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# **HELMET COMPLIANCE DETECTION USING COMPUTER VISION FOR SAFER ROADS**

A Thesis Project  
presented to the Faculty of  
College of Computer Studies

In Partial Fulfillment of the Requirements  
for the degree Bachelor of Science in Computer Science

By  
Dela Justa, Aina Mae F.  
Epres, Caren Joy L.  
Matubis, Maria Angela N.

May 2025

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## **APPROVAL PAGE**

In partial fulfillment of the requirements for the degree of Bachelor of Science in Computer Science, this research entitled **HELMET COMPLIANCE DETECTION USING COMPUTER VISION FOR SAFER ROADS** prepared and submitted by **Dela Justa, Aina Mae F., Epres, Caren Joy L., Matubis, Maria Angela N.,** , has been examined and is recommended for approval and acceptance.

**KAELA MARIE N. FORTUNO, MIT**

Adviser

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This research project entitled, **HELMET COMPLIANCE DETECTION USING COMPUTER VISION FOR SAFER ROADS**, in partial fulfillment of the requirements for the degree of Bachelor of Science in Computer Science has been examined and is recommended for acceptance and approval for ORAL EXAMINATION.

## **RESEARCH COMMITTEE:**

**TIFFANY LYN O. PANDES, MSC**

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Member

**IAN P. BENITEZ, DIT**

Chairman

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## **PANEL OF EXAMINERS**

**APPROVED** by the Committee on Oral Examination with a grade of **PASSED** on May 2025.

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**ACCEPTED** and **APPROVED** in partial fulfillment of the requirements in Bachelor of Science in Computer Science with a grade of 90.

**ROSEL O. ONESA, MIT**

Dean, College of Computer Studies

Date:\_\_\_\_\_

## **DEDICATION**

Ad Majorem Dei Gloriam

## ACKNOWLEDGMENTS

I would like to thank the members of my thesis committee for their help in preparation of this work – Niles Caulder, without whom I would have been doomed to never complete it, Kimiyo Hoshi, who helped to shed new light on many of my ideas, Pamela Isley, with whom I often disagree but who inspires me to be better, Raymond Palmer, who had no small part to play in the formation of the idea, and Kent Nelson, who always had golden advice.

Special thanks are due to the friends and colleagues who made this work possible. Jimmy Olsen and Pete Ross were invaluable both as friends and as sounding boards for some of my more outlandish ideas. Jack Knight, who I met only briefly, was a major influence, and I'm glad we were able to help each other.

The author gratefully acknowledges the support for this work offered by S.T.A.R. Laboratories under grant award number 3X29YZ4A, and by the Theodore S. Kord Fellowship. Any views and conclusions contained herein are those of the author, and do not necessarily represent the official positions, express or implied, of the funders.

## ABSTRACT

<b>Title:</b>	Helmet Compliance Detection Using Computer Vision for Safer Roads
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<b>Number of Pages:</b>	??
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<b>Degree Conferred:</b>	Bachelor of Science in Computer Science
<b>Keywords:</b>	amet, consectetur, adipisci velit

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## CHAPTER 1

### INTRODUCTION

#### Background of the Problem

It is common knowledge that the star closest to Earth is the Sun, and also that the Sun is yellow. It is this yellow sunlight which is interesting for some of its properties [2] [3]. For instance, plants, algae, and cyanobacteria convert this light into energy via photosynthesis.

In ?? is a photo of a galaxy which contains many stars.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad (1.1)$$



Figure 1: **Barred spiral galaxy NGC 1300**

??

The stars in the sky are of particular interest to the aptly named S.T.A.R. Labs, which in many recent experiments has shown promising results in converting this energy in a non-photoelectric sense into usable energy [4]. Interestingly, Scientific and Technological

Advanced Research Laboratories (S.T.A.R. Labs) has theorized that the famous superhero known as “Superman” converts the light from our sun, which grants his fantastic abilities. There are many methods in industry for converting the sun’s energy (of about  $1000 \text{ W/m}^2$ ) into electrical energy. Some of these are highlighted in ?? [5].

Table 1  
**This is a table**

installation	type	capacity (GW)	location
Longyangxia Dam	photovoltaic	0.85	China
Gansu Wind Farm	wind	6	China
Sihwa Lake	tidal	0.254	South Korea

### **Statement of the Problem**

Enter the statement of the problem here. To cite a study add a bib entry in the references.bib, then use this code [1] to cite the study.

