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INVITED PAPER:

"Machine Learning Techniques for Smart Agriculture"

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Abstract: We present the research results that are a basis for the integration of hardware devices (sensors and actuators with communication devices, computers, and web servers), databases, machine learning techniques, and related application software. We also describe innovative machine-learning approaches and their potential impact on plant treatment and protection. The scientific and technological challenges are discussed as well.
The developed machine learning techniques assist farmers in making data-driven and rule-based decisions to reduce pesticide use and environmental harm. We merge information coming from the features, variables, and correlations extracted by the machine learning algorithms, together with information generated by the previous knowledge in the existing databases. The final goal is to learn actionable rules that assist the farmer and help the decision-making process. Using an ML framework, we map scenarios and situations (agro-meteorological data, soil characteristics, nutrients, aggregated daily temperature, or features extracted by the knowledge module) to actions (for example, irrigation, a dose of fertilizers or pesticides to apply). The developed models can be used to simulate the interaction with the environment and estimate rewards and the expected value function. The framework integrates the objective data, ML algorithms, and application software which can generate and provide end-user relevant information (in the case of traditional crop protection) or control information for actuators (in the case of automated crop protection).

Short biography:

Dr. Zoran Stamenković is a lecturer at the University of Potsdam, a guest scientist at the IHP GmbH, Frankfurt (Oder), and a visiting professor of the Synopsys Armenia Educational Department. He has published more than 160 scientific papers, and given more than 25 invited talks in the field of design and test of integrated circuits and systems. He is the lead editor and a co-author of the book Silicon Systems for Wireless LAN, the deputy editor-in-chief of the Journal of Circuits, Systems, and Computers, and a senior member of the IEEE.
His research interests include hardware and software for artificial intelligence applications, system-on-chip design, fault-tolerant circuits and systems, and integrated circuit yield and reliability modelling. He serves as a program committee member of many scientific conferences (DDECS, ETS, IOLTS, EWDTS, DTIS, MIEL, and TELFOR). Dr. Stamenković was the general chair of DDECS15 and the program chair of DDECS18 and DDECS20.