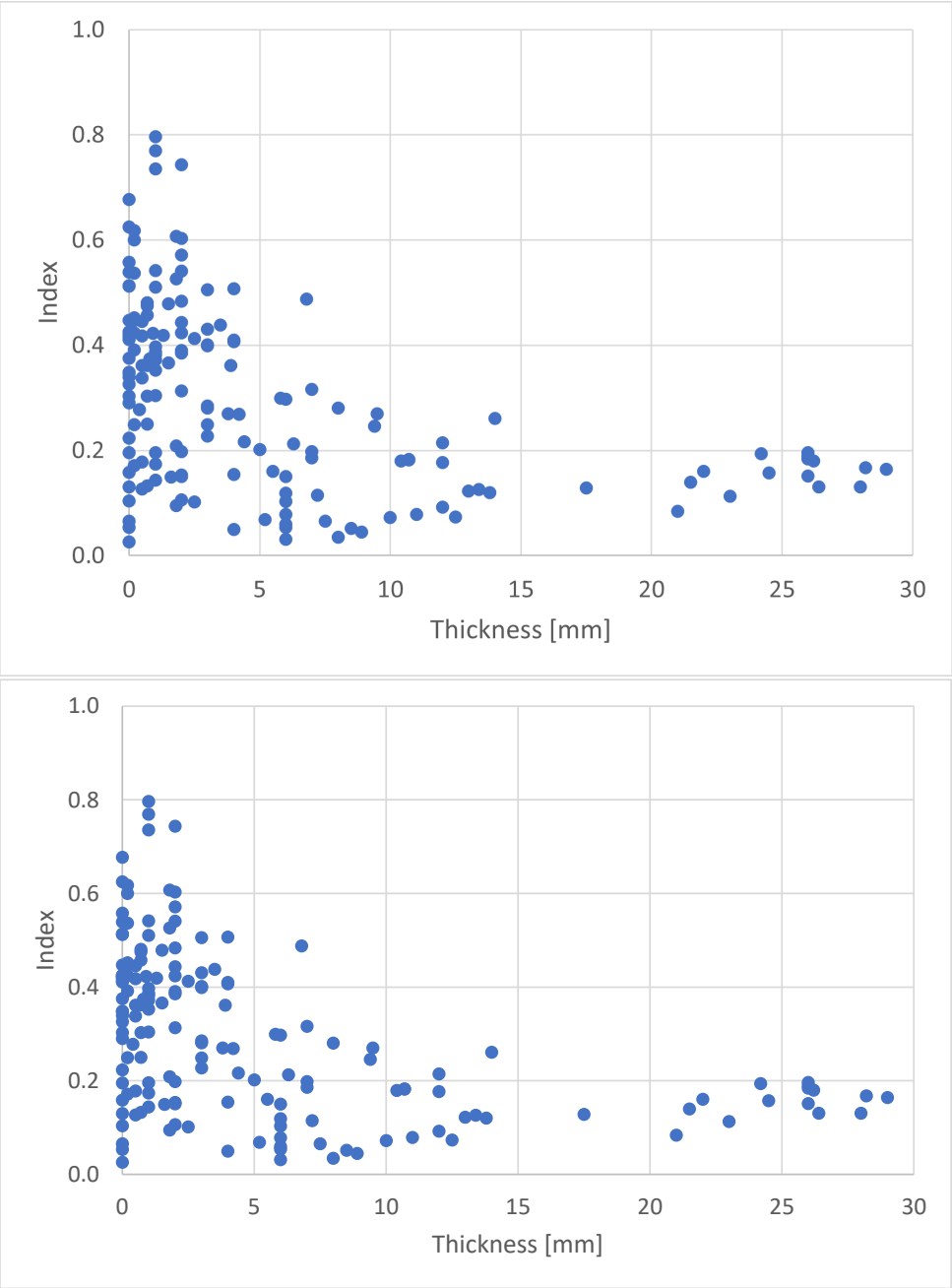


Figure 1.2: My caption text

1.11.3 LaTeX-generated figure

It is also possible to create diagrams in LaTeX using the package `tikz` (which is already loaded for you in this template). Here only the data is supplied and LaTeX code is used to create diagram/figure layout, and present the data content. The advantage of this approach is that font and font sizing is set in coherence with that of the rest of the document. However, it is quite tedious to create graphs/diagrams like that.