### **Objectives of the Study**

#### ***General Objective***

Enter your General Objective here.

#### ***Specific Objectives***

More Specifically, this study aims to:

1. To write this research paper
2. To present it in the title defense.

### **Significance of the Study**

Write your Significance of the study here.

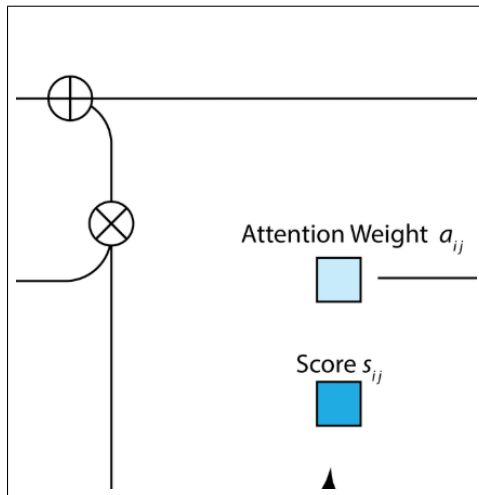
## Scope and Limitation

State the scope and limitation of your study here.

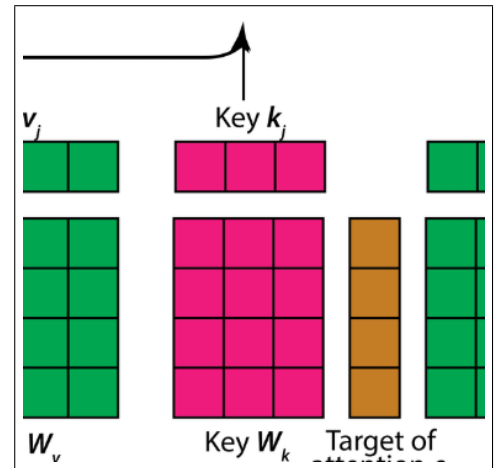
## Project Dictionary

The Project Dictionary contains the technical terms that defined the conceptual and operation of this study:

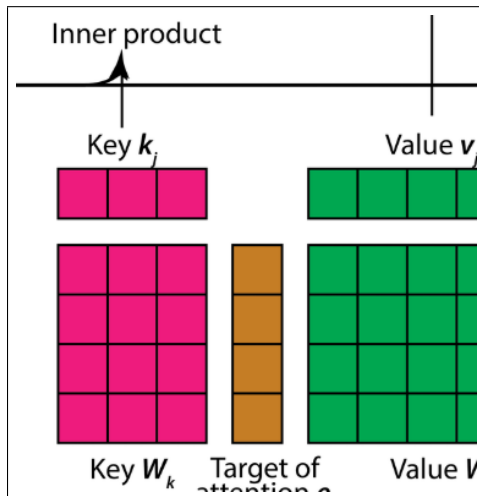
- **Convolutional Neural Network (CNN, or ConvNet).** is a class of artificial neural network, most commonly applied to analyze visual imagery. They are also known as shift invariant or space invariant artificial neural networks (SIANN), based on the shared-weight architecture of the convolution kernels or filters that slide along input features and provide translation equivariant responses known as feature maps.
- **Digital image processing** is the use of a digital computer to process digital images through an algorithm



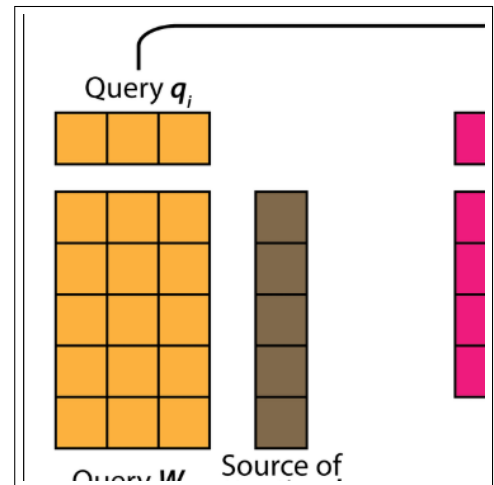
(a) Caption for subfigure a



(b) Caption for subfigure b



(c) Caption for subfigure c



(d) Caption for subfigure d

Figure 2: Main caption for the entire figure showcasing four different aspects.

This is sample in-text citation of ?? and ??.

