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# Computer Vision Based Plant Cataloging and Data Framework for UAV Images

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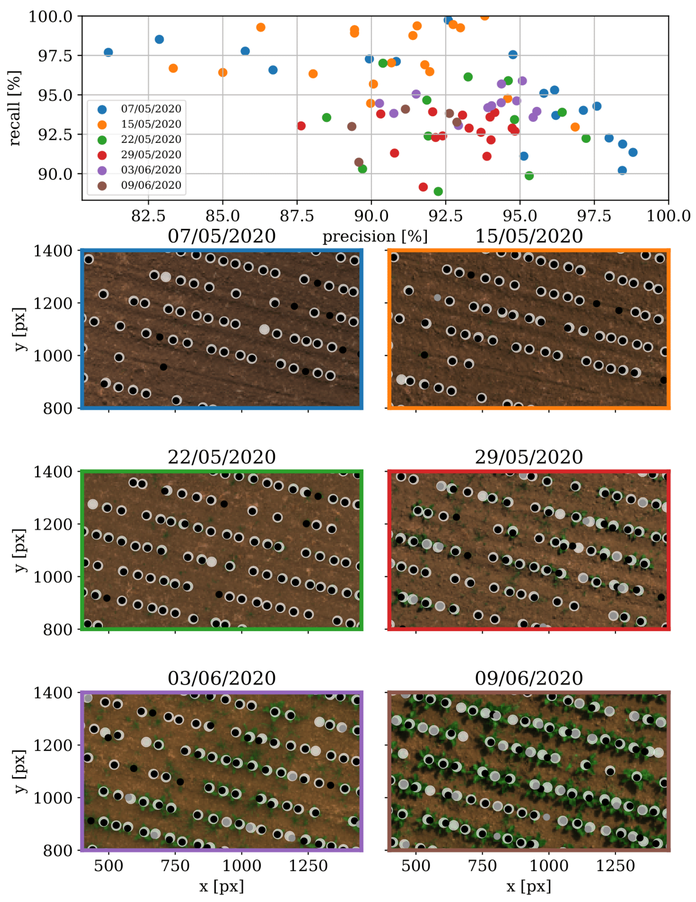
## Background

- Unmanned Aerial Vehicles (UAVs) enable large-scale non-invasive field observations
- Manual annotation of plant positions very expensive
- For observation of temporal effects, plant position recognition is crucial
- Large potential for application of Computer Vision and Machine Leaning methods ("Precision Agriculture")

## Our solution

- Semi-automatized detection of plant positions in large-scale UAV imagery
- Plant recognition and alignment of recording dates
- Advanced efficiency by parallelized computation
- Plants are individualized through space and time → "cataloging")
- Extraction of single plant image time series
- Data framework for advanced AI applications

