Getting started with LaTeX

A laboratory manual written by Duncan Hull

Last updated 2020-12-02

Contents

Welcome

Hello and welcome to the LaTeX lab manual, part of COMP101 at the University of Manchester.

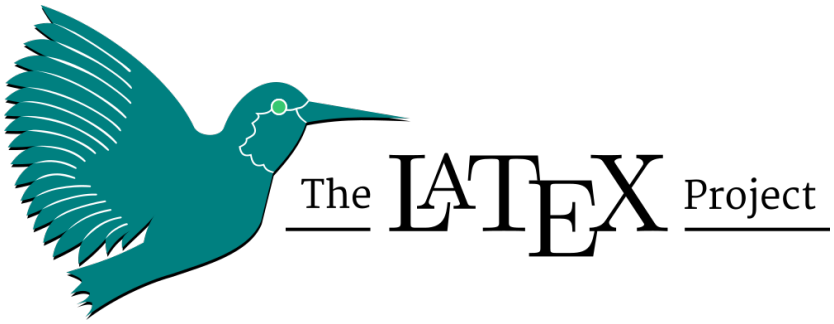


Figure 1: The LaTeX project logo, image by Jonas Jacek CC BY 4.0 via Wikimedia Commons w.wiki/oZs

Reading this LaTeX manual and doing the five exercises it contains will enable you to develop your written communication skills so that you can:

1. Create a simple document in pdf using LaTeX
2. Illustrate a document with figures and cross references
3. Typeset some mathematics
4. Share and collaborate on LaTeX documents using overleaf
5. Draft a CV using LaTeX templates in overleaf

Acknowledgements

This manual is a substantially revised version of earlier LaTeX lab manuals created by Ulrike Sattler, Graham Gough, Paul Waring, Toby Howard and Steve Pettifer.

Improve this guide

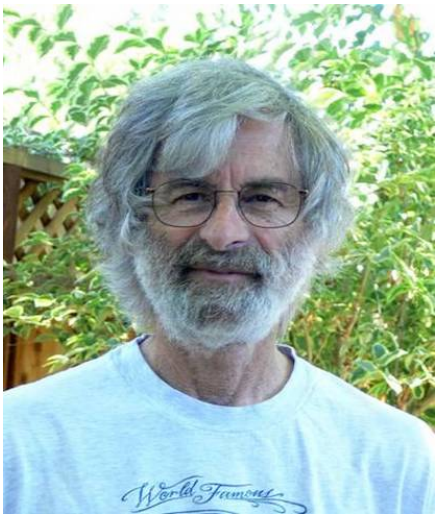
The source of this manual is on github so if you have any comments or suggestions on how to improve it, you can raise an issue or submit a pull request. We'll credit every contribution, however small, because they all make a difference.

If you want to make suggestions for improvements that **don't** get attributed to your name, email me directly.

Chapter 1

What is LaTeX?

LaTeX is a document preparation system for high-quality typesetting. (Text, 2020) LaTeX is a mature and established typesetting system that has been around since 1980's. (Knuth, 1984) It was originally written by Leslie Lamport, a computer scientist now working at Microsoft Research, although its development has long been taken over by a world-wide LaTeX community. It's actually built on top of another system called TeX, a computer typesetting system designed by another influential Computer Scientist, Donald Knuth of Stanford University. Lamport and Knuth are shown in Figure 1.



\begin{figure} \caption{Turing award winners Leslie Lamport and Donald Knuth created TeX and LaTeX during the 1980's. Lamport portrait by Lamport, GFDL via Wikimedia Commons w.wiki/oyM, Knuth portrait by Jacob Appelbaum CC BY-SA via Wikimedia Commons w.wiki/oyL} \end{figure} LaTeX is typically used for technical documents but it can be used for almost any form of

publishing, including writing CVs, formal letters, presentations and much more. Whatever you create with LaTeX, one of its key strengths is making documents look professional in portable document format (pdf) using industrial-strength typesetting.

1.1 Not a word processor

LaTeX is not a word processor! Instead, LaTeX encourages you to concentrate on the content of your documents, while it takes care of many of the details of its presentation. This is similar to the approach you've been using for creating web pages where the style (CSS) is separated from the content (HTML).

LaTeX is **not** a what you see is what you get (WYSIWIG) system either. The raw document you edit (a `*.tex` file) is not your final output (usually a `*.pdf` file).