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## Notes

- [1] [n. d.] Biblatex - How to use biber. Retrieved Feb. 16, 2022 from <https://tex.stackexchange.com/questions/26516/how-to-use-biber>.
- [2] Joseph Jessie S. Oñate and Marianne Ang-Tolentino. 2021. Exploring RAU-net for semantic segmentation of Philippines satellite images in identification of building density. en. *International Journal of Remote Sensing*, (Nov. 2021), 1–19. DOI: 10.1080/01431161.2021.1986239.
- [3] Gregory D Scholes, Graham R Fleming, Alexandra Olaya-Castro, and Rienk Van Grondelle. 2011. Lessons from nature about solar light harvesting. *Nature chemistry*, 3, 10, 763. doi:10.1038/nchem.1145.
- [4] dssdsd ssdsdsd dssdsd. 2012. *Solid Waste Management and Flooding in Nabua*. Ph.D. Dissertation.
- [5] [n. d.] Techopedia: Educating IT Professionals To Make Smarter Decisions. (). Retrieved Jan. 24, 2023 from <https://www.techopedia.com/>.

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## CHAPTER 2

### RELATED LITERATURE AND STUDIES

The process of data collection began with analysis of the physical principles underlying optical light emission. For illustration purposes, see ??.

#### **Review of Related Literature and Studies**

Depending on the energy of a photon, it may be referred to as “light” (in the case of optical photons) or as something else – for example, a gamma ray. By convention, there are many names for these particles Allen and West [2019].

#### ***Low-energy photons***

The lowest energy electromagnetic radiation is carried by radio waves.

#### ***Intermediate-energy photons***

These include several types of radiation, including the usually-harmful.

#### ***Microwaves***

Microwaves have wavelengths on the order of  $1 \times 10^{-2}$  m, or a few cm.

#### ***Visible light***

Visible light is that which is detectable by the human eye, with wavelengths about 380 nm to 750 nm.

