School of Photovoltaic and Renewable Energy Engineering

Faculty of Engineering

The University of New South Wales

Bioinformatics of the Immune System

by

My Name

Thesis submitted as a requirement for the degree of

Bachelor of Engineering in Computer Engineering

Submitted:	January 1970	Student ID:	z1234567
Supervisor:	A/Prof. Person	Topic ID:	XX00

Abstract

This document describes the requirements to theses submitted for the Bachelor of Engineering in Computer Engineering degree at the School of Photovoltaic and Renewable Energy Engineering. Requirements described are that of both of context and layout of the theses. The document is written using the LaTeX template provided by the school.

Acknowledgements

This work has been inspired by the labours of numerous academics in the Faculty of Engineering at UNSW who have endeavoured, over the years, to encourage students to present beautiful concepts using beautiful typography.

Further inspiration has come from Donald Knuth who designed TEX, for typesetting technical (and non-technical) material with elegance and clarity; and from Leslie Lamport who contributed LATEX, which makes TEX usable by mortal engineers.

John Zaitseff, an honours student in CSE at the time, created the first version of the UNSW Thesis LATEX class and the author of the current version is indebted to his work.

Abbreviations

HMM Hidden Markov Model

BLAST Basic Local Alignment Search Tool

Contents

List of Figures

List of Tables

Chapter 1

Introduction

Having a set of clear requirements to their thesis is important to student finalising their BE, or other, degree. Such requirements are both in relation to the physical appearance of the thesis, as well as the writing style and organisation. The present document tries to concisely state the theses requirements while appearing in layout and structure as a thesis itself.

Chapter 2 explains the background for this document. Chapter **??** states the style and submission related requirements to theses submitted at the school. Chapter **??** explains content related requirements to theses. Chapter 6 evaluates the thesis requirements template. Finally, Chapter 7 draws up conclusions and suggest ways to further improve the thesis requirements template.

Chapter 2

Background

Every semester, students ask their supervisor how to write their thesis, what the requirements are, and what to write in it. This document tries to answer all such questions.

2.1 Previous work

Previously, Nooshabadi [Noo05] has descried style-related thesis requirements, Shepherd [She05] has provided LaTeX templates while other academics have discussed contents with their students. This work draws all the relevant information regarding thesis writing into one document. The present template/document is heavily influenced by Nooshabadi and Shepherd, incorporating requirements from The Graduate Research School [GRS14] for Higher Degree Research theses.

Chapter 3

Design & Implementation

3.1 Initialization

Since iHMMuneAlign is rather configurable, it requires a large amount of input data for each run that cannot be embedded in the code directly. This data has to be read during program initialization and stored in memory such that it can be efficiently used in their required of the algorithm.

3.1.1 D/J Repertoires

3.1.2 V Repertoire

3.1.3 Mutation Ratios

3.2 Pipeline

The entire process of creating a HMM to represent immunoglobulinrecombination and solving it using Viterbi's algorithm can be split up into several smaller problems. These

can be viewed as stages in an assembly line where the result of each one feeds into the next, terminating with the final result. In computing, this is called a pipeline.

3.2.1 BLAST

The first step is to determine the most likely germline V gene is in the target sequence. Fortunately, this can be determined quite efficiently by aligning the input sequence with all known V genes [**?**]. For we opted to use the excellent alignment tool by NCBI: BLAST [**?**], like the original implementation.

BLAST is distributed as source code, and can be used in two ways:

Binary

Shared Library

3.2.2 Parsing Blast

3.2.3 Calculate A-Score

3.2.4 Build Model

3.2.5 Solve Model

3.2.6 Print Results

Insert diagram of pipeline in dotty here

3.3 Approach

Talk about agile here.

Chapter 4

Maintenance

Talk about how I attempted to improve maintainability/readability here

4.1 Revision Control

Explain how revision control will help future maintenance

Chapter 5

Performance

Talk about how I set off to improve performance here

5.1 Blast Lib

Chapter 6

Evaluation

This chapter is mainly provided for the purpose of showing a typical thesis structure. There are no more thesis requirements described.

6.1 Results

The result of this work is the present document, being both a LaTeX template and a thesis requirement specification.

