

Integration of RF-SVM Hybrid Machine Learning Model and IoT for Water Demand Prediction and Irrigation Automation: A Systematic Literature Review and Future Research

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Abstract:

The administration of water resources in agriculture is significantly hindered by the increasing global demand for food. Consequently, employing hybrid machine learning-based intelligent systems has emerged as a feasible approach for enhanced accuracy and efficacy in water demand forecasting. This study conducts a Systematic Literature Review (SLR) focussing on the Random Forest (RF) and Support Vector Machine (SVM) algorithms, which are commonly utilised in hybrid models, to examine recent research on the application of hybrid machine learning models in water demand prediction. Relevant materials were identified, evaluated, and analysed through the IEEE Xplore, ScienceDirect, SpringerLink, and Google Scholar databases as part of the systematic literature review procedure. The results indicate that the RF-SVM hybrid technique, when integrated with real-time data from Internet of Things (IoT) devices, enhances the accuracy of water demand prediction relative to a standalone model. Data integration, computational complexity, and restricted model interpretability are persistent challenges. The practical application is further impeded by the diversity of environmental data utilised in these studies and the limitations of extensive testing. The study identified potential areas for further research, including the development of more comprehensible and adaptive hybrid models, as well as the integration of data from several sources to enhance prediction accuracy and robustness. This study is expected to provide recommendations for practitioners and researchers on the optimal utilisation of intelligent systems in sustainable agricultural water management.

Keywords:

Intelligent System, Water Demand, Hybrid Machine Learning, Random Forest, Support Vector Machine, Literature Review