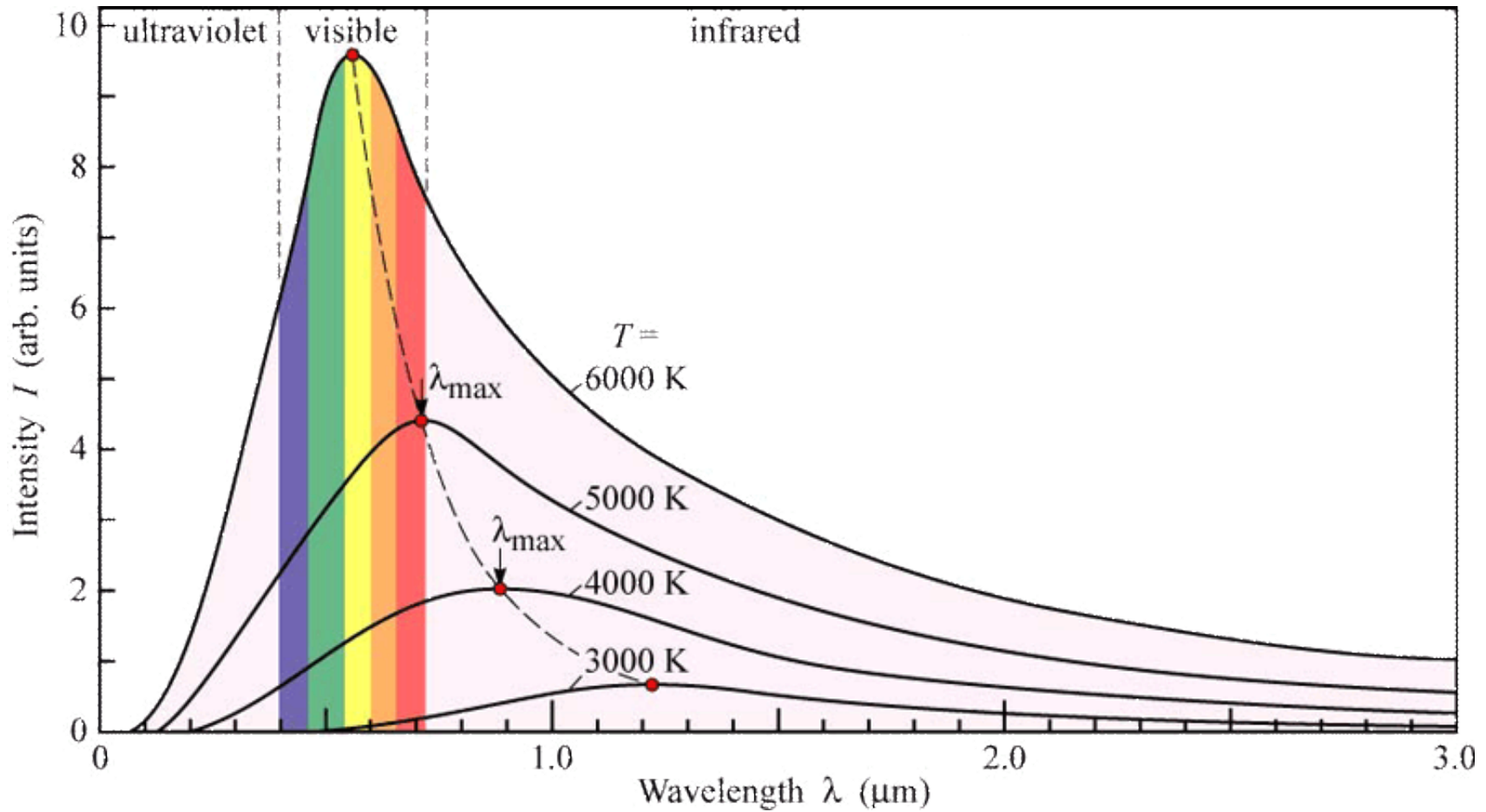


Figure 3: Spectra of black-body radiation at various temperatures, according to Wien's displacement law [1].





**Figure 4: Barred spiral galaxy NGC 1300 photographed by Hubble telescope. While the galaxy in the photo is not our sun, it does emit light, much like our sun. Image credit: NASA.**

## Notes

- [1] Milton Abramowitz and Irene A. Stegun. 1964. *Handbook of Mathematical Functions with Formulas, Graphs, and Mathematical Tables*. (ninth Dover printing, tenth GPO printing ed.). Dover, New York City.
- [2] Barry Allen and Wally West. 2019. Attosecond-length perception of events toward truly sustainable energy. eng. *Journal of Ultrafast Physics*, 42, 1, 43–45.

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## CHAPTER 3

### METHODOLOGY



**Figure 5: Barred spiral galaxy NGC 1300 photographed by Hubble telescope. While the galaxy in the photo is not our sun, it does emit light, much like our sun. Image credit: NASA.**

## **CHAPTER 4**

### **RESULTS AND DISCUSSION**



**Figure 6: Barred spiral galaxy NGC 1300 photographed by Hubble telescope. While the galaxy in the photo is not our sun, it does emit light, much like our sun. Image credit: NASA.**

## **CHAPTER 5**

### **CONCLUSION**



**Figure 7: Barred spiral galaxy NGC 1300 photographed by Hubble telescope. While the galaxy in the photo is not our sun, it does emit light, much like our sun. Image credit: NASA.**

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## **APPENDICES**

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**APPENDIX A**  
**LANGUAGE EDITING CERTIFICATION**

This is to certify that the undersigned has reviewed and went through all the pages of the  
Bachelor of Science in Computer Science thesis manuscript titled  
**”Helmet Compliance Detection Using Computer Vision”**  
of **Dela Justa, Aina Mae F., Epres, Caren Joy L., Matubis, Maria Angela N.**, as  
against the set of structural rules that govern research writing in accord with the  
composition of sentences, phrases, and words in the English language.

**JUAN DE LA CRUZ**

*Language Editor*

Date:\_\_\_\_\_



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**APPENDIX B**  
**SECRETARY'S CERTIFICATION**

This is to certify that the undersigned has provided accurate recommendations, suggestions, and comments unanimously agreed and approved by the panel of examiners during the oral examination of the thesis titled

**"ENTER YOUR TITLE HERE"**

prepared and submitted by **AuthorName1, AuthorName2, AuthorName3**, and that the same have not been amended, modified or obliterated.

**MS. MARIA DAISY R. BELARDO**

*Secretary*

Date:\_\_\_\_\_

## **APPENDIX C**

### **JOINT AFFIDAVIT OF UNDERTAKING (PLAGIARISM)**

#### **JOINT AFFIDAVIT OF UNDERTAKING**

## VITA



- **Joseph Jessie S. Oñate** is a faculty member of the College of Computer Studies. He finished his Master of Science in Computer Science degree at Ateneo de Naga University. His research interests focused on Intelligent Systems, Algorithm and Complexity, Web Technologies, Computer Vision, and Graphics.



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