1.2 So what is LaTeX then?

The best way to understand LaTeX is to create some documents which we'll do in the next chapter.

Chapter 2

Simple LaTeX documents

Let's start by creating a simple LaTeX document.

2.1 A very short document

Open up your favourite editor, enter the following text, then save it as a file called `turing.tex`

```
\documentclass[a4paper]{article}
\begin{document}
Computational excursions
\end{document}
```

To turn this into a PDF we need to use a LaTeX compiler, we're going to use `pdflatex`, though several other compilers are available.[1] The `pdflatex` compiler is already installed on the Linux VM image for VirtualBox.[2] For other operating systems you'll need to explore the options at latex-project.org/get.

```
# compile turing.tex
pdflatex turing.tex
# open the pdf output
xdg-open turing.pdf
```

The first command outputs a pdf file from your TeX input using the `pdflatex` compiler. The second command opens the file you've created. If you list the directory contents, you'll see that the compiler has also created an auxillary

[1] https://www.overleaf.com/learn/latex/Choosing_a_LaTeX_Compiler
[2] https://wiki.cs.manchester.ac.uk/index.php/CSImage_VM

`*.aux` file and a `*.log` log file which can be helpful for debugging the compilation of more complicated documents:

```
# files created on compilation
turing.tex
turing.pdf
turing.aux
turing.log
```

2.2 A longer LaTeX document

Our `turing.tex` file is a very simple document, so let's add some sections and fill them out a bit:

```
\documentclass[a4paper]{article}
\begin{document}


\section{Algorithms: Cooking Up Programs}
A program specifies in the \textbf{exact syntax} of some programming language the compu

\section{Finite automata: The Black Box}
It occasionally happens in industrial, military or educational settings that one is pre

\section{Systems of Logic: Boolean Bases}
In an age of computers and automation, almost every electronic device one can name inco

\section{Simulation: The Monte Carlo method}
In the quest to understand the many systems that comprise the modern world we turn inci

\section{Gödel's Theorem: Limits on Logic}
In the early 1930's, Kurt Gödel, a German mathematician, attempted to show that predica

\section{Can machines think?}
Turing addressed the question ``Can machines think?'' in his 1950 paper \textit{Comput

\section{But what is LaTeX good for?}
We're using this \LaTeX\ document to demonstrate some of its key strengths that you wi

\begin{enumerate}
\item LaTeX can quickly create pdf files
\item LaTeX uses professional typesetting
\item LaTeX documents can be more legible, clear, and visually appealing to the reader
\end{enumerate}
```

```
\end{document}
```

The text here is excerpted from *The New Turing Omnibus: 66 excursions in Computer Science* (Dewdney, 2001). The Omnibus is a lovely introduction to the fundamentals of Computer Science that you might enjoy. In his book review, the software engineer Jeff Atwood calls it an "incredibly fun little book". (Atwood, 2007)

2.3 Exercise one: documentum

In your file `turing.tex` either cut-and-paste this longer text into your document or make your own sections and text. You could use text from Lorem ipsum at lipsum.com to fill out the page.

Now, at the top of your document after the `\begin{document}` line and before first `\section`, add the following commands, each on their own line:

```
\title{The New Turing Omnibus}
\author{A. K. Dewdney}
\maketitle
\tableofcontents
\newpage
```

The `title`, `author`, `tableofcontents` and `newpage` commands are self-explanatory. The `maketitle` automatically inserts today's date. Your table of contents won't be created until you run pdflatex **twice** because on the first run, LaTeX gathers and stores information about what to put in the table of contents, and only creates it on the second run.

```
# remember to run pdflatex twice for the table of contents
pdlfatex turing.tex
pdflatex turing.tex
```

2.4 Bold, italic, lists and quotes

Here's a few points to note about the text above:

- Notice how **bold** and *italic* formatting are created using `\textbf{}` and `\textit{}`
- Notice how lists are created using `\begin{enumerate}` and `\item`

- Notice that curved open quotation marks (“ - looks a bit like a mini 66) and close quotation marks (” - mini 99) are different characters. Look carefully at the quotes around the phrase “Can machines think?” in the excerpt above in section on a longer LaTeX document. If you don’t pay attention to this your quotes will look odd.

2.5 Summary

You’ve created a basic document in LaTeX and we’ve introduced some of its advantages:

- LaTeX can quickly create pdf files
- LaTeX uses professional typesetting
- LaTeX documents can be more legible, clear, and visually appealing to the reader that those created with word processing software

Next we’ll look at adding some cross-references, figures and citations.

