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Student M. Name

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Thesis Adviser:

Adviser M. Name, PhD
Electrical and Electronics Engineering Institute
University of the Philippines Diliman

Thesis Reader:

Reader M. Name, PhD
Electrical and Electronics Engineering Institute
University of the Philippines Diliman

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STUDENT M. NAME
Student Signature and Date over Name

This thesis, entitled **MANUSCRIPT TEMPLATE FOR THE NATIONAL GRADUATE SCHOOL OF ENGINEERING**, prepared and submitted by **STUDENT M. NAME**, in partial fulfilment of the requirements for the degree of **MASTER OF SCIENCE IN ELECTRICAL ENGINEERING** is hereby accepted.

ADVISER M. NAME, PHD
Thesis Adviser

Accepted as partial fulfilment of the requirements for the degree of **MASTER OF SCIENCE IN ELECTRICAL ENGINEERING**.

DIRECTOR M. NAME, PHD
NGSE Director

DEAN M. NAME, PHD
Dean

Acknowledgments

Thanks to my adviser, Adviser M. Name, PhD. Thanks to the panel members for their valuable feedback during the oral defense. Thanks to ABC Foundation for funding my studies. Thanks to the Filipino people for subsidizing my education. Thanks to my family.

Abstract of Thesis

Make a concise summary that will fit in half a page. Must answer the following:

1. What is the problem that I am solving and why does it matter?
2. What are the state-of-the-art (SOTA) solutions to this problem?
3. What is the gap in the current SOTA?
4. What is your idea to address this gap?
5. Why do you think your idea will work?
6. How will you execute your idea?
7. What is the empirical evidence that your idea works?
8. What can you conclude from the study that you have accomplished?

Table of Contents

List of Tables

List of Figures

1. Introduction

- At least 5 pages.
- Summary of the whole thesis. Use previous studies, diagrams, and illustrations to emphasize the motivation behind this thesis.
- Must answer the following:
    1. What is the problem that I am solving and why does it matter?
    2. What are the state-of-the-art (SOTA) solutions to this problem?
    3. What is the gap in the current SOTA?
    4. What is your idea to address this gap?
    5. Why do you think your idea will work?
    6. How will you execute your idea?
    7. What is the empirical evidence that your idea works?
    8. What can you conclude from the study that you have accomplished?
    9. What are the possible future works that will extend your study?
- List the roadmap to the rest of the manuscript.

Start Strong: For every chapter (except possibly the Problem Statement), make an introduction (2 or 3 paragraphs) on what the chapter is all about.

Stay Strong: Explain ideas in the simplest and most direct way that many people in your field can understand. If a certain topic is a bit specialized or hard to remember, make a concise introduction. Point the reader to a reference for further understanding. Each chapter should be complete or stand-alone and concise.

Finish Strong: At the end, make a summary (2 or 3 paragraphs) to re-emphasize the points discussed in the chapter.

1.1. Scope and Limitations

What is the scope of your work? What are its limitations?

1.2. Structure

This thesis is organized as follows. In Chapter 2, the discussion on the body of work contextualizes our approach. Chapter 3 discusses the problem statement of this thesis. In Chapter 4, the methodology is discussed in more detail. Chapter 5 contains the evaluation results, while Chapter 6 contains the analysis and discussion. The thesis is concluded in Chapter 7.

2. Related Work

- Expound #2 (*What are the state-of-the-art (SOTA) solutions to this problem?*) and #3 (*What is the gap in the current SOTA?*) by rigorously enumerating related works and analyzing these in the context of the problem that you are solving.
- Build a taxonomy or survey to narrow down the field of study of the problem and to limit the scope of your thesis. If there is a recent survey paper in your problem, use it. If none, use Google Scholar to build a tree diagram of related work.
- Build a table or graph with metrics to show what are available features and what are lacking in the current SOTA.
- Using the table/graph, identify the gap to show what do you intend to solve.
- Introduce the idea on how to solve this gap.

2.1. Chapter Summary

Start Strong: For every chapter (except possibly the Problem Statement), make an introduction (2 or 3 paragraphs) on what the chapter is all about.

Stay Strong: Explain ideas in the simplest and most direct way that many people in your field can understand. If a certain topic is a bit specialized or hard to remember, make a concise introduction. Point the reader to a reference for further understanding. Each chapter should be complete or stand-alone and concise.

Finish Strong: At the end, make a summary (2 or 3 paragraphs) to re-emphasize the points discussed in the chapter.

