Next-Generation Sensing for Precision Agriculture: Tools and Techniques for the Modern Farm

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Abstract: This tutorial explores the applications of next-generation sensing technologies in precision agriculture. The first part will provide an overview of emerging sensors and sensing techniques used in precision agriculture. The second part will focus on two key technologies: drone-based imaging and millimeter wave (mmWave) sensing. Participants will learn how these technologies enhance modern farming by enabling efficient resource use and promoting sustainable agriculture. This section will cover drone applications like multispectral and thermal imaging, along with advanced image processing methods for crop health assessment and weed management. Additionally, we will explore the use of mmWave sensing for farmland applications. In the final part, the tutorial will include demonstrations of a smart farming application using Node-RED and Grafana, guiding participants in creating data flows and building informative dashboards for agricultural decision-making. By the end of the tutorial, attendees will have a solid understanding of next-generation sensing technologies and practical skills to implement smart farming solutions, contributing to more efficient agricultural practices.

Bio: Jahan Hassan holds a PhD from the University of New South Wales and a Bachelor's degree from Monash University, Australia, both in Computer Science. She is a Senior Lecturer in the School of Engineering and Technology at Central Queensland University and serves as the College of ICT Discipline Leader for ICT foundation discipline. Dr Hassan is an Area Editor for Elsevier's Ad Hoc Networks journal and has guest-edited for IEEE Communications Magazine, Elsevier Ad Hoc Networks, and IEEE Network. She has edited a book on machine learning in drone networks. Her research focuses on civilian applications of drones, IoT, and AI, including leading a grant-funded project on AI-assisted weed management. She is a Senior Member of the IEEE and a Certified Professional Member of ACS. She has received the Dean's Award for Research Excellence, Vice-Chancellor’s Awards in Learning & Teaching, Student Voice Commendations, and conference best paper awards. Dr Hassan champions women in technology, co-chairing the N2Women initiative at IEEE WoWMoM 2024 and chairing the Women in Technology workshop at IEEE ITNAC 2020. She has also served on Technical Program Committees for over 30 international conferences and is a co-chair of the 2024 DroneSense-AI workshop.