ASHESI
UNIVERSITY

[CAPSTONE TOPIC]

CS APPLIED PROJECT

B.Sc. Computer Science

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2025

ASHESI UNIVERSITY

[CAPSTONE TOPIC]

CS APPLIED PROJECT

CS Applied Project submitted to the Department of Computer Science & Information Systems, Ashesi University in partial fulfilment of the requirements for the award of Bachelor of Science degree in Computer Science.

David Abeiku Saah

2025

DECLARATION

I hereby declare that this CS Applied Project is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature: .....

Candidate's Name: .....

Date: .....

Candidate's Signature: .....

Candidate's Name: .....

Date: .....

I hereby declare that preparation and presentation of this CS Applied Project was supervised in accordance with the guidelines on supervision of CS Applied Project laid down by Ashesi University.

Supervisor's Signature:

.....

Supervisor's Name:

.....

Date:

.....

Acknowledgements

Provide a clear and concise acknowledgment of individuals or organizations that contributed to your capstone. This may include your capstone supervisor, relevant institutions, seniors or alumni, friends, and family. It is important to maintain a professional tone; therefore, **personal beliefs or religious expressions, such as thanking God**, should not be included as this is a formal academic document.

Abstract

In this section of your capstone, you are required to concisely summarize the key elements of your work. The abstract should provide a clear overview that informs the reader about the scope and significance of your research before they proceed to the detailed chapters. Ensure that your abstract addresses the following components: the research problem, the central research question, and a brief summary of your key findings.

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Chapter 1: Introduction

Welcome to the Ashesi CSIS Capstone Template. This document provides a standardized LaTeX style designed for consistent use throughout your capstone project. If you are new to LaTeX it is highly recommended that you explore online resources and tutorials to familiarize yourself with its basic commands and functionalities.

For those with prior experience using LaTeX this document offers comprehensive guidelines for structuring and formatting your capstone report in accordance with the required standards.

Here are the general guidelines;

1.1 Structure

At the end of your project the manuscript must have the following order for the pages:

- Outer cover page(see sample)
- Title page / inner cover page (see attached sample)
- Declaration / signature page (see sample)
- Acknowledgement
- Abstract
- Table of Contents
- List of Tables (optional, if needed)
- List of Figures (optional, if needed)
- List of Abbreviations(optional, if needed)
- Main body of report

- Begin every chapter on a newpage (don't worry, this template handles this for you.)

■ References

- Begin the list of references on a new page after the last page of the main body of the report.

■ Glossary (optional, if needed)

■ Appendices (optional, if needed)

- Each appendix should begin on a new page

Chapter 2: Background and Literature Review

This section talks about the format for your capstone. Using this template means most of the formatting requirements have been handled already. However, should you decide to modify this template, then you need to adhere the formatting instructions listed below;

2.1 Formatting

- *Font stlye:* Use **Times New Roman**
- *Font size:* Use **12 pt** sizing for the body text, and **14 pt** sizing for chapter headings.
- *Spacing:* Double-space the manuscript text, including between lines of body text and titles, headings, block quotations, references, etc. Information in tables, may, however be single spaced for more attractive formatting.
- *Margins:* Use **1 inch** for all margins except the left, which should be **1.2 inch**
- *Indentation:* Indent the first line of every paragraph by **0.5 inch**
- *Alignment:* Justify the manuscript text (i.e. text is aligned both to the left and right)
- *Page numbering:* Number pages consecutively starting with Roman numerals (i, ii, etc.) for preliminary pages such as the signatory page, acknowledgment and abstract, and Arabic numerals (1, 2, etc.) for pages in the main body of your document (your chapters) and all subsequent pages (references, appendices, etc.). However, your inner and outer title pages should have no page numbers. This template handles this for you, so you do not need to do this manually.
- *Chapter & section numbering:* Chapters should be numbered with Arabic numerals (1, 2, etc.). Sections should be numbered hierarchically (e.g. 1.1, 1.2, 1.2.1 etc.)

  Given this it doesn't mean your capstone should be one big **.tex** file. This template has sectioned the document into folders. Key to this project is the **chapters** folder,

each chapter is named as *chapter 1, chapter 2, etc....* You can edit the **.tex** file under the sub-folders. Also, you can create sub-folders or *.tex* files as you deem fit.

