Lecture series on the subject "AI, Data Science and Society"

3. Anne-Katrin Mahlein: Digital technologies in agriculture - how can sensors, robots and machine learning assist in crop production?

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Abstract

Agricultural practice and scientific research is confronted with new challenges. Environmentally friendly and sustainable solutions are increasingly demanded. Precision agriculture and phenotyping technologies are increasingly developed and implemented in processes during vegetation period from sowing to harvest. These technologies can provide information on plant growth dynamics, plant development and plant vitality or to the presence of pest and diseases, drought stress or weeds in fields. The information may help to make a decision on a subsequent management practice. The current presentation focuses on the potential of digital technologies for monitoring crop parameters and provide interpretable results, guiding decisions in crop cultivation. A specific focus will be on current work at the Institute of Sugar Beet Research (IfZ) on the use of optical sensors for an accurate and objective detection of pests and plant diseases. An approach for monitoring disease incidence and disease severity of relevant foliar diseases like Cercospora leaf spot will be presented. Furthermore information on accurate plant monitoring via unmanned aerial vehicles (UAVs) will be shown. However, the application of optical sensors in a practical context in the field is still challenging. Sophisticated data analysis methods have to be developed and results need to be compared to human expert results. In general, the entire system pipeline, consisting of the type of sensor, the platform carrying the sensor, and the decision making process by data analysis has to be tailored to the specific problem and evaluated application-oriented. For this purpose, an experimental field site for testing digital technologies in sugar beet cultivation is currently being established in Göttingen, Germany, called FarmerSpace, funded by the BMEL (https://www.farmerspace.uni-goettingen.de/).