Chapter 3

Cross-referencing, illustrating and citing

LaTeX has simple but powerful tools to allow you to cross-reference, illustrate and cite sources in your documents.

3.1 Cross-referencing

LaTeX allows you to cross-reference almost anything in your document, including sections, sub-sections and figures. To use the cross-referencing feature you simply insert the command:

```
\label{mymarker}
```

at the point in the document you want to refer to, and then use the command:

```
\ref{mymarker}
```

when you want to use the reference. Obviously you replace the text `mymarker` with something more meaningful. An important tip here is to call the marker something that refers to the content of that part of the document, and to avoid the temptation to use numbers in case you re-order your document. For example, lets say we wanted to cross reference between sections:

```
\documentclass[a4paper]{article}
\begin{document}
\section{Turing Machines: The Simplest Computers}
```

```
\label{sec:simplest}
Turing machines are the simplest and most widely used theoretical models of computing.

\section{Alan Turing}
The Turing machines described in section \ref{sec:simplest} are named after Alan Turing
\end{document}
```

3.2 Illustrating your documents

Documents without figures, images, pictures and graphs are pretty dull, so you'll want to illustrate your document with figures such as the one in Figure 3.1, for example.

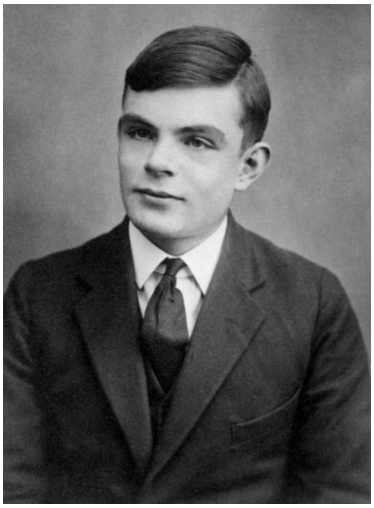


Figure 3.1: Alan Turing at the age of sixteen, picture by unknown author, public domain, via Wikimedia Commons w.wiki/oZx

Including figures and pictures in your document is straightforward. You do it like this:

```
\begin{figure}
\includegraphics[width=10cm]{images/turing.jpg}
\caption{Turing machines are named after Alan Turing}
\label{figure:turing}
\end{figure}
```

The command `\includegraphics{}` gets your image, which can be PDF, PNG, JPG, GIF or PostScript. The `\begin{figure}` and `\end{figure}` code wraps

up whatever picture you're including, and allows LaTeX to treat it as an unbreakable floating thing that it will position for you as best it can in the document, while maintaining an overall nice typographical layout. This "floating" of figures can sometimes result in the figure ending up in a place you didn't expect, but in most cases LaTeX will make the most sensible choice. It's possible to employ finer control over figure placement, but that's beyond the scope of this guide.

The `\includegraphics` command is not built in to core LaTeX but is in an additional package, which needs to be explicitly loaded. You can load this package by using the command `usepackage` in the document preamble, in between the `\documentclass` and the `\begin{document}`.

```
\documentclass[a4paper]{article}
\usepackage{graphicx}
\begin{document}
```

3.3 Exercise two: figures

Create a document `image.tex`, that contains some text (maybe from Lorem Ipsum), together with a figure containing an image of your choice. Create a cross reference to the figure in the text.

3.4 Citations and footnotes

Footnotes[1] can be added to a document with `\footnote{}`

```
\footnote{This is a footnote about footnotes}
```

You can cite sources such as websites, books or journal articles in your document using the `\cite` command.

```
\cite{alanturing}
```

The citations themselves can be stored in a separate `*.bib file` using a format called BibTeX, in this case we'll use `turing.bib`. BibTeX provides citation types so books[2] using the `@book` type like this:

[1] This is a footnote about footnotes. Very meta.