Example: In the *chapter 2* folder, you can create the .tex file, *asv.tex*. Since *asv.tex* is a section for chapter two of this capstone, you will go to the tex file for the chapter, i.e *two.tex* and include it like this:

```
\section{Automatic Speaker Verification Systems}
\input{chapters/chapter2/asv}
```

The approach is similar for subsections and subsubsections, if you want you working text to be more modular.

```
\subsection{Deepfake Encoder-Decoder Approach}
\input{chapters/chapter2/encoder-decoder}
```

- *Chapter headings:* Chapter headings should be centred, bold, in 14 pt font, and be of the form: Chapter [number]: Title, e.g. Chapter 1: Introduction. The following headings should also be centred, bold, and in 14pt font: Acknowledgements, Abstract, Table of Contents, References. Chapter headings should use title case (i.e. capitalize the first letter of each word, except "small" words such articles and conjunctions)

- *Section headings:* Section headings should be left-aligned, bold, and use 12 pt font. E.g. 1.1 Background. Section headings should also use title case. As you get deeper with the subsections, subsubsections and subsubsubsections, headings should still use title case. Example:

```
\section{Deepfake Audio Systems}
\subsection{AutoV}
\subsubsection{Architecture}
```

- *Figures and Tables:* Keep figures and tables in the main body of the report (not grouped at the end of the document). Captions for figures should be just **under** the

figure. The **"figure"** environment is intended for incorporating figures. You may include one or more images within this environment. If your figure includes material from third-party sources, it is essential to properly attribute it, as demonstrated in the example below.

Example with appropriate citation:

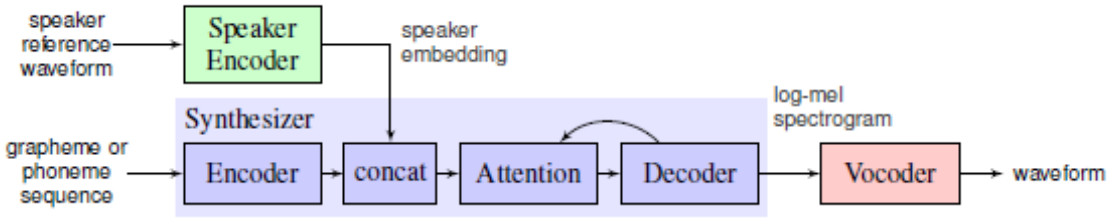

Figure 2.1: Architecture of SV_2TTS adapted from [3]

Example with figure created by the author:

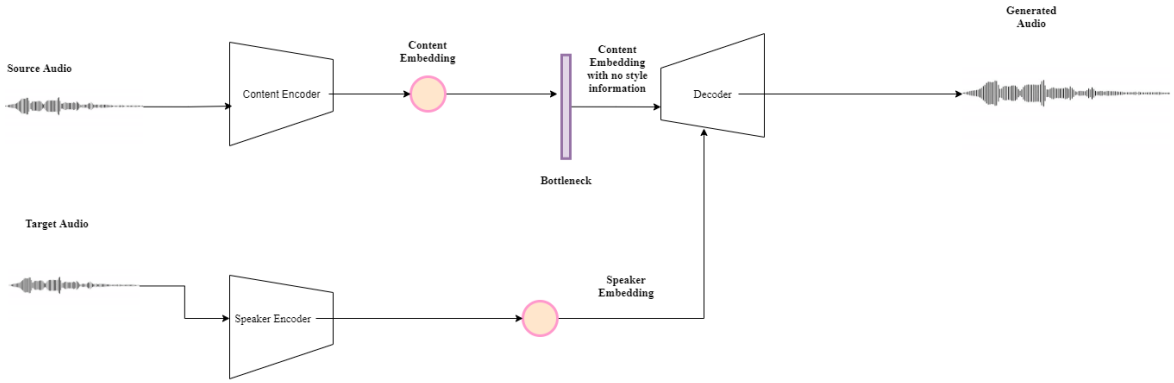

Figure 2.2: Architecture of AutoVC

When working with figures, you may use either `\linewidth` or `\textwidth` to define the width of your figure, depending on your layout requirements. Additionally, you have the option to specify the dimensions of the figure by explicitly setting the *width* or *height* in centimeters or other units.

