

VLAIO TETRA

Machine Vision for Quality Control

(MV4QC)

Case 2
Detectie van optimale snijlijn van witloof

Objectives

- Inagro
- Objectives
 - Detection chicory
 - Detection cutting line
 - Classification good/bad



Hardware setup

- Camera: RealSense D415
 - USB3.0
 - 1280 x 720 (1MP)
- Illumination: from environment



Dataset

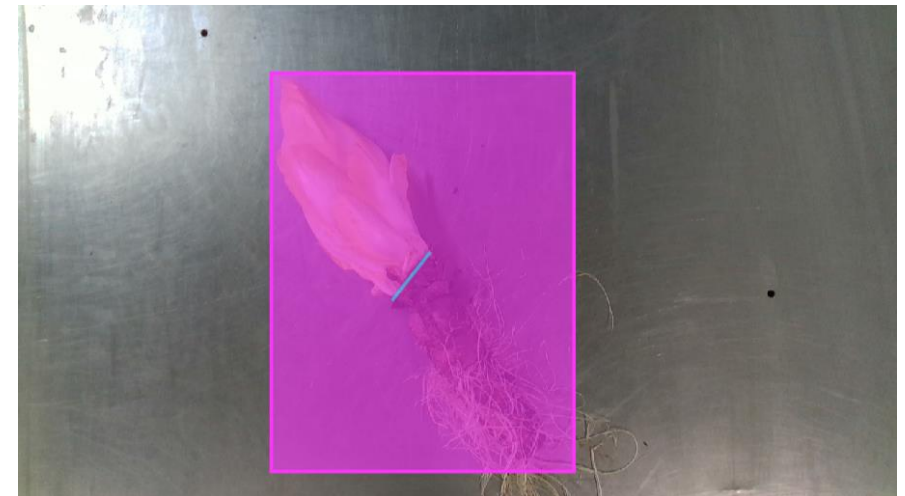
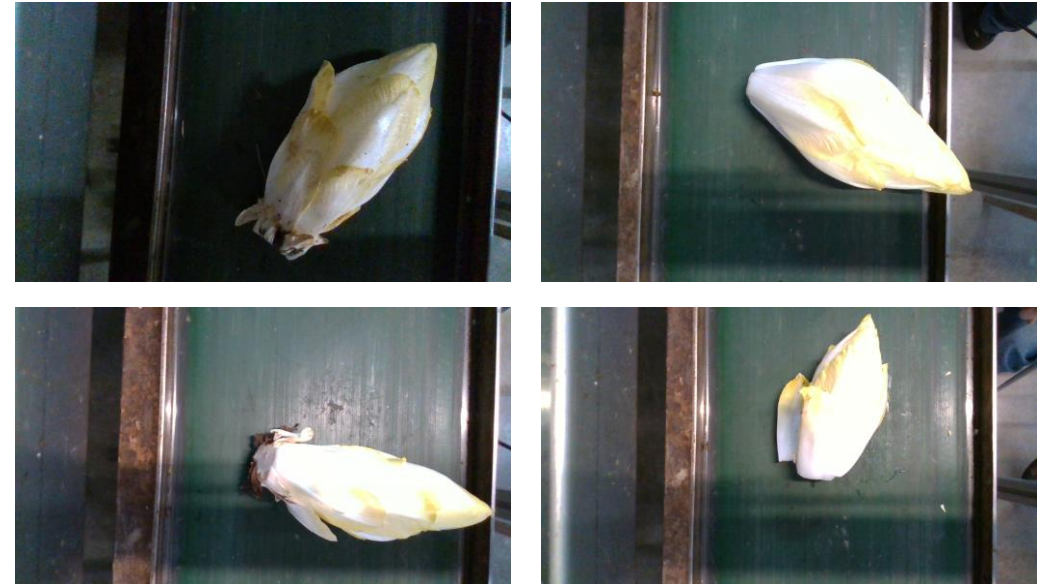
Dataset containing:

