ECE 471: Computer Vision
Project Deliverable: Final Project Report and Code

Revised: Final Submission: April 08, 11:59pm
Course weight: 20% of final mark

January 31, 2022

Abstract

Final report guidelines for the group course project worth 20% of your final mark. You are to implement your solution to the Duck Hunt Computer Vision Challenge. The implementation will be evaluated against the provided `ece471_duckhunt` python module.

The report **must demonstrate** that you have a good understanding of the strengths and weaknesses of your implementation and analytic skills regarding your results and how they informed further development. The minimum page length is **6 pages**, not including references. There is no maximum page length.

Your project must be written in `Python 3.7`. You can implement your solution in Google Colab or using a `virtualenv` environment with the `pip` package manager. Instructions on using `virtualenv` and `pip` are posted on Brightspace under "Final Project".

<div style="text-align: center; color: red;">

Instructions are provided first for a reason.
Please read the instructions carefully.

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1 Expected Learning Outcomes

The goals of the final project are manifold:

- Provide an opportunity to solve a constrained computer vision problem (Duck Hunt Challenge);

- Experience data collection from a non-deterministic source;

- Experience implementing and debugging an computer vision problem in Python;

- Experience designing and analyzing experiments;

- Provide an opportunity to write an technical report/white paper;

Details regarding the Duck Hunt Python module and API are posted separately.

2   Report Evaluation

Your final projects will be evaluated based on:

- The report is well structured and the ideas have a logical flow;

- Clear and detailed descriptions (no vague language, correct computer vision terminology/language);

- Appropriate use of figures, tables, diagrams, equations, etc. All should be referenced at least once in the report;

- All references are included, and material is properly cited;

- Penalties will be applied for poor grammar and spelling;

- All necessary code is included and credit to third-party code is provided. Code must run without error and **reported results are reproducible**;

- All code must be in python (excluding scripts like bash).;

Review the guidelines for more detail on what key elements each section should include or address. Refer to Fig 1 for the detailed marking rubric.

3   Instructions

3.1   Submission Package

Your submission will include:

- A **PDF copy** of your final report;

- A link to your public GitHub with your source code, documented with comments for clarity. The licenses for any open-source or third-party software used should be included.

- `requirements.txt` with required modules;

NOTE: No marking will occur on code quality. However, it must run without error and produce the results reported in the paper.

3.2   Demo

All groups will demonstrate their code in action during the last week of classes (week of April 04). This is not an oral report or presentation. Logistic details will be provided closer to the demo week.

3.3   Third-Party Software

You are allowed to use third-party software in this project. **Clearly** indicate where third-party software is used in both the code *and* your final report (i.e. footnote the source). Include a `licenses` folder with all the licenses from third-party software (if one is provided). If you are using a deep learning approach, you may only use **PyTorch or Tensorflow/Keras**.

3.4 Report Format

Reports will be submitted in PDF format. Any other format will **not** be accepted without prior authorization. You will be using the BMVC single column conference template. Both Microsoft Word docx and LaTeX versions are available.

4 Guidelines

4.1 Sections

This section outlines the requirements for the final report. These sections do not need to be followed exactly, but is meant to provide guidance. Your proposal should consist the following sections: Introduction/Overview, Implemented Approach, Experiments & Evaluation, Conclusion, and References. **Make sure you cite all your references.** Missing citations, code attributions, or licenses for open source software will be considered academic dishonesty.

4.2 Title & Abstract

Your title page should include all members of your group, but V# and emails are not required. Include a small abstract that details the approach you implemented.

4.3 Introduction

This section gives a description of the *problem domain* you are solving (Duck-Hunt Computer Vision Challenge). Your introduction should include details on what is difficult about the challenge. Introduce the main methodologies (i.e. motion, color, etc.) you will be using to solve the challenge. **Reminder that you are not allowed to use reinforcement learning algorithms.**

4.4 Implemented Approach

This section should describe **in detail** the implemented approach of your source paper. In this section, you need to demonstrate that you understand the implemented/used algorithm(s). This includes the rationale beyond *why* you chose to use these algorithm(s).

Avoid vague statements and direct quotations to original authors. **Describe and explain the approach as if it is your own, but highlight areas where you deviated from the original paper(s).**

Include all mathematical equations that are used by your approach; even those not implemented directly by you (i.e. third-party software). All equations should have all variables explained. Highlight areas that were ambiguous in the source paper(s), and your solutions. Also highlight any deviations and/or improvements to the source paper(s). Without looking at your project code or third-party documentation, I should know exactly how the algorithm works.

