Journal of Computer Science and Information Systems,

ISSN 2535-1451

Deep Learning and Metaheuristics for Smart Agriculture Optimization in Potato Crop Management

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Abstract:

In the pursuit of optimizing agricultural practices, smart agriculture leverages advanced technologies to enhance crop management efficiency. This study integrates deep learning and metaheuristic algorithms for the optimization of potato crop management in smart agriculture systems. By combining deep learning models, such as Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs), with metaheuristics like Genetic Algorithms (GA) and Particle Swarm Optimization (PSO), the research aims to develop a comprehensive solution for optimizing irrigation schedules, pest control, nutrient management, and crop yield prediction. IoT sensors are employed to collect real-time data on soil conditions, weather patterns, and plant health, which is then analyzed to inform decision-making processes. Experimental results show that the hybrid approach significantly improves crop yield, reduces resource consumption, and enhances sustainability in potato farming. The proposed methodology offers a data-driven, adaptive solution to address the evolving challenges of modern agriculture.

Keywords:

Deep learning, metaheuristics, smart agriculture, potato crop management, optimization, IoT.

ISSN 2535-1451

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