- 1463 images
- Different lighting conditions

Foto klasse:	met de volledige wortel	te weinig gesneden	te veel gesneden	ideaal gesneden	schuin gesneden
Aantal afbeeldingen:	218	418	282	421	123

LabelBox render:

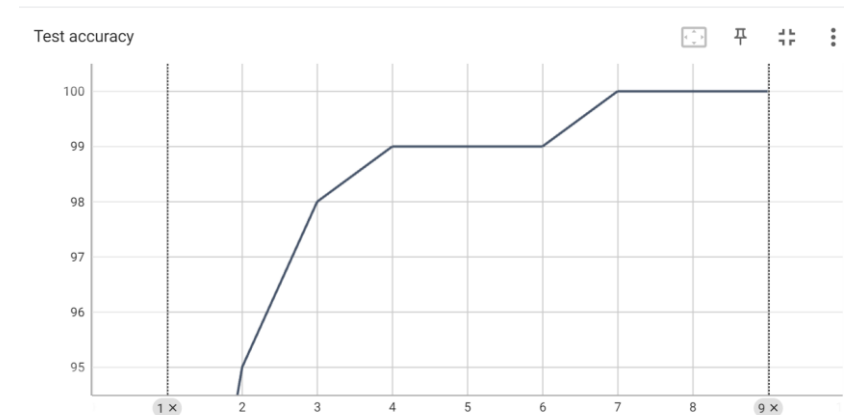
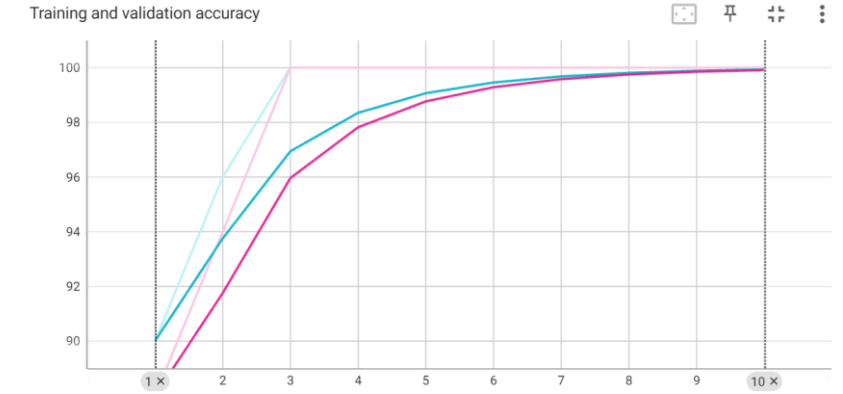
- Image url
- Bounding box [left, top, width, height]
- Line [x1, y1, x2, y2]