Make use of figures, pseudo-code, diagrams, etc to to help describe your algorithm. All figures, code, diagrams and equations should be labelled. Refer to the template formatting guide for examples. **Do NOT include actual code in your final report. You may include code segments in an appendix.**

4.5　Experiments & Evaluation

This section should describe in detail the experiments performed to analyze and evaluate your implementation. In this section, you need to demonstrate your analytic skills by interpreting the results, and how they guided further development. Make sure you are answering the key question **why**, when discussing results. **Results reported as your own should be obtainable by running your submitted final code. Results produced by third-party code must be properly cited with a link to the source code.** In the end, I should have a clear understanding of the strengths and weaknesses of the implemented approach.

Your evaluation should include quantitative and qualitative, when applicable, to justify your analysis. I am interested in seeing **rather a thorough evaluation of the algorithm** and the **ingenuity of your approach**. Your discussion should demonstrate you understand *both why the method works, or why it does not.*

4.6　Conclusion

This section should conclude your report by giving a brief description of the problem domain. Briefly reiterate the approach implemented, and highlight key or interesting results. End with your final conclusion regarding your implementation.

4.7　References

All references must be included and be in the IEEE citation format. I recommend using LaTex as the formatting will be done automatically for you when using Bibtex.

Reminder, `ieeexplore` is *not* a conference or journal.

Element	Excellent	Average	Poor	Points	
Overall Content 15%	Content is thorough, accurate and supported by cited literature or experimental results. There is no redundancies or unnecessary information. Shows ability to analyze and summarize essential information and experimentations. The report is appropriate number of words. 1 5 1 3 pts.	Content is accurate, but not as explicit or covered in as much depth as expected and is inadequately supported by citations or experimental results. Results are reported with minimal analysis. 13 12 10 pts.	Content is not accurate or complete and is not supported by citations. Experimental results are reported with no or incorrect analysis. 9 7 5 2 pts.	/15	
Reasoning & Clarity of Introduction and Conclusion 10%	The topic is introduced, and groundwork is laid as to the direction of the report. Culminates in a conclusion that relies on all the prior information. 10 8 pts.	Overall topic is identified implicitly, and/or significance is not clear. Some material presented is not critical to the paper's conclusion, and/or some of the conclusions were not supported in the body of the paper. 7 6 pts.	Neither implicit nor explicit reference is made to the topic that is to be examined. No conclusions drawn. 5 3 0 pts.	/10	
Approach 30%	Clear organization. Paragraphs complete, yet concise. Paragraphs follow a logical flow. Demonstrates clear understanding of theoretical topics. Concepts are clearly explained using mathematical equations, figures, tables, and images. Figures, etc. are clearly explained and captioned. 30 2 7 pts.	Clear organization, but not all sections or paragraphs follow in a natural/logical order. Demonstrates a basic or high-level understanding of theoretical topics but lacks in-depth explanations. Mathematical equations, figures, tables, and images are used inappropriately or do not provide additional context. Figures etc. are not always clearly explained or captioned. 2 6 2 4 2 2 2 0 1 8 pts.	Appears to have no direction, with subtopics appearing disjointed. Theoretical concepts are presented without or incorrect explanations. Few or inappropriate mathematical equations, figures, tables, or images. 17 1 5 1 0 5 pts.	/30	
Experiments and Evaluation 30%	Written at an appropriate level, with no or well-defined jargon, explanation of concepts where necessary, and a formal but not stuffy tone. 30 2 7 pts.	Written mostly at the appropriate level, with occasional use of undefined jargon or inadequately explained concepts. Tone not consistent. 26 24 22 20 18 pts..	Proper terms never used, and concepts poorly explained. Inappropriate tone. 17 15 10 5 pts.	/30	
Clarity of Language and Writing Technique 10%	Writing is crisp, clear, and succinct. *Complete* sentences and grammatically correct. No spelling errors. Punctuation used correctly. Written at an appropriate level, with no or well-defined jargon, explanation of concepts where necessary, and a formal but not stuffy tone. 10 8 pts.	Writing is generally clear. Grammar, spelling, and punctuation are correct. Writing is wordy or repetitive. Written mostly at the appropriate level, with occasional use of undefined jargon or inadequately explained concepts. Tone not consistent. 7 6 pts.	Writing is not clear; it is hard to understand what the author is trying to convey. Incomplete sentences, misspelled words, incorrect grammar, and improper punctuation are common. Proper terms never used, and concepts poorly explained. Inappropriate tone. 5 3 0 pts.	/10	
Citations / References: 5%	Cites appropriate references in the body of the paper, using appropriate IEEE citation format. Bibliography is complete, appropriately formatted, and matches in-text references. 5 pts.	References are cited appropriately, but bibliography is incomplete, or citations are inconsistent. Either some formatting problems exist, or components were missing. 4 3 pts.	References are not used or are not relevant. Bibliography is incomplete or includes works not cited in text. 2 1 0 ts.	/5	

Figure 1: Marking rubric for the final project report