Computer Vision and Deep Learning for Remote Sensing applications

MSc. Project TUDelft VisionLab

About the company

EagleView Netherlands is a rapidly growing remote sensing start-up based on the campus of Wageningen University. We are specialised in aerial image acquisition and information extraction of large (mostly agricultural) areas. These areas are typically located in the tropics (currently: Ecuador, Philippines and Mexico). Our imagery contains 4 bands (red, green, blue and near-infrared) and has a spatial resolution of around 7 cm.

These images are analyzed using cutting edge algorithms which run on our own super computers. Examples are our automatic banana plant center recognition and our image classification (Figure 1). One of the big challenges is that our images are typically 10,000 by 10,000 8-bit pixels with a size of around 400 mb. Therefore, the algorithms have to be very efficient and preferable multi-core and/or multi-gpu.

In addition to the orthophoto generation and analysis, we provide our clients with possibility to review their plantation. We have an online platform at which each client has access to their farm. Please contact me if you would like to view our test farm to get an insight in our datasets.

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Requirements

- You are experienced in programming (Python, R, C++ etc.).
- Strong background in computer vision and/or deep learning

What we provide

- Sample data
- Validation data
- Laptop (if needed)
- Working place
- Monthly stipend

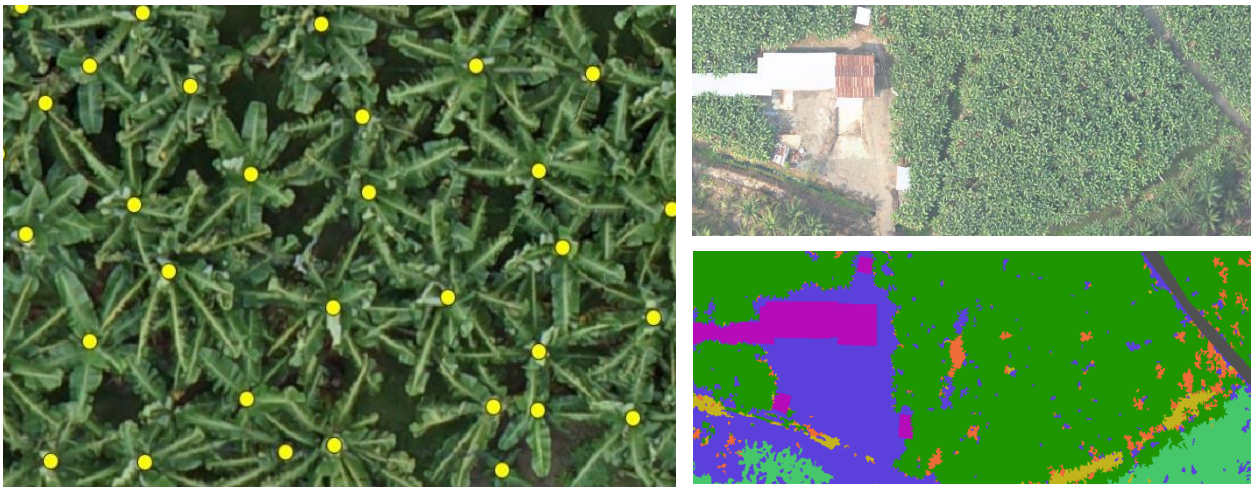


Figure 1 Automatic banana plant center recognition (left) and image classification (right).

Possible Projects

1. Object center detection

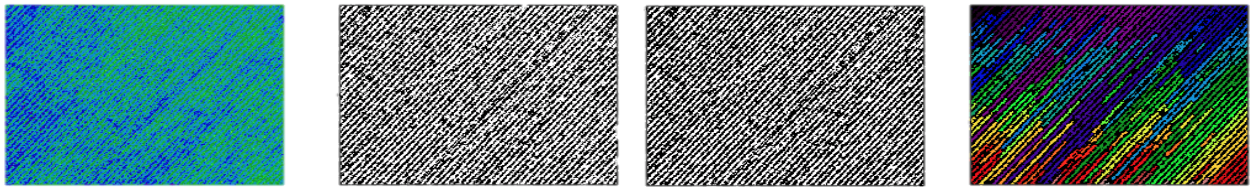
EagleView likes to help plantation holders by providing them with valuable information. Information about this specific crop starts with the detection of it. The input of your computer vision algorithm is an image containing 4 bands (red, green, blue, near-infrared) and the output should be a point dataset. These points should be located on the object centers (preferably geo-referenced). Possible objects are coconut, palm-oil and mango trees. Preferably the object detector can be trained on different objects, but a project which only focusses on one specific object is also possible.

2. Cloud shadow detection and correction

Our crop specific products are highly dependent on the image quality. Imagery with a relative low quality is sometimes caused by hardware problems, but most of the time by weather conditions. As we gather aerial imagery in the tropics, cloud shadows occur frequently. The main challenge for cloud shadow detection is that we fly below the clouds. Our aerial imagery is variable as it is not always acquired under similar conditions. Therefore, the algorithms should be robust and smart. Texture and the use of infrared is promising for cloud shadow detection. In addition to the shadow detection, a shadow correction is needed to improve the quality of our products.

3. Crop row detection

Some of the crops that we fly are planted in rows (pineapple, coffee, maize etc.). Most of the time it is not possible to detect single plants as they are too small or their canopies are overlapping too much. However, in our imagery the crop rows are clearly visible. To be able to estimate biomass and yield crop row detection is required. Difficulty is that not all crop rows are straight or evenly spaced. In addition, the appearance of the crop rows differs per crop type.



4. Other projects

Possible other projects in computer vision and/or deep learning are open for discussion.