

# Gradient Descent by Grad Student

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Bachelor of Science  
Doctor of Philosophy

(Replace degree as needed above and remove alternatives)



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# Declaration

This work has not been previously accepted in substance for any degree and is not being con- currently submitted in candidature for any degree.

Signed ..... (candidate)

Date .....

# Statement 1

This thesis is the result of my own investigations, except where otherwise stated. Other sources are acknowledged by footnotes giving explicit references. A bibliography is appended.

Signed ..... (candidate)

Date .....

# Statement 2

I hereby give my consent for my thesis, if accepted, to be made available for photocopying and inter-library loan, and for the title and summary to be made available to outside organisations.

Signed ..... (candidate)

Date .....



*I would like to dedicate this work to the Hypnotoad.*

*All glory to the Hypnotoad.*



# Abstract

In your abstract you should aim to summarize the core contributions of your work in the context of the problem domain. Start by outlining the domain and the problems posed within it. Discuss how the methods you focus on approach the relevant problems. You should end your abstract by concretely stating the tangible outputs and deliverables you have created in order to complete your work on this document, and whether those outputs represent an improvement or alternative approach to existing methods.

Your abstract should be a couple or so paragraphs long, and roughly approximate the order and flow you then use for structuring the main document. If a viewer has read your abstract then they should already understand at a high level what it is you have created and delivered, and whether it is better than or comparable to existing methods. If your project is driven by a research hypothesis then the reader should know what that is at a high level from this section. Reading on, little should surprise the viewer.

For paper submission of your thesis you should physically sign your name on each of the above declaration statements and date them in black ink. For digital submissions you should sign and date them digitally using a touch or stylus input if available. There are pieces of software that allow you to write directly on PDF documents, or alternatively you can bring a signature into your document as a figure with a transparent or white background. If you do not have a stylus input / tablet like device you should ask your supervisor, as many in the department do their grading / work on digital tablets.





# Acknowledgements

This is an opportunity to acknowledge and thank those who have supported you throughout your studies. Friends and colleagues who you have studied alongside, your families, and your mentors within the department are the usual suspects.



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# Chapter 1

## Introduction

This document is intended both as a thesis template and a written tutorial on typesetting a professional looking academic document. The style of the template is designed to mimic an equivalent LaTeX document template that is commonly used for within the Computer Vision and Visual Analytics group here at Swansea. This LaTeX template is itself based on a LaTeX template named Custard.

### 1.1 Motivations

Large documents can become cumbersome to work with and format consistently. Sensibly chosen aesthetic cues are important to help imply structure and can greatly aid the reader in understanding your work. The accompanying LaTeX template uses abstraction to hide the formatting from the author during content preparation, allowing for consistent styling to be applied automatically during document compilation. In this Google Docs theme it is the responsibility of the author to manually adhere to the styling laid out in this template.

#### 1.1.1 Objective

In this document we present a tutorial on thesis creation and typesetting, and discuss topics such as literature surveying and proper citation.

### 1.2 Overview

The remainder of chapter 1 outlines the document structure and the key contributions of this work is organized as follows. Chapter 2 reviews techniques for finding and properly citing external resources from the academic literature and online. In chapter 3 we show examples of how to typeset different types of content, such as internal references, figures, code listings, and tables. And lastly in chapter 4 we summarize the main contributions and key points to take away from this template.

## 1.3 Contributions

The main contributions of this work can be seen as follows:

- **A LaTeX ‘like thesis template**

Modify this document by adding additional TeX files for your top level content chapters.

- **A typesetting guide of useful primitive elements**

Use the building blocks within this template to typeset each part of your document. Aim to use simple and reusable elements to keep your document neat and consistently styled throughout.

- **A review of how to find and cite external resources**

We review techniques and resources for finding and properly citing resources from the prior academic literature and from online resources.



## Chapter 2

# Finding and citing resources

The university has subscriptions to a vast number of major academic journals spanning a wide range of subject areas. By accessing the internet from a university network connection (Eduroam or Ethernet), the paywalls of many journals will simply vanish without any need for login credentials.

### 2.1 Tunnel your internet connection via the university internet

When you are working from outside of the university then connecting to an on campus machine via remote desktop (RemoteDesktopProtocol, TeamViewer, ect) or via port forwarding (ssh, ssh tunnel, ect) can allow you to access papers that would otherwise be behind a paywall.

If you do not have individual access to a machine that is exposed for ssh on the university network you can always use the computers in Linux Lab CF204<sup>1</sup> for the purpose of setting up an ssh port tunnel to proxy your internet through. These machines have fixed IPv4 addresses and respond to ssh using your student account credentials. While in use your internet will be routed<sup>2</sup> to the university and then out to the internet, granting you transparent access to journals without a paywall.

