

Water Management Analytics: AI-Powered Smart City Water Management Dashboard

Mr. Aniruddha Walavalkar¹, Mr. Labhesh Aiwale², Mr. Rishabh Bade³, Prof. Arjun Kadam⁴

Student, Computer Technology^{1,2,3}

Guide, Computer Technology⁴

Bharati Vidyapeeth Institute of Technology, Kharghar, Navi Mumbai, Maharashtra, India

Abstract: *Efficient water resource management is essential for sustainability, transparency, and operational effectiveness within municipal corporations. Traditional water monitoring systems rely on manual processes and PDF-based annual reports, resulting in delayed responses, inaccurate leakage estimation, and no real-time visibility. Recent advancements in machine learning and cloud computing enable the development of intelligent forecasting platforms. This research presents the Water Management Analytics Dashboard, an AI-powered full-stack smart city water management platform integrating 29 Gradient Boosting Regression models across 27 zones of the Panvel Municipal Corporation. The system is built using React.js, Flask, Python 3.11, and scikit-learn, deployed on Vercel and Render cloud infrastructure. The platform supports secure JWT-based role authentication (Admin and Student roles), 1 to 365-day rolling water supply forecasts, 4-level smart leakage alert classification (CRITICAL/HIGH/MODERATE/NORMAL) with real-time toast and bell notifications, and an interactive multi-chart analytics dashboard. Experimental validation achieves city-level $R^2 = 0.9802$ with $RMSE = 0.0461$ MLD, demonstrating reliable prediction accuracy and 100% match to the official PMC 9.52% leakage benchmark from the IIT Bombay ESR 2024-25.*

Keywords: Smart City Water Analytics, Gradient Boosting Regressor, Flask REST API, React.js Dashboard, JWT Authentication, Rolling Prediction, Leakage Alert Classification, 27 Zones, PMC ESR 2024-25, IIT Bombay, Vercel, Render, Role-Based Access Control, PWA

