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Preliminary Programme

Online Winter School on Image Analysis for Plant Phenotyping

Wageningen University & Research

Course leaders
Dr. Gerrit Polder, Rick van de Zedde MSc & Dr Gert Kootstra

Date: 7 February – 11 February 2022

Duration & study load: 21 hours in 1 week programme

Location: Online in Microsoft Teams

Programme includes 8,5 of pre-recorded lectures and 12,5 hours Q&A live sessions with experts

14 December 2021, changes may occur

Lecturers
Dr. Harm Bartholomeus, Wageningen University & Research (to be determined)
Dr. Haris Ahmad Khan, Wageningen University & Research
Dr. Lammert Kooistra, Wageningen University & Research
Dr. Gert Kootstra, Wageningen University & Research
Dr. Puneet Mishra, Wageningen University & Research
Dr. Ard Nieuwenhuizen, Wageningen University & Research
Dr. Gerrit Polder, Wageningen University & Research
Dr. Jip Ramakers, Wageningen University & Research
Dr. Hendrik de Villiers, Wageningen University & Research
Rick van de Zedde MSc, Wageningen University & Research

Guest lecturers

Syngenta, UK	Rob Lind
University of Angers, France	David Rousseau and/or Natalia Sapoukhina
Phenovation	Vincent Jalink
Perclass	Pavel Paclik
IPK	Evgeny Gladilin
Phenorob	Chris McCool

Schedule
(all mentioned times are Amsterdam time zone)

	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Live sessions	09.00-11.00 & 15.00-16.00	09.00-10.00 & 15.00-16.30	09.00-10.00 & 15.00-16.00	09.00-10.00 & 14.00-16.00	14.00-15.15
Self-study	30min	2hours	1hour	1 hour	1 hour

It is advised to watch the pre-recorded video presentations in advance of the live Q&A sessions.

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Monday 7 February 2022
Introduction to image analysis and phenotyping & image acquisition

Online learning materials

Introduction

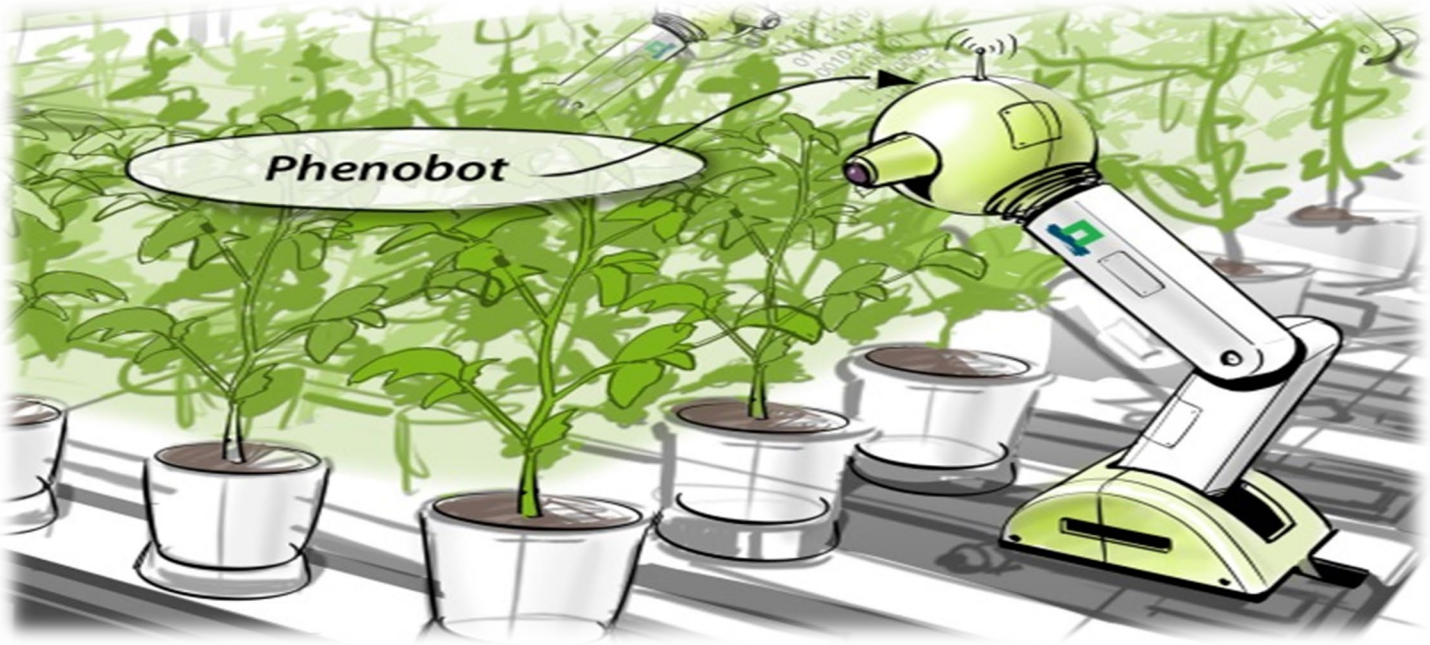
30 min — Introduction to Image analysis and phenotyping (pre-recorded)
3 interactive video clips of 10 minutes with (individual) assignments
Ard Nieuwenhuizen