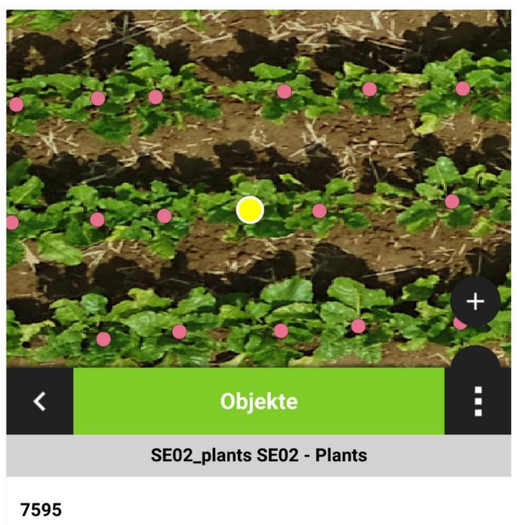


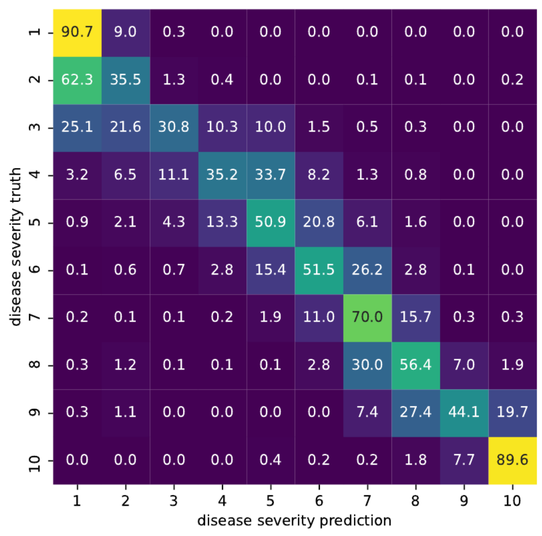

## Results

- Test datasets: sugar beet and cauliflower fields
- Accurate plant recognition
- By alignment of multiple recording dates, "direct" and "indirect" detections possible

## Applications

- Efficient in-field annotations with GPS enabled devices (smartphone, tablet, ...)
- Disease severity classification
- Prediction of harvest time
- ...



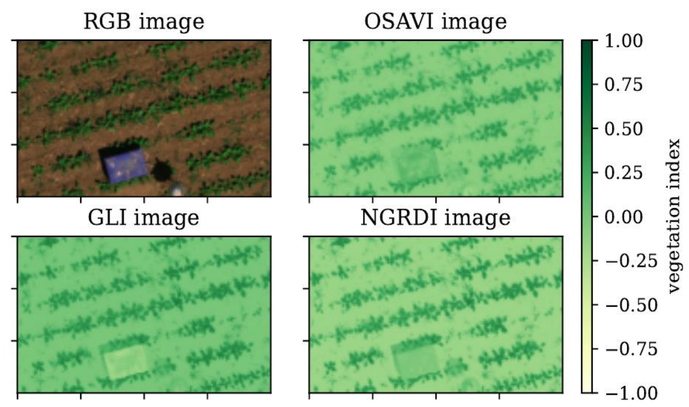

## Limitations

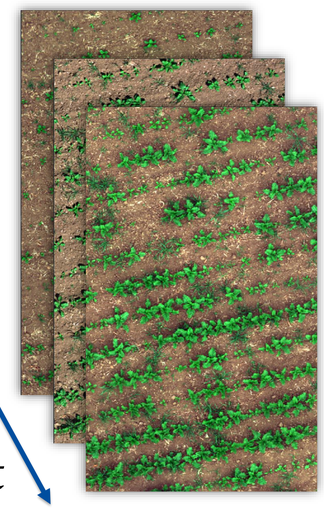
- Not applicable on field images after canopy closure (high cover ratio) → If early-stage images available, the late-stage images can be incorporated for indirect detections
- Ranges of some parameters (blurring width, thresholds) need to be predefined and fine-tuned on specific crop or use case

**Read me!**

**Try it!**

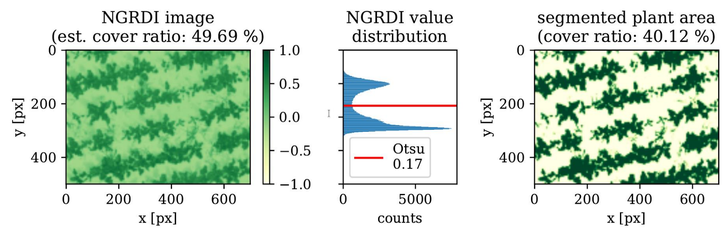
## How the workflow works

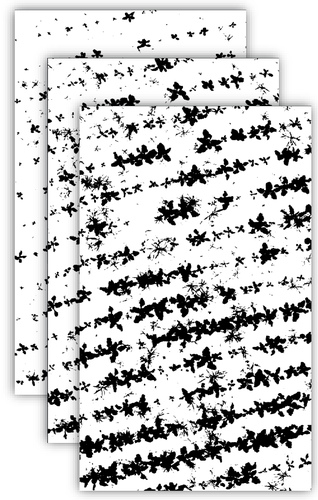



### plant-soil segmentation

- Calculation of Vegetation Index (VI)
- Robust thresholding depending on plant cover ratio