### 2.2 Practice your Google Fu

The internet is big [3]. Knowing how to phrase a question to a search engine is therefore an invaluable skill. If the request is simple enough, even a poorly structured query will likely return usable results. For resources that are more difficult to find you can leverage the syntax of the search engine to gather relevant papers and resources for your research more efficiently.

`https://www.gwern.net/Search`

---

<sup>1</sup> One caveat of using computer lab machines for remote tunnelling is that an environmentally conscious student who has worked late in the computer lab might choose to switch off the machine you were using...

<sup>2</sup> Painfully slowly.



“Internet Search Tips” [4] provides an excellent review of methods and tips for scouring the internet for hard to find resources. You will also be less likely to get caught behind journal paywalls when working remotely without a tunnel as your queries can be made to look for raw pdfs that are often released by the authors directly.

## **2.3 Properly using and formatting citations within the text**

Usually you would not put the URL of the resource you are citing directly in the text like is done previously in section 2.2. The citation for the resource [4] is sufficient to reference it within the text given that full details of its location are then kept neatly within the bibliography at the end of the document.

In normal usage the purpose of a citation is not to direct the reader away from your thesis, but to justify and back up assertions you are making about the state of the domain. If a reader questions your assertions then they can follow the rabbit hole of papers which will likely also make and justify assertions with even earlier papers from the literature.

In the above case the intention is for the reader of this template to actually go to that resource and read what it has to say directly. The link is therefore shown clearly within the main text to indicate that the reader should visit it. This as opposed to wanting the reader to purely acknowledge that the facts which are within the resource legitimize the points made in this document, in which case a simple inline citation is the best way to back up your assertions.

## **2.4 Formatting the bibliography**

The bibliography is a longform enumerated list of external works that you cite throughout the document. In the main text we refer to the bibliography using inline citations like [6] and at the end of the document we use the IEEEtrans citation format:

- [6] J. T. Kajiya, “The rendering equation,” in Proceedings of the Conference on Computer Graphics and Interactive Techniques, ser. SIGGRAPH: ACM, 1986, pp. 143–150.

The example bibliography in this document contains a couple of extra (unused) citations for the purpose of showing how to format citations for different types of media. In practice you should only include citations in your bibliography for resources that were directly referenced using inline citations within the main text.

## Chapter 3

# Typesetting your thesis

This document is intended as both a thesis template and as a tutorial on structuring and typesetting your thesis. This Google Docs file is themed to mimic the style of the associated LaTeX document which is itself based on a template called Custard. While it is proof that a professional looking document can be created in Google Docs (a'la MS Word) it is highly recommended that you use our LaTeX template to typeset your thesis.

The following are some powerful online resources for learning about LaTeX:

- **Overleaf Documentation for LaTeX**

Overleaf [7] is an online browser-based LaTeX IDE which stores your document in the cloud and provides live recompilation as you type. The documentation on Overleaf's website has a good knowledge base of examples for how to typeset things cleanly and simply in LaTeX code.

Link: <https://tex.stackexchange.com>

- **TeX StackExchange, the StackOverflow site dedicated to TeX questions**

TeX StackExchange [8] is sub-community of the StackOverflow network dedicated to questions about the TeX family of typesetting tools including LaTeX, BibTeX and others. A vast majority of the time it is unlikely that the question or issue you are facing is one that has not been encountered before, and this site more than likely to be able to point you in the correct direction.

Link: <https://tex.stackexchange.com>

## 3.1 Section Heading

Top level section headings are typeset using the **Heading 2** Google Docs style. Main text is typeset using the **Normal Text** style.

Chapter headings are typeset using the **Heading 1** style, and additionally are split across two lines by using shift+enter to ensure the full chapter title appears in the Table of Contents as a single entry.

### 3.1.1 Subsection Heading

Subsections are typeset using the **Heading 3** Google Docs Style.

#### 3.1.1.1 Sub-subsection Heading

Sub-subsections are typeset using the **Heading 4** Google Docs Style.

### Paragraph Heading

Most paragraphs go unlabelled and have their context implied by the section they are an immediate child of. However, sometimes we would like to imply deeper structure to the document than just the numbered section, subsection, sub-subsections shown above. At such depths it is less meaningful to label the region with a numerical identifier as the section codes are quite long by that point. If you do feel it is useful to give a title of a deeply nested paragraph level element of your document then the **Heading 5** style can be used. It is formatted the same as **Heading 4** for sub-subsections without a numerical identifier and will appear nested correctly within a sub-section element in the automatically extracted document outline.