Classification

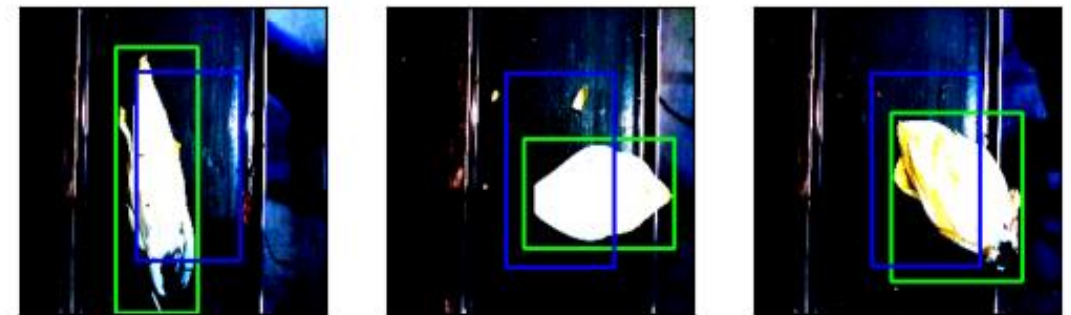
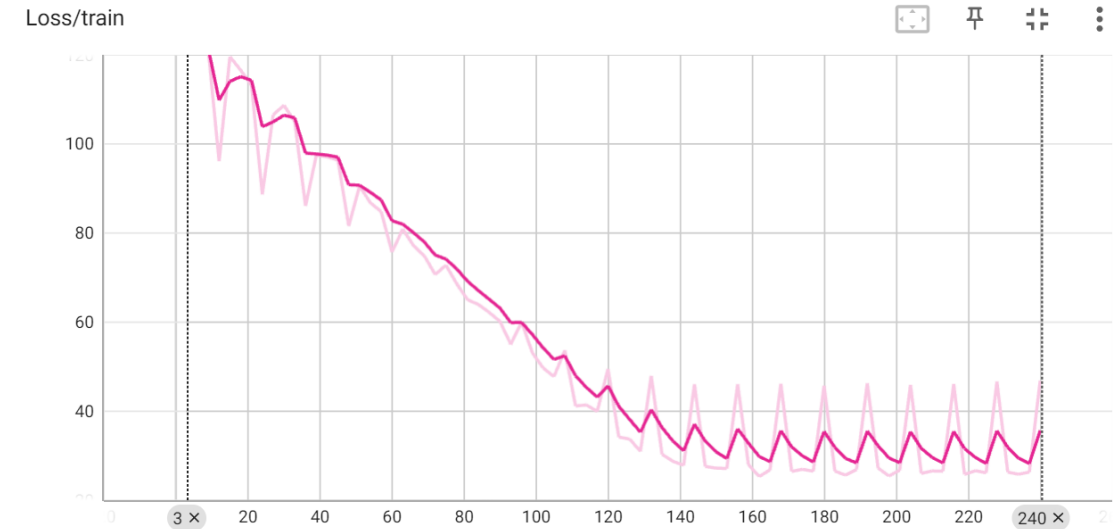
- Needs more cutting / does not need cutting
- ResNet18
- 681 training, 146 validation, 147 test
- Epochs: 10
- Learning rate: 0.001
- Batch size: 64
- Loss: Cross Entropy
- Accuracy: 99,72%

	Root	No Root
Root	50 (98%)	0 (0%)
No Root	1 (2%)	96 (100%)



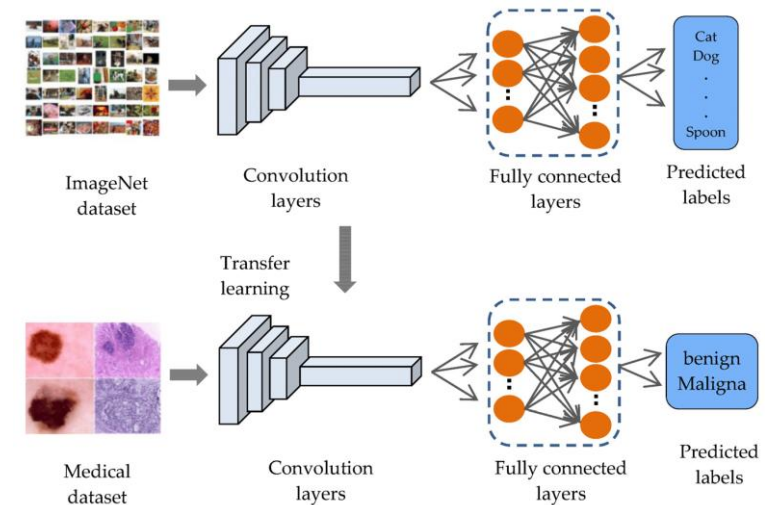
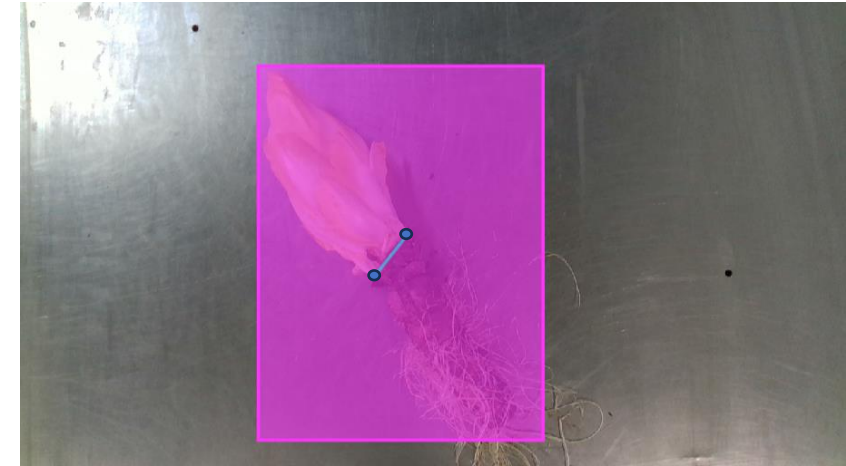
Detection of bounding box

