

[TYPE THESIS TITLE]

An Undergraduate Research Scholars Thesis

by

[TYPE NAME OF INDIVIDUAL OR TEAM MEMBER 1 NAME¹, TEAM MEMBER 2
NAME², AND TEAM MEMBER 3 NAME³, ...]

Submitted to the LAUNCH: Undergraduate Research office at
Texas A&M University
in partial fulfillment of the requirements for the designation as an

UNDERGRADUATE RESEARCH SCHOLAR

Approved by

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May 2023

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ABSTRACT

[Type Thesis Title Using Title Case]

[Type Name of Individual or Team Member 1 Name¹, Team Member 2 Name², and Team Member 3 Name³ ...]

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[The Dedication page:

- Is optional
- Must be placed directly after the Abstract Page (page 1)
- Limited to one page (no more than a few sentences)
- The same font size and style as the other text in the thesis (however, if you prefer, your text can be centered and italicized)
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 - Identifies the person or group (can be simple or use formal titles)
 - Varies in style from formal to informal
 - May include an explanation of why you chose the person or group]

SAMPLE DEDICATION TEXT (MODIFY AS NEEDED)

[To our families, instructors, and peers who supported us throughout the research process.]

ACKNOWLEDGMENTS

[The Acknowledgments page:

- Is required
- Must be placed directly after the Dedication page (if you do not have a Dedication page, the Acknowledgements page goes directly after the Abstract page)
- Must state whether or not you had contributors and/or funding
- Can be 1-2 pages
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Contributors

[I would like to thank my faculty advisor, Dr. [XXXX], and my [XXXX], [XXXX], for their guidance and support throughout the course of this research.

Thanks also go to my friends and colleagues and the department faculty and staff for making my time at Texas A&M University a great experience.

Finally, thanks to my [XXXX] for their encouragement and to my [XXXX] for her/his/their patience and love.

The [DATA/MATERIALS/etc.] analyzed/used for [MANUSCRIPT TITLE] were provided by [NAME – can be the names of other faculty, graduate students, lab, lab members, teammates, etc. who contributed to specific aspects of the project]. The analyses depicted in [MANUSCRIPT TITLE] were conducted in part by [NAME – can be the name of a department, lab, research group, etc.] and were published in [YEAR] [OR and these data are unpublished].

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[Undergraduate research was supported by [XXXX] at Texas A&M University and an additional research fellowship from [XXXX].

This work was also made possible in part by [FUNDING SOURCE] under Grant Number [INSERT GRANT NUMBER]. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the [NAME OF AWARDED OFFICE]. NOTE: If you received no funding, state that here instead.]

NOMENCLATURE

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- Must be placed directly after the Acknowledgements page
- Can be a list of identified acronyms, abbreviations, symbols, definitions, terms, etc.
- Can be 1-2 pages]

SAMPLE NOMENCLATURE TEXT (MODIFY AS NEEDED)

[B/CS	Bryan and College Station
TAMU	Texas A&M University
HSUS	Humane Society of the United States
P	Pressure
T	Time
FFT	Fast Fourier Transform
TVA	Tennessee Valley Authority
TxDOT	Texas Department of Transportation
O&M	Eller Oceanography and Meteorology Building
L^1	Space of absolutely Lebesgue integrable functions; i.e., $\int f < \infty$
L^2	Space of square-Lebesgue-integrable functions, i.e., $\int f ^2 < \infty$
PC(S)	Space of piecewise-continuous functions on S]

1. INTRODUCTION

Paragraph one starts here. If you want to break up your paragraphs into more sections, you can use first order, second order or third order subheadings.

1.1 First-order Subheading (optional, remove/add as needed)

Directly above is a first order subheading. Note that first order subheadings are bold. If you feel that the information under a first order subheading needs to be split into more sections, use additional subheadings. Take note that all first order subheadings must be included in the Table of Contents. Second and third order subheadings are NOT to be included in the Table of Contents.*

1.1.1 Second-order Subheading (remove/add as needed)

This information still pertains to your first order subheading. If you need to break up content even further, you can use one last level of subheadings, called third order subheadings.

