CSCE 5222 Feature Engineering

Project Plan/Report

Group NUMBER 9

Member: **John Lage, Phongsiri Nirachornkul, Ibrahim Alkuwaifi**

**Git Repo :** [Road-Detection](https://github.com/bring-nirachornkul/Road-Detection)

1. Problem statement

*Clearly state the project you want to work on.*

Our project goal is detecting roads and field boundaries.

This project aims to identify the different line features in the images that delineate fields such as roads, canels, or trails. The fact that the roads are not necessarily consistent in size, color, and shape makes this somewhat challenging. The techniques used in this project could potentially be used by a navigation software developer or space-based photography company to draw the road from the ground truth images, or to identify the boundary of the road for future autonomous cars.

Cite : [nvdia](https://developer.nvidia.com/blog/solving-spacenet-road-detection-challenge-deep-learning/)

1. Data used

State the data used in this project including ground truth for evaluation

There are nine satellite images which show the fields, roads, structures, and woods. The size of each image is 2048 by 2048. All of the images are in JPG format.

1. Method

Give details of the method and any parameters used.

1. Convert to grayscale image in order to perform the test of the edge detection in each category.
2. Normalized and equalized to make the image clearer.
3. Apply edge detection to see the different :
   1. **Apply Sobel filter** - this filter will verify the gradient between each pixel across an image. It is one of the built-in matlab functions that performs an operation in both the horizontal and vertical direction and combines the results.
   2. **Apply Canny filter** - this filter will reduce the noise and the amount of data to be processed which will reduce a lot of false edges in the image. The detection will accurately catch the edge in the image accurately.
   3. **Apply Laplacian of Gaussian** - this filter is great for large images because it can capture tiny details in the image such as roads and field boundaries. This filter will highlight the number of roads and reduce the amount of noise in the image significantly.
4. Apply transformer
   1. HOUGH transform : detect line or the object in the geometric

Citation for this project : [Toward Data Science](https://towardsdatascience.com/finding-land-area-of-farm-plots-using-edge-detection-5b070cc05c5a), [Road Extraction Using Edge Detection](https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.187.389&rep=rep1&type=pdf), [Edge Detection for Satellites Image](https://arxiv.org/pdf/2105.12633.pdf)

-HOUGH transform : detect line or the object in the geometric

-Wavelet transform : give the feature in the different scale

-Fourier transform

1. Evaluation

State the evaluation metric and discuss the results

The following are examples of inserting tables and figures. You can duplicate them and make changes for yours.

Table 1 This is an example of a table

| Name | Size | Type | Filter | Accuracy | Precision |
| --- | --- | --- | --- | --- | --- |
| Image 1 | 1024 x 1024 | JPG | Sobel | Pending | Pending |
|  | 1024 x 1024 | JPG | repmat | Pending | Pending |
|  | 1024 x 1024 | JPG | Candy | Pending | Pending |
|  | 1024 x 1024 | JPG | Laplacian of Gaussian | Pending | Pending |

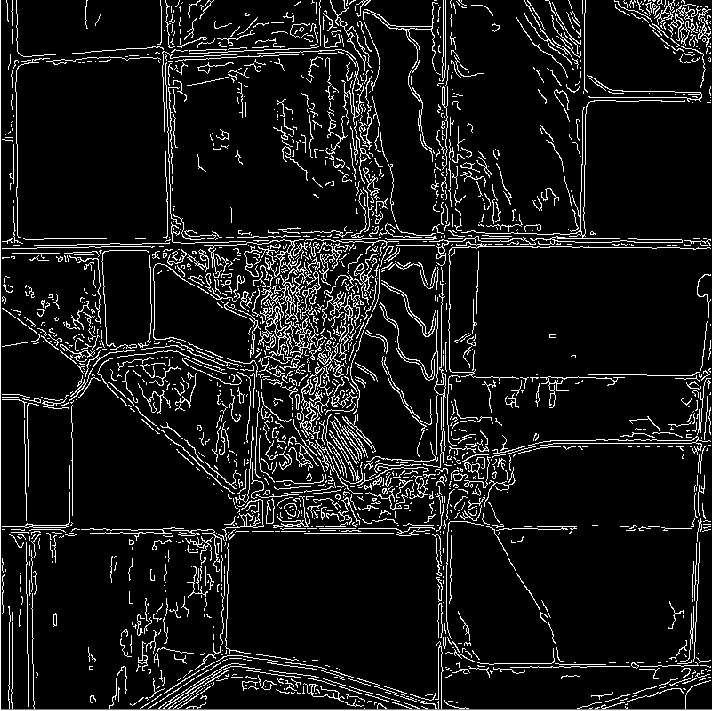


Figure 1 : Candy threshold 0.09

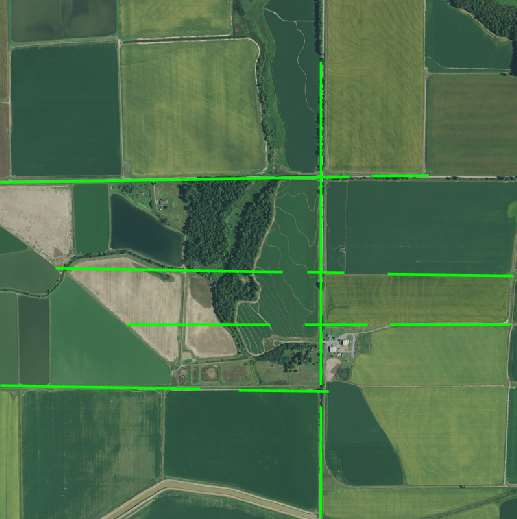


Figure 2 : Hough Transform