3. Problem Statement

- Following up from #3 (*What is the gap in the current SOTA?*), formalize the main problem and subproblems using a list.
- Use math models and diagrams to clearly show the problem and subproblems being addressed (*e.g.* prior work uses $P(\mathbf{y}|\mathbf{y}_{<t}, \mathbf{x})$ as the model, while we use $P(\mathbf{y}|\mathbf{y}_{\neq t}, \mathbf{x})$).

Start Strong: For every chapter (except possibly the Problem Statement), make an introduction (2 or 3 paragraphs) on what the chapter is all about.

Stay Strong: Explain ideas in the simplest and most direct way that many people in your field can understand. If a certain topic is a bit specialized or hard to remember, make a concise introduction. Point the reader to a reference for further understanding. Each chapter should be complete or stand-alone and concise.

Finish Strong: At the end, make a summary (2 or 3 paragraphs) to re-emphasize the points discussed in the chapter.

3.1. Objectives

The specific objectives of this thesis are:

1. Propose a new method X to solve problem Y.
2. Compare methods A, B, and C against our method X.

4. Methodology

- Expound #4 (*What is your idea to address this gap?*), #5 (*Why do you think your idea will work?*), and #10 (*Introduce the idea on how to solve this gap*).
- Propose a solution. Use math models, diagrams, and algorithms to formalize your method.
- Cite related literature of the building blocks used in the proposed method.
- Justify every decision in your proposed method (*e.g.* we used batch normalization to stabilize the training)

4.1. Style and Formatting

4.1.1. Mathematics

Please number all of your sections and displayed equations as in these examples:

$$E = m \cdot c^2 \tag{4.1}$$

and

$$v = a \cdot t. \tag{4.2}$$

It is important for readers to be able to refer to any particular equation. Just because you did not refer to it in the text does not mean some future reader might not need to refer to it. It is cumbersome to have to use circumlocutions like "the equation second from the top of page 3 column 1". (Note that the ruler will not be present in the final copy, so is not an alternative to equation numbers). All authors will benefit from reading Mermin's description of how to write mathematics: `http://www.pamitc.org/documents/mermin.pdf`.

4.1.2. Footnotes

Please use footnotes[1] sparingly. Indeed, try to avoid footnotes altogether and include necessary peripheral observations in the text (within parentheses, if you prefer, as in this

[1]This is what a footnote looks like. It often distracts the reader from the main flow of the argument.

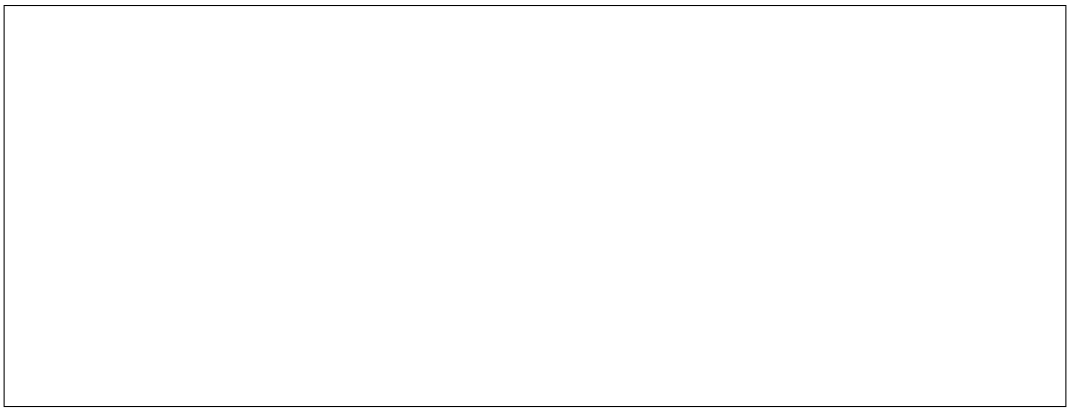


Figure 4.1. Example of caption. It is set in Roman so that mathematics (always set in Roman: $B \sin A = A \sin B$) may be included without an ugly clash.

sentence). If you wish to use a footnote, place it at the bottom of the page on which it is referenced. Use Times 10-point type, single-spaced.

4.1.3. Cross-references

For the benefit of author(s) and readers, please use the

```
\cref{...}
```

command for cross-referencing to figures, tables, equations, or sections. This will automatically insert the appropriate label alongside the cross-reference as in this example:

> To see how our method outperforms previous work, please see Fig. 4.1 and Tab. 4.1. It is also possible to refer to multiple targets as once, *e.g.* to Figs. 4.1 and 4.2a. You may also return to Sec. 4.1 or look at Eq. (4.2).