[2] Using tools like https://www.ottobib.com can help you to quickly generate BibTeX entries from a given ISBN number

```
@Book{turingomnibus,
  title = {The New Turing Omnibus: Sixty-six excursions in Computer Science},
  author = {A. K. Dewdney},
  publisher = {Henry Holt},
  address = {New York},
  year = {2001},
  isbn = {9780805071665},
  url = {https://en.wikipedia.org/wiki/Special:BookSources?isbn=978-0805071665}
}
```

and articles[3] use the `@article` type like this:

```
@article{alanturing,
  doi = {10.1112/plms/s2-42.1.230},
  url = {https://doi.org/10.1112/plms/s2-42.1.230},
  year = {1937},
  publisher = {Wiley},
  volume = {s2-42},
  number = {1},
  pages = {230--265},
  author = {Alan Turing},
  title = {On Computable Numbers, with an Application to the Entscheidungsproblem},
  journal = {Proceedings of the London Mathematical Society}
}
```

For everything else[4] you can use the `@misc` type:

```
@misc{googlescholar,
  author       = {Anon},
  title        = {Alan Turing Google Scholar page},
  url          = {https://scholar.google.co.uk/citations?user=VWCHlwkAAAAJ},
  year         = {2020},
}
```

If we wanted to create the text:

"You can find Turing's publications in Google scholar. (Anon, 2020) His paper on the Entscheidungsproblem was published in 1937. (Turing, 1937) He wrote about thinking machines in 1950. (Turing, 1950)"

We would need the following in our tex file:

[3] BibTeX entries for journal articles can be automatically generated from persistent identifiers known as digital object identifiers or doi's, see https://doi2bib.org for example. This saves you the unpleasant, time consuming and error prone task of typing them in by hand.

[4] There are many other types of BibTeX entries besides articles, books and misc. See https://en.wikibooks.org/wiki/LaTeX/Bibliography_Management#BibTeX

```
You can find Turing's publications in Google scholar. \cite{googlescholar}
His paper on the Entscheidungsproblem was published in 1937. \cite{alanturing}
He wrote about thinking machines in 1950. \cite{turing50}
```

To generate your bibliography you'll need to specify what style of bibliography you're using with `\bibliographystyle{stylename}` and where to find the metadata with `\bibliography{bibfile}`. The example below uses `unsrt` for style and uses a bib file called `turing.bib` which might contain many articles and books. You don't need to specific the file extension `.bib`:

```
\bibliographystyle{unsrt}
\bibliography{turing}
```

When you compile you need to run `pdflatex` before and after running `bibtex` like this:

```
pdflatex turing.tex
bibtex turing
pdflatex turing.tex
pdflatex turing.tex
```

If you find all the typing at the command line tedious, you could write a little bash script to automate this simple workflow including opening pdf when it is created.

3.5 Summary

You have cross-referenced, illustrated and added citations and footnotes to your document. Next we'll look at doing some maths.

Chapter 4

Doing the maths

LaTeX provides powerful tools for typesetting mathematics and this chapter looks at some of them. If you can't see the equations and matrix below in your web browser, you'll need to use the pdf version of this document at latex4year1.pdf. Otherwise, if you can see the equation below, it is safe to read on…

4.1 Equations

Consider this equation:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

To render the equation, you include this in your tex file:

```
\[ x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} \]
```

You can probably work out how most of this creates the formula, but it won't be obvious that the `\[` and `\]` symbols that enclose the formula mean typeset this as a displayed formula, giving it some vertical space from the surrounding text. If we'd used `\(` and `\)` instead to enclose the formula it would appear in-line, like this: $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$. It still looks very nice, and observe how it's automatically been resized to fit, and that the lines of text have had their spacing changed a bit. This all looks simple, but the implementation inside LaTeX and TeX is complex. It involves parsing the description of the formula to create a corresponding tree data structure, which is then recursively walked to work out the horizontal and vertical typographical spacings needed. You'll meet these

ideas in COMP11120 Mathematical Techniques for Computer Science in your first year and COMP26120 Algorithms and Imperative Programming in your second year.

Here's another example, taken from computer graphics, it's a local illumination model incorporating ambient, diffuse and specular reflection by multiple lights:

$$I = k_a I_a + \sum_{i=1}^{M} \frac{I_{p_i}}{d'_i}[k_d(\hat{N} \cdot \hat{L}_i) + k_s(\hat{R}_i \cdot \hat{V})^n]$$

We write this in LaTeX as follows:

```
\[ I = k_a I_a + \sum_{i=1}^M { \frac{{I_p}_i}{d'_i} }
[ k_d(\hat{N} \cdot \hat{L_i})
+ k_s(\hat{R_i} \cdot \hat{V})^n] \]
```

Try to match the LaTeX commands with the formula displayed above. You'll see lots of curly brackets, and this example illustrates their two uses in LaTeX. The first is to provide an argument to a command; for example `\hat{N}` means apply the `\hat` command to N', which creates $\hat{N}$, the vector N with a little hat on.

