

IoT-Based Optimization of Smart Water Resource Management Using Machine Learning and Metaheuristics

Nader Behdad, Sofia Arkhstan, Najaad OubeBlika

1. Electrical and Computer Engineering, The Polytechnic University of the Philippines, Manila, 1016, Philippines
2. Department of Computer System, South Ural State University, 454080 Chelyabinsk, Russia
3. Energies Materials and Industrial Engineering Research Center, Faculty of Sciences and Technology, University of Tamanghasset, Tamanrasset, 10034, Algeria

Abstract:

Effective water resource management is critical for achieving sustainability in smart cities, particularly in the face of growing population demands and climate change. This study proposes an IoT-based framework for optimizing water resource management by integrating machine learning algorithms with metaheuristic optimization techniques. Real-time data from IoT sensors—monitoring parameters such as water levels, flow rates, and quality indicators—are processed using machine learning models to predict consumption patterns and detect anomalies. Metaheuristic algorithms, including Genetic Algorithms (GA) and Particle Swarm Optimization (PSO), are employed to dynamically allocate water resources and schedule distribution with maximum efficiency. The proposed system demonstrates improved water usage efficiency, reduced wastage, and enhanced decision-making capabilities for urban water management infrastructures.

Keywords:

IoT, water resource management, machine learning, metaheuristics, smart cities, optimization.

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