1.3 is an example of figure generated using the drawing package `tikz`.

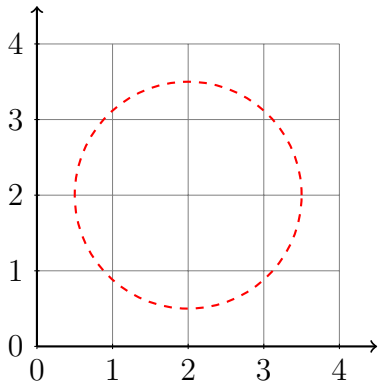
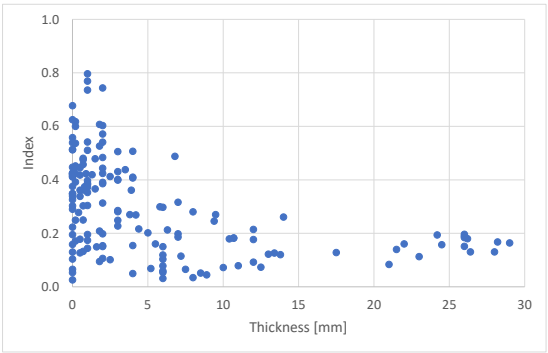


Figure 1.3: A diagram generated using the TikZ package.

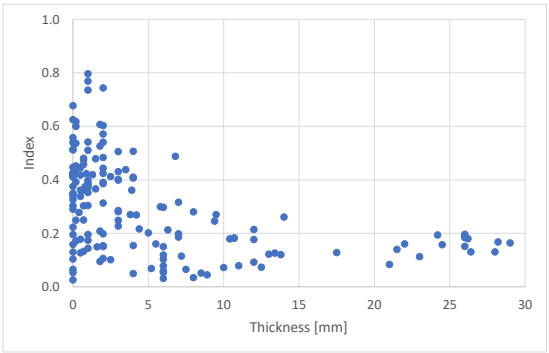
1.11.4 Sub-figures

It is possible to create figures with subfigures. This requires the use of the packages `caption` and `subcaption` (which are already loaded for you in this template).

Usage is shown in 1.4. You can see both subfigures have labels, which means you can cross-reference them individually in the text as 1.4a and 1.4b (see 1.15 for details on cross-referencing).



(a) Caption of subfigure 1



(b) Caption of subfigure 2

Figure 1.4: Caption of overall figure

1.11.5 And more...

Many other formatting/typesetting options exist. For example, you can put a figure in landscape mode using the environment `sidewayfigure` provided by the package `rotating`.

But, once again, if you have any specific need, we recommend you search for solutions at the locations suggested in 1.8 or by using your favourite search engine.

1.12 Tables

1.12.1 Simple Table

The lines below show an example of LaTeX code to create a environment that defines a table `graph_a.pdf`, gives it a caption and centres everything. It also gives the table a label so that it can be easily cross-referenced in the text. The table produced by that code is also shown as 1.1.

```
\begin{table}[!ht]
 \centering
 \begin{tabular}{||c c c c||}
 \hline
 Col1 & Col2 & Col2 & Col3 \\
 \hline\hline
 1 & 6 & 87837 & 787 \\
 2 & 7 & 78 & 5415 \\
 3 & 545 & 778 & 7507 \\
 4 & 545 & 18744 & 7560 \\
 5 & 88 & 788 & 6344 \\
 \hline
 \end{tabular}
\caption{Table to test captions and labels.}
 \label{tab:MyFirstTable}
\end{table}
```

Table 1.1: Table to test captions and labels.