The second use of curly brackets is to group things together to avoid ambiguities. In the example you can see $\sum_{i=1}^{M}$, which creates a summation sign and its lower and upper limits: $\sum_{i=1}^{M}$. We wrap the lower bound, `i=1` in curly brackets to group it into an indivisible unit. If we were to omit the brackets, writing `\sum_i=1^M`, LaTeX would then produce $\sum_i = 1^M$, which is not at all what we want (even LaTeX can't always know what we really want).

4.2 Matrices

If we need to use matrix, such as the one below which expresses a particular 3D geometrical transformation

$$T_1 = \begin{bmatrix} \cos\theta & -\sin\theta & 0 & \delta \\ \sin\theta & \cos\theta & 0 & \epsilon \\ 0 & 0 & 1 & \eta \\ \alpha & \beta & \gamma & 1 \end{bmatrix}$$

we can use the following

```
\[ T_1 = \left[
 \begin{array}{cccc}
 \cos \theta & -\sin \theta & 0 & \delta \\
 \sin \theta  & \cos \theta & 0 & \epsilon \\
 0 & 0 & 1 & \eta \\
 \alpha & \beta & \gamma & 1
 \end{array}
 \right] \]
```

In the LaTeX code, `\left[` means 'big opening square bracket please'; `{cccc}` means 'an array with 4 columns please, with the items in each column centred'; `&` means 'start a new column'; and `\\` means 'start a new row'. You'll notice that LaTeX knows about greek letters; it knows about most standard maths symbols too, and also the ways they're usually used.

There are some symbols that you might need (for example `\therefore`, which produces the usual three dots symbol) that are not part of standard LaTeX. Many such symbols are provided by the `amssymb` package of symbols compiled by the American Mathematical Society. Details of the many symbols provided by this package can be found online. To use these extra symbols, you need to have `\usepackage{amssymb}` in your document preamble.

LaTeX really shines at typesetting mathematics, we've really only scratched the surface here. For more have a look at en.wikibooks.org/wiki/LaTeX/Mathematics or books such as the *Guide to LaTeX* by Helmut Kopka and Patrick W. Daly. (Kopka and Daly, 2003)

4.3 Exercise three: maths

Now for an exercise that involves some mathematics. Create a file `maths.tex` which typesets the following piece of text and mathematics:

There are many positive integer solutions to the equation

$$x^2 + y^2 = z^2$$

which can be rewritten as

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

For example $(3, 4, 5)$ or $(5, 12, 13)$. Such solutions are called *Pythagorean triples*.

However, for higher powers the situation is very different, and we have:-

Theorem: Fermat-Wiles For all natural numbers $n \geq 3$, there are no integers x, y, z satisfying the equation:

$$x^n + y^n = z^n$$

4.4 Summary

We've briefly looked at typesetting mathematics in LaTeX with some equations and a matrix. LaTeX can do a lot more maths than equations and matrices but this has given you a flavour of what it can do. In the next chapter we'll look at collaborative authoring and editing in the cloud with overleaf.

Chapter 5

Collaborative editing with overleaf

If you are the sole author of a document, then compiling files on your local machine is fine. However, if you need to collaboratively co-author a document with other people, you'll need to share your TeX on a server. Overleaf (overleaf.com) allows you to do this, and is shown in the screenshot in Figure 5.1.