Live online sessions

09.00 – 10.00 **Introduction and Getting to know each other part 1**

Image acquisition
10.00 - 11.00 **Working with the camera: assignments and practice with project cameras**
Gerrit Polder and Harris Khan

15.00 – 16.00 **Live Q&A, participants work on assignments**
Gerrit Polder, Harris Khan



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Tuesday 8 February 2022
Noise filtering & phenotyping applications

Online learning materials

Noise filtering

30 min	Noise and image enhancement (pre-recorded) *3 interactive video clips of 10 minutes with (individual) assignments noise and image enhancements* *Gert Kootstra*

Phenotyping applications

30 min	UAVs/lidar and phenotyping (pre-recorded) *3 interactive video clips of 10 minutes with (individual) assignments* *Lammert Kooistra*
30 min	Industry perspective (pre-recorded) *3 interactive video clips of 10 minutes* *Rob Lind*
10 min	Introduction Netherlands Plant Eco-phenotyping Centre (NPEC) (pre-recorded) *Rick van de Zedde*
5 min	Characterize plants or seeds e.g. on germination grids and extract a lot of data (pre-recorded) *Pavel Paclik*
5 min	CropReporter – chlorofyll fluo imaging en analyses (pre-recorded) *Vincent Jalink*

Live online sessions

09.00 – 10.00	**Introduction and Getting to know each other part 2**
15.00 – 16.00	**Live Q&A, participants work on assignments**
16.00 - 16.45	**Guided tour NPEC** ▪ *Vehicles and experimental fields – Gerrit Polder (15 min)* ▪ *NPEC Greenhouses – Rick van de Zedde (15min)* ▪ UAvs and drones – Harm Bartholomeus *(15 min)*

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Wednesday 9 February 2022
Segmentation and image shape features & spectral imaging