Col1	Col2	Col2	Col3
1	6	87837	787
2	7	78	5415
3	545	778	7507
4	545	18744	7560
5	88	788	6344

In this code, the *table* environment (i.e. `\begin{table}...\end{table}`) creates a floating environment of the type 'table' that can be given a caption and a label. `\centering` centres the table inside that table floating environment. Then, the *tabular* environment is the environment that contains the description of the table. The tabular environment argument tells LaTeX the alignment to be used in each column and the vertical lines to insert. In the table above, `||c c c c||` defines a table with four columns in all of which the text is centred. It also instructs that double vertical lines should bound the table on the left and right. Inside

the *tabular* environment, `\hline` creates a horizontal line through the table (you can use the command `\cline{...}` to make a horizontal line that only spans a subset of the columns). Finally, each row of data is entered with the cell content delimited with the character `&` and the end of the row marked with the characters `\\`.

1.12.2 Merging Rows and Columns

If you wish to merge some cells together horizontally or vertically, use the `\multicolumn{...}`) or `\multirow{...}` commands, the latter requiring the `multirow` package (which already loaded for you in this template). Table 1.2 shows an example of table containing both merges columns and merged cells.

Table 1.2: Table with merged cells.

Col1	Col2	Col2	Col3
	7	87837	787
5	7	78	5415
	545	778	7507
4	545	18744	7560
5	88	788	6344

If you have to insert a very long table, which takes up two or more pages in your document, use the *longtable* package. If you wish to have your table in landscape mode, consider using the *sidewaystable* or *landscape* packages.

1.12.3 Column Widths

As mentioned, in the tables above, `||c c c c||` defines a table with four columns in all of which the text is centred (it also instructs that double vertical lines should bound the table on the left and right). However, as illustrated in 1.3, the width of each column expands in order to accommodate the largest width of the content of any of its cells; there is no text wrapping.

To address this, you can replace the first `c` with `p{0.2\textwidth}` which forces the first column to have a width of no more than 20% of the text width, which triggers some text wrapping in this case. This approach is illustrated with the first column of 1.4. However, note that the content of the cells in that column is not centred anymore. To retain text centering, `p{0.2\textwidth}` needs to be prepended by `>{\centering}`, which is illustrated for the second column of 1.4.

Table 1.3: Table with fixed column widths.

Col1	Col2	Col2	Col3
1	6	87837	787
Best table in the world	7	78	5415
3	545	778	7507
4	545	18744	7560
5	88	788	6344

Table 1.4: Table with fixed column widths.

Col1	Col2	Col2	Col3
1	6	87837	787
Best table in the world	7	78	5415
3	545	778	7507
4	545	18744	7560
5	88	788	6344

1.13 Mathematical Expressions

1.13.1 Inline vs Display Mode

Mathematical expressions, including formulas, can be entered in two different ways: *inline* mode or *display* mode. Inline mode means that the mathematical expression will appear within the text; display mode means that it will appear in a separate line (or set of lines).

You can use two types of delimiters to typeset mathematical expressions in inline mode, `\(...\)` or `$...$`, or the *math* environment `\begin{math}...\end{math}`. Two example of inline mathematical expressions are $d = \sqrt{x^2 + y^2}$ and $M = A + B$.

You can use the delimiters `\[...\]` or the *displaymath equation* or *align* environments `\begin{equation} ...\end{equation}` to typeset mathematical expressions in display mode.