- ResNet18
- 681 training, 146 validation, 147 test
- Epochs: 10
- Learning rate: 0.001
- Batch size: 64
- Loss: L1 loss

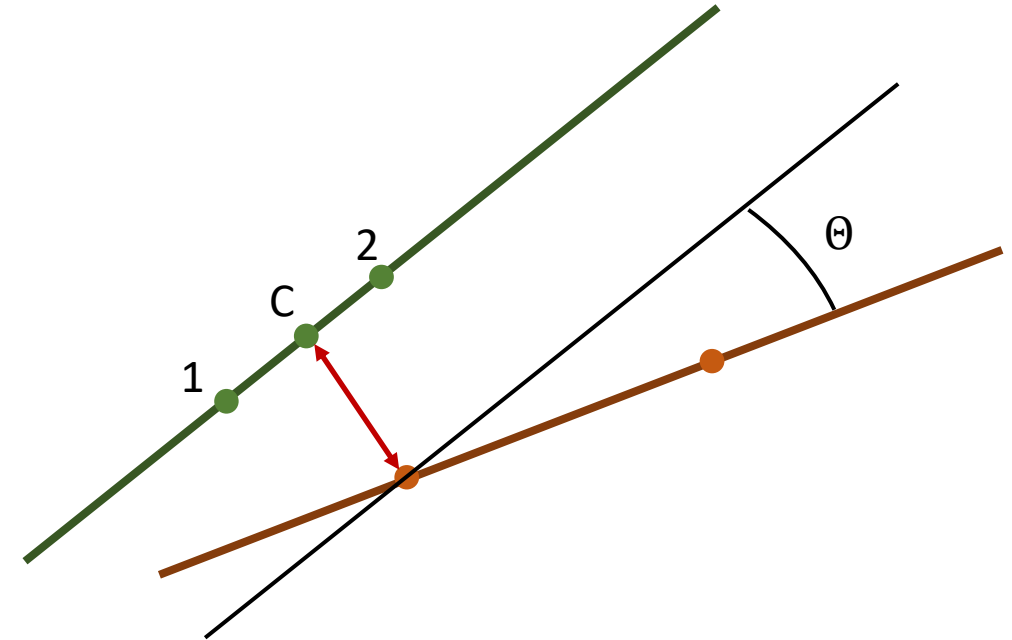


Detection of cutting line

- Using line labels $[x1, y1, x2, y2]$
- Using ResNet18
- Using transfer learning