If you do not wish to abbreviate the label, for example at the beginning of the sentence, you can use the

```
\Cref{...}
```

command. Here is an example:

> Figure 4.1 is also quite important.

4.1.4. References

List and number all bibliographical references in 12-point Times, single-spaced, at the end of your thesis. To make a reference in the text, use the

Table 4.1. Results. Ours is better.

Method	Frobnability
Theirs	Frumpy
Yours	Frobbly
Ours	Makes one's heart Frob

```
\autocite{...}
```

command instead of plain `\cite{}`, for example [6]. Where appropriate, include page numbers and the name(s) of editors of referenced books. When you cite multiple papers at once, please make sure that you cite them in numerical order like this [1, 2, 4–6]. If you use the template as advised, this will be taken care of automatically.

4.1.5. Illustrations, graphs, and photographs

All graphics should be centered. In LaTeX, avoid using the `center` environment for this purpose, as this adds potentially unwanted whitespace. Instead use

```
\centering
```

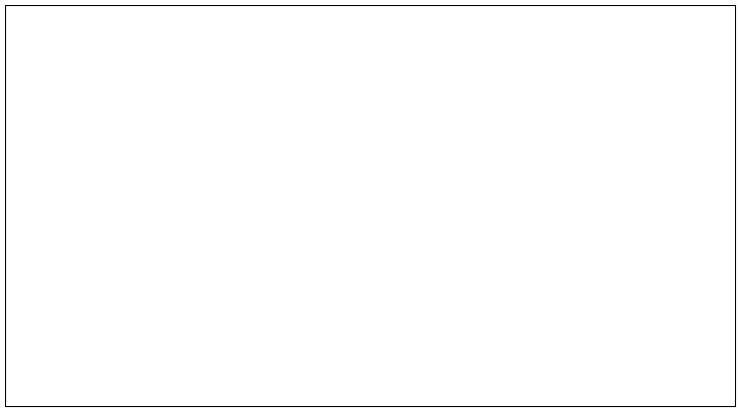
at the beginning of your figure. Please ensure that any point you wish to make is resolvable in a printed copy of the paper. Resize fonts in figures to match the font in the body text, and choose line widths that render effectively in print. Readers (and reviewers), even of an electronic copy, may choose to print your paper in order to read it. You cannot insist that they do otherwise, and therefore must not assume that they can zoom in to see tiny details on a graphic.

When placing figures in LaTeX, it's almost always best to use `\includegraphics`, and to specify the figure width as a multiple of the line width as in the example below

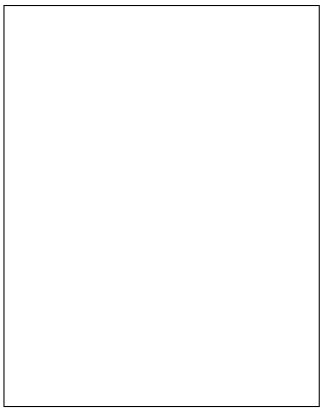
```
\usepackage{graphicx} ...
\includegraphics[width=0.8\linewidth]
                {myfile.pdf}
```

4.1.6. Color

If you use color in your plots, please keep in mind that a significant subset of reviewers and readers may have a color vision deficiency; red-green blindness is the most frequent kind. Hence avoid relying only on color as the discriminative feature in plots (such as red *vs.* green lines), but add a second discriminative feature to ease disambiguation.



(a) An example of a subfigure.



(b) Another subfigure.

Figure 4.2. Example of a short caption, which should be centered.

4.1.7. Miscellaneous

Compare the following:

`$conf_a$` $conf_a$

`$\mathit{conf}_a$` conf_a

See The TEXbook, p165.

The space after *e.g.*, meaning "for example", should not be a sentence-ending space. So *e.g.* is correct, *e.g.* is not. The provided `\eg` macro takes care of this.

When citing a multi-author paper, you may save space by using "et alia", shortened to "*et al.*" (not "*et. al.*" as "*et*" is a complete word). If you use the `\etal` macro provided, then you need not worry about double periods when used at the end of a sentence as in Alpher *et al*. However, use it only when there are three or more authors. Thus, the following is correct: "Frobnication has been trendy lately. It was introduced by Alpher [1], and subsequently developed by Alpher and Fotheringham-Smythe [2], and Alpher *et al*. [3]."

This is incorrect: "... subsequently developed by Alpher *et al*. [2] ..." because reference [2] has just two authors.