An example of mathematical expression in display mode is:

$$d = \sqrt{x^2 + y^2}$$

An example of mathematical expression in display mode is:

$$d = \sqrt{x^2 + y^2}$$

An example of mathematical expression in display mode is:

$$d = \sqrt{x^2 + y^2} \tag{1.1}$$

1.13.2 Mathematical Symbols and Greek letters

You can use an extremely broad range of Greek letters and mathematical symbols, such as:

- Binary operators: $\times \otimes \oplus \cup \cap$
- Relation operators: $<>\subset\supset\subseteq\supseteq$
- Greek letters: $\alpha\beta\gamma\rho\sigma\delta\epsilon$, and $AB\Gamma\Sigma\Delta E$
- Other: $\int \oint \sum \prod$

A first list of mathematical symbols can be found at `https://www.overleaf.com/learn/latex/List_of_Greek_letters_and_math_symbols` with an even more detailed list of symbols available at `https://oeis.org/wiki/List_of_LaTeX_mathematical_symbols`

1.13.3 Equation

LaTeX is extremely powerful in general, but in particular when it comes to typesetting mathematical expressions, such as equations. The equation below is just one example. As you can see,

$$\begin{aligned} S(\omega) &= \frac{\alpha g^2}{\omega^5} e^{[-0.74\left\{\frac{\omega U_\omega 19.5}{g}\right\}^{-4}]} \\ &= \frac{\alpha g^2}{\omega^5} \exp\left[-0.74\left\{\frac{\omega U_\omega 19.5}{g}\right\}^{-4}\right] \end{aligned} \tag{1.2}$$

1.14 Properly Typesetting Units

In any scientific and engineering piece of work units play a major part. Without them our numerical information is practically useless. We need to be able to properly typeset them as in publishing they often do follow specific rules that sadly most of the time simple word processing packages ignore. Units for example are not set in italics or in random fonts that we seem to be using.

There are many LaTeX packages you can use and explore to help you typeset units properly but in this template we use the `siunitx` package.

For example, `\unit{kg.m.s^{-1}}` produces $\mathrm{kg\,m\,s^{-1}}$. `\unit{\kilogram\metre\per\second}` produces the same output $\mathrm{kg\,m\,s^{-1}}$.

If you want to nicely refer to an angle you can just type `\ang{10}` to get 10° or `\ang{3;23;5}` for $3^\circ 23' 5''$ or type `\qty{3}{mm}` for $3\,\mathrm{mm}$ or more explicitly `\qty{3}{\milli\metre}` for the same effect as $3\,\mathrm{mm}$. `\qtylist{5;10;15}{\metre}` will produce nicely $5\,\mathrm{m}$, $10\,\mathrm{m}$ and $15\,\mathrm{m}$. `\qtyproduct{5 x 10 x 15}{\metre}` produces $5\,\mathrm{m} \times 10\,\mathrm{m} \times 15\,\mathrm{m}$.

The options are very comprehensive, and no matter how complex or simple your units are they will be typeset properly and beautifully. Detailed instructions on how to use the various commands that the `siunitx` package makes available for typesetting units properly are given in `https://mirror-hk.koddos.net/CTAN/macros/latex/contrib/siunitx/siunitx.pdf`

1.15 Cross-referencing

Your work will have internal references to various objects like equations, figures, chapters, sections, etc. Let's have a look at some examples.

Using the readily available command `\ref{}`, you can automatically reference such objects. For example:

- `Section~\ref{sec:Figures}` typesets 'Section 1.11'
- `Figure~\ref{fig:SimpleFigure}` typesets 'Figure 1.1'
- `Table~\ref{tab:MyFirstTable}` typesets 'Table 1.1'
- `Equation \ref{eq:sedov}` typesets 'Equation 1.2'

However, `\ref{}` requires you to actually type the type of object referenced, i.e. `Section` in `Section~\ref{sec:Figures}` in order to obtain 'Section 1.11'. A smart and easier way to cross-reference is to use the `cleveref` package (already loaded for you in this template). The `cleveref` package provides the commands `\cref{}`, `\Cref{}`, `\crefrange{}`, and many more. For example:

- `\ref{sec:Figures}` typesets '1.11' and `\ref{tab:MyFirstTable}` typesets '1.1'
- `\ref{sec:Figures}` typesets '1.11'
- `\ref{sec:Figures,sec:Math}` typesets '**??**'
- `\refrange{sec:Figures}{sec:Math}` typesets 'sec:Figuressec:Math'

These commands automatically identify the type of each referenced object and ensure that those types are typeset consistently throughout the document.