1.1.1.1 Third order subheading (remove/add as needed)

Note that third order subheadings are regular. This information still pertains to your first order subheading, but is directly related to your second order subheading.

This subsection tests the usage of references. The book [1] is referred in this way. Actually, the option is available for you to change the default way of how references appears. The default and most commonly used option [2] is displayed here [3].

Unrelated citations are referred here just for the sake of testing the reference section only [?]. If you find that the reference [?] has more items than you need [4], question marks will show up in place of a reference handle, like these [?].

1.2 Another First-order Subheading (remove/add as needed)

[Type content here.]

*Yes, this is how you do a footnote in LaTeX.

2. METHODS

Paragraph one starts here. If you want to break up your paragraphs into more sections, you can use first order, second order or third order subheadings (see the examples in the previous section). Remember, only first order subheadings can be included in the table of contents. Examples of how to format figures, tables, equations, and algorithms are in this chapter.

2.1 Methods Subheading 1 (remove/add as needed)

The figure below (**Figure 1**) is taken from R. While there are packages available to import graphics from R, MATLAB, and similar software, it is probably best to export plots generated by these programs as a PNG file, save it in the **figures** folder, and then import it via the *includegraphics* command. (For more information on inserting images, check out [this helpful link](#).)

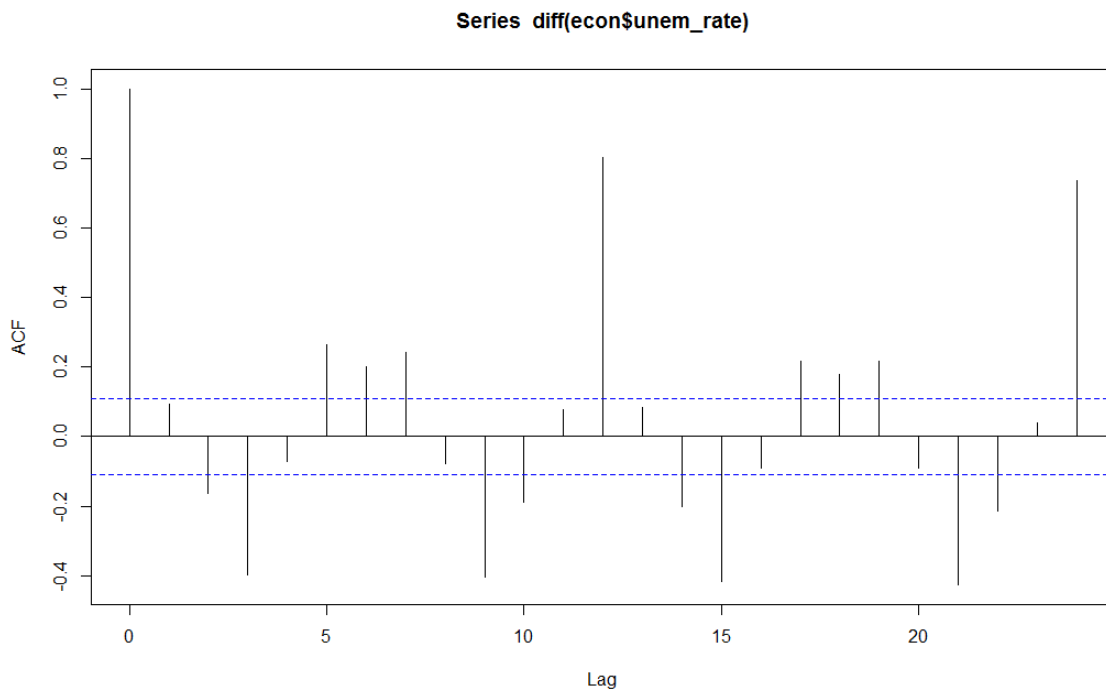


Figure 1: The autocorrelation function (ACF) of the differenced unemployment series. Seasonal adjustments may be needed.

You must scale the figures so that they fit within the prescribed margins. All the figures included in this document have been scaled. It is best to use PNG and JPEG files for figures.