4.2. Chapter Summary

Start Strong: For every chapter (except possibly the Problem Statement), make an introduction (2 or 3 paragraphs) on what the chapter is all about.

Stay Strong: Explain ideas in the simplest and most direct way that many people in your field can understand. If a certain topic is a bit specialized or hard to remember, make a concise introduction. Point the reader to a reference for further understanding. Each chapter should be complete or stand-alone and concise.

Finish Strong: At the end, make a summary (2 or 3 paragraphs) to re-emphasize the points discussed in the chapter.

5. Results

- Expound #6 (*How will you execute your idea?*) and #7 (*What is the empirical evidence that your idea works?*).
- Make a complete description of your experimental setup (*e.g.* dataset, train and test/validation configurations, hardware configurations, software framework).
- Describe the metrics (performance measures) that are used to benchmark the task. These are the same metrics in the review of lit. Sometimes, you may need to introduce new metrics. However, you have to have a strong justification on why there is a need for a new metric and it is a good measure of performance in a task.
- Make sure the metrics are comprehensive (*e.g.* include model parameter count, FLOPS, inference time, memory use, energy consumption, *etc.*).
- Use graphs and tables to summarize the quantitative results from your proposed method vs SOTA.
- Illustrate sample outputs to qualitative describe the results of your experiments.

5.1. Chapter Summary

Start Strong: For every chapter (except possibly the Problem Statement), make an introduction (2 or 3 paragraphs) on what the chapter is all about.

Stay Strong: Explain ideas in the simplest and most direct way that many people in your field can understand. If a certain topic is a bit specialized or hard to remember, make a concise introduction. Point the reader to a reference for further understanding. Each chapter should be complete or stand-alone and concise.

Finish Strong: At the end, make a summary (2 or 3 paragraphs) to re-emphasize the points discussed in the chapter.

6. Analysis and Discussion

- As a follow up of #7 (*What is the empirical evidence that your idea works?*), given the experimental results, make an in-depth analysis and discussion to argue and justify that your proposed method works.
- Use further evidences (*e.g.* attention maps) to emphasize the strong points of your method.
- Make an ablation study (*e.g.* what if we vary the depth of the network, what if we introduce data corruption, *etc.*) to further show strong/weak points of your proposed method.
- No method is perfect. What are the failure cases of your method (*e.g.* method does not work on rotated text). Explain why your method fails in these cases.

6.1. Chapter Summary

Start Strong: For every chapter (except possibly the Problem Statement), make an introduction (2 or 3 paragraphs) on what the chapter is all about.

Stay Strong: Explain ideas in the simplest and most direct way that many people in your field can understand. If a certain topic is a bit specialized or hard to remember, make a concise introduction. Point the reader to a reference for further understanding. Each chapter should be complete or stand-alone and concise.

Finish Strong: At the end, make a summary (2 or 3 paragraphs) to re-emphasize the points discussed in the chapter.

7. Conclusion

- Expound #8 (*What can you conclude from the study that you have accomplished?*) and #9 (*What are the possible future works that will extend your study?*).
- Please summarize all important points of your thesis (*i.e.* from the beginning to end).
- What are the future unsolved issues in your thesis?
- How other researchers can take off from your outputs?

7.1. Limitations and Future Work

What are the limitations of your work? Given these, what are possible future research directions?

Bibliography

[1] F. Alpher, "Frobnication," *IEEE TPAMI*, vol. 12, no. 1, pp. 234–778, 2002 (cit. on pp. 7, 8).

[2] F. Alpher and F. Fotheringham-Smythe, "Frobnication revisited," *Journal of Foo*, vol. 13, no. 1, pp. 234–778, 2003 (cit. on pp. 7, 8).

[3] F. Alpher, F. Fotheringham-Smythe, and F. Gamow, "Can a machine frobnicate?" *Journal of Foo*, vol. 14, no. 1, pp. 234–778, 2004 (cit. on p. 8).

[4] F. Alpher and F. Gamow, "Can a computer frobnicate?" In *CVPR*, 2005, pp. 234–778 (cit. on p. 7).

[5] F. LastName, *Frobnication tutorial*, Supplied as supplemental material `tr`.pdf, 2014 (cit. on p. 7).

[6] F. LastName, *The frobnicatable foo filter*, Face and Gesture submission ID 324. Supplied as supplemental material `fg`324.pdf, 2014 (cit. on p. 7).

A. Additional Results and Discussion

In this appendix, we present and discuss additional results.

B. Background Material

In this appendix, we discuss some background material and show the proof to our method X.