

Problem Statement and Goals

Software Engineering

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Table 1: Revision History

| Date | Developer(s) | Change |
|-----------|-------------------|---|
| 9/18/2024 | Mathew Petronilho | Added Problem, Challenge level and Extras |
| Date2 | Name(s) | Description of changes |
| ... | ... | ... |

1 Problem Statement

[You should check your problem statement with the problem statement checklist. —SS]

[You can change the section headings, as long as you include the required information. —SS]

1.1 Problem

There is currently a lack of high-quality, labeled satellite imagery datasets tailored for specific use cases. Many industries require specialized data for tasks like disaster response, environmental monitoring, urban planning, or defense, but building these datasets manually is time-consuming, costly, inefficient and may require expert data analysis. This hinders the development and deployment of accurate computer vision models for critical use cases across these various industries.

Our team at OKKM Insights aims to solve this problem by creating an on-line platform that accelerates this process and brings transparency to satellite imagery data analysis. Using an AI-powered crowd-sourcing model, our platform will allow users to label commercially available satellite images, helping us

to build datasets. These datasets will then be used to train custom computer vision models for various use cases. At its core, the platform will offer a paid service for identifying objects within satellite images, and in turn, distribute the earnings to the users who contribute to the labeling effort.

1.2 Inputs and Outputs

[Characterize the problem in terms of “high level” inputs and outputs. Use abstraction so that you can avoid details. —SS]

1.3 Stakeholders

1.4 Environment

[Hardware and software environment —SS]

2 Goals

Test1

3 Stretch Goals

4 Challenge Level and Extras

4.1 Challenge Level

We anticipate this project to be advanced due to our limited domain knowledge of satellite imagery and the complexity of the implementation. To begin, we will be developing a web application from scratch, which poses a challenge as most team members lack experience in front-end development. Additionally, we need to figure out how to seamlessly and automatically acquire paid satellite images for labeling from third-party providers upon customer request. We also need to consider how to break down and distribute image-labeling tasks. This may involve algorithms for splitting larger images into smaller pieces for analysis, identifying images with relevant objects, and determining which users are best suited to label specific images. We will also need to design a consensus algorithm to ensure accurate labeling, likely incorporating a user accuracy system and a statistical model—both of which will require research to understand and implement effectively. Once a dataset is validated, we will face additional challenges in the realm of computer vision models. Our team has minimal experience in this area, so selecting, tweaking, training, and testing the appropriate model for optimal accuracy across diverse datasets will require significant effort. Moreover, we aim to automate the training of the model once a labeled dataset is complete, which will add to the complexity. The application will also need to handle secure payments from customers and distribute payments to users and

third parties. Since we have no experience with online monetary transactions, this will involve additional research and effort to ensure security and reliability. Finally, we must integrate all these components seamlessly and deploy the system in a way that ensures efficiency and an excellent user experience.

Overall, with the complexity of the implementation and our current knowledge gaps, we believe that the extra research and level of development will make this an advanced project.

4.2 Extras

- Usability Testing: Conducted by allowing users to test the application interface and provide feedback to us through a questionnaire
- Demonstration Video: Create a video demonstrating how to use the product and its various features
- Formal Proof: Come up with a proof of convergence for labeled images to show that they have a certain level of consistency and accuracy

[State your expected challenge level (advanced, general or basic). The challenge can come through the required domain knowledge, the implementation or something else. Usually the greater the novelty of a project the greater its challenge level. You should include your rationale for the selected level. Approval of the level will be part of the discussion with the instructor for approving the project. The challenge level, with the approval (or request) of the instructor, can be modified over the course of the term. —SS]

[Teams may wish to include extras as either potential bonus grades, or to make up for a less advanced challenge level. Potential extras include usability testing, code walkthroughs, user documentation, formal proof, GenderMag personas, Design Thinking, etc. Normally the maximum number of extras will be two. Approval of the extras will be part of the discussion with the instructor for approving the project. The extras, with the approval (or request) of the instructor, can be modified over the course of the term. —SS]

Appendix — Reflection

[Not required for CAS 741 —SS]

The purpose of reflection questions is to give you a chance to assess your own learning and that of your group as a whole, and to find ways to improve in the future. Reflection is an important part of the learning process. Reflection is also an essential component of a successful software development process.

Reflections are most interesting and useful when they're honest, even if the stories they tell are imperfect. You will be marked based on your depth of thought and analysis, and not based on the content of the reflections themselves. Thus, for full marks we encourage you to answer openly and honestly and to avoid simply writing "what you think the evaluator wants to hear."

Please answer the following questions. Some questions can be answered on the team level, but where appropriate, each team member should write their own response:

1. What went well while writing this deliverable?
2. What pain points did you experience during this deliverable, and how did you resolve them?
3. How did you and your team adjust the scope of your goals to ensure they are suitable for a Capstone project (not overly ambitious but also of appropriate complexity for a senior design project)?