Although LaTeX does not require it, it is good practice to try and name labels by giving an indication of what they represent, such as `\label{sec:...}` for labels of sections and sub-sections. This way, they can be retrieved easily and not be confused.

1.16 Bibliography and Citations

Citations of works that support your arguments and are used to reference and acknowledge the original source of information that you use, discuss or develop, is very easy.

LaTeX uses a specific methodology to describe and process lists of references: Bibtex manifest itself in your LaTeX project in the form of a file with extension `.bib` and requires loading the package `natbib` to be able to process `.bib` files and typeset the information they contain. In the current project, the file is called `mybib.bib`. The file has a simple text format and essentially contains a database of entries. The most common entry is for an `@article` but there are many more as can be seen in the example file `mybib.bib`. What is important is that every entry you create has its own unique label that is then used to *cite* the entry appropriately in your LaTeX text and create the list of references that is created automatically and included at the end of our thesis.

Citations in the text are made using the commands `\citet` and `\citep` and possibly `\citeauthor` or other forms of citation commands useful for more specific cases. For example, "**?** provided a comprehensive survey in their review paper" is obtained using the command `\citet{Zhuang2021ALearning}`. This command creates an entry that has the authors names as part of the sentence (here used as subjects). In contrast, "a comprehensive survey is provided in (**?**)" is obtained using the command `\citep{Zhuang2021ALearning}`. This commands just creates an entry that is just citation to the reference. Also note that an entry in the list of references, located at the end of the thesis.

You must let LaTeX know where the bib file is that contains the details of the references that you cite in you `tex` file. This is done by adding the command `\bibliography{file.bib}` in your main `.tex` file. In this thesis template, `\bibliography{mybib.bib}` is added at the end of the `RIT_Thesis.tex` file.

LaTeX, in combination with its bibliography packages, can create any style of referencing that you might need and more information can be found at `https://www.overleaf.com/learn/latex/Bibliography_management_with_natbib` or using different packages `https://www.overleaf.com/learn/latex/Bibliography_management_with_bibtex` or alternatively `https://www.overleaf.com/learn/latex/Bibliography_management_with_biblatex`. However, for this thesis template, we have already selected the APA style (and suggest you keep it) that is defined in the `RIT_Thesis.tex` file with the command `\bibliographystyle{apalike}`.

Note: An emerging alternative to the use of *Bibtex* (used with the `natbib` package) is emerging. It is called *Biber* (used with the `biblatex` package). We do not explain here how to work with Biber, but it is in fact very similar to working with Bibtex. For now, we however recommend to stick to Bibtex.

Chapter 2

Literature Review

Alexander (2012) The literature review shows your skill in locating and critically evaluating the sufficiency of secondary data in the form of published academic articles and practitioner surveys.

Your critical evaluation should reveal the research gaps which motivated you to plan primary research on the topic.

At the conclusion of the literature review you should clearly state your research aim, objectives, questions and/or model for testing with indication of hypotheses. The key takeaways from your LR should be bulleted at the end of the section (4-5 max).

The content of a literature review may be derived from textbooks, journal articles, conference papers, reports, case studies, the Internet, magazine features or newspaper articles.

For theses the most essential source of academic literature is journal articles and you should familiarize yourself with the most recent publications in journals relevant to your topic. The evaluation should serve as the basis for your research's purpose, objectives and questions/hypotheses.

To complete a literature review, you must select relevant search terms, use them in appropriate databases, study a variety of sources, summarize the contents, assess the efficiency of the knowledge, and synthesize your evaluation in order to highlight the research gap.

It is expected that every article that is referenced in the Bibliography is read and reported on in the literature review.

The literature review should justify the research objectives and questions with clarity. It should not be a descriptive list of authors, frameworks and concepts but rather an attempt to evaluate these authors' work critically.