2.2 Methods Subheading 2 (remove/add as needed)

Here is an example of a properly formatted table and table title (**Table 1**):

Table 1: Example of a properly formatted table and title

Heading 1	Heading 2	Heading 3	Heading 4
Content example.	Content example.	Content example.	Content example.
Content example.	Content example.	Content example.	Content example.

Be sure to reference all figures and tables in your body text within one page of where the figure/table appears.

2.3 Methods Subheading 3 (remove/add as needed)

The following format is used to display equations:

$$y = c_1 \cos(t) + c_2 \sin(t) \tag{1}$$

$$e^{it} = \cos(t) + i \sin(t) \tag{2}$$

Equation 1 is the general solution to the differential equation $y'' + y = 0$. In the source code, the *ref* command allows you to refer to an equation by a label you created. References must be made after the equation has been created; attempting to refer to an equation before it is defined results in a question mark placeholder. Some more sample equations are below. Notice the first set below is not numbered (this is usually done when you are writing a mathematical proof or solution, where a series of equations are used. These equations should not be numbered).

$$\begin{aligned}
\log(x^n) &= \log(x \cdot x \cdot \dots \cdot x) \\
&= \log x + \log x + \dots + \log x \\
&= n \log x
\end{aligned}$$

$$X^T X \mathbf{u} = X^T \mathbf{y} \tag{3}$$

$$u(x, t) = \int_{-\infty}^{\infty} G(x, \tau) \exp\left(-\frac{(t - \tau)^2}{4kt}\right) d\tau \tag{4}$$

$$\mathcal{L}(f) = \int_0^{\infty} e^{-st} f(t) dt \tag{5}$$

$$\mathcal{F}(f) = \frac{1}{2\pi} \int_{-\infty}^{\infty} e^{i\omega x} f(x) dx \tag{6}$$

You can use labels to refer to equations you create. Equation 6 is the **Laplace transform** used extensively in differential equations. Equation 3 is the matrix representation of the **normal equations** used in least-squares regression.

To have equations without labels appearing the right margin, simply add an asterisk to the name of the environment (equation, align, etc.) when making the declaration.

To write pseudocodes, we will use the *algorithm* package. Here is an example of a pseudocode below:

Algorithm 1 An algorithm with caption

Require: $n \geq 0$

Ensure: $y = x^n$

$y \leftarrow 1$

$X \leftarrow x$

$N \leftarrow n$

while $N \neq 0$ **do**

if N is even **then**

$X \leftarrow X \times X$

$N \leftarrow \frac{N}{2}$

else if N is odd **then**

$y \leftarrow y \times X$

$N \leftarrow N - 1$

end if

end while

▷ This is a comment

3. RESULTS

Paragraph one starts here. If you want to break up your paragraphs into more sections, you can use first order, second order or third order subheadings.

Feel free to add more Chapters as necessary, but don't forget to include the Chapter Headings as seen at the top of this page. Also remember that all new Chapters should begin at the top of their own pages and be included in the Table of Contents.

3.1 Results Subheading 1 (remove/add as needed)

If you need to enumerate some ideas, the *enumerate* environment can be used to generate an ordered list. The following example illustrates how to do so:

1. This is item number one.
2. This is item number two.
3. This is item number three.
4. This is item number four.

3.2 Results Subheading 2 (remove/add as needed)

Here is another example of a figure in this section (**Figure 2**). Make sure you always reference your figures in the body text.