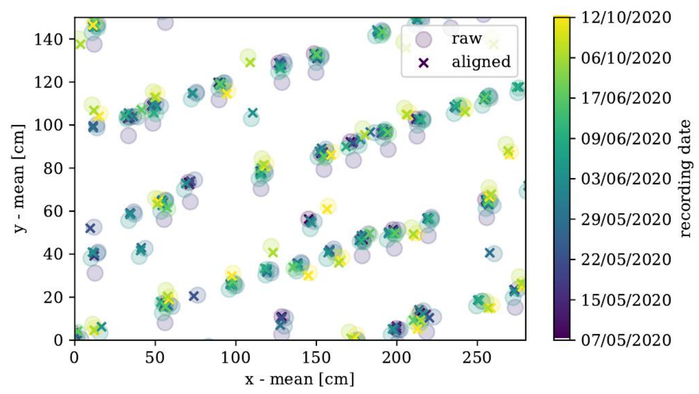



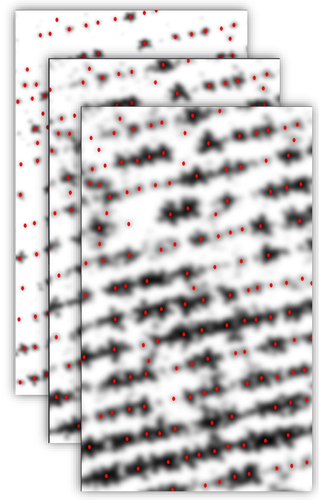
### blurring

- Adaptive width

### peak detection

- Adaptive peak thresholds



### alignment

- Peak-to-peak registration

### grouping

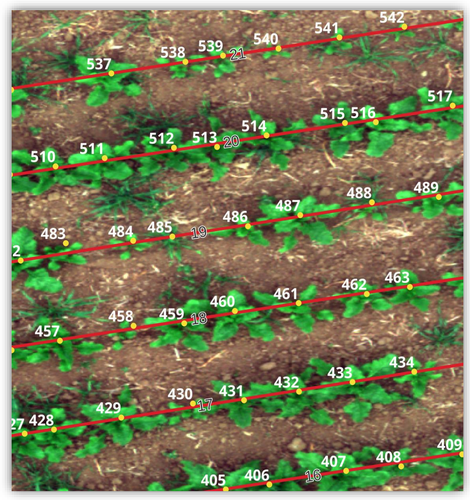
- Clustering peaks of same plants
- Seeding line detection

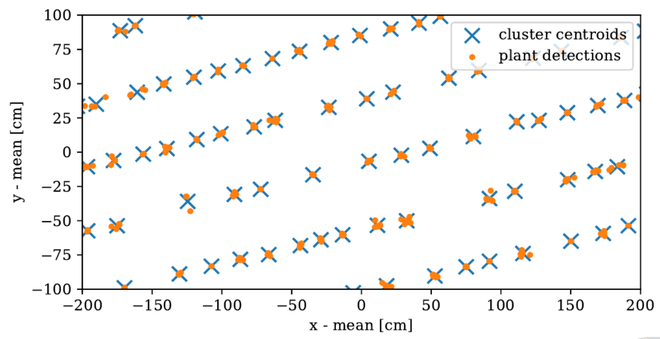
### filtering

- Off-line weed
- Double detections

### cataloging

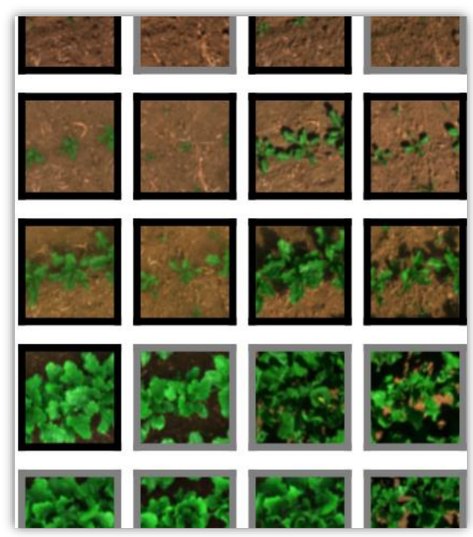
- Individualization of plants






### image extraction

- Use time dependent plant positions from catalog
- Image time series of individual plants



**Further questions? Contact me!**