6.2 Discussion

The Dual function of this document somewhat de-emphasises the primary purpose of the document, namely the thesis requirements. It would be better, if these could be stated on a few concise pages (cf Appendix 1, p10).

Chapter 7

Conclusion

A thesis requirements/template document has been created. This serves the dual purposes of giving students specific requirements to their theses — both style and content related — while providing a typical thesis structure in a LaTeX template.

7.1 Future Work

Extract the requirements from the template in order to have very concise requirements.

Bibliography

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Appendix 1

This section contains the options for the UNSW thesis class; and layout specifications used by this thesis.

A.1 Options

The standard thesis class options provided are:

undergrad	default
hdr	
11pt	default
12pt	
oneside	default for HDR theses
twoside	default for undergraduate theses
draft	(prints DRAFT on title page and in footer and omits pictures)
final	default
doublespacing	default
singlespacing	(only for use while drafting)

A.2 Margins

The standard margins for theses in Engineering are as follows:

	U'grad	HDR
`\oddsidemargin`	40 mm	40 mm
`\evensidemargin`	25 mm	20 mm
`\topmargin`	25 mm	30 mm
`\headheight`	40 mm	40 mm
`\headsep`	40 mm	40 mm
`\footskip`	15 mm	15 mm
`\botmargin`	20 mm	20 mm

A.3 Page Headers

A.3.1 Undergraduate Theses

For undergraduate theses, the page header for odd numbers pages in the body of the document is:

Author's Name *The title of the thesis*

and on even pages is:

The title of the thesis Author's Name

These headers are printed on all mainmatter and backmatter pages, including the first page of chapters or appendices.

A.3.2 Higher Degree Research Theses

For postgraduate theses, the page header for the body of the document is:

The title of the chapter or appendix

This header is printed on all mainmatter and backmatter pages, except for the first page of chapters or appendices.

A.4 Page Footers

For all theses, the page footer consists of a centred page number. In the frontmatter, the page number is in roman numerals. In the mainmatter and backmatter sections, the page number is in arabic numerals. Page numbers restart from 1 at the start of the mainmatter section.

If the **draft** document option has been selected, then a "Draft" message is also inserted into the footer, as in:

	14	**Draft:** May 29, 2015

or, on even numbered pages in two-sided mode:

Draft: May 29, 2015	14	

A.5 Double Spacing

Double spacing (actualy 1.5 spacing) is used for the mainmatter section, except for footnotes and the text for figures and table.

Single spacing is used in the frontmatter and backmatter sections.

If it is necessary to switch between single-spacing and double-spacing, the commands `\ssp` and `\dsp` can be used; or there is a `sspacing` environment to invoke single spacing and a `spacing` environment to invoke double spacing if double spacing is used for the document (otherwise it leaves it in single spacing). Note that switching to single spacing should only be done within the spirit of this thesis class, otherwise it may breach UNSW thesis format guidelines.

A.6 Files

This description and sample of the UNSW Thesis LaTeX class consists of a number of files:

unswthesis.cls	the thesis class file itself
crest.pdf	the UNSW coat of arms, used by `pdflatex`
crest.eps	the UNSW coat of arms, used by `latex` + `dvips`
dissertation-sheet.tex	formal information required by HDR theses
pubs.bib	reference details for use in the bibliography
sample-thesis.tex	the main file for the thesis

The file sample-thesis.tex is the main file for the current document (in use, its name should be changed to something more meaningful). It presents the structure of the thesis, then includes a number of separate files for the various content sections. While including separate files is not essential (it could all be in one file), using multiple files is useful for organising complex work.

This sample thesis is typical of many theses; however, new authors should consult with their supervisors and exercise judgement.

The included files used by this sample thesis are:

definitions.tex	mywork.tex
abstract.tex	evaluation.tex
acknowledgements.tex	conclusion.tex
abbreviations.tex	appendix1.tex
introduction.tex	appendix2.tex
background.tex	

These are typical; however the concepts and names (and obviously content) of the files making up the matter of the thesis will differ between theses.

Appendix 2

This section contains scads of supplimentary data.

B.1 Data

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