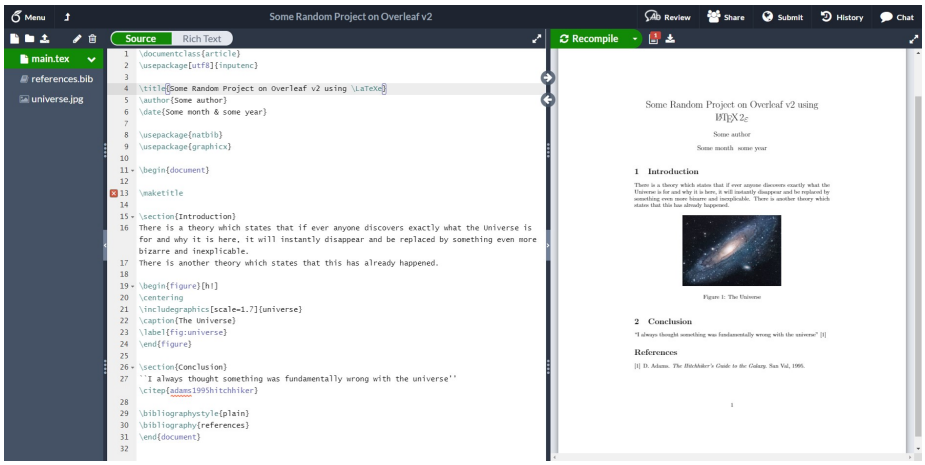


Figure 5.1: A screenshot of overleaf showing the source TeX on the left hand side and the corresponding pdf on the right hand side. Screenshot by Dan Cherniy via Wikimedia Commons at w.wiki/omo

Compared to LaTeX, overleaf is relatively new, the company responsible was founded in 2013. It has several features which you might find useful:

- Your documents are automatically saved to the cloud
- Packages, class files, compilers and other LaTeX components are also in the cloud, saving you time installing and managing them
- Templates are provided for common types of documents, although you don't need to use overleaf to get access to LaTeX templates[1]

5.1 Exercise four: overleaf

Login to overleaf.com and try the following:

1. Create and save a simple document using the overleaf tutorial *creating a document in Overleaf*[2]

2. Note that overleaf allows you to store your TeX source in a git repository so you can use version control
3. Browse the overleaf tutorials at overleaf.com/learn if you want to take things further

5.2 Summary

Overleaf provides a modern and convenient cloud based interface to tried and tested LaTeX tools, which have been around for over thirty years. (Knuth, 1984) It also allows you to share the source of your documents while providing some handy templates for common document types. Overleaf and command line are just two popular interfaces to LaTeX amongst many others. (Text, 2020) Which interface is "best" for you will largely depend on what kind of documents you are working on. In the next chapter we will create a curriculum vitae using CV templates provided by overleaf.

[1] see http://www.tug.org/texshowcase and https://www.latextemplates.com for example
[2] https://www.overleaf.com/learn/how-to/Creating_a_document_in_Overleaf

Chapter 6

Your curriculum vitae

You'll write many documents at University, but there is one document that is **really** important in a potentially life-changing way. Your curriculum vitae[1] or resume. An example CV is shown in Figure 6.1.

Creating a professional looking CV is particularly important, because it determines if you are invited to interview for opportunities you are applying for. The decision to interview is typically based on:

- how your CV looks, the typesetting and style (typography)
- the content of your CV, what you've done
- the quality and clarity of your written communication, how you describe yourself
- the editing, what you've decided to leave in (and leave out) of your CV

By opportunities we mean both immediate ones within the next 12 months as well as those further in the future. These opportunities might include:

- Spring insights during easter next year[2] some of which have application deadlines before Christmas
- Summer internships next year or during subsequent summers[3]
- Year long placements in your penultimate year, if you're considering doing industrial experience
- Graduate jobs or graduate schemes after graduation
- Postgraduate study or research via masters or PhD

Any time you invest in creating a convincing CV will pay off in the long run. Yes, you've only just started University, so might not have much to talk about just yet, but it's never too early to make a start.

[1] strictly speaking it should be vitæ (not vitae) if you're being pedantic
[2] see the essential guide to student insights at https://www.ratemyplacement.co.uk/insights
[3] see where can I look for jobs? https://waggle.cs.manchester.ac.uk/waggle/search

Jake Ryan

123-456-7890 | jake@su.edu | linkedin.com/in/jake | github.com/jake

Education

Southwestern University — Georgetown, TX
Bachelor of Arts in Computer Science, Minor in Business — *Aug. 2018 – May 2021*

Blinn College — Bryan, TX
Associate's in Liberal Arts — *Aug. 2014 – May 2018*

Experience

Undergraduate Research Assistant — June 2020 – Present
Texas A&M University — *College Station, TX*
- Developed a REST API using FastAPI and PostgreSQL to store data from learning management systems
- Developed a full-stack web application using Flask, React, PostgreSQL and Docker to analyze GitHub data
- Explored ways to visualize GitHub collaboration in a classroom setting

Information Technology Support Specialist — Sep. 2018 – Present
Southwestern University — *Georgetown, TX*
- Communicate with managers to set up campus computers used on campus
- Assess and troubleshoot computer problems brought by students, faculty and staff
- Maintain upkeep of computers, classroom equipment, and 200 printers across campus