## 3.2 Figures

In this template figures are numbered starting with the current chapter number followed by a figure number that resets to 1 each new chapter. As you can see below, the first figure is labelled Figure 3.1 because we are in Chapter 3.

[The content.]
Figure 3.1: The caption.

Figures in this template are structured as tables to facilitate the pairing of captions. The caption block shown above with its borders displayed can be used anytime you need to pair a reference point and description to a piece of media.

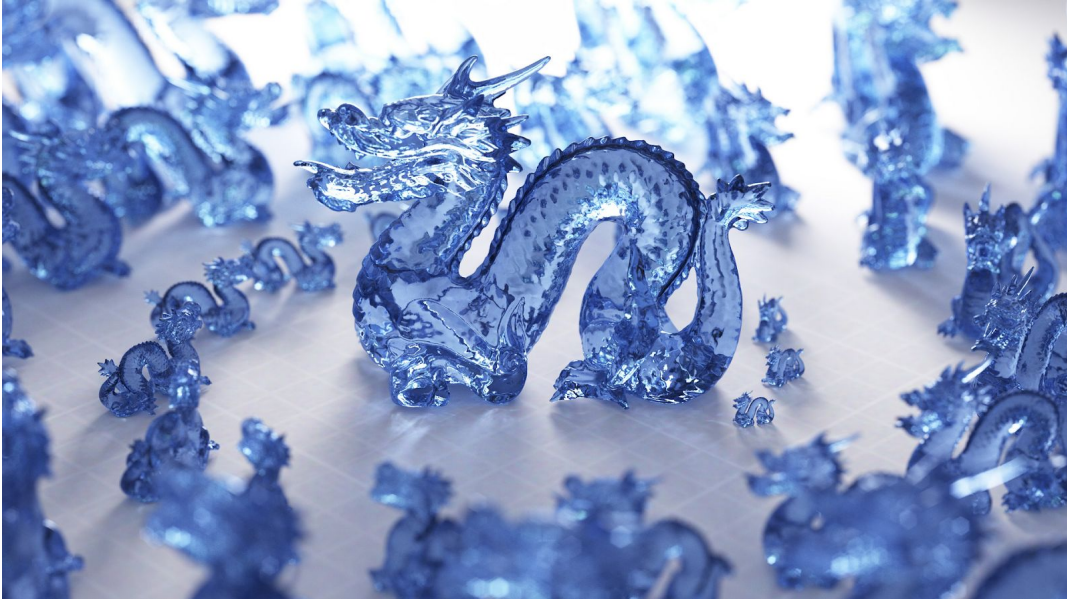


Figure 3.1: A good caption should be sufficient enough to put the figure in context even if the reader has randomly flicked to the current page and looked only at the figure in isolation. All figures should also be referred to directly within the main text of your document. Figures from external sources should be cited in the caption and in the bibliography Image of glass dragons rendered using Path Tracing [10].

For aesthetic reasons we hide the borders when displaying images, and give the caption a slightly smaller font size than the normal text font. This same basic block can be nested to create figures of subfigures.

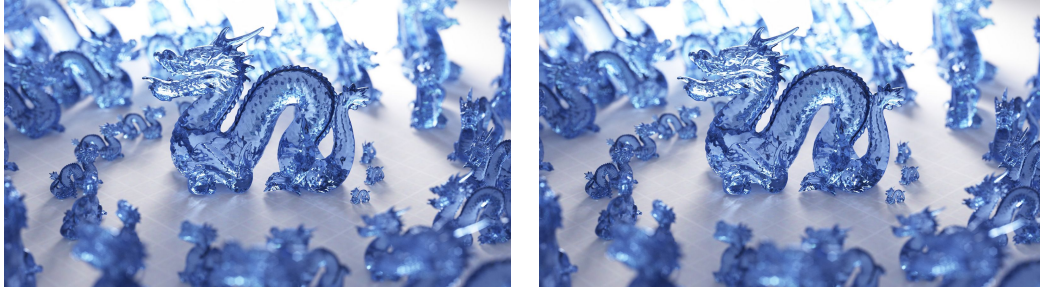
The following are best practices when formatting embedded media such as figures, tables, code-listings into your document:

- **Consistent presentation throughout the document**

Figures work best in a document when you use a consistent style for formatting and captioning them and make sure that figures always actively support the content of the main text.

- **Justified use of space in the document**

All figures must be referred to directly in the main text of the document and discussed with meaningful and critical analysis. If you don't need to use the



A. Left image sub-caption.

B. Right image sub-caption

Figure 3.2: A demonstration of a 2x1 subfigure layout. Image of glass dragons rendered using Path Tracing [10].

figure to support your discussion then it is only taking up space in the document.