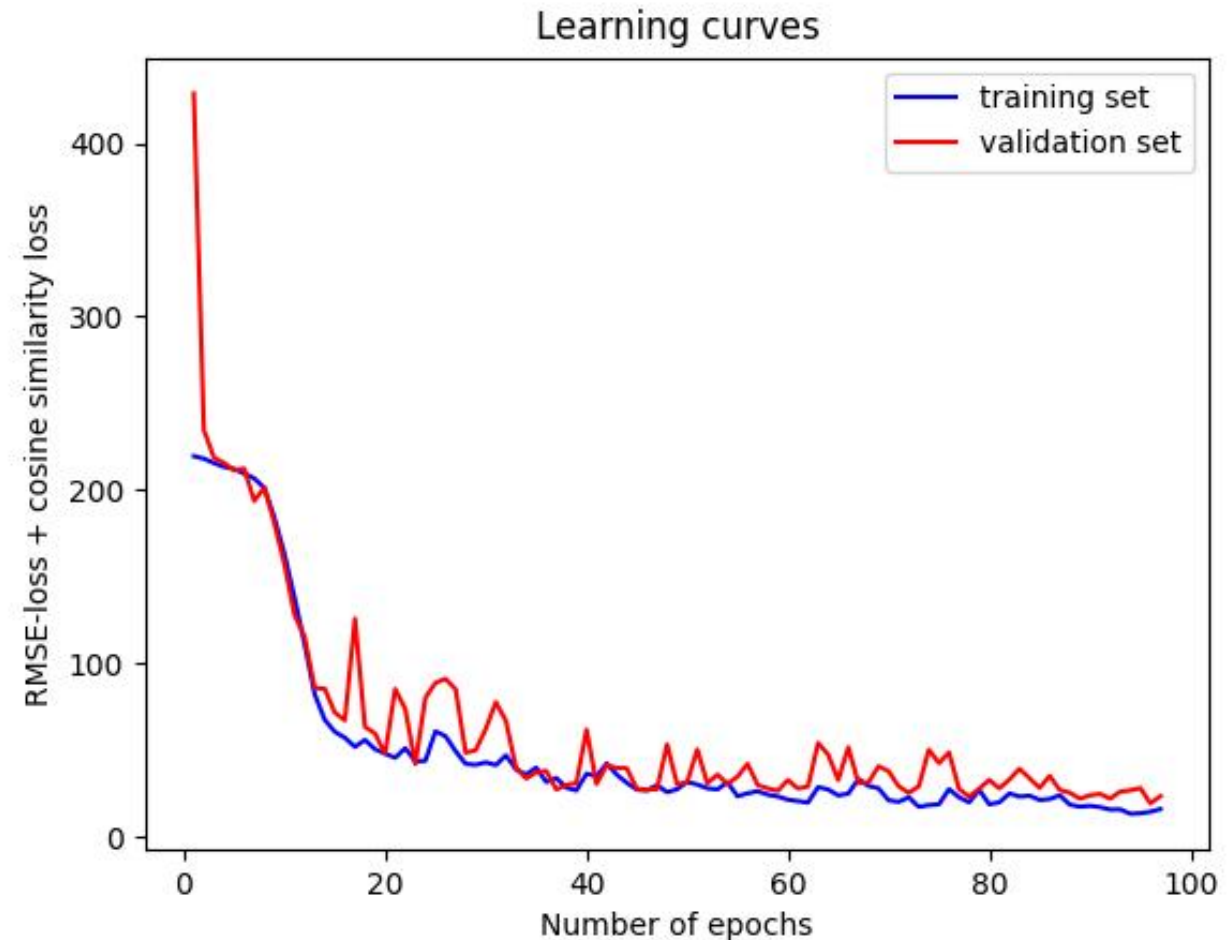


Detection of cutting line – Loss computation



Detection of cutting line – Model training

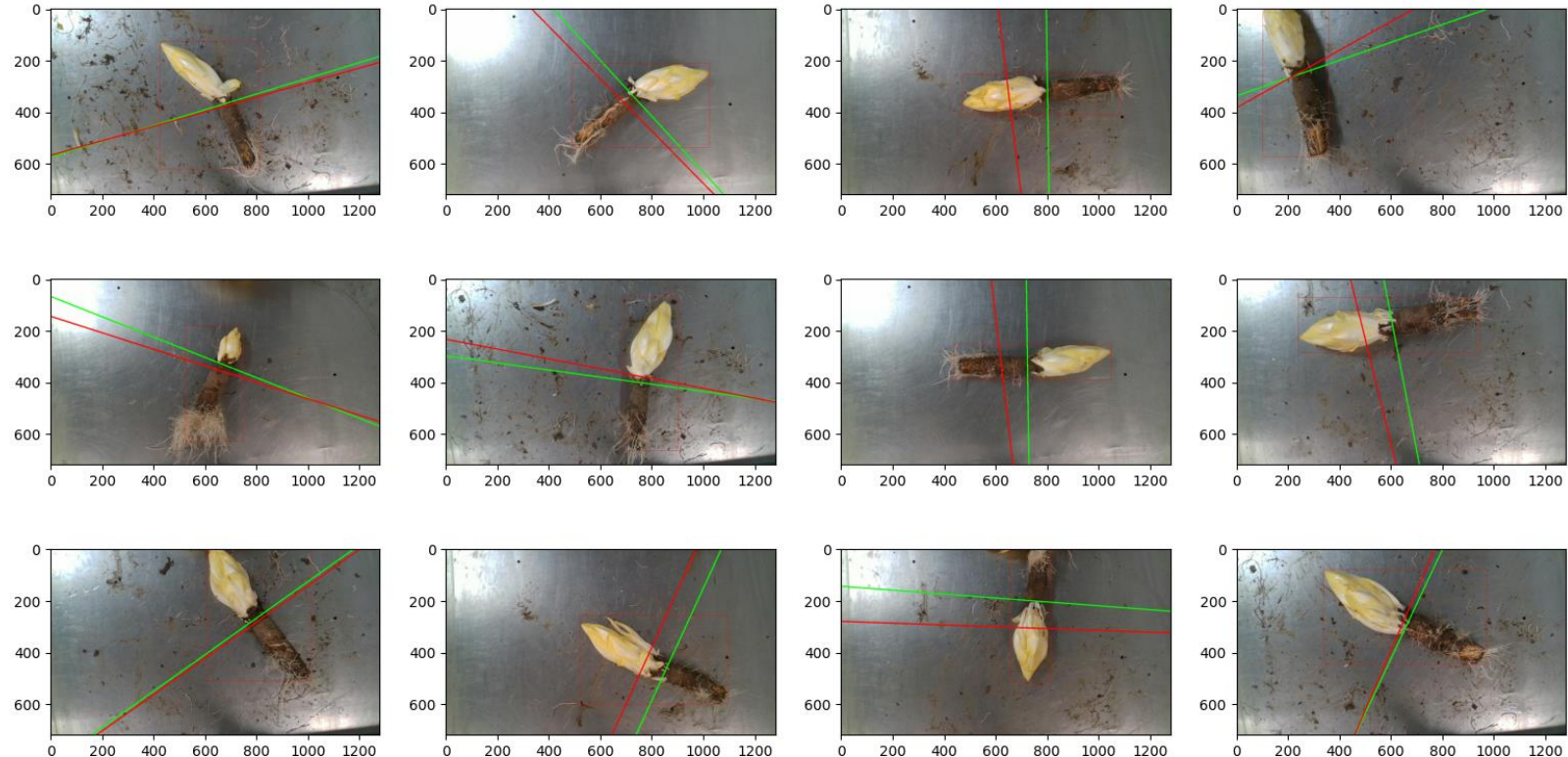
- Dataset: 216 images
 - Train: 151
 - Validation: 32
 - Test: 33
- Hyperparameters:
 - Epochs: 100
 - Learning rate: 0.01
 - Batch size: 16
- Results on validation set
 - RMSE-loss: 8.6 pixels
 - Angle loss: 10.6 degrees
 - Total loss: 19.3