Artificial Intelligence Research Assistant — May 2019 – July 2019
Southwestern University — *Georgetown, TX*
- Explored methods to generate video game dungeons based off of *The Legend of Zelda*
- Developed a game in Java to test the generated dungeons
- Contributed 50K+ lines of code to an established codebase via Git
- Conducted a human subject study to determine which video game dungeon generation technique is enjoyable
- Wrote an 8-page paper and gave multiple presentations on-campus
- Presented virtually to the World Conference on Computational Intelligence

Projects

Gitlytics | *Python, Flask, React, PostgreSQL, Docker* — June 2020 – Present
- Developed a full-stack web application using with Flask serving a REST API with React as the frontend
- Implemented GitHub OAuth to get data from user's repositories
- Visualized GitHub data to show collaboration
- Used Celery and Redis for asynchronous tasks

Simple Paintball | *Spigot API, Java, Maven, TravisCI, Git* — May 2018 – May 2020
- Developed a Minecraft server plugin to entertain kids during free time for a previous job
- Published plugin to websites gaining 2K+ downloads and an average 4.5/5-star review
- Implemented continuous delivery using TravisCI to build the plugin upon new a release
- Collaborated with Minecraft server administrators to suggest features and get feedback about the plugin

Technical Skills

Languages: Java, Python, C/C++, SQL (Postgres), JavaScript, HTML/CSS, R
Frameworks: React, Node.js, Flask, JUnit, WordPress, Material-UI, FastAPI
Developer Tools: Git, Docker, TravisCI, Google Cloud Platform, VS Code, Visual Studio, PyCharm, IntelliJ, Eclipse
Libraries: pandas, NumPy, Matplotlib

Figure 6.1: An example CV using an overleaf template. Would you invite Jake to interview based on his CV? This is what your CV needs to do, convince a decision maker to invite you to interview. There are many other CV templates available, this one is by Jake Gutierrez and published under an MIT license at [overleaf.com/latex/templates/jakes-resume/syzfjbzwjncs](https://www.overleaf.com/latex/templates/jakes-resume/syzfjbzwjncs)

6.1 Exercise five: your CV

Create a basic CV which tells your story, in particular:

- your *education*, including high school and University
- your *experience*, voluntary, paid, casual, technical and non-technical: it all counts and demonstrates your range of soft and hard skills
- your *projects*, both personal or at University and beyond

You can do this using the ready-made templates at overleaf.com/gallery/tagged/cv. Have a good look around, there are plenty of templates to choose from.

6.2 Debug your CV

As you progress through University, continuously update your CV and solicit feedback from as many people as you can. Your fellow students, personal tutors, friends, family and anyone else you trust can all give you valuable feedback. There will be opportunities to debug your CV later, but you'll need a "beta release" (version 1.0) of your CV to get started. The best time to start debugging is now, so that you can squash any bugs before employers see them. Innocent bugs **can be fatal** because most employers typically have to deal with lots of applicants. Here's some common bugs we have seen in students CVs:

1. Is your year of graduation, degree program, University and expected (or achieved) degree classification clear?
2. Are there any spelling mistakes, typos and grammatical errors? Don't just rely on a spellchecker, they can't detect everything
3. Does it look good, decent layout, easy to scan?
4. Does it fit comfortably on one page (preferably) or two pages only? Not too cramped or gappy?
5. Is it in reverse chronological order? Are the most important (usually recent) things first?
6. Have you talked about what you have actually done using prominent verbs, rather than just what you know? See git.io/verbsfirst for examples
7. Have you mentioned disciplines you are studying now and throughout the current academic year, not just courses you have finished?
8. Have you quantified and provided evidence for the claims you make?
9. Is your CV robot proof? Many large employers use automated applicant tracking systems that use software to screen CVs long before a human ever sees them. You can feed your CV through software like careerset.io/manchester and resume.io, what feedback do the robots give you? How can you make your CV more robot proof?
10. Find out more in the *Debug your CV* (Hull, 2020) guide at git.io/mycv

6.3 Summary

Your curriculum vitae is a *really* important document and it will most likely take many iterations to get it right. We recommend you start working on it sooner rather than later and get feedback from as many different people (and bots) as you reasonably can.

In the meantime, enjoy exploring and using LaTeX to create professional documents for:

- your individual COMP101 coursework (see blackboard)
- your CV / resume
- your third year project dissertation. It might seem a long way off now but it comes around very quickly!

...and more.

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