- **Placement that supports and enhances the flow of the document**

Figures should be displayed in relevant locations, ideally just after they have been referred to in the main text. Large figures can often fit best at the top or bottom of a page, rather than forcing a small amount of text to flow above and below them.

- **Avoid directly importing other peoples images**

You should avoid using other peoples figures whenever possible, and instead create your own figures for visualizing the specific methods and data you are working with in a way relevant to your project.

- **Format sub-figures in document, not in the image itself**

Construct sub-figures from multiple image files in Google Docs using an embedded table within the caption block, not by modifying the image file itself. This allows you to tweak the positioning and layout without having to modify the images. Figures 3.2 shows an example of a side-by-side layout.

- **Robust captions can stand in isolation**

Figures need to be captioned such that they can be viewed in relative isolation and still be meaningful to the reader. There will likely be some duplication of information that is written in the main text, but this is intended.

- **Proper attribution and citation of images**

If an image does not belong to you it **must** be cited directly in the figure caption. It is not correct to put a URL in the figure caption directly. A URL in isolation is not an accurate or reliable way of directing a future reader to the exact content you are referencing. Instead make a new entry in your bibliography and then reference that citation in the caption. Figures 3.1 and 3.2 each include a statement in the caption stating “Image of glass dragons rendered using Path Tracing [10].”. Try to find the proper information about the original author and source document to strengthen the citation in case the URL changes.

### 3.3 Code Listings

Code listings should be formatted in the same style as figures. It is important to use a monospace font so that characters line up vertically. Syntax highlighting is also extremely important for effectively displaying complicated code segments.

```
#include <stdio.h>

int main(int argc, char *argv[]) {
    printf("Hello world.\n");
    return 0;
}
```

Listing 3.1: An example code listing formatted using Slides Code Highlighter [11].

<https://romannurik.github.io/SlidesCodeHighlighter>

Slides Code Highlighter [11] is a simple web-app for applying syntax highlighting to code in a format that is safe for use in Google Docs and Google Slides. It supports a wide range of programming languages and can be pasted directly into a caption block within your document. Listing 3.1 shows an example code listing, we display a border around the code to help isolate it from the main text.

## 3.4 Tables

Tables are also quite predictably captioned and formatted the same way. It is important to decide on a style for how you will organize your data and apply that style consistently for all of your tables. Table 3.1 shows one possible way of styling your data but is by no means the only way of doing so neatly. Consistency is the key.

<b>Some</b>	<b>Relevant</b>	<b>Fields</b>	<b>From</b>	<b>Your</b>	<b>Data</b>
0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2

Table 3.1: An example of a table formatted with caption.

## 3.4 Document wide formatting

As you write your document you want to ensure that the formatting and structure flows consistently and coherently throughout. It is important that all new chapters start on an odd numbered page. If the previous chapter has ended and a new chapter begins on an even page, you can add a page break (ctrl+enter) to insert a blank page into the document before the start of the next chapter.





## Chapter 4

# Conclusions and Future Work

In this document we have demonstrated the use of a Google Docs thesis template which can produce a professional looking academic document.

### 4.1 Contributions

The main contributions of this work can be summarized as follows:

- **A LaTeX ‘like thesis template**

Modify this document by adding additional top level content chapters. These descriptions should take a more retrospective tone as you include summary of performance or viability.

- **A typesetting guide of useful primitive elements**

Use the building blocks within this template to typeset each part of your document. Aim to use simple and reusable elements to keep your document neat and consistently styled throughout.

- **A review of how to find and cite external resources**

We review techniques and resources for finding and properly citing resources from the prior academic literature and from online resources.

### 4.2 Future Work

Future editions of this template may include additional references to Futurama.



# Bibliography

- [1] Cornell University. (1991) arxiv. [Online]. Available: <https://arxiv.org>
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- [10] J. Whittle. (2015) Path traced glass dragons.
- [11] R. Nurik. (2017) Slides code highlighter. [Online]. Available: <https://romannurik.github.io/SlidesCodeHighlighter>



# Appendix A

## Implementation of a Relevant Algorithm

```
#include <stdio.h>

int main(int argc, char *argv[]) {
    printf("Hello world.\n");
    return 0;
}
```

Listing A.1: An implementation of an important algorithm from our work.



## **Appendix B**

### **Supplementary Data**

The results of large ablative studies can often take up a lot of space, even with neat visualization and formatting. Consider putting full results in an appendix chapter and showing excerpts of interesting results in your chapters with detailed analysis. You can use labels and references to refer the reader here for the full data.