A good literature review will allow you to use the literature in the methodology and analysis chapters of your dissertation to argue for the validity of your choices(s) of research approach, the appropriateness of the process by which you analyze your results, and again in the discussion when you determine whether or not your findings are consistent with the accepted research which has come before.

2.1 Background

2.1.1 bbnb

Chapter 3

Research Methodology

The research methodology begins by restating the research objectives and describing the project's specific research questions. Your methodology is evaluated based on whether it is a valid strategy for answering these questions.

Students should identify the philosophy and approach chosen, the rationale behind that decision, and the advantages and disadvantages of that choice. The justification should be based on the study subject and context, and not on time and cost considerations. Depending on the field of study, the chapter should include information about;

- the limitations of secondary research (the gaps identified in the literature review),
- the research philosophy
- the research strategy (qualitative or quantitative methods)
- detailed discussion of data collection instrument (interview topic guide, survey etc.)
- data inputting
- data analysis plan
- the sampling criteria
- the response rate

The conclusion of this chapter should include a summary of the most important points discussed. The conclusion should also inform the reader how the contents of this chapter relate to the conclusions presented in the following chapter.

Chapter 4

Findings and Data Analysis

The chapter should contain the primary data you have collected. This may be qualitative or quantitative data. You should define the type of the sample or dataset as well as the distinguishing qualities of the individuals that make them relevant to your study. Any measures you take to establish the validity and reliability of your data should be specified. Problems encountered during the implementation of the research study should be discussed and clarified.

After defining the sample or dataset, you should analyze your data to demonstrate how it connects to your research questions/ hypotheses. You should demonstrate your ability to reduce a large amount of data to easily interpretable information. This data must be organised in a logical and coherent manner so that the reader may comprehend your thought processes and interpretation.

Chapter 5

Discussion

In the chapter introduction restate the research aim, objectives and questions. In this chapter you should relate your findings to each question and emphasize the most pertinent and significant results.

The next step is to evaluate the findings in light of the broader study literature. This involves determining where your findings are consistent with theory and where they are inconsistent with theory. This entails drawing connections between your research findings and other published works; you may need to refer back to your literature review.

This is the thesis's core and must be more than descriptive. This chapter cultivates analytic and critical thinking on outcomes and analysis by referencing theoretical arguments derived from the literature review.

Chapter 6

Conclusion

This is the conclusion to the dissertation as a whole. In this chapter you summarize what was learned throughout the entire process, highlighting the specific contributions your work made to knowledge and practice.

This chapter will discuss the research gaps, data collection techniques, and findings. Your summary will synthesize the dissertation by demonstrating how the initial research strategy has been addressed so that conclusions can be drawn from the dissertation evidence. No other information or references should be added here.

You should highlight the limitations of your research and give suggestions for how future research could address these limitations, keeping in mind the research philosophy you have chosen. Remember that limitations aren't always problems! Rather, they set the parameters for understanding the value of your work. You should also consider how future research could be conducted in this topic area; this will demonstrate your comprehension of how your research adds value in the overall body of knowledge.

6.1 Conclusions

6.2 Recommendations

6.3 Future Work

References

All references used in writing the dissertation (whether direct quotations or paraphrasing) should be included in a reference list, compiled in alphabetical order by the author and numbered. The Harvard system for listing references should be used.

Where there is any formal mention that you make in your master's dissertation to something written by someone else you have to use in-text referencing. Every citation must be supported

by a reference at the end of the report which supplies the details which will enable the reader to follow up that citation.

Bibliography

Alexander, M. (2012). *The New Jim Crow: Mass Incarceration in the Age of Colorblindness*. The New Press.

Appendix A

Appendix: Code/Questionnaire/Interview Guides

Appendices may be used to provide relevant supporting evidence for reference. Students may wish to include in appendices, evidence which confirms the originality of their work or illustrates points of principle set out in the main text e.g. questionnaires, and interview guides or programming coding. Only subsidiary material should be included in appendices.