SCS Honors Undergraduate Research Thesis
mid-semester report/thesis draft

Spring 2022

Your Thesis Title

by

Your Name

Advisor

Your Advisor's Name

Contents

Chapter 1

Introduction

This is the introduction to your work. Explain the overarching research area where this falls under, and motivate your project.

1.1 LaTeX tips & tricks

Look at the source code for this section to see the LaTeX source for what follows.

This is a reference [1]. They are included in file `references.bib`. Note that the `hyperref` package has added a link there for you. If you click on it, this should take you to the corresponding reference in the Bibliography section. Don't worry about the strange frame around it, it does not show when printed (and some pdf viewers are not really good at rendering it – that includes Overleaf).

You can leave comments in little boxes like this. This is very useful when collaborating. Your advisor can use it to leave notes in your document. This is useful.

Some environments are already predefined for you.

Example 1. *An example* example.

Remark 1. *An unremarkable* remark.

Definition 1. *A definitive* definition.

Lemma 1. *A helper* theorem.

Theorem 1. *A* theorem.

Proof. A proof of Theorem 1 using Lemma 1. □

Corollary 1. *A* consequence *of Theorem 1*

If you need to define other environments as above, they are in the file `configs/preamble.tex`.
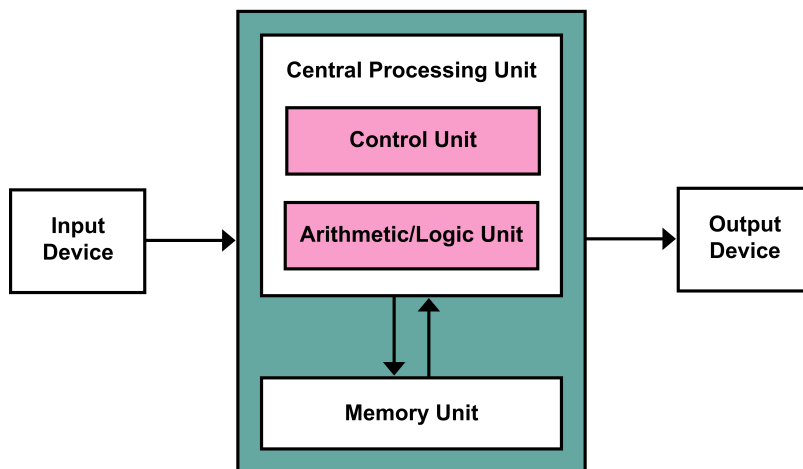
Figure 1.1: Von Neumann Architecture

You can include macros and definitions in `configs/newcommands.tex` to make typing easier and keep consistency throughout the document. For example: $a^2 + b^2 = c^2$.

The `graphicx` package allows you to include pictures like the Von Neumann Architecture in Figure 1.1.

You can also draw figures directly in LaTeX using tikz[1] and some patience. For example, check the source code for Figure 1.2, look how nicely it blends with the document (same font, thickness, style).

You can draw proof trees as well (but if you have ever taken a logic & languages elective, you should know this by now).

$$\frac{\Gamma \vdash A \quad \Gamma \vdash B}{\Gamma \vdash A \land B} \land_r$$

You can also write equations, number them, and refer back to them later.

$$e^{i\pi} + 1 = 0 \qquad (1.1)$$

Some claim that Equation 1.1, also called *Euler's identity*, is one of the most beautiful equations in Mathematics.

The `listings` package[2] provides a nice way for you to include code in your document. It supports a number of programming languages natively, and it is highly customizable. For this document in particular, I left a configuration for Python code. You can see how this is done using the `lset` command in the `configs/preamble.tex` file. Check out the final result in the implementation of binary search in Python below:

---

[1] `https://texample.net/tikz/`
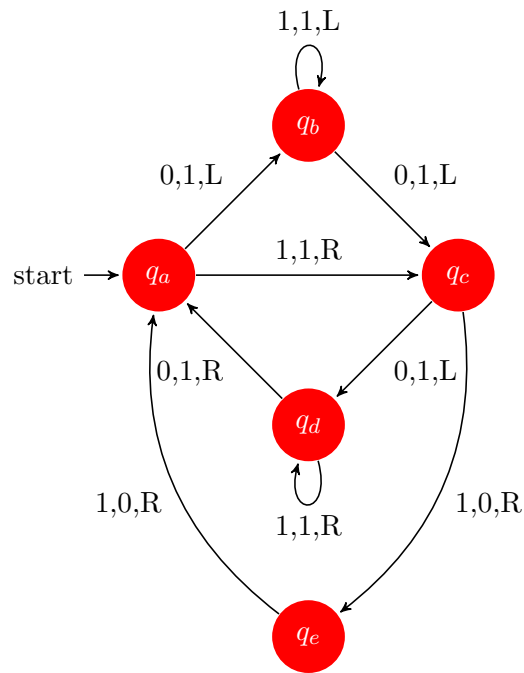[2] `https://en.wikibooks.org/wiki/LaTeX/Source_Code_Listings`

Figure 1.2: A graph drawn using tikz

```python
# Iterative Binary Search Function
# It returns index of x in given array arr if present,
# else returns -1
def binary_search(arr, x):
    low = 0
    high = len(arr) - 1
    mid = 0

    while low <= high:
        mid = (high + low) // 2

        if arr[mid] < x:
            low = mid + 1
        elif arr[mid] > x:
            high = mid - 1
        else:
            return mid

    return -1
```

Chapter 2

Related Work

Cite works related to what you are doing. Place your contributions in the state of the art. Compare your approach to existing ones.

Chapter 3

Conclusion

Summarize your project and results. Mention future directions.

Bibliography

[1] A. M. Turing. On computable numbers, with an application to the entscheidungsproblem. *Proceedings of the London Mathematical Society*, s2-42(1):230–265, 1937.

Appendix A

Extra Material

Appendices should be reserved for extra material that would be too much for the actual text, but serves as evidence that you have done all the work. In any case, a reader should never need to look at material in the appendix to understand your work.