Detection of cutting line – model validation

Training set

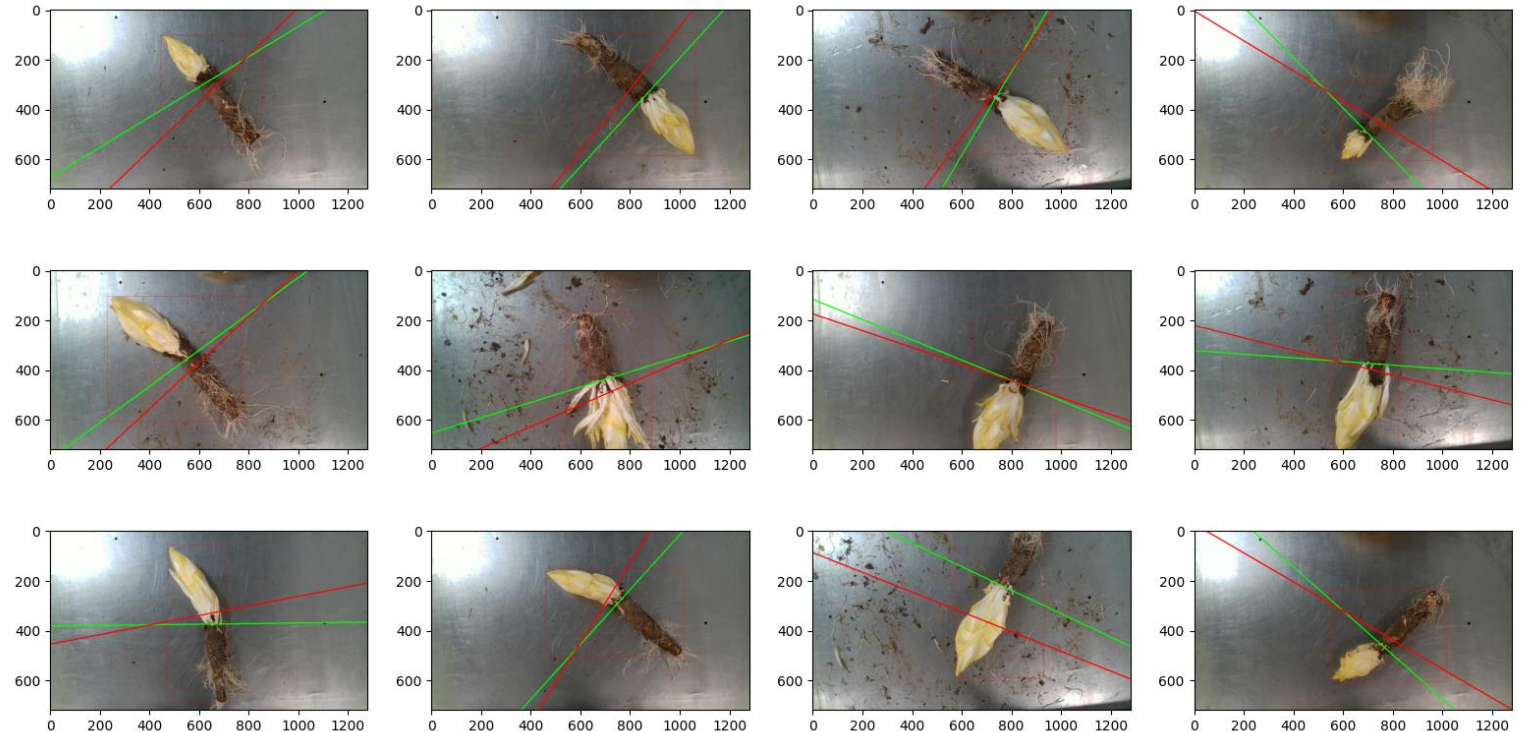
- RMSE: 7.9 pixels
- Cosine: 6 degrees
- Total: 13.9



Detection of cutting line – model validation

Test set

- RMSE: 11.1 pixels
- Cosine: 22.8 degrees
- Total: 33.9



Detection of cutting line – Data augmentation

- Resizing
- Normalization
- Rotation
- Horizontal flip
- Brightness

