Special Section Guest Editorial: Advanced Image Processing and Applications for Smart Agricultural Systems

Yang Li[a] and Sezai Ercişli[b]
[a]Shihezi University, College of Mechanical and Electrical Engineering, Shihezi, China
[b]Ataturk University, Department of Horticulture, Agricultural Faculty, Erzurum, Turkey

Recently, image processing based on deep learning has developed rapidly and has been successfully applied in the field of smart agriculture. The Special Section on Advanced Image Processing and Applications for Smart Agricultural Systems presents six peer-reviewed articles that focus on several critical issues in smart agriculture.

In the field of pest detection, Li et al. collected a dataset containing 20 categories and 2000 samples, designed a few-shot object detection network based on object pyramid, and received very competitive results in comparative experiments. Zhu, Li, and Hu focused on data utilization efficiency in deep-learning-driven crop pest identification and proposed a new data quality evaluation method based on Mahalanobis distance and entropy to address the problem of lacking labeled data.

In the field of weed detection, Harders et al. evaluated three lightweight deep learning model architectures and tested three different edge computing devices for real-time UAV-based weed detection in horticulture. Ma and Zhang designed a high-information data-centric weed identification system, which can reduce training data usage by 20%, and further improved the accuracy by 4.9%.

In the field of plant leaf counting, Štaka and Mišić focused on *Arabidopsis thaliana* plant leaf counting in the presence of occlusion and proposed a solution including four different convolutional neural network architectures, achieving superior experimental performance.

An object detection and localization algorithm in agricultural scenes was designed by Yang et al., combining monocular vision with deep learning model. Specifically, the UAV images were processed to obtain the attitude angle and GPS information of the target object, and satisfactory speed and accuracy were achieved in experiments.

All these papers show that advanced image processing technology based on deep learning can effectively support the development of relevant applications in the field of smart agriculture and improve the quality and efficiency of agricultural production.

Yang Li received his PhD degree in information and communication engineering from Tianjin University, China. Currently, he is an associate professor with the College of Mechanical and Electrical Engineering, Shihezi University, Shihezi, China. His research interests include machine learning, image processing, edge computing, data quality assessment, and smart applications in precision agriculture. He has published over 50 technical articles on highly ranked international journals, such as IEEE TII, IoT-J, JSTARS, TCSVT, TNSE. His research work has been funded by the National Natural Science Foundation of China. He serves as an active peer reviewer for dozens of flagship journals. He is an associate editor for many reputed international journals, such as *Precision Agriculture, Plant Methods, Data Technologies and Applications*, etc.

Sezai Ercişli is the editor-in-chief of the *Turkish Journal of Agriculture and Forestry.* He received his PhD degree at Ataturk University, Turkey, and then became a visiting scholar at the University of Nebraska. Currently, he is a professor with the Department of Horticulture, Agricultural Faculty of Ataturk University, Turkey. His research interests include smart agriculture, deep learning, plant biotechnology, both in theory and applications. He has published more than 200 technical articles on international peer-reviewed journals. He is on the list of the Stanford's top 2% most highly cited scientists in 2022.