Online learning materials

Segmentation and image shape features

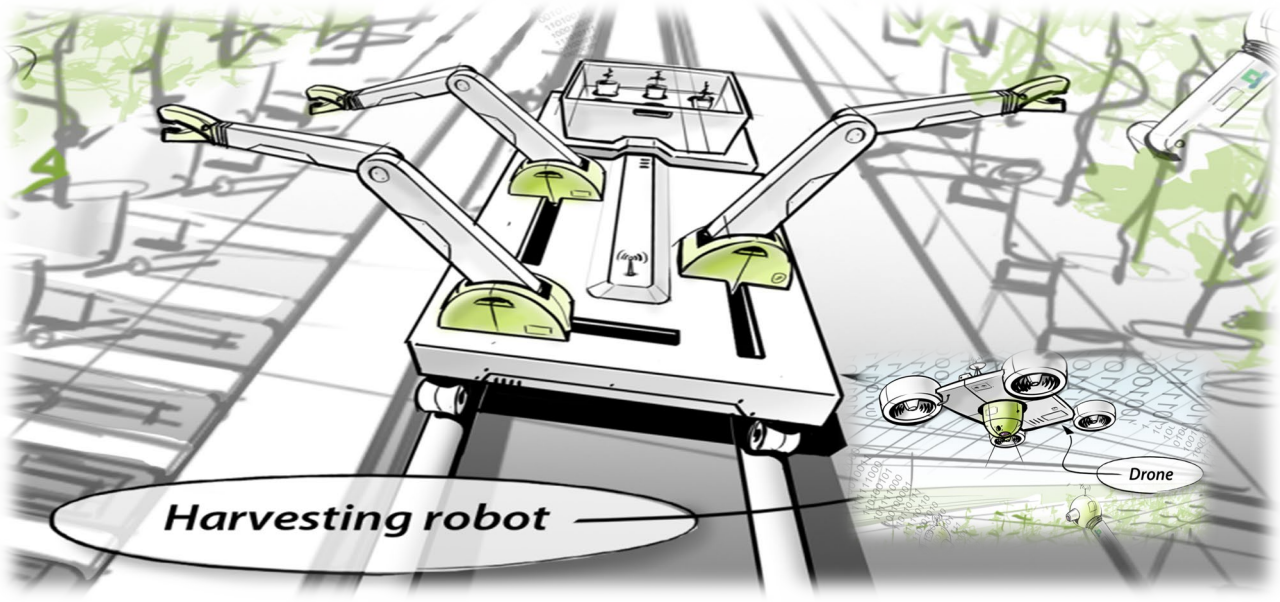
30 min	Introduction to segmentation (pre-recorded) *3 interactive video clips of 10 minutes with individual/group assignments* *David Rousseau*

Spectral imaging

30 min	Spectral imaging (pre-recorded) *3 interactive video clips of 10 minutes with individual/group assignments* *Puneet Mishra*

Live online sessions

09.00 - 10.00	**Classical Machine learning:** K-MEans, Linear discriminant, svn, supervised/unsupervised, clustering, spectral data (in de cloud) *Gert Kootstra and student assistant*
15.00 – 16.00	**Live Q&A, participants work in groups on assignments**



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Thursday 10 February 2022
Neural networks and Deep learning & 3D vision

Online learning materials

Neural networks and Deep learning

30 min	Deep learning (pre-recorded) and leaf segmentation challenge *3 interactive video clips of 10 minutes with individual/group assignments (leaf segmentation challenge)* *Hendrik de Villiers and student assistant*

3D vision

30 min	Methods to capture plants in 3D and Explanation of parameter computation (pre-recorded) Chris McCool, *Phenorob*

Live online sessions

3D vision

09.00 – 10.00	**3D workshops:** Generate 3D point cloud with laser light section principle practical). Explanation of parameter computation *Chris McCool, Phenorob*

Q&A session

14.00 – 15.00	**Live Q&A, participants work in channels on assignments** *Hendrik de Villiers and student assistant*
15.00 – 16.00	**Practical: 'Bring your own images' session** (5 selected images will be demonstrated and discussed) *Rick van de Zedde, Gerrit Polder, Gert Kootstra and student assistant*

Friday 11 February 2022
Imaging and data

Online learning materials

30 min — Presentation: challenges by root (pre-recorded)
IPK, Evgeny

30 min — Tutorial spatial trends and modelling over time (pre-recorded)
3 interactive video clips of 10 minutes with individual/group assignments
Jip Ramakers

Live online session

14.00 – 15.00 — **Practical: 'Bring your own images' session** (5 selected images will be demonstrated and discussed)
Rick van de Zedde, Gerrit Polder, Gert Kootstra and student assistant

15.00 – 15.15 — **Evaluation *and* closure of the Summer School Plant Phenotyping**
Rick van de Zedde, Gerrit Polder, Gert Kootstra and student assistant

Online follow-up

- **Background materials:** there will be related movies and articles available
- **Survey:** please help us to improve this course by filling in the survey
- **Certificate:** after completing the survey you'll receive your (digital) certificate