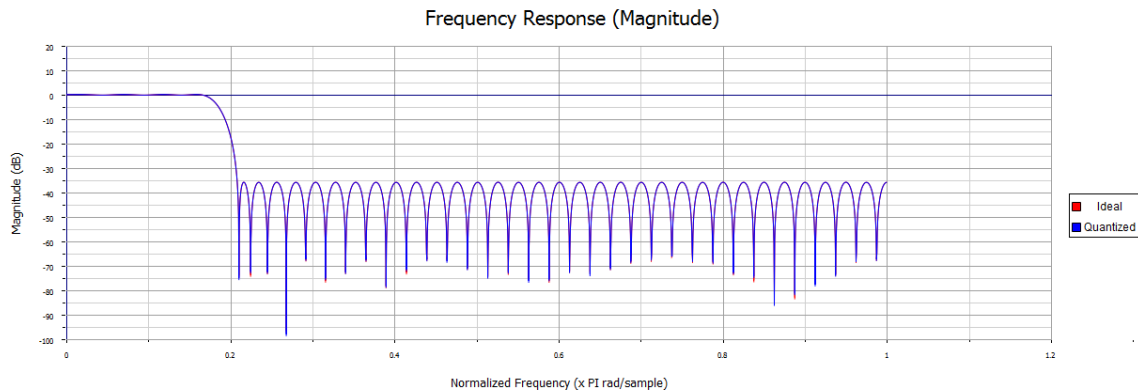


Figure 2: A low pass filter design.

4. CONCLUSION

4.1 Conclusion Subheading

Paragraph one starts here. If you want to break up your paragraphs into more sections, you can use first order, second order or third order subheadings.

REFERENCES

- [1] N. Carothers, *Real Analysis*. Cambridge University Press, 2000.
- [2] A. Einstein, “Zur Elektrodynamik bewegter Körper. (German) [On the electrodynamics of moving bodies],” *Annalen der Physik*, vol. 322, no. 10, pp. 891–921, 1905.
- [3] C. F. Barnes and R. L. Frost, “Residual vector quantizers with jointly optimized code books,” *Advances in Electronics and Electron Physics*, vol. 84, pp. 1–59, 1992.
- [4] G. T. Gilbert and R. L. Hatcher, “Wagering in final jeopardy!,” *Mathematics Magazine*, vol. 67, pp. 268–277, October 1994.

APPENDIX: TITLE

[The Appendix section:

- Is optional
- Must be placed directly after the References section
- Can be a collection of large data sets, images, and/or tables that would interrupt a significant portion of your writing
- Can be a single Appendix (label as Appendix: Title)
- Can include multiple Appendices (label as Appendix A: Title, Appendix B: Title, etc.)
- Label figures, tables, and equations consecutively starting with A.1, A.2, etc. For additional Appendices (B, C, etc.), label figures, tables, and equations as B.1, B.2, etc.
- Can be as many pages as needed]

[Type content here.]

Table A.1: Call this table A.1.

Heading 1	Heading 2	Heading 3	Heading 4
Content example.	Content example.	Content example.	Content example.
Content example.	Content example.	Content example.	Content example.

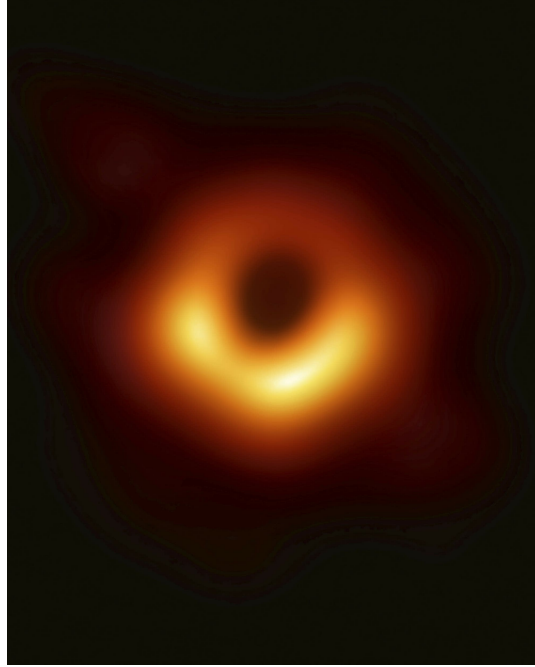


Figure A.1: The first recorded image of a black hole

$$R_{\mu\nu} - \frac{1}{2}g_{\mu\nu} R + g_{\mu\nu}\Lambda = \frac{8\pi G}{c^4}T_{\mu\nu} \quad (\text{A.1})$$