CSCE 5222 Feature Engineering
Project Plan

Group 11
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1. Problem statement

Our project focuses on image segmentation. In this project, we propose an effective segmentation algorithm to extract green-field crops from background images. To achieve our goal, we must overcome several challenges. One of which is woods and water ponds are often treated as crop fields. If time permits, we will strike to address this challenge. Also, variations in color of different crop fields can affect our method's performance. Our approach can potentially be used in satellite image analysis and other precision agriculture applications.

Below is an example of the project's outcomes. Figure 1 shows an original image whereas Figure 2 represents how a segmented image looks after processing.
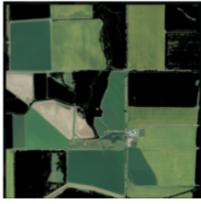

Figure 1: Original image

Figure 2: Processed images

2. Data used

We use nine satellite JPG format images that have a 1-meter ground sample distance and dimensions of 2048x2048. These images contain crop fields, roads, woods, structures and ponds/lakes.

3. Method

3.1. Preprocessing
- Create ground truth labels for original images to be used to identify crop fields later and other important infrastructures in the image.
- Convert images into gray to get the images ready for edge detection.
- Apply Histogram processing methods, such as histogram stretching, equalization, and matching to enhance the images.

3.2. Thresholding and edge detection
Thresholding will be applied to the process of our segmentation to effectively separate crop fields from the background within the images.

The filters we plan to use for edge detection are Sobel, Canny, and Laplacian. Details on the usage of these filters will be updated during the project progress.

3.3. Transformer:
We plan to apply HOUGH transform, Wavelet, and Fourier transform to achieve our goal of segmentation.

Details on the usage of these Transformers will be updated during the project progress.

3.4. Advanced techniques:
Various deep learning techniques including Segnet, U-Not have been recently popular for image segmentation tasks. We are also planning to implement those in our problem domain.

4. Evaluation

Table 1: Evaluation results for applying different methods on images.

Name	Size	Type	Class	Jaccard's Index	Precision
Image 1-9	2048x2048	JPG	Filters	To be updated	To be updated
Image 1-9	2048x2048	JPG	Transformers	To be updated	To be updated

Table 2: Assigned tasks to each team member.

Name	Assigned task
Nghia Dang	Conceptualization (P), Preprocessing (P), applying technique (P), validation (S), paper writing (S), slide (S)
Riyad Bin Rafiq	Preprocessing (P), applying technique (P), validation (P), paper writing (P), slide (S)
Truc Nguyen	Preprocessing (S), applying technique (S), paper writing (P), slide (P), finding reference (P)

* P = primary, S = secondary role

Table 3: Timeline for each task

Tasks	Timeline
Conceptualization	Sep 27
Data preprocessing	Oct 4
Applying thresholding and edge detection	Oct 18
Applying transformation	Nov 8
Other advanced methods such as machine learning, deep learning	Nov 22
Report writing and preparing slides	Nov 29

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