When working with tables, the titles should be just **above** the table. Since tables cannot be divided between pages, they are usually best placed at the top of the page closest to their first reference. To achieve this correct "floating" positioning, use the **table** environment to wrap the table and its caption. The table's data should be placed

Table 2.1: A table LaTeX with sample table commands

Command	A Number	Comments
`\author`	100	Author
`\table`	300	For tables
`\table*`	400	For wider tables

Table 2.2: Sample complex table adapted from [5]. Use this to get a sense of how to create and format complex tables for your Capstone.

	Participant Perception		
	Fake	**Real**	**Undecided**
Experiment I	100%	0%	0%
Experiment II	90%	10%	0%
Experiment III	40%	20%	40%
Experiment IV	30%	70%	0%
Experiment V	70%	30%	0%
Experiment VI	90%	10%	0%
Experiment VII	40%	40%	20%
Experiment VIII	60%	40%	0%
Experiment IX	10%	20%	70%
Experiment X	20%	60%	20%
Experiment XI	30%	70%	0%
Experiment XII	20%	50%	30%

within the **tabular** environment to ensure proper alignment in rows and columns, including any necessary horizontal and vertical lines.

Apart from the tabular environment you can use **tabulax** for more complex tables.

Finally, number figures and tables according to the chapter they are in. For example, Figure 3.1: High-level system architecture or Table 4.1: Execution time of the algorithm for different problem sizes. However, if you are using this template it handles it for you but keep this in mind when editing in MS Word.

Figure captions and Table titles should use "sentence case" (i.e. only the 1st word and proper nouns need to start with a capital letter) rather than "title case" (i.e. all words starting with a capital letter)

- *Code and algorithm listings:* For code and algorithm listings, use `Courier 11pt` font. However, note that long code listings are typically not included in the main body of the report.

- *References:* Use the ACM referencing style. Ensure that both in-text citations and the reference list adhere to the specified style. The bibliography should be included in `main.tex` using the appropriate commands, positioned just before `\end{document}`. This ensures the proper formatting and placement of your references within the document. The commands ensuring this works as expected are:

```
\bibliographystyle{acm}
\begin{flushleft}
    \bibliography{references}
\end{flushleft}
```

  To do an in-text citation use the command `\cite{bibentry`—. Examples: [4], citing more than one bibentry in-text, [1, 5, 2]. All bib entires are placed in the file `references.bib`. If you do not know how to create bib entries you can use the website zoterobib.

- *Appendices:* If your work requires an appendix, include it before the `\end{document}` command in your source document. Begin the appendix by using the `\appendix` command. Keep in mind that in accordance with ACM formatting, sections within the appendix are lettered rather than numbered.

  An example Appendix is included for your perusal.

Chapter 3: Methodology

Chapter 4: Experiments and Results

Chapter 5: Conclusion and Future Work

References

[1] AHAMAD, A., ANAND, A., AND BHARGAVA, P. AccentDB: A Database of Non-Native English Accents to Assist Neural Speech Recognition. In *Proceedings of the 12th Language Resources and Evaluation Conference* (Marseille, France, May 2020), European Language Resources Association, pp. 5351–5358.

[2] ARIK, S. O., CHRZANOWSKI, M., COATES, A., DIAMOS, G., GIBIANSKY, A., KANG, Y., LI, X., MILLER, J., NG, A., RAIMAN, J., SENGUPTA, S., AND SHOEYBI, M. Deep voice: real-time neural text-to-speech. *arXiv:1702.07825 [cs]* (Mar. 2017). arXiv: 1702.07825.

[3] JIA, Y., ZHANG, Y., WEISS, R. J., WANG, Q., SHEN, J., REN, F., CHEN, Z., NGUYEN, P., PANG, R., MORENO, I. L., AND WU, Y. Transfer learning from speaker verification to multispeaker text-to-speech synthesis. *arXiv:1806.04558 [cs, eess]* (Jan. 2019). arXiv: 1806.04558.

[4] NGUYEN, T. T., NGUYEN, Q. V. H., NGUYEN, C. M., NGUYEN, D., NGUYEN, D. T., AND NAHAVANDI, S. Deep learning for deepfakes creation and detection: a survey. *arXiv:1909.11573 [cs, eess]* (Apr. 2021). arXiv: 1909.11573.

[5] YAMOAH, K. A., AND FUSEINI, H. Deepfake speech and automatic speaker verification systems in the African setting.

Appendices

A Capstone Requirements

A.1 CS Students

[1]

A.2 MIS Students

[2]

B To Dos

[4]